Waiting for the Big One: instauration of the risk of Earthquake in the San Francisco Bay Area

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UNIVERSITÉ PARIS-EST

Thèse de doctorat de l'Université Paris-Est
Géographie

Charlotte Cabasse-Mazel

Waiting for the Big One
Instauration of the Earthquake Risk in the San Francisco Bay Area

Thèse dirigée par Valérie November
Soutenue le 6 Janvier 2015

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A Etienne

Method or hyphen, those are soft bridges;
viaduct or bridge, those are hard unions or methods.
Watch: I am constructing a new footbridge;
moving from matter to the sign and from the abstract
to the concrete, I am bridging the hard and the soft. Whether of one
or the other kind, I find bridges everywhere.
Examples: the method of translation mobilizes two grammars
and a bilingual dictionary, it bridges languages;
the method
for producing
living mutation
moves through
genetic
manipulations;
it bridges
organisms
and soon species;
the method
for transmuting
elements passes
through radioactive
decay;
it bridges inert bodies.
Bridging, respectively, languages,
living beings and elements, we bridge, transversely,
the soft empire of signs with the hard realms of physics and biology…
First labour, to build bridges in the hard;
second work, to think of soft bridges. To launch oneself between
the second and the first, the final enterprise. Bridging, in general, becomes
an activity so large that it coincides perhaps with the whole human project, in that
our very body bridges flesh and word.

M. Serres

"It's just that the world becomes so vast, if there is more than one type of existence. And if it is true that we have not exhausted it once we have covered everything within just one of these modes (physical or psychical existence, for example); if it is true that to understand it one needs to encompass it with all that its meanings and values entails; if it is true that at each of its points, the intersection of a determinate network of constitutive relations (such as spatio-temporal ones), then like a portal opening onto anther world, we need to open up a very new grouping of determinations of being: atemporal, non-spatial, subjective perhaps, or qualitative, or virtual, or transcendental. And we must include those in which existence is only grasped as a fleeting and almost unutterable experience, or which demand an enormous intellectual effort to understand what it is they are not yet made of, and which only a more extensive thinking could embrace. If it is even true that it would be necessary to understand the universe in all its complexity, not only to make thought capable of all the multicoloured rays of existence, but of a new white light, a white light which unified them all in the brightness of a superexistence which surpasses all these modes without subverting their reality."

E. Souriau

La conquête de notre propre pensée va de pair avec celle du monde extérieur,
elles sont une seule et même opération .

E. Souriau

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Abstract

The potentiality of disasters forces us to rethink progressive, yet non-linear definitions ("instauration," in Souriau vocabulary) of risk, space, and expertise. Following a symmetrical approach, this work explores several moving dimensions of the subject and space "at risk" in the San Francisco Bay Area, within the shared experience of an epistemic community waiting for a major earthquake - "the Big One" - to unfold. With a Geography, Science and Technologies Studies perspectives, we will look at the complex system of relations that co-construct the risk of earthquakes and the ways in which this successive instauration convene transformations in the making of space, the definition of risk, and finally, the translation of this scientific work into public policies and the figure of the expert.

Drawing from in-depth empirical research of the Bay Area, analyzing the community of "Earthquake Junkies"—as these experts called themselves—and other risk-conscious residents, this work emphasizes the role of experience and emotions in multiple interlaced processes, connecting risk, space, and expertise.

Following this exploration will see that the rigid definition that have separated science and experience, rationality and emotion, expertise and lay perception should be recomposed in favor of a more systematic approach that takes into account the role of the different dimensions of knowledge. As a prospect for a better understanding of the complex definition of risk in the public sphere, this research also proposes a framework to think about the definition of the subject "at risk," as well as allows for reflection on the establishment of closest relation between scientific and non-scientific knowledge.

Key words: risk, earthquake, expertise, instauration.

Résumé

En attendant le “Big One“
l’instauration du risque de tremblement de terre dans la baie de San Francisco.

La possibilité des catastrophes nous oblige à repenser les définitions progressives, non-linéaires ("l’instauration," dans le vocabulaire d’Etienne Souriau) des concepts de risque, d’espace et d’expertise. Suivant une approche symétrique, ce travail explore plusieurs dimensions de l'espace «à risque» dans la Baie de San Francisco, ancrées dans l'expérience partagée d'une communauté épistémique plongée dans l ‘attente d’un séisme majeur - le "Big One." Avec les outils de la géographie et des études des sciences et technologies, nous nous pencherons sur le système complexe de relations qui construisent le risque de tremblements de terre et regarderons la façon dont son instauration progressive entraine des transformations dans l’aménagement et la pratique de l'espace, la définition du risque, et, finalement, dans la figure de l'expert.

A partir d’une recherche empirique approfondie menée dans la baie de San Francisco, l'analyse de la communauté des "Earthquake Junkies" - comme ces experts se présentent eux-mêmes - nous verrons que les différentes existences du tremblement de terre questionnent la séparation rigide entre science et expérience, rationalité et émotion, expertise et savoir profane. En proposant une perspective pragmatique, cette recherche propose également un cadre pour réfléchir à la définition du sujet «à risque ».

Mots clés : risque, tremblement de terre, expertise, instauration.

Résumé Substantiel en Français

Chaque fois qu'elles se produisent, les catastrophes convoquent un kaléidoscope de petits et grands événements, qui engagent humains et non-humains actants, croisant échelles temporelles et spatiales. Après chaque catastrophe, l'ampleur de l'évènement, des tragédies humaines ainsi que le coût financier de la reconstruction dépassent les prédictions et l'imagination des victimes, des observateurs et des experts. Dans le contexte universitaire, risques et catastrophes ont été analysés et étudiés par de nombreuses disciplines qui traversent les champs des sciences humaines, sociales et géophysiques. Cette multiplicité d'approche est accentuée par le fait que cette production scientifique est souvent traduite en pratiques politiques et entretient un dialogue constant avec résidents, consommateurs et citoyens qui sont à la fois les bénéficiaires et les sujets des connaissances scientifiques.

Nous allons examiner ici les opérations de traduction et de médiation nécessaires à la définition du risque du tremblement de terre dans la baie de San Francisco, depuis la reconnaissance des différentes modalités de son existence jusqu'à sa définition scientifique et son implantation (imparfaite et incomplète) en politiques de prévention. Suivant les perspectives théoriques développées par la Géographie et les Sciences Sociales et Techniques, nous intéresserons aux systèmes complexes de relations que le tremblement de terre développe, suivant ses différentes manifestations, non seulement comme un processus géologique mais aussi comme un évènement passé et comme une menace future. Nous verrons que ce grand tremblement de terre à venir, à la fois redouté et attendu, le Big One, est finalement une co-construction du risque et l'expertise.

Cette recherche déploie donc l'horizon de l'événement - le prochain Big One - en fournissant des pistes de réflexion sur un ensemble d'opérations qui se produisent quotidiennement dans la baie de San Francisco. Entre choix résidentiels et représentations des données sur support cartographique, commémorations des évènements passés et définition des probabilités des évènements futurs, ces pratiques s'inscrivent dans un mouvement oscillant entre proximité et distance par rapport à un objet – le tremblement de terre - à la fois scientifique et familier : un mouvement propre à l'expérience quotidienne de la menace que nous avons appelé «en attendant le Big One. »

Nous verrons comment le risque est donc appréhendé comme une expérience collective qui rassemble des experts et non-experts. Pour ce faire, nous avons suivi et interrogé des spécialistes du risque qui sont aussi des habitants de cette zone d'activité sismique et qui « font avec » le risque de tremblement de terre, l'instaurant comme un savoir « hybride, » à la fois scientifique et profane. Définir cette hybridation des connaissances qui instaure le risque ne change pas seulement l'ontologie de l'évènement, ni même la relation entre science et savoir profane, mais touche également à la question de la subjectivité de ces experts, scientifiques et résidents de la Baie de San Francisco.

Pour cela, ce travail s'intéresse aux « Earthquake Junkies, » une communauté auto-définie d'individus profondément impliqués dans la définition et la gestion des risques de tremblement de terre, qui incarne le complexe procédé de distanciation décrit plus haut ; et ce faisant, propose une alternative à la figure canonique de l'expertise: un sujet connaissant, ancré dans son environnement, circulant entre les modalités de connaissance. Bricoleurs amateurs, résidents à temps plein, scientifiques empathiques et citoyens concernés, nous verrons comment les Earthquake Junkies transforment la catégorisation de ces savoirs.

Construit en suivant le principe de symétrie généralisée, ce travail met l'accent sur trois moments importants de l'instauration du risque de tremblement de terre dans la Baie de San Francisco, en commençant par la dimension spatiale, vécue, parcourue, éprouvée du risque de tremblement de terre et en se déplaçant progressivement vers sa construction scientifique et politique. Dans ce contexte, chaque chapitre a été défini comme un moment spécifique d'instauration, de co-construction, menant à une transformation (complète ou incomplète) des actants engagés. Partant de ces points de vue, nous avons utilisé une définition du risque qui prend en considération ses différentes dimensions sémantiques et opérationnelles.

> *1. Risk: an unwanted event which may or may not occur.*
> *2. Risk: the cause of an unwanted event which may or may not occur.*
> *3. Risk: the probability of an unwanted event which may or may not occur.*
> *4. Risk: the statistical expectation value of an unwanted event which may or may not occur.*
> *5. Risk: the fact that a decision is made under conditions of known probabilities ("decision under risk" as opposed to "decision under uncertainty"). (Hansson, 2012)*

Le chapitre, *Première instauration: la définition d'un cadre conceptuel*, se concentre sur les principales ressources théoriques utilisées dans cet examen de l'instauration du risque de tremblement de terre dans la Baie de San Francisco. En partant d'une relecture des définitions successives des concepts de « risque » et de « catastrophe » au cours des dernières décennies, nous avons vu comment ils ont d'abord été traités de façon systémique et inclusive avant d'être morcelés suivant les champs disciplinaires. En suivant une approche pragmatique définie par William James, qui fut le témoin et analyste du tremblement de terre de 1906 à San Francisco, nous verrons comment les différentes dimensions du tremblement de terre, ses différentes existences, peuvent être finalement réarticulées en suivant l'approche développée par la Théorie de l'Acteur Réseau. Une citation de James a été utilisée comme fil conducteur dans cette exploration des modes d'existence du tremblement de terre, qui ne sont pas des régimes distincts et opposés de connaissance, mais pourraient être décrits comme un continuum entre les formes de connaissances légitimes et celles qui le sont moins.

> *For "science," when the tensions in the earth's crust reach the breaking-point, and strata fall into an altered equilibrium, earthquake is simply the collective name of all the cracks and shakings and disturbances that happen. They are the earthquake. But for me the earthquake was the cause of the disturbances, and the perception of it as a living agent was irresistible. It had an overpowering dramatic convincingness. (James, 1906)*

Nous verrons également comment certaines approches en Géographie des risques et des émotions permettent de clarifier ces concepts, offrant une perspective de connaissance située et distribuée et qui définit le risque et les « Earthquake Junkies». Pour tracer ce continuum de définitions, nous avons utilisé le concept d'«instauration», développé par le philosophe français Etienne Souriau et popularisé par Bruno Latour qui en donne la définition suivante :

> *Instauration et la co-construction sont clairement synonymes. Mais le mouvement inverse, de dire d'une œuvre d'art qu'il résulte d'une instauration, est d'obtenir soi-même prêt à voir le potier comme celle qui accueille, rassemble, prépare, explore et invente la forme de l'œuvre, tout comme on découvre ou invente « un trésor.» (Latour, 2011a: 10)*

Partant de l'hypothèse que le risque de tremblement de terre est un objet complexe, et difficile à saisir, le chapitre suivant, *Deuxième instauration, l'insaisissable dimension des risques et catastrophes dans la baie de San Francisco*, interroge la visibilité du risque. En cherchant les traces de tremblements de terre dans le paysage, au travers des souvenirs des résidents de longue date et durant les commémorations du séisme de 1989 et de l'incendie de 1991, nous allons tenter de saisir l'influence de ces existences sur la définition des espace à risques, des pratiques spatiales des résidents et des politiques territoriales des municipalités.

Nous verrons comment ces pratiques et ces espaces ont été dissimulés à plusieurs moments de l'histoire urbaine : De façon intentionnelle après le tremblement de terre de 1906 pour éviter de faire fuir les investissements nécessaires à la reconstruction et de façon plus diffuse ces dernières années. En effet, malgré les récentes campagnes de sensibilisation aux risques de tremblement de terre, le non règlement de la controverse entourant la définition des évènements passés de la région (lié notamment à la question de leur amplitude : sont-ce là vraiment des catastrophes ?) et le manque de reconnaissance de la souffrance des victimes, ont contribué à rendre flous les contours des espaces du risque et à nier la situation particulière des habitants de ces zones sismiques.

En regardant les transformations que la cohabitation avec le risque de tremblements de terre crée dans les pratiques spatiales, ce chapitre s'intéresse donc aux relations entre les dimensions territoriales, patrimoniales et mémorielles de l'habiter des « Earthquake Junkies. » Le croisement des problématiques de l'habiter avec celles de l'expertise n'est pas fortuit et a permis de mettre en évidence l'impact profond de ces évènements sur les scientifiques et les experts, et l'importance de ces expériences qui les situent, les rendent attentifs et les attachent à la fois à un lieu et à un sujet de recherche et/ou d'expertise.

Le chapitre suivant met l'accent sur la diversité des expériences, directes et médiatisées, du risque de tremblement de terre. Dans ce chapitre, *Troisième instauration: vivre avec les risques*, nous nous intéresserons à quelques uns des différents modes d'existence du tremblement de terre, défini ici comme un actant à part entière. Dans ce chapitre, nous allons essayer de comprendre comment, en attendant le Big One, le tremblement de terre existe pour les résidents de la baie de San Francisco.

En regardant les répercussions des grands séismes de ces dernières années (par exemple ceux de Christchurch, Haïti ou Tōhoku) ou les conséquences des petits tremblements de terre locaux, nous verrons comment le risque prend forme dans les récits médiatiques, les images et les conversations véhiculées par les réseaux sociaux ou partagées entre voisins. Ces différentes existences du tremblement de terre nous permettrons d'approcher les dimensions performatives de ces récits dans la construction du risque.

En effet, si le Big One reste à l'horizon du possible, ce sont ces évènements qui contribuent à définir de manière kaléidoscopique son existence. Dans ce chapitre, nous allons nous intéresser à une particularité de la baie de San Francisco, à savoir, la capacité à utiliser les émotions, et ici plus particulièrement l'humour et l'empathie pour distancier la peur. D'une certaine manière, on pourrait argumenter que la compréhension profonde du risque se trouve encapsulée dans cette capacité à rire du Big One. L'humour agit ici comme une mise à distance caractéristique de la capacité des résidents de la région à "faire avec" avec les risques de tremblement de terre.

Le dernier chapitre, *Un plaidoyer pour ne pas laisser de San Francisco s'écrouler,* aborde le travail des Earthquake Junkies au cours des dernières décennies. Prenant le contre pied de Mike Davis, et son texte célèbre, *'Plaidoyer pour laisser bruler Malibu' ('The Case for Letting Malibu burn'* (Davis, 1998)), nous allons voir comment les experts et les scientifiques de la Baie de San Francisco collaborent pour tenter de minimiser les conséquences d'un énorme tremblement de terre. Ce chapitre offre donc une anthropologie de l'instauration du tremblement de terre comme un objet de science, et explore l'hypothèse qu'une amélioration des projets de prévention des risques est possible grâce à la reconnaissance de l'articulation des différentes existences du tremblement de terre, évoquées dans les chapitres précédents.

Dans ce dernier chapitre, nous allons donc voir comment les expériences du terrain et les connaissances scientifiques du tremblement de terre sont intégrées dans un ensemble plus vaste de pratiques scientifiques et de préoccupations politiques qui s'attachent à améliorer la résilience des villes et des résidents. Suivant, une fois encore, les Earthquake Junkies, nous nous attacherons à décrire les opérations nécessaires à la définition d'une carte de risques ainsi que les traductions de ce risque en politiques publiques. Cette partie aborde également la question de la relation avec un public plus large, les habitants des zones à risque, qui reste encore à construire. Dans ce cadre, l'expérience de Parkfield a montré à quel point les processus scientifiques sur le terrain sont en constante relation avec l'éducation et la sensibilisation des habitants, et comment les échecs des premiers, parfois, peuvent aboutir aux succès des secondes.

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Chapter 1
An introduction

In April 2013, after the Tōhoku earthquake had triggered a tsunami that partially destroyed the Fukushima I Nuclear Power Plant, caused the death of 15,884 people, the evacuation of 300,000 others, and a nuclear accident which consequences are still to be clearly determined; the Center for Science, Technology, Medicine, and Society (CSTMS) of the University of California Berkeley hosted "An STS Forum on the East Japan Disaster".[1] A team of scholars[2] felt the urgency to join forces to develop answers drawing from Science and Technology Studies (STS) and think through the unthinkable of disasters at the scale of the Fukushima. The objective of the meeting was to "build a transnational research agenda and community centered on this disaster, and to extend the social scientific and humanistic understanding of disasters and the disaster sciences." ("An STS Forum on the East Japan Disaster - Interdisciplinary conversations about the 2011 Disaster including the Fukushima Dai-ichi nuclear accident," 2013).

For three days, scholars from Japan, Europe and USA tried to find a common language to describe the complexity of the disaster that had been, for all, a deep emotional and intellectual shock. But what resource do scholars have to approach such a catastrophe? How can we deal with the different perspectives, meanings and consequences of what seems at first a single event; but whose ramifications and multiple specificities can easily overcome our capacity of thinking? How useful is the knowledge of past or other disasters to address new ones? While each speaker was presenting his work, it became clear that the Fukushima disaster had multiple *existences*, multiple way of "being into the world", which were hard to reconcile. This apparent incompatibility seemed reinforced by the many ways in which the narration, the stories and the analysis of the event were performed, across disciplinary fields and epistemologies.

[1] http://fukushimaforum.wordpress.com/

[2] Among others, Atsushi Akera Associate Professor and Kim Fortun Professor and Acting Department Head at Rensselaer Polytechnic Institute; Scott Frickel, Associate Professor in the Department of Sociology and Institute for the Study of Environment and Society at Brown University; Scott Knowles Associate Professor; Interim Department Head for History, Drexel University; Cathryn Carson, Associate Professor, Department of History, University of California Berkeley.

1.1. A questioning situation

During the time of my research, I realized that if this discussion is difficult when the disaster has happened, it is also the case before hands, when the disaster is still only a possibility, a probability, and a risk among others that needs to be defined and constructed.

Within their different theoretical framings and methodologies, studies on risk and disaster have always favored strong empirical evidence. Yet, despite the considerable work conducted in an attempt to reduce the impact of disaster on one side, and to understand the ways in which unfolding events can become so dreadful, on the other (Gilbert, 2007; Watts & Bohle, 1993; Wisner, Blaikie, Cannon, & Davis, 2006), disaster still “surprise” many—including professionals—by their violence, and their capacity for destruction and transformation. This earthquake’s resistance to be grasped fully in all of its multidimensional aspects calls for more investigation.

1.1.1. Situated knowledge and multiple perspectives

In the academic context, risk and disaster have been analyzed and studied by many disciplines which cross the fields of humanities (as will see in the next chapter), social and political sciences and earth a sciences; using multi-disciplinary methodologies coming from statistics, computers or engineering sciences, anthropology or all of the above. This multiplicity of perspectives is even complicated by the fact that academic expertise is constantly in discussion with the more operational level of policy making and, sometime also, with lay people, residents, consumers, citizens or concerned groups who are both the beneficiaries and the subjects of scientific knowledge. In addition, as it happened during the “STS Forum on the East Japan Disaster,” each event brings together different level of expertise and narration, situated in the specific time and place.

This difficulty to deploy the complexity of each situation has been, and for several decades now, one of the many research programs tackled by researchers in Sciences and Technology Studies (STS) which can be defined as an "*interdisciplinary field that examines the creation, development, and consequences of science and technology in their cultural, historical, and social contexts"* (Hackett, Amsterdamska, Lynch, & Wajcman, 2008, backcover). In this perspective understanding how knowledge is define and circulate has been one of the central questions of the field, building on what has also been developed previously by Anthropology, as Tim Ingold recalled:

> *A fundamental insight of anthropological studies of learning is that knowledge is not transmitted across generations as a ready-made corpus of information, but rather undergoes continual regeneration in the context of learners' practical engagement with their surroundings. Thus the contribution of each generation make the next lies in shaping the contexts, or providing the scaffolding, within which leaners will develop their own understanding. (Ingold, 2005)*

This mobility of knowledge in the making of Science has been pointed by Hélène Mialet who recalled that Science, as a discipline but also as a narrative, has for long been "concealing" many aspect of its practices, in a effort to present an even – but unrealistic – appearances: *"the assistant are hidden (…), the conversation effaced (…), the memory is re-invented, the mythical account circulate (…)"* (Mialet, 2012a: 4). In the continuity of these researches, the ideal of a scientist "detached" from his environment has been criticized by authors in who had favored the description of a hybrid methodologies, personae and objects (Haraway, 1988; Latour, 1991; Star & Griesemer, 1989) making visible situated knowledge made possible by a network of human and non-human (Houdart & Thiery, 2011) which encapsulate the description of the contexts and processes that make science possible (Houdart, 2008).

Looking at the history of the earthquake sciences, Deborah Coen recalls that, in the nineteenth century, the *"scientific description of an earthquake was built of stories – stories from as many people, in as many different situations, as possible"* (Coen, 2013: 3). To define earthquakes, seismologists used their own perceptions of the event ("How did the earthquake feel?"); and their sense of observation ("What did it produce?"). They also used as many indirect sources as they could, including accounts from the magazines and newspapers, testimonies of other observers, and when available, measurements from scientific equipment.

In seismology, like in many others scientific domains, progress of research in the last century has favored the movement from subjective accounts to instrument produced data, allowing the development of predictive models and the development of probabilistic vision of the earthquake risk. In the process, earthquakes have become more abstract objects of science, defined mainly by complex mathematical operations and modeling. In such context, it could have been expected that scientists and experts working on earthquake risk grow more and more distant from resident experience (Bessy & Chateauraynaud, 1995; Mitchell, 2002). In a *World at Risk*, (to borrow one of Ulrich Beck book's title see Beck, 2008), earthquakes could have finally become like any other ungrounded, immaterial threat. Yet, knowledge about earthquake has remained hybrid and grounded in experience, and this diversity of perspectives is precisely what makes it an object of scientific research.

1.1.2. Making the risk visible

Specialists of earthquakes who are also residents in this active seismic zone continue to frame earthquake risk both as an object of science and one of experience, pursuing a tradition of knowledge making that is now considered "hybridized." For them, all sharing the same risk in the place where they live and work, earthquake are, as they were for seismologist of the past century, phenomenon that *"cannot be comprehended* exactly*"* (Coen, 2013: 8), or need to be understood from different perspectives (James, 1906).

This hybridization of knowledge changes not only the definition of the science and knowledge, but also the subjectivity of experts, scientists and residents living in the Bay Area. For instance, as I have discovered during my field research, some experts and scientists call themselves the Earthquake Junkies, this name given to themselves by a group of individuals deeply involved in the earthquake risk preparedness illustrates how these individuals' relation to the knowledge of the earthquake risk redefines a figure of expertise: a knowing subject, grounded in its environment, circulating between the layers of knowledge(s) that are usually proofed to distinct the scientist, the expert, the lay person or the amateur.

One of this instance of knowledge hybridization happened in 2014, just after the South Napa Earthquake,[3] when Joshua Bloom, a Professor of Astronomy at University of California Berkeley, made the headlines of the local newspaper with an invention tucked into a sandwich box: an homemade, easy to build and cheap early warning system. *"I thought it was silly that every time I closed my laptop, I couldn't get a warning"* (Knobel, 2014), explained Bloom who is an Early Warning Program Beta Tester, and who through this invention, was reviving a modus operandi which usually more associated to amateurs than University Professor.

Figure 1 - "Joshua Bloom's homemade earthquake early warning alarm, in a box from East Bay restaurant Grégoire. Photo: Joshua Bloom" (Knobel, 2014)

In a blog post reflecting on this invention, Bloom recalled that his device uses the latest development of the Early Warning Program which has been sending live alert to test users since 2012: *"In October 2013, I built a prototype earthquake early warning (EEW) device, for less than $110 in parts, for my house that taps into the California Shake Alert system. In the recent 6.0 magnitude quake centered near Napa, we got about 5 seconds warning here at my home in Berkeley, CA, before the shaking began"* (Bloom, 2014). Asked what would be the

[3] The South Napa Valley earthquake was a M.6.0 event that hit the city of Napa, California, August 24, 2014 at 3:20 a.m. local time.

next steps for his invention, Bloom explained that he had placed the device in his kids' classroom and plan to improve his prototype, adding that his kids find the project *"super cool"* (Knobel, 2014). Connecting big science, bricolage and community preparedness Joshua Bloom device is a good example of what an "earthquake junkie" does.

1.1.3. Waiting for the Big One

Waiting for the Big One is an active posture, encapsulating a large set of practices that articulates past, present, and future knowledge at different geographical scales: how memories of past disaster resonate with the risk of future ones, how expert knowledge emerge from past and distant experiences and finally how the invisible threat transforms space, subjectivity, knowledge and politics in and of the Bay Area. This event horizon – the next Big One - provides an important perspectives on a set of operations that happen today, every days, in the Bay Area and which, from residential choices to seismic-mapping activities, from memorialization to projection, define and help bring the potential consequences of an earthquake into existence, into visibility.

We'll see how waiting for the Big One is a collective experience that brings together both experts and non-experts, who collaborate to mobilize residents' attention and concern in a way that, they hope, will limit the damages and causalities. Looking at the many different ways an earthquake exists, not only as a geological process but also as a past and a potential future threat, allows us the ability to unfold the everyday experiences of concerned individuals in the San Francisco Bay Area, and thus provides us a way to see how a preconceived framework of analysis fails to recognized the complexity of "living with risk." Following the many ways in which the earthquake risk is approached by the experts-residents, I will consider the Big One as geographical and historical, and collective and individual, as well as scientifically and empirically made assemblage. Therefore, the earthquake risk, and the understanding of future earthquakes, are the results of co-constructions that vary depending upon the particular situation of the person or persons concerned.

Consequently, this work does not intend to measure, or even describe, the public's understanding of earthquakes in the Bay Area. Rather, it seeks to describe the emergence, the “instauration,” of the earthquake as an object of science for the scientific community; as an object of concern for residents; and as a motive for action for risk managers and its consequence in the shaping of a specific place: the Bay Area of San Francisco. How do experts of the earthquake risk themselves, most of them living in the Bay Area, live and work with this threat of the “the Big One” as a possible horizon? How do they combine scientific knowledge with their personal experiences, as residents of the Bay Area living in an actual major seismic zone?

1.2. Thinking with disaster

The attention of examining the multiple, and what seems to be increasingly complex impact of disasters, and the challenges they make visible for large metropolitan areas, is not recent. One of the most famous historical examples is the 1755 Lisbon earthquake, which had a considerable influence on the emergence of scientific knowledge. It transformed the social, philosophical, and metaphysical paradigms of the time, marking—for some—the beginning of the European Enlightenment (Amador, 2004; Coen, 2013; Dynes, 1997; Favier & Granet-Abisset, 2009; Fressoz, 2012; Quenet, 2005; Walter, 2008). Gilles Deleuze recalled the importance of the Lisbon earthquake, which he stated, had an impact on intellectual and metaphysical framing, equivalent to the Holocaust in the twentieth century:

> *It is very curious that in the eighteenth century, it is the Lisbon earthquake which assumes something like that, when across Europe people said: how is it still possible to maintain a certain optimism founded on God? You see, after Auschwitz raised the question: how it is possible to maintain a fading optimism about human reason. After the Lisbon earthquake, how is it possible to maintain the fading belief of rationality in divine origin?*[4] *(My translation, Deleuze, 1987)*

In the twenty-first century, large-sized earthquakes continue to provoke shifts, having us question certain "modernist" categories that we inherited from the Enlightenment. They also force us to face the human capacity to deal with and respond to such events. As French Geographer Michel Lussault observed during the aftermath of the 2004 Indian Ocean Tsunami, when engaged with destructive events, thinking becomes complicated by the influx of overwhelming information that seems incompatible with science's need for impartiality and objectivity:

[4] "*Il est très curieux que au dix-huitième siècle, ce soit le tremblement de terre de Lisbonne qui assume quelque chose de cela, où toute l'Europe s'est dite: comment est-il encore possible de maintenir un certain optimisme fondé sur Dieu. Vous voyez, après Auschwitz retentit la question : comment est-il possible de maintenir le moindre optimisme sur ce qu'est la raison humaine. Après le tremblement de terre de Lisbonne, comment est-il possible de maintenir la moindre croyance en une rationalité d'origine divine?* " (Deleuze, 1987)

> *Soon, emotion facing what appeared as incomparable tragedies became global. […] The extension at the scale of the globe of the rumors of the disaster came together with the diffusion of a spectacular dramaturgy associating narratives, pictures of professional and amateurs, more or less scientific description of the tsunami and its consequences, anticipation discourses on the conceivable future replicas of such phenomena.*[5] *(My translation, Lussault, 2007: 15)*

Since the Indian Ocean Earthquake and Tsunami, other major disasters, including a great number of earthquakes, have not only deeply transformed the actual space that they impacted but also the world around them. Among others, they include Hurricane Katrina in 2005, the Haiti Earthquake in 2008, the Christchurch Earthquake, and the Tōhoku Earthquake, Tsunami, and nuclear disaster of 2011, just to name a few.

These events have raised concerns about the capacity for individuals and collectivity to face the disaster, to cope with the aftermath, and to remain resilient. They have also shown that disasters do not respect borders; they are not limited to only one space, one political context, or for the researcher, one academic discipline. Because of their incredible power, they can also change larger understandings of epistemologies and metaphysics, and they have done exactly this in the past. Each time they occur, disasters convene a kaleidoscope of both micro- and macro-events, which then engage both human and non-human agents at different scales and times. After each occurrence, the shock provoked by the violence of a disaster, including the tragedies of lives disrupted or ended, the financial cost of the destruction, and the amount of time, energy, and money needed to return to "normal," surpass the predictions and often even the imagination of victims, observers, and researchers. More often than not, the consequences of such large events last for decades, both visible in the urban landscape, but also alive in people's memories. Each disaster leaves it own trace, but each time, the tribute paid is the same: destruction, loss, and grief.

This *"sudden emergence of environmental issues on the political agenda [… and] the multiplication of tangled objects, which can no longer be confined to the natural world or naturalized by anyone"* (Latour, 2004, as quoted by November et al., 2009: 195) has pushed researchers to redress the question raised by risk and disaster (Collectif, 2008a, 2008b), reconnecting, for some, with the field of early "Disasters Studies" (E L Quarantelli, 1999; E.L.

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[5] *"Rapidement, l'émotion face a ce qui apparut comme une tragédie incomparable devint mondiale (...) La dilatation à l'échelle du globe et l'écho de la catastrophe s'accompagna de la diffusion d'une dramaturgie spectaculaire, associant des récits, des images de professionnels et d'amateurs, des descriptions plus ou moins scientifiques du tsunami et de ses conséquences, des discours d'anticipation sur les future répliques envisageables d'un tel phénomène."* (Lussault, 2007: 15)

Quarantelli & Perry, 2005a; Tierney, 1994). Historians have for long shown how the Industrial Revolution created both the conditions for the creation of innovative technologies designed to reduce risk, and the narratives that denied the materiality of these conditions to support the idea of "progress" (Favier & Granet-Abisset, 2009; J. Fressoz, 2012).[6] In so doing, industrialization, urbanization, and modern life have created the conditions of their own vulnerabilities (Beck, 2009; Lagadec, 1987).

In more recent years, experts and lay people alike have also come to question the horizon of a world without disaster, as well as the place that disasters take in our lives (Dupuy, 2002; Latour, 2013; Neyrat, 2008; Serres, 2009; Stengers, 2009). Acknowledging that the balance between dangers and safety precautions is constantly renegotiated in contemporary societies (Lupton, 1999a, 1999b; Wiener & Rogers, 2002; Wiener, 2010), researchers have also emphasized the role of expertise in the definition of such concepts (Callon, Lascoumes, & Barthe, 2009; Haas, 1992). Here, questions related to the threat of potential disasters – coming together under the concept of "risk" – have become an extensive field of research. In this field, the seminal work of Ulrich Beck (Beck, 1992) has been both celebrated and criticized (Lash, Szerszynski, & Wynne, 1998; Bourg, Joly, & Kaufmann, 2013; Latour, 2004).

Building on these perspectives, I will use a definition of risk that takes into consideration the different semantically and operative dimensions of the concept of risk. Five of these seem particularly important since they are widely used across disciplines. The Stanford Encyclopedia of Philosophy provides the following definition:

> *1. Risk: an unwanted event which may or may not occur.*
> *2. Risk: the cause of an unwanted event which may or may not occur.*
> *3. Risk: the probability of an unwanted event which may or may not occur.*
> *4. Risk: the statistical expectation value of an unwanted event which may or may not occur.*

[6] Douglas pointed out: *"Risk has largely replaced older ideas about the cause of the misfortune. Concepts such as sin, which were once used to provide explanation for misfortune, are now discredited. In their place, is the 'modern, sanitized discourse of risk' which 'is all we have for making bridges between the known facts of the existence and the construction of a moral community (…) Indeed, risk provides secular terms for rewriting scripture: not the sins of the fathers, but the risks unleashed by the fathers are visited on the heads of their children, even on the nth generation"* (Douglas 1992: 26; as quoted by Lupton, 1999: 47).

> *5. Risk: the fact that a decision is made under conditions of known probabilities ("decision under risk" as opposed to "decision under uncertainty"). (Hansson, 2012)*

Moving from the threat to the actual disaster, anthropologist have looked at past events (Clavandier, 2004; Henry, 2005; S. M. Hoffman & Oliver-Smith, 2002; S. Hoffman, 1994; Langumier, 2008a; Revet, 2007) and everyday risks (Tulloch & Lupton, 2003). From the perspective of the social sciences, some of the most important trends have questioned the intersection between risk, regulation, and governance (Borraz, 2008; Cabane, 2012; Jasanoff, 1986, 2010); technological responsibility (Clark, 2006; Demuth, 2002; Jonas, 1995); and questions related to alerts, vulnerabilities, and the environment (Burton, Kates, & Whites, 1993; Charvolin, 1997; Creton-Cazanave, 2010; D'Ercole, Gluski, Hardy, & Sierra, 2009; Gralepois, 2008; Hoffman, 1998; Miller et al., 2010; Pelling, 2003; Reghezza-Zitt, 2013; Watts & Bohle, 1993). Adding on the previous definition, researchers today generally acknowledge that *"disasters come into existence in both the material and the social world and perhaps, in some hybrid space between them"* (Oliver-Smith & Hoffman, 1999: 24).

1.3. Methodology: looking for the Big One

Looking at the everyday existences of the earthquake, this work will show how a group of concerned individuals have manage to navigate through the different existence of the earthquake and successfully gather residents attention around the necessity of disaster preparedness. To do so, we will combine the result of an extensive field research among earthquake experts, scientists and concerned residents of the Bay Area, and use a conceptual framework that takes into consideration the condition in which science, expertise and concerned attention are produced, becoming a transformative and performative agent.

1.3.1. About the actant, agency and action

This work brings light one the processes that have conducted to what could be described as a network of risk awareness across the Bay Area of San Francisco. To approach this complexity, we will focus on the relationships between human and non-human agents that come into play during large-sized earthquake, unfolding an anthropological investigation among the mode of existence, or ontologies, of the earthquake: what people (experts, scientists and residents) do between two Big Ones in a situation that could be described as "waiting for the Big One".[7]

[7] As in the Latin prefix *ad* which in English means "to," or "toward," and which formed worlds like 'attention 'in French—translated in wait for in English—and attachment, which are important in the work of earthquake risk construction. Attention to the density of experience of living with the risk, but also attachment to the ways in which this particular existence of the risk has been constructed through time.

1.3.1.1. Defining a sample for interview

I have chosen to focus on people locally engaged in the earthquake risk preparedness who are also residents of the Bay Area.[8] Many interviewees do, in fact, overlap in more than just one category, being both earthquake experts and also long-time residents of the Bay Area who had dealt with previous local disasters. The insights of these rather understudied categories of actors are, for this reason, unique in the field of Risk and Disasters Studies. In building this sample, I have also tried to interview individuals whose professional activities have situated them at different temporal stages of an unfolding earthquake event. From the geological and mechanical dimensions of the phenomenon, to the questions it poses to structural engineers monitoring buildings and policy analysts crafting regulations, to first responders dealing with a catastrophe.

Finally I have also focused on representatives of the Bay Area Earthquake Alliance, an organization that brings together the major actors of earthquake-risk prevention: the California Emergency Management Agency (Calema), Association of Bay Area Government, California Geological Survey, California Seismic Commission, Berkeley Seismological Lab, Earthquake Engineering Research Center, and the American Red Cross. Along with these major actors, I also interviewed city officials from the cities of Oakland, Berkeley, and San Francisco; urban planners and architects in charge of the reconstruction of Oakland after the Loma Prieta Earthquake; and independent researchers and lobbyists dedicated to the cause of earthquake safety in local, state, and national arenas. I have also interviewed grassroots associations, which often had a different perspective on ideas concerning risk and disaster community management. They spoke for the ones who are not heard in this research: the most fragile and vulnerable populations for whom these organizations are geared.

To guarantee diversity when it came to the varied experiences of the individuals discussing earthquakes, I identified four categories that reflect the dominant type of relationship that people have established with the question of earthquake risk. After some interviews with

8 To the exclusion of the insurance and actuarial sector, which is covered by other, ongoing researches (Johnson, 2011).

residents with no particular interest in, or experience of earthquake risks,[9] I chose to reframe the focus on people who have, in a way or another engaged with the risk of earthquake.

The first category that is represented is the scientists and researchers who have contributed to the creation of knowledge and the production of data. Here again, they come from different backgrounds. I attempted to cover all of the connection points regarding the phenomena of earthquakes: geophysicists, seismologists, computational engineers, architects, public scientists, geographers, structural engineers, and urban planners. They all work to produce different types of data, and over the last few decades, some of them have taken their roles as spokespeople regarding earthquake risk very seriously, advocating for the improvement of infrastructure for better safety, as well as a more active engagement from the general public in risk preparedness.

People who had personal experiences of disasters comprise the second group of interviewees. These are people who care and are concerned about earthquakes, but have no professional training in this area. In this category, I also interviewed people who had lost their homes during the 1991 Oakland Fire. The question of the integration of their testimonies, which follow the questionnaire (in Appendix A of this dissertation), was important in the spectrum of voices heard for this research. The recollection of this massive, yet geographically limited disaster provide an important perspective regarding the questions of loss, resilience, and (re-) construction of a space of risk and disaster that has elapsed through the decades.

To this typology we could add a third category, which concerns the media, composed of writers, journalists, essayists, some of them quite polemical, who have taken on the issue of earthquakes, or natural disasters more generally, in various publications and broadcasts. They form a very disparate aggregate—people with different backgrounds and interests, and very different perspectives on the question of California natural disasters. Their contributions to the debate are important, as they can solidify some common views about the questions I address here.

[9] This last category is less represented than the other, since it seems that the lack of interest in the question produced less interesting results for our specific research.

1.3.1.2. Following the actants

In the tradition of Actor Network Theory (ANT), I have learned how to "follow" the actants. Following the strings of thoughts, events, practices and objects that define the earthquake to come (Latour, 1988), this research will be looking for material and immaterial evidence to construct, or instaure, the existence of the earthquake risk in the San Francisco Bay Area.

This work follows the anthropological approach of semi-directive interviews. In order to collect material for this research, I contacted 65 people and conducted 34 extensive interviews—most of them lasting for several hours. Having people switch between their professional and their personal experiences was not always easy: three interviewees clearly expressed their disapproval over asking personal questions. However, most of the interviewees did not have much difficulty slipping between personal and professional accounts, acknowledging, often even before I broached the subject, the open secret of the permeable frontier between hard science and personal experience.

The line of my questioning was focused in several directions. The first was to get at the definitions of key concepts, such as the terms "risk" and "disaster." Second, a large part of any interview concerned the relationship that the interviewee maintained with a pre-defined concept applied to earthquake risk in the Bay Area. A third part of the questioning looked at their relationship with other important stakeholders and the ways in which that person engaged with them. The respondent was then asked about the territorial consequences of living with earthquake risk. Finally, we discussed his (or her) own personal experiences with one or more disasters.

In order to maintain confidentiality, the interviewees' full names are not disclosed in this dissertation. However, in Appendix A, each interviewee's code can be found, along with their job title, place of residence, and the date that the personal communication took place. This field research was also completed by reading the grey literature on the subject, thanks to the help of the librarians at the Pacific Earthquake and Engineering Resource Center Library on the University of California, Berkeley campus.

1.3.1.3. A word about the position of the researcher

As a resident of the Bay Area since 2008, I have been embracing my field research fully, so much so that I now call this region “home.” Living in the East Bay of San Francisco Bay Area day by day, playing a part in its urban environment, I have known that my family and I, have never been farther than 500 meters from the Hayward Fault. In a sense, one could say that I have been conducting long participatory observation over the course of these years. Yet, to leave it at that neglects the fact that I, like all other residents, have had to make decisions and evaluate earthquake risks for my family and myself.

Our first rented apartment was located in the Berkeley Hills: a large un-retrofitted three-story building planted on the hillside, surrounded by large trees, with only one wining road to access and a stunning view on the Golden Gate Bridge. I experienced my first earthquake in this house, and this is also where my son was born in 2010. But while doing interviews for this research, I learnt that 1. hillside houses had been responsible for most of the casualties in Los Angeles during the 1994 Northridge earthquake (Von Winterfieldt, Roselund, & Kisuse, 2000) and 2. that most of the casualties during the 1991 fire happened because of a traffic congestion in the very narrow road of the Oakland Hills: people were trapped in their car when the fire reached them. In addition of living in an unsafe house, in a fire hazard prone area, it happened that my son’s first preschool classroom was in a 1950s building basement, with concrete walls 20 meters high…

As local residents, we had to adapt to the extreme tightening of the rental market, and as parents, adjust to the cost of private, early-childhood education.[10] Over time, and after some very dark thoughts, nightmares and cold sweats at drop off; I started to talk to the teachers and alerted the school about the dangers of an un-retrofitted building. The teachers themselves were feeling unsecured in the building and the School Board took the matter seriously enough to decide to carry out a certain amount of retrofitting work. We eventually moved to a less hilly place in a retrofitted house.

While I was interviewing respondents, and reading about the earthquake risk, it occurred to me that these mundane decisions (where to live, which school to choose, how to travel) where never studied and thought together with more academic approaches of the

[10] There are virtually no public early childhood education (before age 5) alternatives in the Bay Area.

earthquake risk. In the Bay Area, scientists and experts were never to be residents, parents, and commuters. But very soon, the first interviews that I conducted among earthquake-risk experts revealed more than classic socio-technical associations. I found myself dealing with a material that had no evident "place" within the corpus of social science research. For example, I was left wondering how best to incorporate the emotions of a Building Inspector as she revealed her Post-Traumatic Stress Disorder Syndrome (PTSD) after being commissioned to evaluate the damage of houses destroyed during the Northridge Earthquake, in which residents had perished. And how much should I include of a U.C. Berkeley architecture Professor crying at the memory of her lost home, destroyed in the 1991 Oakland Fire?

Did these elements really have no place in a study of risk and disaster in the Bay Area? As I pursued my field research, it became clearer that the subjective dimensions of risk should be not be hidden in this work, but instead, that they should be taken seriously and fully into consideration in my study. By this I mean that they should not be discussed as "irrational" perceptions or emotions, but should rather, thought of as actants, in the ANT sense. For disaster experts and residents in the Bay Area, living with risk and facing the possibility of a disaster is something that happens not only to others: the same fears and preparatory measures occur in their own homes, as well.

As someone who had long worked as journalist before embarking on this dissertation project, I have always been curious about people's stories. As someone engaging with Social Sciences, I was interested to discover how stories are in a constant relationship with specific spaces, being influenced by a certain environment, and in return, how that environment shapes these stories. The research for my master's thesis, which I conducted in the city of Johannesburg, South Africa in 2002, questioned the reminiscences of a mixed, culturally vibrant area, known as Sophiatown, 50 years after its destruction by apartheid. In that work, I was interested to look at how memories of place and space had survived the forced residential relocation to Soweto, and the brutality of decades of apartheid discrimination, to be brought to life again by a new generation of urban planners eager to rebuild the post-apartheid city. In the years that followed, I have worked in other traumatized locales such as Kabul, Afghanistan; Banda Aceh, Indonesia; and Beirut, Lebanon. Each time, I was struck by the power of destruction, but also the "invisible presence" of the past city, still vivid in residents' memories and daily, cultural practices.

Based on my anthropological work on risk-aware residents and experts, this field research was designed to understand the different, and mostly invisible, existences of earthquake risks and the influence of these existences on experts' practices. I have not chosen between realism and constructivism, but have taken both the irreducibility of the materiality of tectonic-plate movement and the importance of the various narrations about it seriously, all in order to instaure these risks. Thus, following these threads, this work evolved in two ways, as the field research not only validated or invalidated hypotheses but also demanded an encompassing theoretical framework that could support the diversity and the eclecticism of this study's full results. In this sense, this work is also an instauration.

1.3.2. Paying attention to the process of instauration

Working along the lines of both emotion and science, taking the materiality of the soft spots seriously, the experts that I have met during this research are like those who have been described elsewhere as the figure of the "amateur" (Gomart & Hennion, 1999; a. Hennion, 2007; A. Hennion, 2004): a person that possesses certain technological or scientific literacy (Chavrolin, 2013; Flichy, 2008; Greenberg, 2010; Haring, 2006) but, most important, who pays attention to several mode of existence - or several ontologies - of the risk and show a deep attachment of to idea of making the Bay Area resilient to the forthcoming manifestation of earthquakes.

If earthquakes are not the same "objects" for scientists today than they were for seismologists 50 years ago, they are also becoming a different entity when taking into consideration the potential damage of the earthquake to come, the fault mechanism that triggers the movement, the ensemble of calculation that has conducted to the probabilities evocated earlier, the way people live with an active seismic fault, or the memory of past events. Earthquakes and the risk they represent are never completely predefined. Instead, they have a changing definition that is the result of their complex trajectory – from the moment of recognition, to being identified, and then potentially to be prevented. To capture what it means to be waiting for the Big One, this work will focus on three moments of the definition of the earthquake risk in the Bay area of San Francisco. As will see the earthquake is many "things" at the same time: a past or a future event, a distant or close phenomenon, an object of science, worries and joke, a geophysical process with some agency on its own, etc.

Looking at the moment when the urgency to understand is not so pressing, before the disaster happens, when it is still a risk, invisible but present, is a good starting point. To do so, we will focus on relations between human and non-human actants of course, but within these categories on the relations between different "modes of existences" that take into account the diversity of experience that we try to capture. Indeed, time and space between earthquakes are populated by policy-making, thoughts, feelings, remembrances, anticipations, and speculations that define a specific aspect of the risk ontologies and its estimated threat by scientists, experts and residents.

Souriau's concept of instauration, which is widely used in the present work, allows for the coexistence of these socio-technical assemblages - which also have been studied by STS scholars – along with other form of "existences." In this context, instauration is an action of doubling: experts neither create earthquake risk nor does this risk create an expert, but it is the "oscillation" (Latour, 2013: 166) between the agents that creates both the earthquake risk as well as the resident "at risk" and the scientific expertise that defines them. Taking into account these relations, experts and concerned residents of the Bay Area need to "instaure" the risk of earthquakes, which lead to a transformation of the territory, but also the categories of knowledge and expertise (Chateauraynaud, 2008), in the sense define by Latour and Stengers':[11]

> *Instauration, in this case, designates the experimental schemes, the active preparation of observation, the production of facts, endowed with the power of showing whether the form realized by the arrangement is able to catch it, or not. (My translation; Stengers and Latour, 2009: 17)*[12]

[11] As Latour explained, making science and making art are actually comparable activities: *"What fascinates Souriau about art (and what fascinates me about the laboratory), is the doing of making [le faire faire], the making exist, or in other words the replication and redundancy. It is the artist (or researcher) bouncing off the action and the reception of the work (or the autonomy of the fact)"* (Latour, 2011:9).

[12] *"Instauration, dans ce cas, désigne les dispositifs expérimentaux, la préparation active de l'observation, la production de faits dotés du pouvoir de montrer si la forme réalisée par un dispositif est ou non apte à les saisir"* (Stengers and Latour, 2009: 17).

To this concept of instauration, we will add the concepts of distance (distanciation) and space (spatialization) via ANT perspective to make visible the transformations created by the various ways in which the earthquake is instaured. Creating a conceptual framework that connected key notions of geography (space, scale, territory, distance, but also dwelling and remembering), studies of risk (vulnerability, resilience, and hazards), and STS (translation, mediation, and networks) these researches traced the dynamic emergence - or disappearance - of risk.

1.4. Framing the field research

A non-spatialized risk is an abstract threat, as much as space without any risks - which would be like a base map - remains an object of fiction, an imagined territory that bares few correspondences with the materiality of what make space (November, Camacho-Hübner, & Latour, 2010). In the other hand, anticipating a disaster is a complex operation which includes the capacity to organize various forms of knowledge, temporalities, and spatial dimensions (November, 2008, 2011).

1.4.1. The space of the question

My field research, localized in the Bay Area of San Francisco, in the state of California, on the West Coast of the United States, seeks to understand how the possible displacement of two massive tectonic plates along the Pacific Rim could becoming "the Big One," the next large size earthquake, a large-scale scientific and social event, both feared and awaited and yet so far, invisible. In the past, other earthquakes have also been named "Big One": the M6.8 1868 Hayward earthquake was, for instance, a "Big One" before being dethroned by the M7.8 1906 San Francisco earthquake. The most recent one, however, the M6.0 2014 South Napa Earthquake that hit American Canyon in the North of the San Francisco Bay Area, was never considered big enough to qualify for the name, despite the large amount of damage.[13]

[13] 613 building have been inspected after the earthquake, 133 of them were red flagged and 500 others were yellow tagged. According to an early estimation by USGS, the amount of damage could be as high as 1$ dollars. (Wikipedia, n.d.-a)

Figure 2 - A woman checks the damages of a house near downtown Napa the day after the earthquake. (Xia & Rong-Gong, 2014)

Being a resident of the Bay Area implies to be confronted to the eruption of risk in the everyday but also to ask the question of how to “deal with” the earthquake and to “dwell,” in an unstable a built environment (Breviglieri, 2006; Lazzarotti, 2006; Paquot, Lussalut, & Younes, 2007; Stock, 2004). As will see, risk transforms the space in many ways that are often hard to articulate. November has argued that, indeed, most studies on risk, “*address […] only one facet of the relationship between risk and territory, since they fail to take into account the way in which the risks themselves help to transform spaces*” (November, 2008: 1523).

Building on corpus that has shown how risk and space co-construct one another in a reflective movement, November recalled that *“studies clearly show that the relationship between risk and territory is highly complex, and that only a detailed analysis of local areas and contexts can help us to understand risks”* (November, 2008). Looking for the traces, the footprints of the risk (November, Penelas, & Viot, 2009), we will deploy the dynamic understanding of the spatiality of risk (November et al., 2010; November, 2002, 2004, 2008, 2011), looking for stories that both recall the event and redefine the place (Imaoka, 2013; Lamy, 2007); emotions (Bondi, 2005; Davidson, Bondi, & Smith, 2005; Thien, 2005a) that shape the everyday practices of space (Anderson & Harrison, 2010; de Certeau, 1988), but also the scientific and urban project that define the specificity of the Bay Area (Lévy & Lussault, 2000).

1.4.1. The earthquake risk in the Bay Area

In and around the Pacific Ocean, the junction of the Pacific plate with others plates (North American plate, the Cocos plate, Juan de Fuca plate, Nazca plate, Antarctic plate, Australian plate, Filipino plate) creates a very active seismic zone, commonly called the “Ring of Fire.” As the following map shows—designed by compiling available earthquake data from 2150 B.C. — the West Coast of the United Sates is particularly concerned by the possibility of large-scale disasters caused by earthquakes.[14]

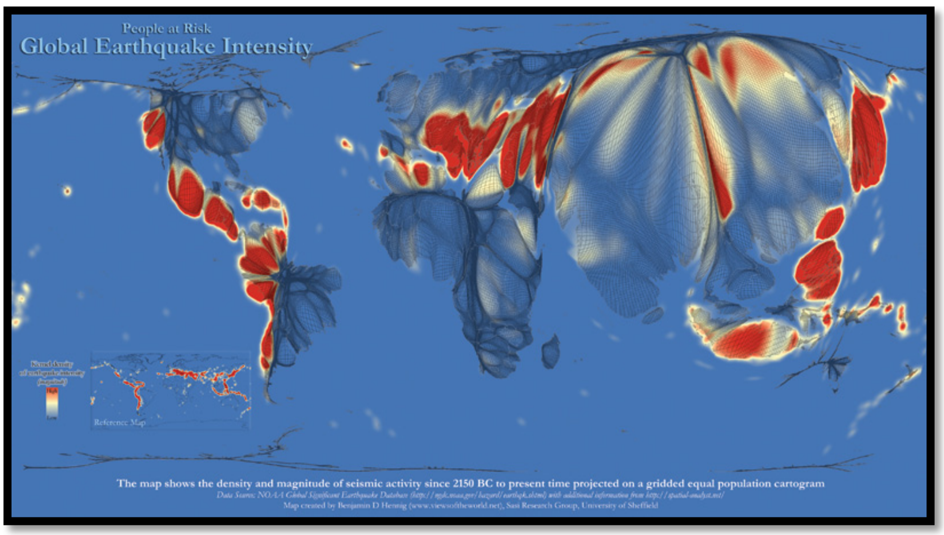

Figure 3 - Population at exposed at risk of earthquake. (Henning, 2011)

Seismology and the earth sciences have only had partial answers about the complex mechanism that trigger an earthquake, and these are still largely informed by empirical studies of past earthquakes. Between 1956 and 1967, the recognition by the earth science community of the theory regarding tectonic plates (Frankel, 2012) proved that earthquakes are the result of movement created by the accumulation of energy in the always-moving earth’s crust. While at the end of 1960s seismologists promised to end earthquake risks,

[14] *“The resulting map gives each person living on earth the same amount of space while also preserving the geographical reference. This map allows to understand the earthquake intensity in relation to today’s population distribution, and thus gives an idea of where most people are of risk related to seismic activity”* (Henning, 2011).

thanks in part to the “Dilatancy-Diffusion Hypothesis” prediction[15] - a research conducted mainly in laboratory - the results were so inconclusive that the hypothesis had to be cut short, jeopardizing the credibility of the scientific community as it pertained to this topic.

Since the early 1980s, however, a new consensus has been reached based on probabilistic methodology, which established the probability of a magnitude 7.0 earthquake in the next thirty years at 63% (Hutchings, Mieler, & Brechwald, 2013). As a consequence, the estimated 7.88 million people living in the Bay Area have been designated “at risk” (Kircher, et al., 2006; Perkins, et al., 2006; USGS, 1999). The earthquake risk takes into consideration the intensity of ground motion in different locations of the Bay Area – as shown on the following map. The red and light pink parts of the map are the locations where the ground motion is expected to be the strongest.

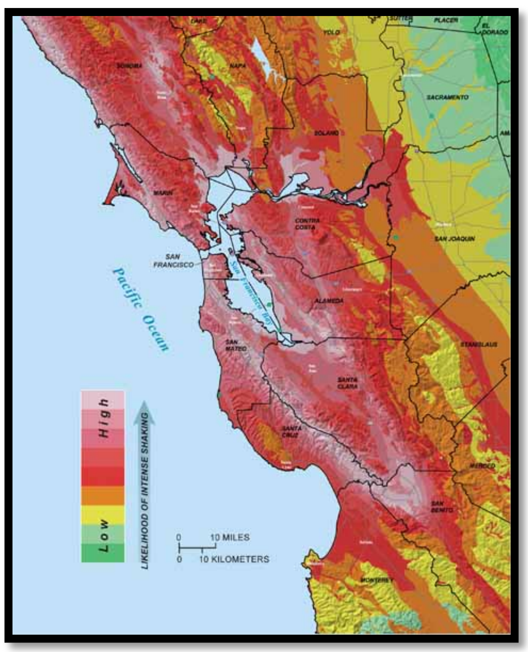

Figure 4 - Probabilistic Seismic Hazard Map. (USGS, n.d.-c)

Confirming experts’ concerns, several faults have been discovered along the West Coast of the United States in the last few decades. Further, researchers have emphasized that faults

15 *“The dilatancy–diffusion hypothesis was one of the first attempts to predict the form of potential geophysical signals that may precede earthquakes, and hence provide a possible physical basis for earthquake prediction. The basic hypothesis has stood up well in the laboratory, where catastrophic failure of intact rocks has been observed to be associated with geophysical signals associated both with dilatancy and pore pressure changes. In contrast, the precursors invoked to determine the predicted earthquake time and event magnitude have not stood up to independent scrutiny”* (Main, Bell, Meredith, Geiger, & Touati, 2012).

should not be described alone, but a rather as part of systems of "sisters faults."[16] For example, in the Bay Area, the San Andreas Fault system, includes two faults: the North and South Hayward Faults (seen in turquoise in the following map), which run through the East Bay, from Richmond to San Jose; and the one along the Pacific Ocean, the well-known San Andrea Fault (in dark and light red), that runs on and off shore in Marin County in the north, and San Francisco and the San Francisco Peninsula in the south.

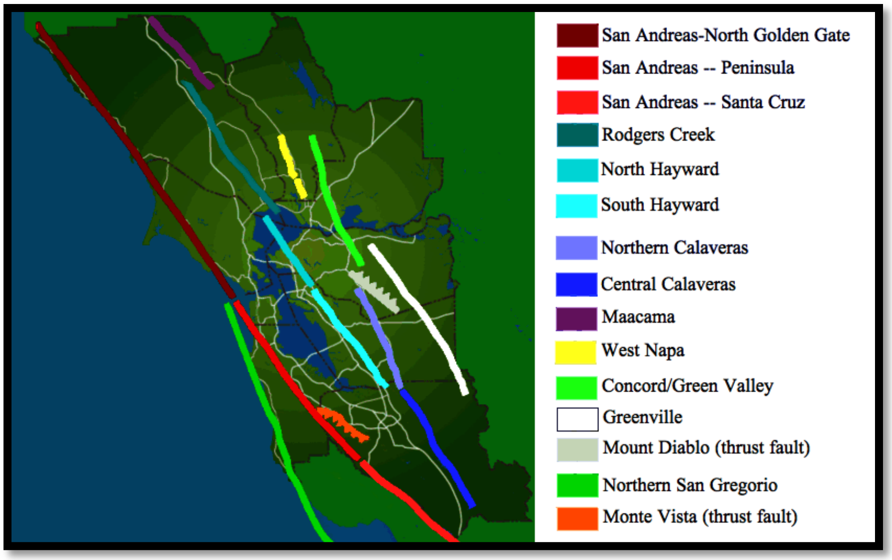

Figure 5 - Actives faults in the Bay Area. (Wikipedia, n.d.-b)

In the twentieth century, residents of the Bay Area have experienced several earthquakes and disasters, the most dramatic of them being the 1906 Earthquake and the subsequent fire that burned almost all of San Francisco. What has been called the *Great San Francisco Earthquake* occurred on April 18, 1906, and despite controversies, it is still considered one of the worst natural disasters in the history of the United States. Out of a population of 410,000 persons, 3,000 people lost their lives in this fire, and about 300,000 were left homeless. In 2009 dollars, the damages are estimated at $8.2 billion.

At the end of the century, seismic activity again put a heavy strain on residents. Two earthquakes hit California and affected the Bay Area: the Loma Prieta Earthquake in 1989, and in 1994 - albeit to a lesser extent - the Northridge Earthquake which hit mostly Southern California. The M.6.9 Loma Pieta Earthquake occurred on October 17, 1991,

[16] According to the United States Geological Survey (USGS), faults are, *"planes of weakness in the earth's crust where one side has moved relative to the other. They are recognized and mapped by sheared and displaced rock units and by the distinctive landforms created by repeated rupture of the earth's surface"* (Department of Conservation, n.d.).

causing 63 deaths and 3,757 injuries. The loss in property damage is estimated between six and eight billion dollars. The consequences of the M.6.7 Northridge Earthquake were more significant because of its epicenter, around the San Fernando Valley, next to city limits of Los Angeles. The earthquake was responsible for 33 deaths and over 8,000 injuries. The damage is estimated at over $20 billion.

Although it does not have a connection with the seismic activity in the region, another event needs to be mentioned, which has contributed to the local comprehension of “what is a disaster.”[17] In 1991, a large fire, caused by years of drought, ravaged the Oakland Hills on the east side of the Bay Area (known as the “East Bay”). The Oakland Fire happened during an Indian summer, beginning on October 20. It killed 25 people, burned 3,354 single-family units and 437 apartments, destroyed 6,302 km of hillside construction and economic loss has been estimated at $1.5 billion. This event stirred up painful memories of the consequences of the 1906 San Francisco Earthquake and represented, at the scale of the region, a contemporary experience of a disaster.

In recent years, despite some rather alarmist forecasts, residents of the Bay Area have not experienced any major earthquake; and several experts do not even consider the M.6.9 Loma Prieta Earthquake of 1989 in the category of “large” earthquakes. The San Andreas Fault system is still moving, of course, but most earthquakes have been relatively small and the in the scientific community, experts fear that “*people don’t understand”* what the risks of earthquakes really are [R.9].

Waiting for the Big One to come, researchers working the Bay Area region have focused mainly on the local consequences of past events: the 1906 Earthquake and the subsequent San Francisco Fire (Hansen, 1989; J. B. Perkins, Chakos, Olson, Tobin, & Turner, 2006; Tobriner, 2006; University of Buffalo, 2008); the Loma Prieta Earthquake (Bourque & Russell, 1994; Nigg & Mileti, 1998; Tubbesing & Mileti, 1994); the Oakland Fire (FEMA, 1991b; S. Hoffman,1998; Schiewe, 2011); and the Northridge Earthquake (Bolin & Stanford, 1998; R. J. Burby, French, & Nelson, 1998; Comfort, 1994; Tierney, 1995), making critical assessment of disasters responses.

[17] To use the title of a book dedicated to this question (E. L. Quarantelli & Perry, 2005).

Earthquake-risk specialists have elaborated probabilistic definitions of earthquakes as uncertain events (Hinman & Hutchinson, 2005; C. A. Kircher et al., 2006; Maffei, 2010; USGS, 2003), and then looked at the consequences on built environments and infrastructure (Bonowitz, 2009a; Paxton, 2004a; Poland, 2009), most specifically examining vulnerabilities and resilience capacities (ABAG, 2013; Chakos, 2011; Hutchings, Mieler, & Brechwald, 2013; Paxton, 2004; Poland, 2009; Tobin, 1999). Other researchers have tackled questions regarding both the history, and the sociology of the definition of earthquake risk in the Bay Area (Geschwind, 2001; Reisner, 2003; Stallings, 1995), and some have considered it with a reflective distance their own contribution to the decades long movement of earthquake risk instauration (Chakos, Schulz, & Tobin, 2002; Hoffman, 1998; Kingston, 2003; Tierney, 2001).

1.4.2. About the following chapters

In a Geography and STS perspectives, we will look at the complex system of relations that instaures the risk of earthquakes, unearthing the role of non-rational actants in the making of the space, the definition of risk, and finally, the creation of a relevant science and its translation into public policies. Considering the rapid propagation of the concepts and methodologies of risk reduction and disaster mitigation within different fields of inquiry, and their constant interactions with everyday life, what various kinds of space, knowledge, and expertise are created through the circulation of information, discourse, and interactions of actors in multi-risk, or post-disaster, environments? Looking for the trajectory of earthquake risk is to focus how it has been progressively instaured: to identify where it appeared or disappeared, why its presence is sometimes overwhelming and sometime forgotten, and how people have regarded it during the relatively short, but intense histories of both seismology and urbanization in the Bay Area.

I have built the present work in a symmetrical way as following Callon principle of generalized symmetry: *"the rule which we must respect is not to change registers when we move from the technical to the social aspects of the problem studied"* (Callon, 1986). As a consequence, this work focuses on three equally important moments of instauration of the earthquake risk in the Bay Area of San Francisco. The structure of this work is an attempt to unveil progressively the different layers of instauration of the earthquake risk. Following the grammar of the network described earlier, we will start with the local spatial dimension of the risk, progressively moving toward the scientific construction of the earthquake risk. In this context, each chapter has been defined as a specific moment of instauration of the earthquake risk leading to a (complete or incomplete) transformation. Building on what was the basis of seismology in the nineteenth century, I have look at the instauration of earthquake risk in regards to Bay Area vulnerabilities, taking into consideration past and present experiences, stories conveyed by the mass media, and socio-technical assemblages, all of which together define risk.

Following this line of questioning, the second chapter, *First instauration: defining a conceptual framework*, focuses on the main theoretical resources that have been used in this examination of the instauration of earthquake risk in the San Francisco Bay Area. Examining the ways in which risk and disaster have been defined during the last several decades to articulate scientific knowledge and living experience, we'll see at how researchers have tied together concepts of risk and disasters, as well as the question of individual and collective responses to threats in a post-WWII context. Then, will see how questions of definitions have been a constant preoccupation of researchers, who are continually trying to both define the scope of this particular object of research, and its complexes, changing relationship with others actants. In an attempt to follow William James's steps, we will see how the different dimensions of earthquakes, from scientific definitions to risk evaluations, can be articulated regarding the experiences of an earthquake. In this perspective, will see first how Actor Network Theory provides the necessary theoretical backbone to best describe what an earthquake is, and what a future "Big One" could look like for Bay Area spatialized residents. Next, we will see how certain approaches in geography can help our concepts, providing a perspective of situated knowledge, and giving an active role to the question of distance. Finally, we will see how these perspectives can open up interesting discussions regarding the question of expertise.

Starting with the hypothesis that earthquake risk is a complex, and not always visible object, the third chapter, *Second Instauration: The Elusive Dimensions of Risk and Disaster in the Bay Area*, questions the visibility of this risk. This chapter looks at the ways in which, since its urban beginnings, the Bay Area has been tied up in a utilitarian relationship with the environment, both denying the materiality of the space and exploiting its resources, thus making earthquake risk difficult to "read." Looking for traces of earthquakes in the landscape, and through memories of long-time residents and commemorations, I argue that even if earthquakes had had a strong influence on shaping the space of the San Francisco Bay Area, their presence can be hard to acknowledge and recognized. We'll see how "footprints" of earthquake risk emerge from traces left by previous disasters. A discussion of the Oakland Fire will be used as an example of an unfolding natural disaster and the methods of reconstruction. Following the discussions of the previous chapter, we will see how definitions play an important role in framing the space of risk in the Bay Area. In this context, controversies about scale, discussions about the legacies of past disasters, urban practices inherited from the time of region's early urban planning, and relationships between residents and their territory add an other layer of complexity of in the definition in the earthquake risk.

The next hypothesis focuses on the experience of living with earthquake risk, and its capacity to transform the categories of knowledge, experience, and subjectivity. In the fourth chapter, *Third Instauration: Living with risks*, I argue that the quality of the idea of an earthquake, as a potential concern or a threat, can only be found while looking at the density of experiences in the everyday coexistence with active seismic faults. Looking at the different existences of earthquake phenomena allows us to approach the elusive quality of this risk, but also its performative dimensions. In this chapter, I argue that inhabitants and experts have instaured earthquake risk according to different modes of existence (Latour, 2011b, 2013; Souriau, 2009), thus inviting us to take into consideration the multiples – and sometime contradictory – forms of experiences of earthquake risk in the hybridization of scientific knowledge, but that can also transform the contour of a subject "at risk." In this chapter, I focus on the operations of translation, as well as mediations that, in the absence of recent major earthquakes in the Bay Area, earthquake risks still maintain their presence. I will show how emotions and concerns about distant earthquakes (e.g., Christchurch, Haiti, Tōhoku) or smaller earthquakes in the Bay Area have contributed to the progressive instauration of risk. Looking at the hybridization of knowledge between science and experience, this chapter focuses on the transformative aspects of earthquake risk for experts and scientists living in the Bay Area, which has resulted in them becoming so-called Earthquake Junkies.

Finally, the fifth and concluding chapter, *The case for not letting San Francisco Scramble*, discusses the work of these Earthquake Junkies over the last several decades. Taking the opposite view of Mike David, and his famous text, "The Case for Letting Malibu Burn" (Davis, 1998), we will see how experts and scientists in the Bay Area have joined forces to save San Francisco from a future, large-scale earthquake disaster. Here we explore the hypothesis that: the possibilities of action, and improvement of actual mitigation projects, lie in the articulation of different existences of the earthquake for different public sectors of the Bay Area. This chapter focuses on the anthropology of expert elaboration on earthquakes and risk as an object of science, and then its translation into public policy and scientific experimentation. In this final chapter, I will show how decades of work on the idea of earthquakes by concerned citizens, scientists, and experts have addressed earthquake risk in the Bay Area and have, despite sometimes mixed results, as it happened during the Parkfield Experiment, laid the foundation of solid risk awareness for all residents in this seismically volatile region.

Chapter 2
First instauration: defining a conceptual framework

This chapter addresses the theoretical and conceptual resources used to support the descriptions of spatialized practices facing the risk and disaster. As will see, the experience of living with the earthquake risk deeply transforms our understanding of the world. In a sense, one could say that, when they move, the seismic faults displace lines: the lines of experience of dwelling, but also more epistemological and metaphysical lines; the lines of thoughts that are often used to define the word. This work attempts to describe the actions, thoughts and emotions involved when seismologists, earthquake experts and concerned citizens are waiting for the Big One.

This chapter is also is the result of my personal journey at the intersection of three established corpus of literature: Disaster Studies, Sciences and Technologies Studies (STS), and more specifically the work developed under the name of "Actor-Network Theory" (ANT), and literature coming from distinct branches of Social and Human Geography, including Geography of risks and the Geography of emotions. As will see, these three corpuses of literature will allow us to reconnect with the pragmatic approach defined by the philosopher James that we mentioned in the introduction.

To understand the instauration of the earthquake risk in the Bay Area, we will look at two corpus of literature that have been to often considered separately: the one dedicated to risk studies and the one to disaster studies. In the last few decades, there have been frustrations expressed among the community of risk and/or disaster researchers about this segmentation, which has made full understanding of this complex field a significant challenge (November et al., 2009). As Susan Cutter puts it, *"it has always been a source of professional frustration that risk, hazard and disaster communities evolve along parallel paths, there was little intersection and integration among them"* (Cutter, 2005: 40). This frustration has also been felt among French researchers, as Pigeon noted: *"Not only does segmentation seems simplistic and odd in light of field experiences, but it tends to be validated by the dual hazard-vulnerability which favors it strongly, in spite of increasing […] questions of coherence*" (Pigeon, 2005: 26). To fully appreciate this transatlantic complaint, we will strongly tie together these researches to look at our topic with a more integrated perspective. As November reminds us, promising perspectives of research have been opened up going beyond academic and disciplinary boundaries, and "*offer(ing) an alternative way for social scientists and geographers to collaborate by circumventing a well-entrenched distinction between 'physical' and 'human' geography"* (November, 2010: 581).

First, we will look back at the emergence of Disasters Studies in the US. Working in the Cold War era, American social scientists were urged by US government fearing a nuclear attack on American ground to study the consequences of such events on populations. Responding to this request, they started to work within an interdisciplinary setting that, several decades later, has proven fructuous, but not in the perspective originally planned. These researches were the first attempt to address, in a systematic way the complexity of disaster, focusing on the distributions of facts, values, and both human and non-human actants as aggregated by pioneers in this field. Will the see how other approaches of risk and disaster have also tackled the problem, tracing a epistemological "continuum" which is useful to understand the different perspective that have been taken to frame and define the earthquake risk. Finally will se how; following James a pragmatic approach of the earthquake might offer the best framework to think the complexity of the situation of living with the risk of a disaster.

The second part of this chapter focuses on the development of a pragmatic approach of the earthquake risk. Following James and more Bruno Latour, we will deploy the definition of the earthquake as a "living agent", or *"the collective* name *of all the cracks and shakings and disturbances that happen"* (James, 1906). Doing so, we will come back to some of the important concepts developed by researchers in ANT. After this conceptual definition will look at the importation and spatialization of these concepts in the Geography of Risk, non-rational geography and geography of emotion. Drawing on the existing set of literature will see how some of the main objects - like the earthquake map - used in the definition of the risk could making visible operations of translations that were kept invisible before. In the second part of this chapter will see how integrating the new actants changes the definition of science and the understanding of this scientist, or the experts. Building on this claim will start to define a hybrid scientist – expert who is emotionally and rationally connected to his object of research.

2.1. Looking for an integrative understanding of risk and disasters

From earlier studies, researchers have built upon questions of how people relate to a space that presents dangers while trying to understand the specificities or the continuities of those situations.[18] Different epistemological traditions - sometimes called paradigms or pluriverses (Khun, 1996; Latour, 2013) – have looked at disasters in an effort to provide rational patterns to the observation of human behaviors when confronted to risks and disasters (Lupton, 1999b; E. L. Quarantelli, 1989). But, as the American Sociologist E.L. Quarrantelli - one of the fathers of the Disaster Studies - recalled, the respective place and role these researches give to different actants transforms the way in which a situation, a system, is described. A "*mature science*" according to Thomas Kuhn, should be able to answer the following questions:

> *What are the fundamental entities of which the universe is composed? How do these interact with each other and with the senses? What questions may legitimately be asked about such entities and what techniques employed in seeking solution? (Khun, 1996: 5)*

Are the Disasters Studies a mature science? It is hard to answer, but following Khun will see how the researchers, working with different epistemologies, have composed, decomposed and recomposed their universe with different entities and actants, starting by the definition of the words themselves.

2.1.1. Etymology and translations

Looking at the etymology shows the difficulties of grasping all of these questions in their full states. The first difficulty comes from the various terms used: danger, risk, disaster, crisis, hazard, and catastrophe. The second comes from the differentiated meanings of these

18 Because it falls outside of our purview here, we will neither delve into the corpus of research that has specifically focused on the question of individuals' risks, nor will we engage with economics research on this topic.

terms, complicated by the question of translation. The question of translation is somehow linked to a question of scale: how can one translate an English disaster into a French one. The French prefer to use "catastrophe," which could be the translation of "disaster," whereas "désastre" is infrequently used. In English, "a catastrophe" is a bigger-sized event than "a disaster." But the question of exactly where the line of "disaster" starts seems largely to depend upon the interpretation of the people involved, as will see in the course of this work.

It seems that since the times of the Ancient Greek world, the word "risk" has been hard to trace partly because of the duality intrinsic in the word κίνδυνος (kindunos), which has both "danger" and "chance" in its definition. Additionally, November (November, 2002) has shown the word risk, as used by geographers from the fourteenth to the nineteenth centuries, engages with ideas of opportunity and danger, as well as concepts of territory and culture. As opposed to the multidimensional concept of "risk," the word "disaster," whose origin can be traced to the Latin's construction *dis* (away) and *aster* ("star" from the Latin "astrum" and the Greek "astron," star has a more limited spectrum: a destructive event – "ill-starred event" - that happens because of the change in the constellation of the asters. With this distant connection to the sky, the idea of "disaster" has provided a somewhat open interpretation and metaphoric use.[19] However, it seems that the Greeks more frequently used the term καταστροφή (katastrofi), from κατά (kata, "against") and στροφή (stroph, "turn"), to evoke the idea of "turning over" that some events generate.[20] Two other common worlds are completing this lexicon. The word "hazard", which can be traced back to Arabic origin (*Al-Zarh*), which is connected to the notion of gambling. The Spanish "*azar*" is known to have appeared in about the first century C.E., followed by the French "*hasard*" and the English "hazard." Again, using etymological roots, the term "crisis" has a different origin, coming from κρίνω (*Krino*, or "to judge"). In medical vocabulary the term "crisis" also shows the paroxysm of a medical condition, where the body is given the choice to either respond or die.[21]

[19] As we will see later, the astrological origin of natural disasters has been very influential, even in the thinkers of rationalists such as Immanuel Kant. Thus, the cosmological dimension of the earthquake question should not be pushed aside too quickly as belonging to an ancient and out-of-date history of science: the cosmological root of disasters is an important step toward a more cosmopolitan view of risks and disasters.
[20] Wiktionary have been mostly used to define the terms quoted above.
[21] See Serres, 2009.

From this profusion of terms and their etymological readings, researchers of the Twentieth and Twenty-First Centuries have been tasked with the necessity to provide a more precise definition of these notions in order to clarify events they attempt to describe and to create new academic discipline. Broadly following social sciences paradigms that have been used during in the last centuries (Law, 2004; Sayer, 2010), the categorizations and definitions of risk and disasters have evolved from realistic or naturalist models to more discursive or constructivist models (Jasanoff, 1998; Lupton, 1999a).[22]

2.1.2. Framing a disciplinary field: a tentative of integrative studies

The beginning of Disaster Studies as an academic discipline can be traced back at the end of the Second World War. During the Cold War period,[23] the first Disasters Studies were designed to understand the consequences of possible nuclear bombing on U.S. territory.[24] In this context, earthquakes[25] - as well as other technical disasters - [26] became a favored field of study for researchers. Through the deep understanding of these events, the U.S. government was hoping that *"empirical study of peacetime disasters will yield knowledge applicable to the understanding and control, not only of peacetime disasters, but in the event of another war"* (E.L. Quarantelli, 1988: 5). In addition, the US army was also interested by the psychological consequences of such events on populations. The Psychiatric Institute at the University of Maryland, which conducted researches for the U.S. Army Chemical Corps,

[22] While the realistic perspective have tended to recused a major part of the population, with the necessary capacities to understand risk and therefore exclude them from any other forms of participation, the constructive or discursive models have started to pay attention to the many forms that "otherness" and knowledge could take. (Jasanoff, 1986)

[23] The first comprehensive legislation to deal with emergency planning in the United States is found in the Federal Civil Defense Act of 1950. The prime focus was to be able to respond to potential enemy attacks, and secondly, to deal with civilian emergencies. The Disaster Relief Act of 1970 pushed a different action framework focusing "to individuals, organizations, businesses, and States and local communities suffering from major disasters. It also strengthens the administration and coordination of Federal disaster assistance efforts"(Nixon, 1970).

[24] See the United States Civil Defense (USCD) in 1950, or the Blue Book, which was the foundation of the 1951 Defense Act. See also the 1953 Manual Civil Defense Urban Analysis (Collier & Lakoff, 2008).

[25] Studies conducted by geographers on slower, but none of the less devastating phenomena like floods, hurricanes, or fires did not awaken the same interest from funding agencies, and were, for some time, were investigated outside the field (E.L. Quarantelli, 1988).

[26] The opening of the National Opinion Research Center (NORC) in 1950 was founded by Chemical Corps Medical Laboratories of the Army Chemical Center in Maryland, which commissioned it to investigate a leak of sulfur dioxide in Pennsylvania that killed 25 people. This particular study never happened, but eventually these researchers started to answer the request for a growing demand of data for government agencies, which then gave birth to the Committee of Disaster Studies, which was to become the Disaster Research Group.

[27] focused on the prevailing ideas that the disaster was a disruption of the social and economical order, resulting on damageable psychological consequences on population that needed to be strictly controlled by authorities. [28]

In this context, populations were blamed to exacerbate disaster,[29] and contemporary anthropological studies focusing on populations' reaction after the Germany and Japan's bombings during World War II, which demonstrated the level of self control and organization of victims, were systematically ignored (E.L. Quarantelli, 1988; Solnit, 2009: 6). As Sheila Jasanoff recalled, *"While (or possibly because) they had not been able to control the slides into two catastrophic world wars, advanced industrials states felts increasingly compelled to provide reassurance that they would manage their citizens' destinies better in the future"* (Jasanoff, 2010: 18). Robert Dynes has later showed that one the consequences of this early approach resulted in something called *"the triple C policy: chaos, command, and control*",[30] which is still used for some emergency planning, and has been criticized for allowing only a small, if any, place for human actors (Dynes, 1994, as discussed in Ledbetter, 2003).[31]

Despite the military orientation of these early researches, the disciplinary background of the researchers involved slowly transformed the original proposition. One of the reasons was that the studies produced far more complex and diverse results than the original research design expected. In the sixties, this moved Disasters Studies towards more ethnographic, sociological approaches, and away from the war-centered questions.[32] While

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[27] Their research contract stipulated that they will "study the psychological reactions and behavior of individuals and local populations in disaster, for the purposes of developing methods for the prevention of panic, and for minimizing emotional and psychological failures'' (E.L. Quarantelli, 1988).

[28] As E.L. Quarantelli, who was involved in these first researches, recalled: "*The intent of the work was to find out how social control could be exercised by the authorities, and the assumption was made that disaster problems were primarily socio-psychological i.e., resulted from the internal states of the victim."*(E.L. Quarantelli, 1988: 6)

[29] This idea was still vivid in the minds of some members of the Bush Administration after Hurricane Katrina; See Solnit, 2009.

[30] "According to Dynes (1994), the dominant emergency-planning model, termed the 'military' model, is based on the notion that chaos, command and control are inherently part of disasters and that chaos necessitates command and control. Dynes says the initial false assumption is that emergencies create significant disruptions in society, which require extraordinary measures to resolve. Further false assumptions outlined by Dynes are the incapacity of individuals and the social structure to cope; [and] an artificial structure with a top-down authority system is required. An alternative model offered by Dynes (1994) is described as the 'open' model. This model uses the three C's of continuity, coordination and cooperation" (Ledbetter, 2003: 13).

[31] Expanding these ideas to the field of economy and denouncing of the relationship between liberal economic theory and the creation of a risk and disaster science, Naomi Klein recalls that: "For more than three decades [Milton] Friedman and his powerful followers have been perfecting this very strategy: waiting for a major crisis, then selling off pieces of the state to private players while citizens were still reeling from shock, then quickly making the reform permanent" (Klein, 2007: 7). This is based on Friedman's idea that "only a crisis – actual or perceived – produces real change" (M. Friedman, as quoted by Klein, 2007: 7).

32 The National Opinion Research Center (NORC) at the University of Chicago operated from 1950 to 1954. In 1963, E. Quarantelli, R. Dynes, and J. Haas opened the Disaster Research Center at Ohio State University, and since 1985, run this

some researchers, following the line defined by the State, focused on the risk posed by populations (Klein, 2007), most of the scholars in the field of Disasters Studies continued to document the socio-technical systems that lead to disaster and the individual and collectives resilience to the latter (Drabeck & Quarantelli, 2008; Dynes, 1997a; Peek & Sutton, 2003; E.L. Quarantelli, 1988, 1994, 1998, 2005).

E.L. Quarrantelli, an American sociologist, was among the firsts to focus on the apparent problem of divergent definitions – and beyond, epistemologies - of Disaster Studies that, he thought, could be an impediment to the understanding of the phenomenon he was dedicated to study. As a result, he edited two volumes of *What is a Disaster?* (Quarantelli & Perry, 2005; Quarantelli, 1998) which questioned the definitions proposed by some of the most influential researchers in the field. Building on decades of empirical researches Ronald Perry noted later that there has finally been a consensus that disasters are "*social events in social time," "disruptive to social intercourse,"* and that they *"should be understood in a context of social change (human and institutional adaptability)"* (Perry, 2005: 310). Yet, at the same time Perry noted, academic controversy still surrounds the concepts questioning: *"(1)[the] vision of the context of the phenomena of disasters and hazards, (2) the question of whose perspective is used as a definitional referent: the public the victims, researchers, and policy makers; (3) the definer vision of social sciences, and (4) issues that should be addressed in terms of taxonomy and definition"* (Perry, 2005: 313). With time, these controversies have defined the line of a "disciplinary matrix" of the field (Khun, 1996: 182) or the gradient of a continuum to use Lupton's expression (Lupton, 1999a).

2.1.3. The temptation of modernity.

More recent researches have moved conceptual definitions along what has sometime been described as a "continuum" of perspectives (Lupton, 1999a).[33] This move started from a post-war, realist vision described above, to a new type of study dealing with the complex

center at the University of Delaware. In 1975, G. Whyte and J. Haas founded the Natural Hazards Research and Implication Center (NHRAIC) at the University of Colorado.

[33] D. Lupton identifies several orientations of research: cultural/symbolic perspective, Foucauldian, and post-modern. If Lupton has worked specifically to identify such episteme, these denominations do not act as rigid categories, but rather as different kinds of enlightenment within a socio-cultural frame. Research published during the last few decades have also proven the necessity of a required openness regarding the use of different epistemologies within the social sciences.

interactions of material and immaterial objects, and human and non-human actants, in an world described as "uncertain" (Beck, 1996; Callon et al., 2009; Dupuy & Grinbaum, 2004). It is interesting to note that, while moving along this epistemological continuum, researchers have progressively given up the systemic approach to focus on more specific and defined aspect of the question.

2.1.3.1. The determinist approach

Early researches gave birth to what has been called a "conventional views on disasters" (Wisner et al., 2006), where risks and disasters are thought of as external consequences of physical events. This approach has also been called materialist, realist or naturalist. In this approach, *"a risk maps directly to an underlying hazard"* (Fox 2005: 16) and both human and material structures react to the stimulus of a brutal event that interferes with the normal state of things.

Risk has been examined also from a cognitive dimension, raising questions about how individuals measure and understand a threat, and knowledge to inform their decisions (Frickel & Bess, 2007; Slovic, 1987). In this area, an influential group of conservative thinkers have become interested in developing actuarial, cost-benefit analyses (Ewald, 1991; Oreskes & Conway, 2011; Wildavsky, 1988). As Pigeon noted, these determinist readings have solidified the separation between the binaries of "nature" and "culture," and between "experts" and "laymen" (Pigeon, 2005). The consensus around the fact that experts and laymen had different level of understanding of the world marked the beginnings of the development of a theory of public risk perception, which focused on the biases, and the powers of peripheral information (e.g., reactions to the news; personal emotions) and "disabilities" (e.g., lack of control; resistance to novelty) of the laity. In this matter, the influence of the work of Daniel Kahneman and Amos Tversky has been, and still is, a significant influence.[34]

The growing interest in risk and disaster in urban environments for researchers in social sciences (Burton, Kates, & Whites, 1993; Hewitt, 1993; Watts & Bohle, 1993; Wisner & Luce, 1993) has challenged the veracity of such rigid and pre-determined categorizations (Gilbert,

[34] See "Prospect Theory: An analysis of decision under Risk," Econometrica 47, no. 2 (March, 1979): 263-91. Kahneman won the Nobel Prize in Economic Science in 2002 has contributed to the forging of the concept of Homo economicus, driven by cost-benefit analysis and by rational choices. His analyses have been quoted by several people interviewed during my field research.

1998; Quarantelli, 1998) shedding light on the importance of the diversity of fieldwork, methods and theoretical framework.

2.1.3.2. Vulnerability and resilience: two concepts building on constructivist approach

Researchers interested in the complex relations between space and social practices have looked at the multiples dimensions of the eruption of a risk and disaster the urban and non-urban environments. These studies have focused both on the socio-economic preconditions that worsen the effects of hybrid (both man-made or naturals) disasters, and the cultural and political parameters that influence the conditions and quality of a particular response and reconstruction. Studied through the frame of socially constituted and culturally meaningful practices, theses approaches have enabled researchers to create an index of adaptation – or often mal-adaptation – between human and non-human actants.

Building on multiple cases studies, researchers have progressively explored the now key concepts of vulnerability and resilience. Sharing a common concern about the complexity of interactions between human and non-human actants, researches on vulnerability have tended to emphasis the subject as an agent, and the specific capacity to grasp a problem, while resilience studies have favored a more systematic approach (Reghezza-Zitt, 2013; Vale & Capagnella, 2005).

In recent years, authors have also tried to make explicit the divergence between the two concepts as they relate to different mode of engagement between scholar and their specific object of research:

> *These different emphases are seen in two studies in Limpopo Province, South Africa, […]. In the vulnerability study, the aim was to understand how different stakeholders view their vulnerability to support decision-making at the village and municipal scales in Sekhukhune District. […] In the resilience study, the aim was to establish an overall picture of system function, including qualitative system dynamics and vulnerability analysis, in the Sand river sub-catchment using resilience theory. This study made explicit the linkages between the social and ecological system on the one hand, and the time scales at which certain drivers proved more important than others. The vulnerability approach placed more emphasis on agency and on the*

> *identification of hooks for responding to adaptation and development challenges. (Miller, et al., 2010)*

These approaches have often been described as "cultural/symbolic perspective," following denomination given by Mary Douglas during her long career as an anthropologist (Douglas, 1990). As Pelling stated, these investigations often build on previous radical approaches of these peculiar *"boundary objects"* (Star & Griesemer, 1989). Using this type of perspective, *"…environmental risk in the city is interpreted as an outcome of the political interests and struggles over power that shapes the urban environment and society. As Harvey argues, 'all ecological projects (and arguments) are simultaneously political–economic projects (and arguments) and vice-versa. Ecological arguments are never socially neutral…'* [Harvey, 1993: 25]*"* (Pelling, 2003: 4). In this contexts, the concepts of vulnerability and resilience (Bonanno, 2004; Robert, Gluski, Hardy, & Sierra, 2009; Watts & Bohle, 1993) coupled with certain anthropological perspectives, have been used largely in different geographical contexts (Hoffman & Oliver-Smith, 2002; Langumier, 2008; Oliver-Smith & Hoffman, 1999; Revet, 2002, 2007).

2.1.3.3. Coming back to a more systemic approach

These researchers have opened up the field to reflect on what Oliver-Smith has specifically termed "peril," meaning how people deal with the possibility of death, destruction of their environment, and the sequels of such events (Caruth, 1996; Clavandier, 2004; Das, 2006). Re-opening the question of consequences of disasters on individuals and groups, they have focuses on personal emotions and feelings with the tools of socials scientists. The multitudinous possibilities and interactions that they opened up have made it possible to conceptualize risk and disasters multi-dimensionally:

> *Disasters are both socially constructed and experienced differently by different groups and individuals, generating multiple interpretations of an event process. A single disaster can fragment into different and conflicting sets of circumstances and interpretations according to the experience and identity of those affected. Disasters force researches to confront the many and shifting faces of socially imagined realities. Disasters disclose in their unfolding the linkage and interpenetrations of natural forces or agents. (Oliver-Smith, 1999: 26)*

In reaction to the determinist framework described above social scientists have became increasingly interested in the redefinition of theses articulations, *"the possibility that the studies of disaster could lead to reducing the theoretical and methodological gaps that presently separate the ecological, political-economic, and cultural perspective in anthropology was one major motivation"* (A. Oliver-Smith, 2002: 6). Using these perspectives, the study of urban disasters has been considered an opportunity to document the link between population, production, and environment, and to question the abilities of the general public to adapt to moments of crisis.

2.1.4. Are risk and disaster an overwhelming reality...

Within the last 50 years, the growing interest in risks and disasters, and their inherent increasing volume of data, documented resources, scientific research, and active discussions and controversies, have, according to the United Nations Office for Disaster Risk Reduction, allowed for a diminution of fatalities and other losses in the specific case of earthquakes (UNISDR, 2010).[35] Anthropologists Susanna Hoffman and Anthony Oliver-Smith have argued that this growing research interest into the question of risk and disaster is the result of an increasing number of causes (e.g., unsafe habitats, hazardous technology, and increasing population), combined with the frequency of destructive events, the homogenization of living conditions, and the active exploitation of natural resources (Hoffman & Oliver-Smith, 2002; Oliver-Smith & Hoffman, 1999). In addition, Douglas has pointed out that during the last decades:

> *risk has largely replaced older ideas about the cause of the misfortune. Concepts such as sin, which were once used to provide explanation for misfortune, are now discredited. In their place, is the 'modern, sanitized discourse of risk' which 'is all we have for making bridges between the known facts of the existence and the construction of a moral community […]. Indeed, risk provides secular terms for rewriting scripture: not the sins of the fathers, but the risks unleashed by the fathers are visited on the heads of*

[35] *'The number of catastrophic events has more than doubled since the 1980-1989 decade. In contrast, the numbers of affected people have increased at a slower rate. This may be due to better community preparedness and prevention,' said Professor Guha-Sapir, Director of CRED"* (UNISDR, 2010).

their children, even on the nth generation. (Douglas; 1992, as quoted in Lupton, 1999: 47)[36]

Following Ulrick Beck's thesis, discussed from *Risk Society* (Beck, 1992) through to *World at Risk* (Beck, 2008), one could say that risk and disaster, as they became object of scientific research, have finally "colonized the future,"[37] urging us towards a better understanding of the perils that we face (OECD, 2004). Indeed, Beck's *Risk society* (published in 1986 in German, translated in English in 1992 and into French in 2008) has been one of the first broad scale work to tackle the questions rose by the increasing development of those concepts. Anchoring his project in the ongoing metamorphosis of our environment *in relation* with the evolution of our categories of though, Beck later recalled that the success of his book was also due to its blurry edges of the concept of risk and the multiplicity of questions it approached: "*in place of the seemingly self evident key concept of nature, ecology, and environment, which have their ground in an opposition to the social, this framework start beyond the dualism of society and nature. Its central themes and perspectives have to do with fabricated uncertainty within our civilization: risk, danger, side effects, insurability, individualization, and globalization."* (Beck, 1996: 2).

Quoted by all, and criticized by many (Boudia & Jas, 2007; Latour, 2004; Wynne, 1996)[38] Beck's definition of the concept of *risk society* has marked a turn in the understanding of the questions and the diffusion of the concept outside the specialized field. But as Latour noted *"like most sociologists, Beck suffers from anthropology blindness"* (Latour, 2004). During 50 years of field work, social scientists working have indeed shown that, when examined in detail, the conditions for the emergence the concepts of risk and/or disasters, rather than being a homogeneous set of concepts, practices, and methods as Beck as tended to present them, have *"been continually fraught with internal tensions"* (Collier & Lakoff, 2008: 8).

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[36] From a generational perspective, when inscribing questions of risk, Douglas, as many anthropologists still do, remind us that the links and ties that structure our world exist in the same time and space. The reference to the fathers and children has also been made by Michel Serres when talking about the bridges that we have built across generations.

[37] *"What does risk means? Risk is the modern approach to foresee and control the futures consequences of human action, the various unintended consequences of radicalized modernization. Its is an industrialized attempt, a cognitive map, to colonize the future"* (Beck, 1999:3).

[38] Wynne critics are mostly toward the reproduction of dichotomies *"which are key part of the problem of modernity: natural knowledge vs.. 'social' knowledge, nature versus society, expert versus lay knowledge. It's also reflects – and reinforces – a more basic lack of recognition of the cultural /hermeneutic of scientific knowledge itself, as well as of social interactions and cognitive construction generally. (...) I also thus problematize their uncritical conception of science and knowledge per se. It is important to distinguish here between their recognition of the (in recent years only) contested nature of scientific knowledge, and their uncritical reproduction of realist concept of scientific knowledge. This realist epistemology also, I argue, gives rise to an unduly one dimensional understanding of the underlying dynamics of the nature of 'risk' in the risk society"* (Wynne, 1996:45).

2.1.5. …Or a co- construction?

How should the consequences of a very disparate range of events – whether sudden or slow, dramatic or minor, deadly or costly, foreseen or not – which are thought to compromise our lives, our living conditions, and our environment be anticipated, answered and theorized?

Boudia and Jas (Boudia & Jas, 2007) noted that researchers have reacted strongly to the publication of Beck's book documenting what seemed to have been one of the blind spot of the book, i.e, citizen science, Public Participation in Scientific Research (PPSR), and the role of concerned individual in the shaping of the definition of the risk. Indeed, in the Sciences and Technology Studies literature, experts have been credited for solidifying the techno-politics of the state (T. Mitchell, 2002); but also criticized for creating tensions within the democratic process (Fischer, 2000) and, sometime, for not taking into account local knowledge (Wynne, 1996). But what happens when expertise is indeed based on local knowledge (Lidskog, 2008); when knowledge is co-produced along both expert and non-expert lines (Lane et al., 2010)? As we will see, experts have become the beneficiaries of their own expertise a situation that is, for instance, transforming in the seismologist community (Atkinson & Wald, 2007; Bohy, 2013; Walde, Quitoriano, & Dewey, 2006).

Because their object of research is at the intersection of the "natural," the "human," and the "technological" worlds, researchers have been forced to confront their categories in order to better relate to the multiplicity of actants and the multiple layers of experience found in a single event. Those bridges between disciplinary fields and methodologies have established, de facto, an ongoing discussion, both with other academic disciplines and with emergency-response specialists. In this process, actants (concepts, but also experts, organizations, spatial definitions, populations, memories, etc.) have emerged, sometimes opening up striking new perspectives, but sometime, also, complicating the dialogue, yielding opprobrium on specific theories or practices and sometime crystallizing entrenched positions.

Following the program of the first Disasters Studies to made visible the *"external variability and internal complexity"* (Oliver-Smith & Hoffman, 1999: 19) of risk and disaster, many researchers have included both concepts and relational dynamic developed by STS. Looking back at the first moments of Disasters Studies as a discipline, Oliver-Smith noted that the hybridity – and non-convergence - of concepts and theoretical framework was, in fact, a chance for the social sciences at large: it has certainly conducted to the academic success of the discipline (Oliver-Smith & Hoffman, 1999: 24). However, if this large corpus has transformed our collective and individual approaches to risk and disaster, it has failed to give a clear idea of the spatial articulations, tensions, and associations that come about from the cohabitation of all the actants involve in the making of the risk and the disaster.

2.2. Looking for a pragmatic definition of the earthquake risk

In the next section, we will explore the possibilities to integrate this multi-layered framework a step further in order to seek a theoretical framework that supports the co-construction of scientific and experimental knowledge or the risk of earthquake. To do so we will focus our attention on the links, meaning the holds that connect earthquake experts to their research object and can be mobilize to observe and describe the situation of "waiting for the Big One". What seems to be a new connection is, in fact, nothing but a re-connection. Drawing both on James's pragmatist approach and recent theoretical development coming from a school of STS called Actor Network Theory and Geography, we'll see how to define the nature and intensity of relations that exist between human and non-human actants that come together in situations of risk and disasters.

2.2.1. A Science and Technology tale from 1906

Coming from Stanford, where he was staying at the time of the San Francisco Earthquake in 1906, James, the pragmatic philosopher showed great interest in the complexity of the disaster both as an object of science, but also, as a subjective phenomenon. In an essay called "On the Mental Effect of the Earthquake," James discussed the articulations between scientific and lay understandings of the earthquake, as well as its own comprehension of the "existence" of the phenomenon. As we have noted in the introduction, James details some of the existence of the earthquake:

> *For "science," when the tensions in the earth's crust reach the breaking point, and strata fall into an altered equilibrium, earthquake is simply the collective name of all the cracks and shakings and disturbances that happen. They are the earthquakes. But for me the earthquake was the cause of the disturbances, and the perception of it as a*

> *living agent was irresistible. It had an overpowering dramatic convincingness. (James, 1906)*

We can see in this account that James was aware of the articulations needed to create a chain of actants defining, for scientists, residents and himself, the earthquake. The 1906 Big One was, at the same time, the *"collective name of all the cracks and shakings and disturbances that happen"*, the *"living agent"* and the fear, also dismissed, of the *"final judgment."* During his two trips into the city of San Francisco, James was also surprised by the absence of panic, pathos, and anguish; further, he was very impressed by the residents' capacity to become organized through,

> *ordermakers, whether amateurs or officials, [who] came to the front immediately. There seemed to be no possibility which there was not some one [sic] there to think of, or which within twenty-four hours was not in some way provided for. (James, 1906)*

He also made the point that understanding of the phenomenon cannot be only a rational experience:

> *I realize now better than ever how inevitable were men's earlier mythologic versions of such catastrophes, and how artificial and against the grain of our spontaneous perceiving are the later habits into which science educates us. It was simply impossible for untutored men to take earthquakes into their minds as anything but supernatural warnings or retributions. (James, 1906)*

Making these observations, James was really preoccupied with *"subjective phenomena exclusively"* (James, 1906), and his desire to decipher the nature of agency from the various perspectives of his own consciousness, from science, and from the collective reaction to the earthquake and his reflections invite us to move a step forward in the possibility of taking seriously the density and intensity of what is given by the experience of earthquake. After the San Francisco Earthquake, James returned to the East Coast, where he was from, and worked on the concept of "radical empiricism," which Bruno Latour later translated as: *"we don't want more than what is given in experience, […] but we certainly don't want less either"*

(Latour, 2005). As the British Geographer Nigel Thrift noted, this approach is thus very interested in actual, physical practices[39]:

> *Practices are productive concatenations that have been constructed out of all manner of resources and which provide the basic intelligibility of the world: they are not therefore the properties of actors but of the practices themselves. (Thrift, 2007: 8)*

2.2.2. Defining Souriau's concept of instauration.

During the Second World War, and following the path opened up by James,[40] Souriau worked on the definition of "instauration," explored what he called the "in-between-ness" of things which can bear account of the quality of relations between two actants and which define instauration.

2.2.2.1. Instauration of the earthquake

Souriau's model for instauration is the "*instauration of a work of art*" which, more than the transformation of raw material into an artistic object, is described as the progressive discovery of multimodal interactions during the laboring process of creation. Here Souriau's interest in art creation meets Latour's interest for science and the "*doing of making*" (*faire-faire*), and concerns all form of actants and existences in order to *"get oneself ready to see the potter* [and in our case: the scientist, the expert and or the resident] *as the one who welcomes, gathers, prepares, explores, and invents the form of the work, just as one discovers or* invents' a treasure" (Latour, 2011: 311). Following these important steps, the concept of instauration open the possibility to question the nature of the agencies taken into account in understanding this simultaneous co-construction. In its empirical Jamesian

[39] *"In 1934, geographer Henri Lefebvre noted: 'Upon the basis of acts repeated billions of times (practical, technical and social acts, like the acts of buying and selling today), customs, ideological interpretations, cultures and lifestyles erect themselves. The materialist analysis of these styles has progressed very little"* (Lefebvre 1934: 72, as quoted by Thrift, 2008: 147).

[40] "*W. James valued, in his description of the stream of consciousness, what he called 'a feeling for or, a feeling for because'. Here we would be in a world where the or rather, or the because of, the for, and above all the and then, and thus, would be true existences. ... This would be a sort of grammar of existence, which we would thus decode piece by piece" (Souriau, as quoted by Latour, 2011: 309).*

perspective, instauration recognizes the multiple, sometimes contradictory dimensions of experience. As Latour expanded:

> *You will recall that as James saw it, the first empiricism would only take elementary sense – data into account. In order to create a synthesis, a human mind was supposed to enter at this point to create the relations that the initial experience could not initially provide. Here we find ourselves in such a 'bifurcated'. Nature that everything that comes out of experience has to make a choice, so to speak, and either line up on the side of the thing to be known, or on the side of the knowing consciousness, without having the right to lead somewhere or to come from somewhere. (Latour, 2011a: 3)*

Latour, reading Souriau, has defined instauration as follow:

> *Instauration and construction are clearly synonyms. But instauration has the distinct advantage of not dragging along all the metaphorical baggage of constructivism—which would in any case be an easy and almost automatic association given that an artwork is so obviously 'constructed' by the artist. To speak of 'instauration' is to prepare the mind to engage with the question of modality in quite the opposite way from constructivism. To say, for example, that a fact is 'constructed' is inevitably (and they paid me good money to know this) to designate the knowing subject as the origin of the vector, as in the image of God the potter. But the opposite move, of saying of a work of art that it results from an instauration, is to get oneself ready to see the potter as the one who welcomes, gathers, prepares, explores, and invents the form of the work, just as one discovers or 'invents' a treasure. (Latour, 2011:10)*

But instauration is not only a co-construction. The concept of instauration, a concept that Souriau coined in the field of Aesthetics, also carries a requirement for high quality. As Latour tell us, there is, in this oscillation /movement between the actant making and the other actant being made, a requirement for excellence, and even more, a responsibility that:

> *…Hangs all the heavier on the shoulders of an artist who has no model, because in such cases you don't simply pass from power to action. Everything depends on what you are going to do next, and you alone have the competence to do it, and you don't know how. […] You're not in control, and yet there's no one else to take charge. […] Anyone who hasn't felt this terror hasn't measured the abyss of ignorance at whose edge creation totters. (Latour, 2013: 166)*

In the network of experiences in which they are embodied, things became part of a hybrid assemblage that involves more than a visible design; the mundane familiarity of object and emotion also needs to be taken into consideration.

In this work, Souriau noted the importance of the measure and organization of these "mode of existence" (Souriau, 2009: 169). This starting point gave Latour an occasion to follow Souriau in a "*systemical empirical inquiry*" on the "*mode of existence*,"[41] in order to define the recomposition of the world in "*multiverse*," in which Souriau recognizes five "modes of existences" that we described in Introduction: the phenomenon, the object of fiction, the thing, the soul and the fifth mode that addresses question of the existence of God.

2.2.2.2. About the modes of existence, actant and agency

Looking at study of sciences, Historian have noted that nineteenth-century scientists have *"take(en) out the human element from the research, to make the research processes and products objective*" (Strong, 2008), thus making the multiple agency, the actants, the mode of existence, that "interfere" with the scientific process invisible and, in the same movement taken away the complexity of the subjectivity of the scientist as a knowing subject (Houdart, 2008; Mialet, 2012a). Following the steps of Alfred North Whitehead, who contested what he called this "bifurcation of nature" (Latour, 1991, 2011b), [42] contemporary researchers have looked at the hybrid "assemblages" of primary and secondary qualities, fact and of rationality and irrationality, human and non human (Datson & Galison, 2010; Fressoz, 2008; Houdart & Thiery, 2011; Latour, 1991).

[41] *"Each mode of existence will define itself through its own way of differing and obtaining being by way of the other [....] [E]ach should be granted the capacity to produce, in its own way, the assemblage of ontological categories that are its very own. The situation is as if each mode possessed a specific pattern (in the sense that this word [patron] is used in the clothing trade), an ontological pattern that cannot be applied to other modes, or applied only by bringing about distortions, folds, discomforts, and innumerable category mistakes. To take an industrial metaphor borrowed from the procedure of 'putting out a tender', it is somewhat as if each mode of existence were following a specific set of terms of reference to which it had to conform" (Latour, 2011b: 316).*

[42] *"This bifurcation begins somewhere between Galileo and Locke and comes to an end, in Whitehead's opinion, with William James. This brief period, which I call 'the modernist parenthesis' — during which we thought we were modern—has three main characteristics: the conviction that the world can be divided into primary and secondary qualities (which can be called 'naturalism'); the ever increased intermingling, in ever larger assemblages, of these same primary and secondary qualities (which can be called 'hybrids'); and lastly, a watertight division between the constantly repeated assertion that the division between primary and secondary qualities must be maintained, and the practical reality which is in fact the exact opposite of this theory (which one could call the 'obscurantism of the Enlightenment')"(Latour, 2011: 1-2).*

What are the modes of existences? To identify these agencies, I use the concept of an "actant," which, coming from a Greimasian actantial model,[43] had become for ANT researchers human or non-human agent, characterized by the capacity of mediation or translation. The definition of mode of existence by Souriau allows us to describe phenomenon that are both situated and not ethno and geocentred and that co-exists. In addition the five modes of existence allow us to think outside the dichotomy subject/object, science/ignorance, expert/lay, which has, tend to structure the discussion about risk and disasters, as we'll see in the next chapter.

1. The phenomenon. The principal characteristic of the phenomenon is its irreducibility. He cannot be granted anything other than himself. He is transient by nature: his presence is a flash, arbitrary given, obvious, and specific, that happens only once and cannot be repealed. The phenomenon is rare and unsettling; it is not the "phenomenon of something" or the "phenomenon for someone." The phenomenon does not lead directly to the stand that holding it or that the mind that conceived it, no more than it is fragmented or atomized. It exists, that is it. Eventually, he can be accompanied by sensations that E. Souriau defines as its "rowdy side." This conception of the phenomenon liberates the "thing-in-themselves," and as a methodological impact. We need to recognize them, sort them, identify them, and let them conduct us to other "mode of existences," whatever these could be. With this definition in mind we can think about each disaster, each earthquake, each fire, or each tsunami as phenomenon.

2. The Things. Things are, for Souriau, defined by their capacity to maintain their integrity, their identity through time and space: "The thing must remain 'numerically one' through this 'multiple appearance'" (B. Latour, 2011: 319). Things, or "immutable mobiles," are not altered by time and space, they can appear and be used at different points of space and time Things can form systems (whereas phenomenon cannot), but they need something to carry them along—a vehicle. But the movement of things cannot been done without a price. The thing can numerically be the same, while alterations can happen, slight changes that bear the marks of this ongoing continuity. In the context of our interests in houses, bridges, and ourselves, we are surly things, but so is space, which is transformed by events.

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[43] "*The actantial model, developed by A.J. Greimas, allows us to break an action down into six facets, or actants: (1) The subject (for example, the Prince) is what wants or does not want to be joined to (2) an object (the rescued Princess, for example). (3) The sender (for example, the King) is what instigates the action, while the (4) receiver (for example, the King, the Princess, the Prince) is what benefits from it. Lastly, (5) a helper (for example, the magic sword, the horse, the Prince's courage) helps to accomplish the action, while (6) an opponent (the witch, the dragon, the Prince's fatigue or a suspicion of terror) hinders it*"(Herbert, 2006).

3. The Soul. Souls are not granted, they should be instaured or constructed. They are, for Souriau, the ontique of existence. They can expend, retract, or disappear. They also can provoke suffering, happiness, and subversion. They are our individual and collective psyche and should be taken as a reisme to be granted their full architectonic and monumental presence. Last, but not least, they are "objective": "Souls have their own envelopes of thinghood, their own definition of anaphor, their own understanding of how to subsist" (B. Latour, 2011: 323). Souls, cannot be reduced to the contents of our non-representational thinking. They are ideas and feelings; they are the traces and memories.

4. The fictional being. Although they do not have the same density as souls, fictional beings are defined by their capacity to go through time and space without being affected. They are defined by their "phantom character and a cosmic nature"; they are the stories and myths that we have in common. "There is a thingness specific to fictional beings, an objective isotopy that Souriau defines by the pretty word syndoxic (that is, common doxa). In a certain way, we all share Don Juan, Lucien de Rubempré, Papageno, the Venus de Milo, Madonna, or Friends" (Latour, 2011: 324). We all share a little bit of Don Juan, as we all share a little bit of Oedipus, Amaris, Hermes, or Pandora. A "fictional being" is part of the common culture that we share. They can also be characterized by their monumentality. As opposed to "souls," they cannot be bungled in the sense that they are more objective. They are the story, the factish, the gods, and quantum physics.

5. The fifth one that Latour's names – "Speak of God in its own language, if you dare" – is probably one of the most provocative attempts to approach the question of spirituality with the social sciences' tool box, A discussion of this would certainly need to be given a lot more space.

To avoid overwhelming my reader with too many theoretical inputs, I have chosen to focus only on the "mode of existence" which is really the main operational tool in the context of the present research.

2.2.2.3. Articulations and relations

Following threads of concepts developed by Actor-Network Theory (ANT), these modes of existences, or actants, as I will continue to call them, could be organized with the form of a network. Callon's concept of "network" has been described as a system of relations that connects problematic statements together.[44] The network, considered as an operating category, allows actants to circulate between micro and macro structures in which they can be – at the same time – global or local; and evolve, through time and space. In this context, what makes for an actant's evolution or strength resides in its capacity to negotiate and make alliances with others entities.

Looking at the numbers of articulations possible between actants, researchers have often used the metaphor of grammar to explicate their meaning; following this metaphor, just as Souriau did, defines "prepositions" as the actants that connect to other actants. References to linguistics is also present when researchers started to look at what Serres and Callon have called "translation," which describes the multifaceted interactions that actants maintain with one another. French Sociologist François Dosse has noted: the *"notion of translation became central in sociology, defining an equivalence between heterogeneous objectives within particular actors. Its function was to overpass the false alternative between internalism and externalism"* (Dosse, 1995: 27). "Translation" for ANT researchers, describes interactions, the event of "communication-transformation" between actants connected to one another. This system was first elaborated by Michel Serres,[45] and later became, along with the work by Callon, the theory of "Network-Actors" before evolving more fully and taking form under the name of "Actor-Network Theory" in 1999 (Callon & Ferrary, 2006; Callon, 1986).

Following the reformulation and aggregation of these theoretical articulations, Latour has been credited to move a step further creating an "empirical metaphysics" (Harman, 2009). In this paradigm, actants[46] are both irreducible one to another (and as such, cannot be contained and cannot contain another) and are part of a system – the network – that needs to be unfolded. Latour's central thesis is that "*an actor is its relation*" (Harman, 2009: 17) and because interactions never stop, "*an actant is always an event*" (Harman, 2009: 17). This "path dependency" between the actant and the event, the possibility of a journey in

44 Callon's interest was to understand the circulation of scientific knowledge in relation to cultural and economic practices (Brown, 2002; Callon & Law, 2005; Callon, Méadel, & Rabeharisoa, 2000; Callon, 1986, 1997).

45 Paul Ricoeur also worked on the question of translation. As Domenico Jervolino recalls, Ricoeur's translation is linked to the possibility of difference. Jervollino makes an interesting reference to the myth of Babel, long understood as a malediction. For more contemporary readers, the myth of the Tower of Babel is about the recognition of the necessity for a plurality of humanity: "*Translation become the privileged moment of a reconstitution of the plural unity of human discourse, opening the path for an ethic of verbal hospitality and conviviality"* (Jervollino, 2006). Jervollino clearly sees in Ricoeur's concept the potentiality of a political form of non-violence interaction. I will discuss the political consequence of ANT later in this dissertation.

46 This includes all things, from the most spectacular to the most mundane: tooth brushes, ballistic missiles, the Golden Gate Bridge, or Joshua trees.

multiple dimensions and existences, forces us to trace the origins of a situation by following the reticular connections of a particular network of actants.

It is also important to note that, within these relations, democratic principles prevail: no object has, in its essence, more power than any other. In addition, in a counterpoint to Aristotelian philosophy, which attributes substance to some objects, specifically the natural ones (e.g., flowers, birds, or even people's souls), *"… Latour grants all actants an equal right to existence, regardless size or complexity, all natural and artificial things must count as actants as long as they have some sort of effects on others things"* (Harman, 2009: 17). In this context, power does not exist by itself; it is a combination of actants that may or may not hold for the long term: *"Because of this notion of network, we can see how a point, which was isolated, becomes a control point for a large number of others points, and become a place of power. We can both follow the composition of power and its decomposition"* (Callon & Michel, 2006).

2.2.2.4. Laying out the network

How can we connect experiences with our spatialized network? Following Callon, the French geographer Marc Dumont has noted that this complex combination of attachments/associations between actants and their "in-between-ness" defines the particular spatial organization of our environment:

> *If individuals spatial acts deserve to be taken seriously in account as they qualify, cut and cut out, in short norm, it is because they also simultaneity participate, by attaching themselves to spatial objects, to institute distance, to deal with splits and so to structure the unsteady and stable social order (Dumont, 2011).* [47]

Questions regarding the nature of space find roots in ancient philosophy, the development of physics, and in mathematics. Yet, as opposed to the attention garnered by questions about "time," "space" has not received the same kinds of scientific attention, until relatively recently. For decades, space was mostly defined "*en creux,*" a *"pre-existing Logos, at once substantial and eternal"* (Lefebvre, [1974] 1991: 402). Space was "always already" there, and its transformation was attributed to time. Space remained the stage where action happened,

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[47] *"Si les actes spatiaux individuels méritent d'être pris au sérieux en ce qu'ils qualifient, coupent et découpent, bref* norment, *c'est parce que simultanément ils participent aussi, en s'articulant autour d'objet spatiaux, à instituer de la distance, à gérer de l'écart, et donc à structurer des ordres sociaux labiles ou stabilizes"* (Dumont, 2011).

the map where direction was given. It was the receptacle of memory where morphology, toponymy and property reveal layers of our history.

This research has yielded the emergence of a theory of Anglo-geography, namely, *"emotional geography"* (Davidson et al., 2005; Parr, 2008; Thien, 2005b) and *"non-representational theory"* (Anderson & Harrison, 2006, 2010; Thrift, 2008). As geographers have learned how to "deal with" (*faire avec*) space (Lussault, 2007), non-representational theorists have learned to deal with the always-changing patterns of our affective cartography, engaging them with other dimensions of our "everyday life." [48] These approaches focus on the figure of the subject as inhabitant, arranger, and planner of space. Building upon the deep connection between feelings and place, they have constructed an *"alternative to the notion of geography as a spatial science informed by the assumption of neo-classic economics, in which human beings are assumed to behave as autonomous, economically rational actors"* (Bondi, 2005: 435).

With the many different threads that cross the field of human geography and architecture researchers have been working on questions related to lived space, and how social practices and territories are involved in this notion, as opposed to a more positivist envisioning of space by other theorists (Berque, 1993, 2013; Berques, 1993; Breviglieri, 2006; de Certeau, 1988; Dorier-Appril & Gervais-Lambony, 2007; Hannerz, 1996; Houdart & Minato, 2009; Lazzarotti, 2006; Lefebvre, 1992; Levy, 1999; Lussault, 2007; Paquot et al., 2007; Pattaroni, Kaufmann, & Rabinovich, 2009; Stock, 2004). Utilizing different fields of the social sciences (Elster, 1998; Hatfield, Cacioppo, & Rapson, 1993; Hochschild, 1979, 2008; Yaneva, 2009), geographers involved in the "emotional turn" have started to explore this path, acknowledging the importance of non-representational, non-cognitivist, and non-visual data in the creation of space. Thrift's work opened the grounds for reflection that takes affects and emotions seriously into account.

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[48] *"However many other beginnings could be plausibly given, not least among them; the ongoing impact of post-structuralism on the discipline and, in particular, the avenues for thought opened by the translation of the work of Deleuze and Latour; an emergent concern for 'everyday life' and the forms of embodied practice therein; a specific confluence of energies, research interests and institutional setting focused on the School of Geographical Sciences in Bristol in the UK through the 1990s; the gathering together and elaboration of non-representational theory by Nigel Thrift; the crystallization of desires to find new way of engaging space, landscape, the social, the cultural and the political; the influence of the UK's Research Assessment Exercise through which, in Human Geography at least, value was attached to single author papers and which promoted an academic climate wherein so called 'theoretical' interventions could be valued as highly as more 'empirical' studies; a simple generation shift between the New Cultural Geography and what would follow,; and ever more extensive engagement by geographers with other social science and humanities disciplines, a cynical careerist fabulation"* (Anderson and Harrisson, 2010: 3).

Acknowledging the complexity of relationships between our material and immaterial worlds,[49] geographers have been working on questions related to the perception of urban space (Bailly, 1977; Tuan, 2001), while others have been working on those related to imagined space (Gregory, 1994). For several decades now, geography, seen through humanist and feminist perspectives (Chivallon, 2003; Massey, 1990), has been engaged with questioning more critically the link between emotions, subjectivity, and place. Within the field of geography, as practiced by French theorists such as Anne Volvey (Volvey, 2000, 2012), this has been explored by looking at the interconnection between transitional perspectives of psychoanalysis, as influenced by authors like Bowlby (Bowlby, 1982; Holmes, 2010) and Winnicott (Volvey, 2003). These researches also have contributed to a better understanding of our relationship with space using theory and concepts as they have been developed by psychoanalysis during the past century. As Davidson, Bondi, and Smith state:

> *A genuine emotional geography cannot just deal with feelings, like a stockbroker deals in dollars, or measure policy outcomes in term of some bureaucratically derived hedonist calculus. It must try to express something that is ineffable in such objectivizing languages, namely a sense of emotional involvement with people and places, rather than emotional detachment to them. (Davidson, Bondi, & Smith, 2005: 2)*

Questions concerning emotion in social science are obviously not a new topic, having been investigated through the fields of philosophy and psychology for centuries.[50] The novelty of bringing emotion into this debate might lie in the "manner" in with the idea of emotion enters the discussion. This manner is neither discussed as a psychobiological impulse nor as an irrational and curbed scoria of our intellectual production. It is also not seen as our only and decisive way to exist in the world.

Building on these corpuses, I would like to explore how James's perspective on emotions can help us connect these various and different strings of research. Following the path

[49] *"Assuming the hybrid characteristic – ideal/material – of the spatial dimension certainly confronts the geographer to complex objects. For instance, the lived space of each individual prove itself to be a complex compound: inseparable of form and material structures, of various scales – pieces and objects inside the intimate sphere of the habitat towards the bigger spaces and very abstract, via buildings, public urban spaces – and diverse idealities, from the less reflexive to the more objectifiable, from the most singular to the most general, from the more solidly settled on places 'subject' of mental images and representations to the more abstracts disconnected of any precise spatial referents"* (Lussault, 2009: 70).

[50] The philosophical reference is still present today with researchers working on this question, however I will not address this question in the present work.

opened by James on pragmatic empiricism, we will look at the nature of the relationships between residents and experts of the San Francisco Bay Area vis-à-vis earthquake risk and the knowledge of it.

2.2.3. Hybrid science, hybrid scientists

The earthquake risk is moving, because it is moved by. Moved by the motion of tectonic plates but also by mediated events that affect human and non-human actants. As Coen recalls, seismology has grew as a hybrid science, anchored in empiricism and relying on non-scientists to describe the phenomenon it needed to study.

2.2.3.1. Movement and science

Historians working on disasters have contributed to nuance the understanding of what was once considered strictly “natural” or “factual” in many scientific fields, including in disaster studies (Bird, 1987; Demeritt, 2002; Favier & Granet-Abisset, 2009; Schenk, 2007) by documenting the transformations disasters have operated in our categories of thinking since the European Middles Ages (Amador, 2004; Coen, 2013; Dynes, 1971, 1997b).

> *Making a science of disaster means constructing a basis for comparison, both geographic (how hard your town was hit versus mine) and historical (how much worse this one was than the one in your grandmother’s stories). To this end, a science of disaster must constantly move back and forth between the natural and the social, the objective and the subjective, the global and the local. It must correlate geological formation and the built environment, instrumental data and human responses, planetary waves and local damage. Each informs the analysis of the other. (Coen, 2013: 6)*

Luciana Astiz, in a piece originally published under the title *How the earth moved for them*, reflected on how Coen’s Modern History of Seismology makes visible this hybrid construction disaster have been embedded in, drawing:

on examples of how earthquakes were studied in Western countries, (...) consider(ing) early seismologists' challenge in dealing with the physiological and sociological elements at play in the study of earthquakes, and in particular the impact of national identity, as well as differences in perception of risk in different countries. She details the symbiotic relationship between scientists and the common folk, as well as the impact of journalism on earthquake science and the development of information-gathering by networks of "citizen-scientists" in many central European countries that, by the early 20th century, allowed scientists to establish earthquake catalogues and accounts of their effects. (Astiz, 2013)

Coen argument resonates with James's *Principles of Psychology*, first published in 1890, which focused on the definition of personhood:[51] and the way experiences shape the basis of any form of knowledge.

For James, *"idea and knowledge are not the passive outcome of past experiences but […] are the active projection of our experience into the future"* (Barbalet, 2007: 18).[52] Barbalet explained the importance of this proposition: *"this is a singularly Jamesian proposition, central to his pragmatism, not shared by his fellow founding pragmatists and not understood or appreciated by most of his followers. It is what brings his psychology and his pragmatic method together"* (Barbalet, 2007: 18). In addition, the ambiguity of the future – or its uncertainty - is a source of distress, one that is both practical ("What can I do?") and philosophical ("What should I do?") and transform the definition of rationality. In such context, rationality enables people to *"proceed in their particular affairs. Thus James characterizes rationality in term of the particular emotional configuration that enables the actor to engage unknowable futures. […] In this way, James characterizes rationality as a property of mind or a quality of action explicable in terms of its emotional qualities"*

[51] James's perspective is very different from the one used by Freud in the years following the James's Principles of Psychology (1890), followed by Psychology (Briefer course in 1892). The relation between Freud and James is investigated well by Barbalet's paper. Also, though he recognized that Freud's work represents the future of research in psychology, he expressed reticence about what he calls Freud's "fixed ideas." James wrote, *"I can make nothing in my own case of his dream theories and obviously symbolism is a most dangerous method"* (as quoted in Barbalet, 2007: 41). Barbalet analysis of the relationship between James and Freud is found in the following quotation: *"James's account for human emotions is essentially optimistic: its operates in terms of prospective futures that social agent have role in forming. Emotions for James are creative and decisive forces that human affairs, appropriately guiding social agents through situations that would otherwise be inconclusive outcomes. According to Freud, on the other hand, emotions are necessarily irrational forces that, if not properly discharged, lead to neurotic symptoms. Freud's account resonated perfectly with a political social and economic world that not only experienced the irrationality and violence of total war, but also economic depression and dislocation"* (Barbalet, 2007: 14).

[52] As we will see later, this idea of a "mode of action" being, at the same time, active and passive is one of the main characteristics of ANT's concept of "attachment."

(Barbalet, 2007: 22).[53] In recent years, there has been a renewed interest in James's work mostly focusing on the social dimension of his pragmatism.

Yet, Barbalet states that: *"such compartmentalization should not be accepted, though, at the expense of the appreciation of the continuity of James thought"* (Barbalet, 2007: 170). For Barbalet, *"pragmatism was designated as a method, through which the embroidery of metaphysical speculation is unraveled. The purpose of this method is achieved by inquiring about consequences of practical actions that could be deduced from such speculations"* (Barbalet, 2007: 17).[54]

Anthropologists working with ANT perspectives have also insisted on the fact that the subjective part of their scientific projects remains central in the realization of the latter. As Mialet (Mialet, 2012b) notes, scientists and scientific institutions have been on the edge of becoming schizophrenic, as they have tried to compose an image of science in accordance to its principle: a discipline definitively shaped by reason, and detached from individual components. This clear operation of distinction has been the basis of the construction of the scientific persona, as well as scientific discourse (Datson & Galison, 2010; Latour, 1991). However, Mialet claims,

> *Thanks to Popper I knew that scientists had dreams and phantasms; from Merton I learned that they could be immoral; and I understood from my reading of Kuhn that they, like everyone else, were subject to emotional crises. But as far as these authors were concerned, what was given to the scientists (a certain form of humanity) was immediately taken away for the sake of science. Thus they invented elaborate systems to contain the scientist's subjectivity: hence for Popper, the distinction between the context of discovery (the realm of imagination) and the context of justification (the realm of method); for Merton, the distinction between "normal" institutions and "scientific" institutions ruled by universal norms; and for Kuhn, the distinction between a conflicted philosophical pre-paradigmatic science and the calm and orderly settled scientific paradigm, etc. (Mialet, 2012b)*

[53] As I will discuss later in this dissertation, James's theory is important in decision-making theory. In most circumstances we are forced to make a decision without knowing the outcome of the situation. It is what James called the "forced option," a concept which, as we will see, is useful in the context of facing a risk.
[54] Barbelet also noted that James's last book, Some Problems of Philosophy (1911), unfinished at the time of his death, is a treatise on metaphysics, in spite of the anti-metaphysics of his first propositions. Even if we are not pursuing the same objective of dismissing metaphysics, I believe that James's account of emotions and social life is still noteworthy.

In her work on the practices of invention, Mialet (Mialet, 1994) has defined what she calls a "distributed-centered subject" a materialized, collectivized, distributed and connected knowing subject (Mialet, 2012a: 192). Building on two fields of researches, one in an oil company and the other one studying the Physicist Stephen Hawking, she noted that in situation of making science, *"the more (an) actor was linked to an institution, his object of research, his co-worker and so on, the more potential he had to become inventive, and the more inventive he became the more he seemingly distinguished himself as an inventor, as a kind of genius who existed beyond social material and cultural constraint"* (Mialet, 2012a: 193). She added, recalling the multiple operations performed by scientists she has observed:

> *This work of association, the evolution of this singular link, which is established between the actor and his object of research, is not only caused by phenomenon's of association. This link has a singularity of its own. And when we deploy it, we discover the capacities of one individual. (…) The more he distributes, the more he becomes singular, the more he can operate transformations and news associations. In short, we are discovering a distributed actor closest to the actor from the psychology, thanks to his capacity to transpose problematic, to immerge himself in the objects and to metamorphose himself, than the actor network. We are discovering an actor equipped with a psychological plausibility, which move us away from the cubist figure of the actor network. (Mialet, 1994: 290-291)*

Taking into consideration each condition of experience in its muti-dimensionality,[55] Mialet addresses here the critic formulated by ANT researchers. Indeed, as noted by Nigel Thrift: *"actor-network theory had tended to neglect specifically human capacities of expression, powers of invention, of fabulation, which cannot be simply gainsaid, in favor of a kind of flattened cohabitation of all things" (Thrift, 2007: 111)*. Thrift also draws the contours of a new definition of personhood, one that is no longer totally predicated, but can be deployed using the multiplicity of its links and connections;

[55] "*Philosophy has only ever generated differences by taking being qua being as a starting point (the Copernican revolution never happened: philosophy is still geocentric). It should be possible to adopt another position by 'trying out the Other'. This inquiry into the different ways of altering certainly has something empirical about it; in any case, it should stick as closely as possible to what is given in experience (in the full sense of the second empiricism, not the limited version of the first). The number of modes is greater than two, so we will ignore the subject/object dualism and call an end to the bifurcation of nature, not through going beyond it (that would only be counting to three) but through erasing it in a thousand different ways. The modes are of equal dignity; they are the product of a specific history—I would add of an historical anthropology—which does not aim to define a general ontology"* (Latour, 2011a: 316).

I want to substitute material schematism in which the world is made up all kinds of things brought into relation with one another by many and various spaces through a continuous and largely involuntary process of encounter, and the violent training that such an encounter forces. (Thrift, 2007: 8)

2.2.3.2. Science and dependence

Different theoretical framework can be attributed to different epistemologies, or "situated" perspectives, ideas, concepts, and methodologies. For centuries, the scientific process has been build on the notion that distance between the subject that study and the observed object would give the most reliable knowledge (Shapin & Shaffer, 2011). However, STS scholars have shown that this separation has never been really tight (J. Fressoz, 2007; Latour, 1993). In this context, how can we define the nature of the relation between earthquake experts and their subject of research, when the former call themselves the Earthquake Junkies?

K. calls us "Earthquake Junkies"! That's what he calls us. It's the Earthquake Junkies. The people who are, let's say very concerned, conscious, obsessed, whatever you want to call it, you know! [J.8]

The earthquake experts in the Bay Area, the Earthquake Junkies, share this hybridization of identity. They are also "distributed-centred subjects" who, in addition of the objects of their laboratory, take into consideration the place they live in. To understand the relation that the "earthquake junkie" maintain with their environment, I will stop by explore the concept of distance.

In Geography, approaches of the concept of distance have evolved from considerations about metric Euclidean space as to the construction of space as a result of *"the intensity, nature and length of the relation that link things together"* (Lévy & Lussault, 2000: 269). In the Anglo-American tradition, in the 1960s, David Harvey had already showed that, since the mid-nineteenth century, Kantian conception of space was being challenged by mathematicians and physicists.[56] Jonathan Murdoch, geographer who was among the first

[56] For instance, Gauss *has "employed relative conception of space to show that 'activities and objects…define special field influence'…Thus spatial properties cannot be distinguished from object 'in' space and space itself can only be understood as a system of relation"* (D. Harvey, as quoted by J. Murdoch, 1998: 358).

to look at the possible interconnections between geography and ANT, gave in the 1990's definition of distance which takes into consideration the relation between actants helps understand the complex dimensions of the social interactions.

> *While it is no doubt true that 'distance' remains tyrannical in the hands of some geographers, for most this beast has been rendered rather tame and pliable. (…) That is, ANT seeks to analyse how social and material processes (subjects, objects and relations) become seamlessly entwined within complex sets of association. This leads on to an interest in 'network topologies', with the ways that spaces emerge as socio-material relations are arranged into orders and hierarchies. (Murdoch, 1998: 358 359)*

As Thrift and Bingham noted, this major recomposition replaced Euclidian understanding of space as *one* possible conception amongst many others: "*space and time proliferate […] 'space' and 'time' are less important than the always unique acts of 'timing' and 'spacing' by which place-events are 'folded' and 'pleated' into existence*" (Bingham & Thrift, 2000: 289-290). Building on this conception that space is a dynamic creation, the French geographer Michel Lussault added:

> *Distance is a notion intrinsically multidimensional like the thing it designates: manifestations set of social reality separation and its effects. From this fact, spacing constitutes only one of the manifestations of distance at work in the social field, certainly the most visible, the most immediately perceptible; without doubt more powerful than others to impose its specific actions, rougher and so necessitating imperative an answer from individuals and groups, but not the only one from far. (M. Lussault, 2009: 51)*

Indeed, for geographers, actants interact in plurimodal way: they are connected to one another, and as much as they are neatly linked but they also need to "*keep their distance*" to exist. In addition, distance, which here is conceived as spatio-temporal alters actants: some resist and remain intact; others are transformed, never to be the same again. In this new redistribution actants become "spatial operators," as they are shaped by space; their interactions can, in turn, transform space, but not necessarily always symmetrically.

A careful reader of ANT, Lussault developed what he called the "technology of distance" (M. Lussault, 2009: 51), which he defined as *"the system of the manifestation of distance and the social reality of its affects"* (M. Lussault, 2009: 51) of this new populated space. Lussault's spatial grammar starts at our fingertips and expands to the terrestrial globe, thus defining various scales. The first one is our body envelope, understood as the physical boundaries of self. The second scale, the space of life, is the one of the neighborhood; it is related to the space of the everyday life (de Certeau, 1988). This space is also the one Geographer working in the "non-representational theory" has placed in the center of its analysis:

> *We now understand that the space and rhythms of the everyday, everydayness, and everyday life […] are not just a filigree bolstering an underlying social machine but a series of pre-individual ethologies that incessantly rehearse a materialism in which matter turns into a sensed-sensing energy with multiple centres. (Thrift, 2007: 17)*

The third scale is the regional space. This is the space of displacement and transport that concerns not only commodities but also ideas, ideologies, and so forth. Finally, the last scale is that of the world; this is social space on a world scale. Following the first hybridization of spatial theory with ANT, Lussault has argued that space can be defined as the "visibility regimen" of societal substances. Several regimens of action coexist in space, defined as such: co-presence, displacement, and telecommunication. In this perspective, boundaries[57] are what hold things together.

As much as it seems obvious that "space" for a seismologist is not the same "space" as for an anthropologist, the idea of space also forms a poetic encapsulation of the latent world, well structured and pre-reflective. This interlacing of the pre-cognitive and cognitive dimensions of space is what provides the "paradox of space" that Thrift employs in his thinking:

> *We all know that space is something lived in and through in the most mundane way – from the bordering provided by the womb, through the location of a coffee cup on our desk that is just out of reach, through the memories of building and landscape which intertwine with our bodies and provide a kind of poetic of space, through the ways in which vast political and commercial empires - and the resultant wealth and misery can be fashioned from the mundane comings and goings of ships and trains and now planes, through to the invisible messages that inhabit the radio spectrum in their billion and etch another dimension of life. (Thrift, 2007: 17)*

[57] As much as this chapter proposes to take into consideration articulations across the interactions between space and "modes of existence," we should keep in mind that this is also because boundaries exist between the self and the world, between I and the others, thus that specifically "otherness" can exist. In this sense, it is important that the reticular organization of the network also bears the mark of this reality.

But, Thrift also reminds us with the very artificial demand of researcher when on the act of researching, in the field or in a laboratory which conduct to focus more attention that we probably should on the only cognitive aspect of the answer. In other words, Thrift is calling for our attention; he is calling for attention to a "*social awareness*" which involves a,

> *high level [of] cognitive abilities, like imitation, learning about learning and an ability to carry meaning in a whole series of registers (not only language but also gesture) […] and the manipulation of time and space – [which] predominate over sensory awareness; "our normal focus is social and social awareness is highly conscious, that is it heavily engage our conscious activities. (Thrift, 2007: 7)*[58]

This leads precisely to a necessity to pay attention to, and to be aware of, the actions that we perform at every instant of our everyday lives that we imported into the conceptual framework of this present work.

2.2.3.3. Distance and attention

Defining what it is to wait for "the Big One" necessitates the expert to add another dimension to the Latourian network, namely, attention. This dimension is composed of the ways individuals living in a social environment organize, prioritize, store, and use information, which helps understand how emotions and knowledge interact. Will look at that network using the concept of distanciation defines as follow: *"Distanciation in general refers to the stepping back or distancing of the observer or reader from an object of scrutiny. The process of distanciation. It has both a spatial and an emotional side"* (Harvey, 1997). Of course, examining how people wait is also an act of paying attention. Attention is an operation of the intellect that concerns the knowing subject. As William James defined it:

> *Everyone knows what attention is. It is the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought. Focalizations, concentration, of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others, and is a condition, which has a real opposite in the confused, dazed, scatterbrained state that in French is called distraction, and Zerstreutheit in German. (James, 1961: 403-404)*

[58] (Donald, 2001: 68)

Attention, in James's definition, implies a dimension of anticipation, and as such, it is opposed to "absent mindedness" (Depraz, 2013: 113). It is also inscribed in a dynamic learning process (Depraz, 2013). Attention, just like waiting, is also an active posture that requires that our senses, our minds, and our psychological wills be focused in the same direction and on a certain objective.

Attention is an operation of the intellect that concerns the knowing subject, but which takes root in the affects, experience, feelings and emotions. Attention is selective, and is defined as "reactive spontaneity":

> *My experience is what I agree to attend to. Only those item which I notice shape my mind – without selective interest, experience is a utter chaos. Interest alone gives accent and emphasis, light and shades, background and foreground – intelligible perspective in a words. (James, 1890 quoted by Depraz, 2013: 113)*

As Dupraz noted, James's understanding of "attention" is very subtle. It implies a form of openness, a capacity to welcome any forms of novelty, and in the case of earthquake risk, new forms of knowledge, agents and subjectivities (Mialet, 1994). Attention, as define by Isabelle Stengers, is also an operation of the intellect that concerns the knowing and moral subject: *"attention, which, for some, is a matter a free trade with the categories of obligations, which can not be given away, without, in the same mouvement, being seperated from what make them human »* (Stengers, 2002: 28).[59]

For the researcher, but also the expert and the resident, attention is the moment of care, the precaution at the moment of enunciation, which makes the difference of what Stengers calls "live knowledge" and "dead knowledge" (Stengers, 2003).[60] Attention—as its sister concepts, perception and awareness[61]—has blurred conceptual boundaries. In the field

[59] *"Attention, ce qui, pour certains, relève d'un commerce libre par rapport aux catégories du devoir, de ce qui ne peut être enfreint sans que, par la même, ils se trouvent séparés de ce qui fait d'eux des humains"* (Stenger, 2002: 28).

[60] In other writings, Stengers has also called for our attention as a matter of civic duty: the necessary attention or awareness towards our environment, which is a call echoed by authors concerning the question of political ecology and the consequences of the 2008 global financial crisis (see Morin, 2007; Serres, 2008; Hache, 2011).

[61] *"James indicated that there are a great many categories of fringe experiences, not just one. However, he did not attempt an exhaustive list, or a systematic analysis of their relations to each other, or to other mental phenomena. He offered a few examples: 1. feelings of familiarity (p. 252). [Note that after struggling to find a single term to denote conscious states (cf. pp. 185-186), James settled on "thought" and "feeling" depending on context, used synonymously with experience and awareness]. 2. feelings of knowing; e.g., as in the "tip-of-the-tongue" experience (p. 251) 3. feelings of relation; these are subjective qualities associated with the relations between objects or ideas, as indicated by words such as "and," "or," "if," and "but." James says, "We ought to say a feeling of `and'... quite as readily as we say a feeling of cold... " (p. 245). 4. feelings of action tendency; e.g., the intention to say so-and-so, just before it is articulated (p. 253). 5. attitudes of expectancy; the commands, "wait," "look," "hark," elicit distinct feelings of the domain from which a new impression is to come (p. 250). 6. feelings of "rightness" or being "on-the-right-track": this is a feeling that the content currently in the nucleus of awareness is*

where philosophers and psychologists have largely been involved in conceptual definitions, divergences appear, mostly on the degree of consciousness included in the notion. I consider that attention refers to a passive, yet still active form: to be aware of something is to be able to acknowledge its existence. Attention brings together emotions and knowledge with what has been so important for the pragmatist: experience, and of course, the traces that past experiences have left (which can be both material and immaterial).

2.2.3.4. Distance and attachment

Hennion (2004) has noted the role of attention in the process of attachment, seeing it as a moment of suspension between two otherwise mundane, specific actions. As he began to investigate a theory regarding the network of attachment, Latour also developed what he calls "the middle voice."[62] Recusing a conception of action that would be defined only by either its passive or its active mode, bringing the question of emancipation or alienation to the fore, Latour states the importance of attachment:

> *It is no longer a question of opposing attachment and detachment, but instead of good and poor attachment, then there is only one way of deciding the quality of these ties: to inquire of what they consist, what they do how one is affected by them (Latour & Girard Stark, 1999: 22).*

congruent in some global way with our current goal structure (what James calls the "topic" of our thought)." (Galin, 1994). The tip-of-the-tongue experience is particularly interesting, as it shows the progressive building up of the psychoanalytical theory between William James and Sigmund Freud. For James, *"This state of our consciousness is peculiar. There is a gap therein: but mere gap it is a gap this is intensively active. A sort of wraith of the name is in it, beckoning is in a given direction, making us at moments tingle with the sense of our closeness, and then letting us sink back without the longed-for term. If wrong names are proposed to us, this singularity gap acts immediately to negate them…and the gap of one word does not feel like the gap of another, all empty of content as both might seems necessary to be when describing gap"* (James [1890], 1950: 251-252, quoted by Galin, 1994: 379). On the other hand, for Freud, the act of forgetting proper names is a process: *"The process that should lead to the reproduction of the missing names has been so to speak displaced and has therefore led to an incorrect substitute. My hypothesis is that this displacement is not left to arbitrary psychical choice but follows path which can be predicted and which conform to laws"* (Freud, 1965: 10). This example allows Freud to build on the theory of the unconscious. *"I repressed something. What I wanted to forgot was not, it is true, the name of the artist at Orvieto but something else, something, however which contrived to place itself in an associative connection with his name, so that my act of will missed its target and I forgot the one thing against my will, while I wanted to forget the other thing intentionally"* (Freud, 1965: 13). Galin notes that James's dual construction of awareness had limited impact between contemporary psychologists and cognitivists. The arguments against it have been the extreme limited time period during which the complex relationship between the fringes and the nucleus operate. A second argument has been the too-limited elements of definition between the fringe and the nucleus. Here, Galin argues that, *"There must be some qualities more fundamental that definiteness that make the fringe information unsuitable for the purpose served by the nucleus information, and vice versa"* (Galin, 1994: 13).

[62] The expression is borrowed to Emile Benvenist, found in his work The Active and Middle Voice in the Verb, published in 1971 by the University of Minnesota Press.

Starting again from the scientists and experts of the Bay Area waiting for the Big One, we will consider what James has defined as "The Sentiment of Rationality". Under these decision-making often relies on the "force option." To illustrate this proposition, James give the example of a rock climber who, when confronted with a difficulty, must trust herself enough to be able to succeed in a decisive leap. In this case, the positive emotion of trust might be as decisive as a negative emotion, which could lead to a fatal conclusion. Barbalet describes James's analysis in detail:

> *In "The Sentiment of Rationality", James develops the point, that emotion constructs circumstances, through the case of the "Alpine climber" in which an actor's particular emotional commitment leads to a singular material outcome (James 1897, pp. 96-7). To escape serious difficulty, the Alpine climber must execute a dangerous leap that she has not performed before. If she is engaged by the emotions of confidence and hope, she is likely to perform a feat that would be otherwise impossible. Fear and mistrust, on the other hand, are likely to lead to hesitation, and this will increase the probability that the climber will miss her foothold and fall to her death. Whichever emotion is engaged will be commensurate with a particular outcome, but with contrastingly different consequences. The role of emotion in practical conduct or human agency, then, is to permit action that would be inhibited if it were to rely on logic or calculation alone. The evidence on which "rational" or deliberative calculation relies is simply not available for most social actions. The emotional contribution to agency is to overcome the uncertainty of the future by providing an emotional orientation to one possible future in the realization of a present action. Otherwise action simply could not occur, and the actor would not be able to proceed. (Barbalet, 2007)*

In the James example, context defines what the climber "ought" to do, and we see that emotion is the drive of that action. In a more contemporary version of this example, ANT researcher Antoine Hennion[63] applies a nuance to James's proposition, intending to demonstrate that, for the climber, the music amateur, the drug user, or really any given individual, *"we are actually concerned by a much larger range of practices and activities"* (Hennion, 2007: 99). Moving toward the idea of the co-construction of action and the actor, Hennion likewise uses an example of a climber:

[63] Hennion's work has long investigated classical music amateurs, while Gomart's studies have largely been concerned with drug users and the controversies about methadone programs (Gomart & Hennion, 1999; A. Hennion, 2004a, 2004b).

> *The objective of the ascent conflates with the actual fact of climbing. What counts is entirely in what is happening. From the point of view of the subject, an analogous reduction erases the distinction between the goal and its realization. At the bottom of the route, the climber is eager to abandon all of the personal attributes that make up his regular identity. To practice this sort of thing together, one might begin at the outset by depositing all of that which is not concerned with this activity. […] Before their cliff, the only important thing for a moment, for humans together like this, is common practice. As with all amateurs – be they the miniature modelers that come to compare their balsa wood planes on Sunday at the Bagatelle, or the Bocce players on the promenade in the South of France – it is the activity that defines them, not the inverse. (Hennion, 2007: 99)*

Going a step further, to better define the connection between the risk expert and his or her object of research, November recalled that the climber metaphor has also been used by Bessy and Chateauraynault in their definition of expertise. They discussed the idea as it worked at the intersection of the climbing hold, of "having hold over" the environment, but also to "give a hold" (Bessy & Chateauraynaud, 1995: 239). Once again, the metaphor of the climber is used to describe their point:

> *Holds emerge from the interaction between bodies and strategies, 'like a climber's holds emerging from a series of confrontations between the mountaineer and the rock face. Holds can describe the relationship between people and objects in two ways: as having a hold on something, an expression often used to describe humans (active, interactive and inquiring) gaining the upper hand over objects and their environment (inert, passive and subject to human endeavor); or as suggesting the irreducible nature of objects and the difficulty of even getting a hold' […]. The holds selected are never a foregone conclusion, but "the outcome of a meeting between a strategy, pursued by the relevant stakeholder(s), and a network of bodies, characterized by their peaks, folds and cracks. (Bessy & Chateauraynaud, quoted by November et al., 2009: 193)*

2.2.3.5. The expert as amateur

Drawing on the figure of the "amateur" defined by researchers in ANT, experts and scientists in the Bay Area have recognized that their knowledge and their experience are interwoven give them some responsibilities toward their fellow residents. *"Amateur learn to* *be affected"* recalled Annemarie Mol describing this important figure of the actor in the ANT theory (Mol, 2010). But, *"amateurs care about technicalities"* (Mol, 2010), also. Building on Latour, Hennion has developed a sociology of attachments (Gomart & Hennion, 1999); this is a sociology "*in direct contact with things, uncertainty of sensations, method and techniques used to become sensitive to, and to feel the feeling of, the object being sought"* (Hennion, 2007: 98).[64] The "amateur," in Hennion's vocabulary, is the co-constructed human actant of this relationship.

In the Bay Area, earthquake experts living on the fault lines are like climbers on the rock; they have to navigate between holds. Describing what they have called *"the art of the hold"* Chateauraynaud and Bessy have shown that the experts are capable of identifying and deciphering the different modes of existence of the actants, and can, from his body space, activate the resources that are needed (Bessy & Chateauraynaud, 1995: 243). Characterizing their attachment to earthquakes as a form of dependence seems to open up, for some experts, the possibility to go a step further in their self-proclaimed singularity of their experiencing earthquake phenomena. This is a connection between the scientist and his object of research that connects not only a single individual with a question but also, more broadly, with a type of approach, an ambition one might say, a responsibility, which allows us to see the complexity of the realization of their project.

Amateurs rely as much on the properties of objects – which, far from being given, have to be deployed in order to be perceived – as on the abilities and sensibilities one needs to train to perceive them; they rely as much on the individual and collective determinisms of attachment, as on the techniques and devices necessary in a situation for things to be felt. Understood as reflexive work performed on one's own attachments, the amateur's taste, knowledge is no longer considered an arbitrary election which has to be explained (as in the so-called 'critical' sociology) by hidden social causes. Rather, it is a collective technique, whose analysis helps us to understand the way we make ourselves become sensitized, to things, to ourselves, to situations and to moments, while simultaneously controlling how those feelings might be shared and discussed with others *(Hennion, 2007: 98).*

What interested Mialet, Chateauraynaud and Bessy, Gomart, Hennion, November, and Latour is the study of the devices, practices, and interests that work together to create the inventor, the drug user, the amateur musician, or the expert; it is this type of relationship

[64] Hennion firmly inscribes this in his opposition to a sociology of culture, for which these moment *"are directly denounced as ritual whose principal function is less to make amateur 'feel' than to make them 'believe'"* (Hennion, 2007: 98).

that explains the development of attachment.[65] Thus, following the form of network, the researcher can follow the attachments: *"the formidable proliferations of objects, properties, beings, fears, techniques that make us do things unto others"* (Latour, 2009: 24).

The introduction of these non-rational dimensions of our lives, our processes of decision-making and our production of knowledge, ultimately opens up new perspectives in the definition and organization of our individual worlds. It allows existences – or ontologies – of actants that were not visible before to come into being. Our attachments become visible, the material strings of the network - things, thoughts, beliefs, and experiences that matter – allow us to put each into perspective (Bennett, 2004; Hache, 2011).

2.2.4. The network of risk

Pursuing these first attempts of importing ANT concepts into the scientific fields of geography and the study of risk, November (November et al., 2010; November, 2002, 2004, 2008) have shown how risk and territory co-construct or instaure each other. Focusing on the "*spatial dynamics*" of risk, and this "*dual relationship*" between risk and territory, November developed the concept of the "*spatiality of risk*" (November, 2008: 1523), which describes the ways in which "*risks transform spaces and how spaces subsequently lead to changes in the nature of risks themselves*" (November, 2008: 1523).

In doing so, and articulating scales of the network, November and al. have argued that the use of computers and the development of the web in the twenty-first century have confirmed that James suggested in the nineteenth century; namely that we live in multiverses, and that maps are a parts, or layers, of these multiverses (November et al., 2010). November et al. argue that the usage of the virtual mapping has made what otherwise might have been less visible in the pre-computer era, visible: if the maps bear some resemblance with reality, they are not, in fact, a true representation of the latter. Rather they are 'signposts' as November calls them, which carry useful information. But

[65] First developed by Latour in 1999, the quotation of attachment has been comically illustrated by the Spanish artist, Quino. In his drawing, an emblematic little girl, Mafalda, says to her father, who is smoking a cigarette, "I thought the cigarette was smoking you." The humor here is based on the question of relations, according to the dialectical construction of being either active or passive; meaning that one is either the master of an object or is dependent upon it.

before being a curve or a line or a specific color representing a specific place, a massive amount of information has been collected, selected, compiled, visualized, translated, and then put down on paper.

A map, as is the world itself, is a space of chosen, conflicted, or negotiated relationships that combine several modes of existence. As a "thing," a map participates in the "equilaterality"[66] of the world. In this sense, the object-map bears a three-dimensional view of the thing, described by Souriau as *"the* thingy [réique] *status is made of thought, and even in three possible ways: as a liaison, as a conscience and as a agent"* (Stengers & Latour, 2009: 36).[67] But as phenomenon, it imposes its reality on others by deploying, in a single moment, the complexity of its composition. In other words, a map, as a thing, or as an object, has, with effort and difficulty, an established reality,[68] and as a phenomenon, it is supported by the existence of a specific world,[69] leaving tracks on the soul—the cartographic mind.

In rethinking what seems at first to be only cartographic questions, November et al. have engaged with a much broader definition of the relationship between risk and territory. Their starting point was the map, or more precisely, the hazard map, as they considered its pluri-modal dimensions and the way it reshaped our understandings of the notion of territory. [70] Once a risk is identified in a territory, November argued, this territory will never again be the same (e.g., think of the Chernobyl Exclusion Zone). November successfully imposed the concept of risk as an actant articulated in a spatialized network. She noted that "*risks transform spaces and how spaces subsequently lead to changes in the nature of risks themselves*" (November, 2008: 1523) and observed how successive occupations of specific urban spaces utilized by different users - such as industrial, residential, or recreational

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[66] *"Il ne s'agit aucunement de faire comme si, avec le mode réique, l'on avait découvert enfin le monde réel. L'équilatéralité a dû être instaurée, et l'instauration de l'humanité (un leit-motiv de Souriau) est, disons, à peine ébauchée urgent ici et maintenant"* (Latour and Stenger, 2009: 41).

[67] "*Le statut réique comporte la pensée, et même de triple manière : comme liaison, comme conscience et comme agent"* (Stengers & Latour, 2009: 36)

[68] *"C'est la signature du mode d'existence pure réique que de produire un temps et un espace avec réticence et difficulté"* (Stengers & Latour, 2009: 36)

[69] *"Le phénomène de Souriau ne se trouve plus pris en tenaille entre ce qu'il y aurait derrière lui —les qualités premières— et ce qu'il y aurait devant lui —les qualités secondes. Ce qui va définir ce mode complètement original et rarement qualifié comme tel par la philosophie, c'est sa patuité : Il est présence, éclat, donnée non repoussable. Il est, et il se dit pour ce qu'il est. On peut sans doute travailler à l'exorciser de cette irritante qualité de présence par soi. On peut le dénoncer ténu, labile et fugace. N'est-ce pas là simplement s'avouer dérouté devant une existence pure, d'un seul mode? (p. 113)"* (Latour and Stenger, 2009: 32).

[70] *"What is commonly called the 'outside material' world, the one more or less accurately 'represented' by the maps, is entirely a by-product of the imagination, an aesthetic view of technical practices that have been put in the back-ground. There is nothing especially 'material' in this Euclidian space inside which Galilean objects would flow effortlessly without undergoing any transformation"* (November et al., 2010: 595).

users - progressively increases the vulnerability of that space, producing what could be described as stratums of risk (November et al., 2009).

But what happens when risks are not recognized, or are imperfectly defined – in other words: invisible? This was the case in Lully, Switzerland, where the risk of flooding was, for decades, "partially forgotten" (November et al., 2009: 191). In this small village close to Geneva, the need for more land to develop the urban, agricultural, and industrial activities conducted to the drainage of the former flooding areas. With the drainage, "*the threads have been partially forgotten, partly as a result of planning permission for new housing [… and] the risk was never exactly ignored but, with hindsight, we now know that successive alterations to the watercourse led to other unforeseen risk"* (November et al., 2009: 191). The consequence of this was, of course, some unanticipated floods that strongly affected the unprepared residents of the town. In Lully, risk has failed to "exist fully" (*exister pleinement*). Invisible in the landscape, consigned in reports long forgotten amid the city archives, the risk of flood had become "unreadable", invisible for both experts and new residents.[71]

The Lully case is interesting for several reasons. First, because, as we said, November successfully imposes the concept of risk as an actant, seen within a moving network of other actants. Second, because amongst these actants, November includes those defined by non-representational geography (Anderson & Harrison, 2010; Thrift, 2008) and opened some important tracks in the research of the "footprints" of the risk.[72] In this context, footprints are defined as the collection of marks and traces left by risks, either older or more recent, found in the landscape, buildings, books, maps, or residents practices and memory, questioning the way in which we, as subjects and as collective, engage with risk and disaster.[73] In addition, what was not necessarily visible in previously printed navigational maps, becomes visible in virtual and hazard maps, which, *"… besides the material and physical dimensions of risk, […] consider(s) their social, political, and economic dimensions,*

[71] Because of their everyday practices and observations, the market gardeners in Lully had better knowledge of the risks of flooding than the municipal "authorities," who did not pay sufficient attention to the flood-hazard maps created several years before; those maps were simply gathering dust somewhere in the village archives.
[72] November's footprint also echoes Souriau idea of "wake," as decribed by Stenger and Latour*: "Nous avons, d'autre part, en plus, par dessus, des choses dont la circulation laisse, si on ose dire, à titre de sillage ou de trace, des pensées objectives dans la tête de ceux qui sont capables de se laisser informer par elles"* (Stenger and Latour, 2009: 42),
[73] *"Le coup d'œil synoptique conférera à la diversité des modes d'existence la puissance d'une situation questionnante, où il s'agit non pas simplement de répondre, mais d'instaurer, de réussir le trajet exigé par la réponse. Un trajet dont l'aboutissement n'est autre que la détermination de « comment » nous sommes concernés par les modes d'existence"* (Stengers and Latour, 2009: 24).

which result in ever-changing vulnerabilities, imbalances and delicate rebalancing acts" (November et al. 2009: 192).

Souriau's system is echoed in the navigational uses of signposts as described by November (November et al., 2010). Working on the same continuum as geographers, and by reintroducing the concepts of time and space, and the human and non-human aspects, this perspective allows for the possibility of "making space" and "making territory" for those involved. Taking their distance, so to speak, with what was defined earlier as primary and secondary qualities, there is not any "bifurcation of nature"[74] left, but only one world composed with difficulty and some hesitation.[75]

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[74] *"Mapping risks has forced us to look closer at the ambiguous role of maps. Our paper tackles some of the reasons why this emphasis on the base map does not need to characterize the skills of geographers and offers an alternative way for social scientists and geographers to collaborate by circumventing a well-entrenched distinction between 'physical' and 'human' geography"* (November, Camacho-Hübner, & Latour, 2010: 581).

[75] *"What has been so odd with the advent of geography is that not only does it purport to be about 'spatial dimension' but confesses how difficult it is to 'include' the time dimension"* (see Glennie and Thrift, 2009; Hagerstrand, 1975; May and Thrift, 2001; Schwanen, 2007). See also the difficulty of establishing the knowing subject in Souriau: *"l'esprit connaissant va être institué, instauré, par l'effort des êtres réiques pour gagner leur droit à l'existence"* (Latour, Stenger, 2009: 34).

2.3. Transition 1: A network of attention to the risk

Risk is never a clear given; it needs to be comprehended in its full complexity, and to be approached with caution, taking into account the many ways in which residents, concerned citizens, and experts are actively waiting for the Big One. If a consensus has emerged over the years about the seismicity of the region, controversies remain about how best to frame and define past events and how to manage their legacies. Deploying this first layer of complexity around an understanding of what precisely earthquake risk is for the area, we can then identify how controversies have emerged, and how historical research can illuminate certain aspects of this subject.

This first chapter has focused on some of the possible "readings" of the concepts mobilized in the following chapters of this work: space, risk, and attention. We have argued that the articulation of these three concepts allows us to look at the ways in which earthquake is defined as a risk, and as such how it is memorized and forgotten, perceived and experienced, understood and studied in the Bay Area. Elaborating on three types of literature (Disasters Studies, STS, Geography) we have progressively solidified our approach of the study of earthquake risks. First, we have looked back at the history of the elaboration of the concepts of risk and disaster in American and European scholarly literature in order to see how the distribution of facts, values, and human and non-human actants have been aggregated by pioneers in the field of this science, and further, how these associations have produced a specific type of body politic.

Next, through the Actor Network Theory proposition, or the reticular organization, of risk's actants, that we have looked at the possibility of adding third genre, defined by a scholarly British trend of investigating Human Geography called Non-Rational Theory. Working at the intersection of these two corpuses, I have found the concept of attachment, allows us to articulate and define the different relationships that residents of the Bay Area have to the earthquake risk. In ANT perspective, the concept of attachment insists on the connection between actants, and ties to the world in which we live, and our experiences of it. For Non Rational Theory, attachment also describe an experience, composed of both knowledge and emotions, that are not just fleeting moments, but accumulated through time, and constantly convene by an active, living subject.

Waiting for “the Big One,” experts and residents are looking at the mediations and actants that create a network, and as we have seen, this is a space which will, perhaps, allow residents of the San Francisco Bay Area to be resilient in the event of a catastrophic event. Risk and disaster stand at the intersection points between territory, science, and experience, and between human and non-human actants, or what Pratt (Pratt, 1992) has called a “contact zone.” This means that the space of risk is a zone of contact, where human and non-human elements interact, and where different dimensions of experience are combined. Indeed, interstices between the conditional and the future, between the definition of a risk and the envisioning of a catastrophe, between a regimen of action and a regimen of attachment, is also what characterize the relationships that earthquake experts maintain with the very real risk of an earthquake occurring in the Bay Area.

Not a risk taker, not a potential victim, and not an expert detached from grounded experience, earthquake experts in the Bay Area have developed a particular connection to the object of their research and refer to themselves as Earthquake Junkies. As actants “in between” as in the famous image of the climber on the rock, earthquake experts developed a certain form of attachment toward the place where he lives. This singularity of scientists and experts is what make the situation of Bay Area earthquake research so unique. In this “contact zone” – between tectonic plates, science, experiences, and so forth – earthquake experts have learned how to deal with the multiple actants. They have learned to “think as” the earthquake – just as Mialet’s engineers have needed to think “as the oil” (Mialet, 1994) – but they also have learned also how to think as individual residents—those who live their lives above an active seismic fault. They have learned about the complex mechanisms that can trigger an earthquake, but also the no-less complex policies that would make the Bay Area more resilient.

Chapter 3
Second Instauration: The Elusive Dimensions of Risk and Disaster in the Bay Area

What we have called, following Souriau, the instauration of the earthquake is a slow, but tidy process that needs to be look at within proper historical perspective, while also taking into account the diversity of experiences. Looking for the traces of risk and disaster in the Bay Area, expounding on a complex map of emotions and memories, I argue, define dimensions and intensity of the San Francisco Bay Area earthquake risk. One can also see how this multidimensional, layered object has left traces in the Bay Area, creating an invisible map of dangers, memories, and emotions for concerned residents.

In this chapter, we will first examine some of the difficulties that have emerged when trying to define and localize risk and potential disaster in this region. Doing so, we will see how the various questions of definition, as addressed their theoretical perspective in the previous chapter, can help us better understand the situation of the Bay Area. Then, we will look for the physical traces of earthquake risks on the east side of the Bay Area.

This “on site” research will allow us to identify some of the specificities of this risk, looking at the complex web of interactions that make these particular places iconic of the many ways in which the risk of earthquakes is comprehended. Here we will focus on three different types of materiality of the earthquake risk: first, the Bay Area fault maps, which center on the seismic faults; second, the California Memorial Stadium, which has crystallized some of the most entrenched controversies around the questions of risk and safety, but additionally, around the ideas of conservation and heritage; and third, the San Francisco Bay Bridge. In this chapter, I have also shaped an ethnography of the Oakland Fire, which has been an event of considerable importance in understanding regional disasters among the residents of the Bay Area. This last development allows us to reflect on the spatial transformations that are created in the recognition of risks and disasters.

3.1. The Uncertain space of risk

Talking about risk and disaster in the San Francisco Bay Area can sometime feel a bit inappropriate. *"No, I don't think about that at all, I've lived in California my whole life, so earthquakes are not even part of my thinking"* [M.3], said one of the respondents during our discussion, with the impatient look of someone waiting for his interlocutor to change subject. Another interviewee, a survivor of the 1991 Oakland Fire, told me firmly: *"I never thought that about the fire"* [G.6]. The topic of our discussion almost felt like discourteous attitude about an area that has so much else to offer: the vibrant cities, the picturesque history and political figures, the Silicon Valley, the spectacular landscapes, or even the temperate weather.

3.1.1. The Apparent Paradox of the Bay Area.

Coming to the Bay Area from Europe with a dissertation project about risk in hand, I discovered that what I thought was a problem - namely the risk of earthquakes or fires in the Bay Area - was often considered an almost irrelevant subject by many people whom I interviewed: "*Most people I know don't think about it or, if they think about it and worry about it, I don't think it affects the way they live their lives,"* [R.4] said a third one, leaving me to reflect further on the subject.

Later in the interviewing process, short, "closed" sentences would come back often. When asked how they deal with the risk of earthquakes, common answers would be: *"It is not something that I feel concern with,"* [G.6] or *"That does not affect my day to day thinking at all"*[M.3]. Connected to such statements, the idea prevails among risk managers and experts that residents of the Bay Area cultivate a certain detachment toward the earthquake risk. In fact, this distance between of the possibility of a large-scale disaster, and the residents' seeming disdain, have been a recurrent complaint of risk specialists, who, in return, have been quick to criticize SF Bay Area residents for their general lack of interest in understanding their own risks. However, despite these apparently entrenched stances, recent research has shown not only the level of awareness among resident of the Bay Area has tended to improve over time, but also that residents frame their reasoning into modeling, "*probably reasonable*,"[76] and verifiable matrices.

Following the Northridge Earthquake, that hit the hillsides homes of in Los Angeles particularly hard, researchers at the University of Southern California conducted another study on the personal decisions frameworks regarding retrofitting (Von Winterfeldt et al., 2000). They define types of decision-making framework, which either coincide or conflict with one another. The first one is the "Regulatory Frame" in which the key question is *"what caused the damage to hillside homes in past earthquake (especially Northridge earthquake) and what can be done to avoid similar damage in future earthquake"* (2000: 23). Using the responses to this question, the action rule *"appeared to be to spend no more money for retrofitting than what could be saved by avoiding damages in a major earthquake"* (2000: 23). The second framework of analysis was called the "Homeowner Frame," which challenged the recommendations of the previous one, raising the issues of costs and benefits of major retrofitting and the low probability of large-scale earthquake. They concluded that, *"under three conditions, a minor retrofit becomes the preferred option: 1. If the time horizon is increased to about 30 years; 2. If the replacement value V is increased to about $750,000; 3. If the homeowner is very risk averse. No reasonable assumptions could make a major retrofit the preferred option"* (2000: 29). [77]

In addition, in 2009, the Bay Area Chapter of the American Red Cross conducted a survey among 1,201 residents of the San Francisco Bay Area to evaluate their level of preparedness. The market-research company *Issues & Answers* was hired to conduct interviews in English, Spanish, Mandarin, and Cantonese. In the context of risk and disasters preparedness in the Bay Area, these figure are very interesting, providing a snapshot view of the relationship that people have with the risk of earthquakes. The results were the following: people with previous experiences of a disaster (34% of the panel), were more prone to have taken one of

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[76] "*We identified a new set of problems with the earthquake safety of hillside homes; we know how to fix these problems, at least for moderate to strong earthquakes like the Northridge earthquake; as long as the costs of the fixes are significantly below the damage that is likely to occur in a Northridge-like earthquake, and as long as these fixes provide a higher degree of assurance that there won't be any damage, they are probably reasonable*" (VonWinterfeldt, Roselund, & Kitsuse, 2000: 18).

[77] Following this perspective, from the authors' vantage point, the more accurate solution in terms of public policy should be to implement policy that encourages homeowners to invest in minor earthquake retrofitting. *"The primary reason for this switch is the longer time horizon. With a longer time horizon the probabilities of moderate and strong ground shaking increase (approximately, but not precisely, by a factor of three), and the probability of low shaking decreases. As a result, retrofitting alternatives will become more attractive"* (VonWinterfeldt, Roselund, & Kitsuse, 2000: 31).

several preparedness action steps as advocated by the American Red Cross (e.g., make a plan, build a kit, and get training). In this group, 89% stated that they were ready to face a possible disaster. Respondents with higher incomes ($50K and higher), as well as long-time residents (more than 10 years), were also more likely to take at least one preparedness action step. The research also showed that the level of preparedness is slowly increasing. In 2006, only 6% of respondents indicated that they had fulfilled the three requested steps of the American Red Cross preparedness plan, whereas 22% had done so in 2009. In addition, 32% of the respondents had taken two steps, and 29% only one. Only 16% of Bay Area residents took no safety measures in 2009, which is lower than it was in 2008, when the number was 21%. The role of local and federal institutions is also well-known by respondents. Three-quarters of the population with school-aged children knew about their children's school's emergency plan. The American Red Cross is trusted by 60% of respondents to be a good source of information, as well as a reliable actor in a response to an emergency. In contrast, town and city mayors, the California state Governor, and the Federal Emergency Management Agency (FEMA) were only trusted by one-third of the respondents. Television network were seen as the least accurate source of emergency information (Issues Answer, 2009).

The implication of such studies is important: first, because, at last, residents' decision-frameworks are considered rational and as such, can reach the public space; second, because within a socially and scientifically acceptable perspective, they have put forward original, but also sometimes contradictory, positions, solutions, and re-compositions of the space of risk and disaster in the Bay Area. These controversies – as we can call them – draw the (always temporary) lines between what matters and what does not; what should be taken into consideration and what need to be left aside.

3.1.1.1. The Oakland Fire Controversies

Controversies are an important dimension of framing risks and disasters, and consensus is often hard to obtain. The Oakland Fire that killed 25 people and burned 3,354 houses in 1991, for instance, is still a subject of discussion among, and between, past and present residents and experts. The controversies can be summarized by two debates. The first debate concerns the relevance of the event itself, and its definition as "a disaster." In relation to the geographical scale of the Bay Area, the perimeter of the fire was relatively small. In the following excerpt, the respondent uses a provocative, figure-based approach to explain his view about the size of the event.

> *The Oakland Hills fire affected 3,000 housing units. There are 13 million people in the greater Bay Area. For most of them it is meaningless! It was just a house fire and it really has no effect on [others residents] and does not enter the active memory. […] You know, we just don't have an event of this magnitude in the U.S. in recent memory. Katrina is the only event in my mind that qualifies as memorable. [M.3]*[78]

This statement was, of course, contested by fire survivors, who claimed that they *"have disasters a lot"* [S.16], and that the fire actually affected the Bay Area as a whole; that people have held onto memories of the event.

> *People, over in Marin, people down the Peninsula were seeing ashes in the air! It affected everybody, really a much broader circle than just the immediate East Bay. I still run into people now who talk about where they were the day of the fire. I say: 'I lost my house' and they say: 'Oh, my friend up [in] the hills too!' Everybody has a story about it. It really did affect everybody. [S.16]*

The question of definition brings together questions of border, scale, and distance, but also, the personal experiences of those borders, scales, and distances. Disasters do not happen, literally, everywhere, all the time: they happen in specific times and locations, they happen in different scales, in different environments, and at different moments. Like many American cities, Oakland has a history of suffering with spatial, economic, and racial segregation.[79] These inequalities are still very vivid today, both on the maps and in the minds of the local residents.[80]

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[78] After the quotation, the discussion continued as follows:
"C- What about 9/11?
M- Whoa … 5,000 people, it was not a lot of people! It has a psychological impact in the fact that Americans felt that their country was impacted, but that is very different from the very impact of the disaster. The real impact of the disaster was a tiny, little part of Manhattan. I mean, nobody lost power across the river, you know. It was a very small number of people. There was inconvenience relative to the size of Manhattan and the size of [New York]. And so those things, they don't affect people on the same level. We did not have an earthquake of the scale of the one [that] affected China, where you have 5 million people displaced, or Haiti were you have 2 million people displaced. We hadn't had this sort of disasters in the U.S." (Interview, M.C., 2009)

[79] Self (Self, 2005) has shown that the construction of the city itself is entrenched between conflicting movements that emerged from the progressive suburbanization of the city: defensive "Black Power" community politics on one side, and on the other, the White conservative homeowner associations. As Self noted, "In 1945 boosters in Oakland envisioned their metropolis in the tradition of California Urbanist, as a verdant, interconnected garden that combined suburban

The second controversy concerns the socioeconomic categories of populations affected by the fire.[81] The fire happened in upper-middle class neighborhoods, and as such, residents were able to mobilize a considerable amount of resources to rebuild in a relatively short amount of time, their large and comfortable houses.[82] This situation has been largely acknowledged by the fire survivors: *"My older daughter said to me: 'Gee, Mom, that makes us like the homeless, doesn't it?' I go…'Yes'… and then she said, 'But we still have money, so we'll be okay'. I said 'Yes'"* [S.16] The economic dimension, like having fire insurance, was certainly a major component in the recovery process:

> *We went to some meetings; there were some town hall meetings about how to deal with your insurance company. We didn't have any of those issues that some people have. My husband is an attorney, he's used to talking to insurance companies. We had a sit-down meeting with them at his office in his conference room on his turf with our architect and our contractor, we went through [it all] item-by-item, and we had very smooth time dealing with them. We were among the first to start rebuilding. [R.5]*

But, of course, not all the reconstruction stories were that straightforward and for many residents the experience of reconstruction was an other layer of pain and difficulty, that for many lasted for years.

3.1.1.2. The Complex Legacy of the Big One

If a consensus around the definition of Oakland's "event" has not been yet been reached, the same, in fact, is true for the 1906 San Francisco Earthquake. The real and full impact of the 1906 earthquake and fire, which ravaged San Francisco, has been difficult to appreciate for decades. This is the case not only because analyses of the consequences of this earthquake, and the fire that followed, have been continually mixed together, or because survivors and eye-witnesses' testimonies were long-neglected, but also, because the

growth and urban vitality. Thirty years later the Black Panthers Party and other African American activists viewed Oakland as an exploited colony that was controlled from the suburban perimeter" (Self, 2005: 4).

[80] Interestingly, I was told by a university professor that I should perhaps not start researching on Oakland, as the racial "bias" was "a risk" that might contaminate my work.

[81] Building up on Mike Davis' essay, "The Case for Letting Malibu Burn" (Davis, 1998).

[82] Accomplished via financial remuneration by the homeowners' insurances companies.

earthquake did not fit in with the San Francisco founders' idea of the city. Recent research, conducted in archives as well as in earth sciences laboratories has permitted a reassessment of the real dimensions of this event within its true historical context (Hansen, 1989; Tobriner, 2006).

Figure 6 - San Francisco, April 18, 1906. Source: Arnold Genthes. (Genthes, 1936)

If the event is hard to define today, it is because it was hard to believe then. The unfolding succession of events – first the earthquake, and then the fire, the decision taken to dynamite standing buildings to avoid the propagation of fire, the use of the national guard, and so forth – have created a narrative that has taken liberties with what was really happening. The above image is, in this respect, an interesting story inside the story.

> *There is particularly one scene that I recorded the morning of the first day of the fire (on Sacramento Street, looking toward the Bay) which shows, in a pictorial effective composition, the results of the earthquake, the beginning of the fire and the attitude of people. On the right is a house, the front of which has collapsed in the streets, the occupants are sitting on chairs calmly watching the approach of the fire. Groups of people are standing in the street, motionless, gazing at the cloud of smoke. When the fire crept close, they would just move up a block. It is hard to believe that such a scene actually occurred in the way the photograph represents it. (Genthes, 1936)*

The first aspect of the controversy focuses on the qualification and the definition of the event, which was intimately connected to the challenges and the intellectual framework of the time. As one respondent noted, "*1906 was a mega-catastrophe but there was so much denial on the part of folks*" [J.8]. Denials of the event were indeed coming for variety people and sometime for contradictory reasons, which shows the difficulty of assessing the multiple risks from different vantage points.

> *Early historians chose to emphasize the fire over the earthquake, and in the decades afterward, 1906 was remembered for "the Great Fire." Some recent historians charge that this was a cover-up, geared toward reassuring investors that San Francisco was not a peculiarly disaster prone place, since fires, unlike earthquakes, can happen anywhere. (Solnit, 2009: 41)*

Other discussions have concerned the actual state of the destruction caused by the earthquake. Former sources claimed that more than 28,000 buildings were destroyed by this earthquake,[83] while more recent ones tend to show that the earthquake did little damage when compared to the fire that followed.[84] For researchers,

> *The major buildings of downtown San Francisco […] appear […] undamaged. Even buildings in construction appeared unhurt. The earthquake resistant buildings of the 1870s, like the Palace Hotel, the Occidental Hotel and the Appraiser's Building, appear intact. […] The overall impression from our vantage point is that most buildings, including the overwhelming majority of brick buildings, survived the earthquake with little exterior damage. (Tobriner, 2006: 119)*

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[83] *"Just before 5:12 a.m. on April 18, 1906, a magnitude 4.0 foreshock on the San Andreas Fault quietly rumbled throughout the Bay Area. About 20 seconds later, a magnitude 7.8 to 7.9 temblor began to rupture, with its epicenter below the Pacific Ocean, just 3 kilometers west of Ocean Beach, San Francisco. Violent shaking swept throughout the entire region and included 17 serious aftershocks within 1 hour. The quake ruptured 477 kilometers of the San Andreas Fault between San Juan Bautista to the south and Cape Mendocino to the north. [By comparison, the Bay Area's 1989 Loma Prieta earthquake had a rupture length of only about 35 kilometers and one-thirtieth the energy.] The rupture propagated up to 5 kilometers per second. The amount of horizontal displacement between the Pacific and North American plates varied from 0.5 to 9.7 meters. The earthquake was felt from southern Oregon to Los Angeles and inland as far East as central Nevada. Kevin Starr, professor of history at the University of Southern California and California State librarian emeritus, described the earthquake during a presentation to Lawrence Livermore employees last April. He termed the quake 'one of the greatest catastrophes in U.S. urban areas.' In all, more than 28,000 buildings were destroyed, many of them unreinforced structures that collapsed instantly. From a population of about 400,000, the earthquake killed approximately 3,000 people and left 225,000 homeless"* (Heller, 2006).

[84] Looking at pictures taken directly after the earthquake but before the fire, Tobriner has established a new estimation of the 1906 destructions. Doing so, he has also contested what *"many scholar and popular historians have accepted and repeated [namely] the idea that San Francisco of the 1860s denied the existence of seismic danger [...]. However, historical records show that architects, engineers, and even everyday citizens understood the consequences of the earthquake of the 1860s and tried to inventory the damages, to understand what had happened, retrofit building to resist future earthquake and to build earthquake resistant structures"* (Tobriner, 2006: 35).

Of course, changing the reading of the event also changes the conclusions and recommendation for future events. If it was the fire that brought down the city, and not the earthquake, what does this mean about earthquake readiness of San Francisco's buildings? Should we, following Stephen Tobriner, conclude that the 1906 earthquake *"has proved the capability of our structures to withstand such vibrations of the earth as are liable to occur in the future"* (Tobriner, 2006: 50)?

The 1906 earthquake is a phenomenon that never found its total existence, its own story, because the reading of the specific earthquake event was overlapped by the fire that occurred in the earthquake's aftermath, as well as the wide number of experiences, stories, and interests that were interwoven at the time, and since. In addition, time and distance have washed out the overwhelming effects of the disaster; the last survivors,[85] who were young children at the time, and who are no longer here today to personally discuss the event. In the next section, we will see how both the traces of the events and the memories of them have sometimes been cancelled out, and sometime been kept vivid. If the history of the 1906 earthquake has been marked by a denial of the materiality of the space, the awareness of the specificity has not been totally forgotten.[86]

> *There is no doubt that the fire was far more destructive than the earthquake, but it is also true that for reconstruction of the city, citizen and their leaders had to be sure to emphasize the gravity of the fire damage. […] Still engineers and architects could not ignore what they had seen. Many remained committed to building structures that could resist both earthquake and fire. They tried to implement changes in building practices. Unnamed citizens, like my grandfather, remained concerned as well. (Tobriner, 2006: 197)*

As a new actant (or a set of multiple actants) disasters deeply disrupt and transform the pre-existing order of a particular space. Here, I argue that, if the potentiality of a disaster tends to be difficult to grasp by Bay Area residents, it is partly because their acquaintance with large-magnitude events has been muted for a long time. As pointed out in 1913 in the

[85] The last survivors, who were very young at the time of the disaster, have passed away in recent years.
[86] *"The earthquake shook down in San Francisco hundreds of thousands of dollars worth of walls and chimneys. But the conflagration that followed burned up hundreds of millions of dollars' worth of property. There is no estimating within hundreds of millions the actual damage wrought. Not in history has a modern imperial city been so completely destroyed. San Francisco is gone. Nothing remains of it but memories and a fringe of dwelling-houses on its outskirts. Its industrial section is wiped out. Its business section is wiped out. Its social and residential section is wiped out. The factories and warehouses, the great stores and newspaper buildings, the hotels and the palaces of the nabobs, are all gone. Remains only the fringe of dwelling houses on the outskirts of what was once San Francisco "* (Tobriner, 2006: 197).

Bulletin of Sociology of America, "Shortly after the earthquake of April 1906, there was a general disposition that almost amounted to concerted action for the purpose of suppressing all mention of that catastrophe" (as quoted in Hansen, 1989: 117).

3.2. The Denial of Topography and the Exploitation of Nature

In the short, but rapid history of the urbanization of the San Francisco Bay Area, the feelings of risk and the occasional disasters have been unwelcomed guests. Urbanization has paralleled economic development.[87] If different narratives have told the same story, they have – for sometimes opposite reasons – tended to hide the potentiality of natural disasters. One of these reasons might be that natural resources are what made California rich (Gaar & Miller, 2006; Brechin, 2006).[88]

3.2.1. Nature as a Resource

A nostalgic lost paradise before its massive urbanization, San Francisco was an ecologically diverse ecosystem shaped by a delta, estuaries, wetlands, and strong tides. Fauna and flora were prosperous and early accounts of the area described a "*sky darkened by the flights of ducks and geese, salmon runs coming up the delta so thick that you had the impression you could walk across their backs all the way to the other shore*" (Save San Francisco Bay, n.d.).[89]

Gold extraction in the relatively nearby hills was, of course, the fuel for the economic development of the Bay, but there was also systematic, organized exploitation of available natural resources including water (Reisner, 2003), wood and fish (Montgomery, 2004), and a variety of wild animals. Agriculture soon became great resource of the state. The plantings of melons and oranges could start agricultural empires, and with the help of cheap migrant

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[87] *"Resources extraction and economic development were reciprocal, the gains from resources extraction created prosperity within the region, and the regional special order was such as to maintain these condition"* (Walker, 2010: 5).
[88] I will provide more information about the other reasons in the following chapter of this dissertation.
[89] Most of the wildlife is, of course, no longer found along highways or in the backyards of residential areas: *"tule elk, antelopes and grizzly bears, and thousands and thousands of migratory shorebirds – so many that duck hunters, up until the 1850s describe being able to kill twelve birds with one shot"* (Save San Francisco Bay, n.d.). Wildlife is still present in the East Bay: mule deer, coyotes, gray foxes, raccoons, skunks, opossums, and fox squirrels live in the hills. Mountain lions are also part of the mix of the East Bay wildlands-urban interface, being regularly spotted in the Berkeley and El Cerrito Hills.

labor, in many cases, it did. As a result, the Bay Area, as we know it today, is what is left (or what has grown) from the "voracious appetite" (Walker, 1998) for the resources of this promising "new frontier" land (Berglund, 2007). Natural resources were transformed into valuable commodities, and in the process, an industrial city grew from the ground. The transformation of the space was also a powerful fuel for innovation, and residents of the region have built up the area largely only thinking about its nature as a resource, and not as a threat.

Powered by this incredible growth, in the middle of the nineteenth century, San Francisco had become a city of 25,000 habitants and boasted a large harbor and the capacity to supply trade to the rest of the continent. The process of planning the city's development was concomitant with the necessity to integrate San Francisco with America's larger project of "manifest destiny," transforming what was once a "frontier" into a model of civilized urban life. "*Urbanity, not rusticity, was in fashion*" (Walker, 1995). In a Haussmannian movement to give San Francisco the structure that the gold city was missing, middle- and upper-class houses were planned using a grid system, and were built with highly decorated facades reproducing a mix of European architectural styles. These Victorian homes were about to give San Francisco its distinctive characteristic.

What is less known is that, in order to keep the pace of this growing urbanization, city planners made some trade-offs with nature. The first urban plan of San Francisco was rectangular; it was structured on a rectangular grid. In order to maintain this plan, successive planners had to treat the topography of the peninsula with *"cavalier disregard*" (Tobriner, 2006: 9). Beds of freshwater areas were filled in, and then deleted from maps, while some of the hills and marshes were simply smoothed over.[90] This is how Yerba Buena Cove, once a tidal ecosystem, was filled in, and how 80-foot tall sand hills were shoveled away. This is also how the Ricon Hills, known for their incomparable views, were leveled and how the marshes under Mission Street, which were so unstable that animals would drown in them, were filled in to provide foundations for new buildings.[91]

[90] *"According to one source, O'Farrell [the civil engineer in charge of the grid] at first blanked when asked to extend the grid without reference to topographical features, but in the end, he did. In accordance with standard practice in nineteenth century America, O'Farrell platted across tidelands that were regularly under water, over marshes, and up the slope of steep hills in order to facilitate land sale"* (Tobriner, 2006: 9).

[91] Incredibly, in some place, between 40 and 80 feet deep.

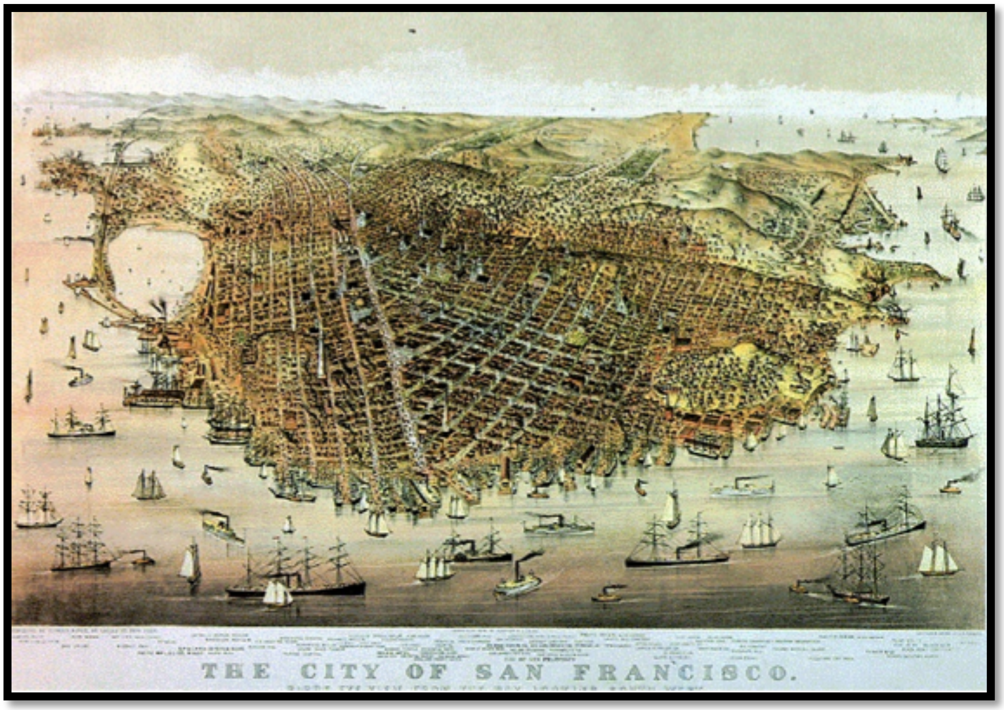

Figure 7 - An 1874 artist's bird's-eye view of San Francisco shows Mission Bay on the left. Image: Bancroft Library, U.C. Berkeley

The real estate market had always been an important economic motor for this area and topography was not allowed to be an obstacle to powerful growth.[92] Water lots, sold by the municipal authorities, were progressively filled in by developers and turned into "made ground," which, it turned out, and not surprisingly, was extremely unstable land when earthquakes hit. By the end of the nineteenth century, this "hard core" development was subject to contestations: new residents, perhaps more sensitive maybe to the quality of their environment than the average gold-digger, started to question the brutal manners of the city's planners.[93] They were not only concerned about the aesthetic quality of their living environment, but also by the matter of safety. For example, earthquakes had rattled the Bay Area in 1838 causing serious damage to the small adobe Mission, which had been built in the late-eighteenth century. And, in 1850, several earthquakes of small magnitudes[94]

[92] As Tobriner noted, the city was then selling lots in order to cover municipal expenses (Tobriner, 2006: 11).

[93] Mobilization by both the citizens and the press had in little to no impact on the city plan, which was drawn according to the city's overriding business plan.

[94] The 1868 earthquake was a M6.8 earthquake, with its epicenter at the southern end of the Hayward Fault. The earthquake was, at that time, the more destructive one in California's history. In San Francisco, fife deaths and significant property loss was reported. A significant amount of damage also occurred in Alameda County, where a number of small rural cities were almost totally destroyed.

caused a lot of damage in the "made ground" areas around the city, more than in other parts.[95] Despite these concerns, weak building codes, mostly for residential homes, remained the norm, as developers were afraid of potential investors fleeing from too many constraints.

Transformation, disruption, losses, and reconstruction have always been part of the history of the Bay Area of San Francisco. The successive land occupations, from the very first Native Americans to last immigrants, not to mention relatively recent redevelopment plans, have contributed to create a place that is used to rapid, and sometime brutal, transformations.

3.2.2. The Multiple Ecologies of the Bay Area

Today, the greater Bay Area remains one of the wealthiest areas of the whole country,[96] and exploitation of its natural resources has not stopped:[97] large-scale civic mobilization has largely been able to successfully defend the remaining species and wetlands[98] from being turned into oil terminals and freeways,[99] in the name of "development."[100]

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[95] After the 1856 earthquake in Alta California, an editorial stated, *"Since the terrible shock of Friday last, speculation has been rife as to the probable effect it would have upon the minds of inhabitants and upon the property interests of the city"*(Tobriner, 2006: 18).

[96] So-called "Silicon Valley," on the Peninsula of the Bay Area, is geographically the third largest high technology centers in the United States, behind the New York City's greater metropolitan area and Washington, D.C.'s metropolitan area. In the SF Bay Area itself, it ranks first. The region is the most important producer of high technology devices in the United States. In 2009, the San Francisco Bay Area's GDP ranked it as the equivalent of the 22nd richest country of the world if it were its own country.

[97] From the first moment of its construction, San Francisco has been pulled apart by the exploitation of its resources on one side and the people's defense of the environment on the other. Bay Area conservations group are numerous and very active. The Bay Institute of San Francisco, San Francisco Baykeeper, the California League of Conservation Voters, California Native Plant Society, Friends of the San Francisco Estuary, the Greenbelt Alliance, The Marine Mammal Center, and the Save the Bay organization, to name a few, have been very active trying to protect the remaining space against the growing "concrete-ization" of the greater Bay Area.

[98] Among others battles, opponents of non-regulated development of the Bay Area have been able to stop developers from filling in the Bay more fully. The first place to be filled in was Yerba Buena area, around Mission Bay, and soon thereafter, every San Francisco creek and tideland. Then came the creation of Treasure Island, the Alameda Naval Air Station, Mills Fields, where the San Francisco Airport is located, and the San Pablo Bay fill project. By the 1960s, 91% of the SF Bay wetlands were gone.

[99] With the freeway revolt, the first of its kind in the United States, neighborhood associations collected 30,000 signatures against the construction of the Embarcadero Freeway which was meant to connect the Bay Bridge to the Golden Gate Bridge. By 1985, the removal of the freeway was supported by a large coalition of environmental organizations. Then-Mayor Dianne Feinstein supported the removal project. In 1991 the freeway was torn down and replaced by a boulevard with trolleys and a pedestrian promenade running along the waterfront. This area's real estate value grew by 300%. For more information about the removal of the freeway, preserving cities, and specifically, the Embarcadero Freeway, see http://www.preservenet.com/freeways/FreewaysEmbarcadero.html.

Despite, or sometimes because of, these antagonisms, San Francisco has been able to keep its singular character; unlike its southern sister, Los Angeles, it has never embodied an *"ecology of fear*[101]*"* (Davis, 1998). The city of San Francisco has kept its character, as did Oakland and Berkeley, and to some extent, Albany, El Cerrito, and Richmond,[102] avoiding, although not completely, the aesthetically destructive effects of suburbanization during the second half of the twentieth century (Walker, 1998). Nonetheless, the landscape (Groth & Bressi, 1997), and the cityscape (King, 2011) today reflect the story of rapid urbanization, and its economic and social transformations, reminders of the diversity of everyday individual experiences, goal and practices.

For both tourists and residents alike, the city appears as a confluence of millions of lives, each having their own map,[103] their own rhythm, and their own path. Putting all of the pieces of this urban puzzle together, all of these different worlds, is a difficult enterprise (Walker, 1995; Solnit, 2010). Richard Walker identified four residential ecologies,[104] which correspond to four socioeconomic types of organizations, historically defined, reflecting the complex web of ideas, needs, or potentialities that went into creating the current urban landscape. The complex ecology of the Bay Area can be found in the interwoven stories, the

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100 *"Urban renewal legislation passed by Congress in 1949 and 1954 gave cities the power to assemble land, clear it of offending uses, and finance redevelopment. San Francisco, like all big cities established a Redevelopment Agency to spearhead its efforts. Justin Herman directed that agency aggressively for many years, backed by the San Francisco Planning and Urban Renewal Association [a citizen Group], and later the Convention and Visitors Bureau [an arm of the hotel and tourism industry]"* (Walker, 1998: 4). The agencies targeted low-income areas and as a consequence, destroyed more than 10% of the Victorian houses that were to become city landmark buildings. 20,000 people were delocalized during the 1950s and 1960s. Other development projects targeted those living in hotels housing, which were mostly occupied by single Filipino, White, and African American men who had retired from working on the docks. This renewal marked the premise of the property boom, which lasted for a little more than a decade, between the 1960s and the first major oil crisis of 1973. Among the famous cases of preservation that were embraced and led by citizen-based organizations was the preservation of San Francisco's cable car, by it receiving national Landmark Status; the "freeway revolt" in 1955 which stopped the freeway from running through Golden Gate Park; and the first loft emerged from Ghirardelli's former chocolate factory. In 1968, the African American community living in the Fillmore District of San Francisco won its battle against an "Urban Renewal Project" allowing them the right to protect their homes from destruction, which was a historical first in the U.S.

101 On this question see also *Insecurity and segregation: rejecting an urbanism of fear*(Pattaroni & Pedrazzini, 2010).

102 This is probably more visible in Oakland and Berkeley that in Albany, El Cerrito, and Richmond. The last two, in particular, have seen larger suburban development, targeting both the lower- and upper-middle classes in these areas. Both cities, however, have succeeded in keeping some of their historic buildings.

103 *"San Francisco has eight hundred thousand inhabitants, more or less, and each of them possesses his or her own map of the place, a word of amities, amours, transit routes, resources, and perils, radiating out from home. But even to say this is to vastly underestimate. San Francisco contains many more than eight hundred thousand living maps, because each of these citizens contains multiple maps. Maps of Knowledge, rumors, fears, friendships, remembered history and facts, alternate versions, desires, the map of everyday activity versus the map occasional discovery, the past versus the present map of this place in relation to others that could be confined neighborhoods or could include multiple continents of ancestral origin, immigration routes and lost homelands, social ties or cultural work "*(Solnit, 2010: 3).

104 These include: the Victorian houses that we have seen, coming before the "Ecotopian houses" that I will discuss in the next section; the hotels which have been provided residences for single working men; and the suburban fabric, which compose a large part of the Bay Area today.

multiple landscapes and landmarks, the living being, and the projects and ideas generated from the area.[105]

It is a moving ecology of an *Infinite City* (Solnit, 2010), as Rebecca Solnit has defined it, born from cohabitation of atomic bombs and cypress trees, butterflies and long-closed jazz clubs, coffee places and murders scenes, murals and creeks, and, of course, the multitudes of "tribes" that inhabit, or have inhabited, the place: joggers, Chinese, the homeless, students, African Americans, hipsters, Mexicans, civil servants, the Irish or the city's gay community.

Solnit used crossed maps (see figure 8) of San Francisco and the Bay Area to reflect the invisibles strata of this urbanity. As did Walkers' schema, her maps make the invisible visible—the remote presence of lost worlds, from the first homes of the Native American dwellers to the now vanished South of Market and Fillmore areas, demolished to profit new development and new people. As Walker noted, *"All four ecologies have their counterparts in other American cities, but the peculiarities of their form, scale and survival in the Bay Area lends the place a special feeling and look"* (Walker, 1995: 35). This *"evidence of the coexistence"* (Solnit, 2010: 115) of different experiences and unique histories, these feelings and looks, are the woven fabric of a unique form of urbanism.

[105] In sum, and said in other words these facets are "actants."

Figure 8 - ***Poison and Palate: The Bay Area in our Body*** **is an artistic map of the complex cohabitation that creates San Francisco urbanity. (Solnit, 2010: 52-53)**

In a great movement that constantly produces new forms of ”being together,” which negotiates and renegotiates, claims and reclaims, creates, preserves, destroys, and rebuilds, it seems that there is little place left for remembering past disasters or anticipating futures one. If the earthquakes have not left obvious traces, they did leave some small, perhaps durable ones. But none of them have been consigned in a map that tell the invisible story of past disasters and risky fire corridors.

3.2.3. Entangled Inscriptions of Risk

"San Francisco is divided into those who remember a vanished or mutated landmark or institution, and those who came later." (Solnit, 2010: 6)

In the Bay Area today, the space where earthquake risk is visible can be difficult to find. The traces of the 1906 earthquake, for instance, have almost entirely been erased from the urban landscape, and signs of prevention for earthquakes to come are, for most residents, also not readily seen. If the transformation of the landscape testifies to the impact of the momentous events of 1906, the changes that have taken place, buried under the growing vegetation and layers of stucco of successive remodeling, are hardly visible to an uninformed and inattentive eye.

The 1906 earthquake not only destroyed a good part of San Francisco, but also affected Oakland, and on a smaller scale, Berkeley. Because of the large extent of the destruction, the earthquake and fire have had long-term consequences on the urban development of the Bay Area. As refugees flew the disaster scene – some of them never to return – the economic construction boom on the Peninsula was brutally stopped and residency patterns redistributed at the scale of the Bay Area.[106] Refugees from San Francisco's "North Beach" neighborhood built homes for themselves across the Bay, in the northern parts of Berkeley. At the turn of the century, Berkeley was a relatively bare bit of hilly land with little vegetation, but it evolved into a cozy neighborhood with large houses surrounded by luxuriant gardens, meticulously arranged, following – in contrast to the grid system of San Francisco – the specific topography of the Berkeley Hills (Schwartz, 2009).

The pictures below show both the spectrum of the destruction after the 1906 fire in San Francisco, and the reconstruction that has followed in the many decades since. The first of the two photographs below was taken from a balloon five weeks after the 1906 earthquake. The one that follows, taken in 1996 from a similar angle, shows the contemporary urban landscape as it has been reconstructed, following a very similar grid layout.

[106] *"All the surrounding cities and towns are jammed with the homeless ones, where they are being cared for by the relief committees. The refugees were carried free by the railroads to any point they wished to go, and it is estimated that over one hundred thousand people have left the peninsula on which San Francisco stood"* (University of Buffalo, 2008).

Figure 9 - The city of San Francisco after the fire. Source: USGS (http://pubs.usgs.gov/fs/1996/fs094-96/)

Figure 10 - The city of San Francisco as it looked in 1996. Source: USGS (http://pubs.usgs.gov/fs/1996/fs094-96/)

At a distance, historic buildings have become undistinguishable from the rest of the city. Once the only visible landmarks of the past, they have become the center of the city, a core around which San Francisco has reinvented itself; stitching together past and present in such a precise way that it has become hard to distinguish one from the other.

For the residents of the contemporary San Francisco Bay Area, the 1906 earthquake is mainly only known through casual conversations and through the stories published in the local newspapers every April 18th commemorating the event. Occasionally commemorations attract more publicity, as happened during the centennial commemorations, which brought together scholars and researchers who focused their discussion on scientifically-oriented aspects (Fehr, 1906; inst, 2006; Kircher, Seligson, Bouabid, & Morrow, 2006; Perkins, Chakos, Olson, Tobin, & Turner, 2006; Grossi & Zoback, 2010; Hinman & Hutchinson, 2005).[107] More than a hundred years after the event, the space of the 1906 earthquake has not yet been totally defined; it is still moving. Even now, people must find ways to navigate the unstable, constantly shifting ground of knowledge (November, Camacho-Hübner, & Latour, 2010), and the complex web of actants that comprise it. Traces of seismic activities have to be found looking closer at, and following, the "signposts."[108]

3.2.3.1. Visible Trace 1. Mapping the Faults.

Thanks to scientific contributions of the earthquake expert community, as well as ongoing efforts to make this information accessible through new interfaces of visualization, the presence and the localization of faults are now rightly part of the urban landscape. The traditional map image of the San Francisco Bay region, striated with red lines indicating fault lines (see figure 14), has become a familiar object, memorized by many Bay Area residents.[109] The map is the reference document that summarizes years of data collection and disciplinary intersections. In its totality, it serves as an important reference document.

[107] As well see later, these pieces of information are crucial for our understanding of the event. Some of this more scientific content produced for these events are accessible online, providing useful first-hand testimonies and a fuller picture of the era. Other documents, not intended to reach large audiences, have remained more confidential, even though a well-indexed Google "Advance Search" can lead one to them.

[108] I have borrowed this word from November, Camacho-Hübner, & Latour (2010).

[109] The maps are regularly published in the newspaper and are part of the earthquake prevention material produced by the USGS and the American Red Cross*, "Putting Down Roots in Earthquake Country"* (American Red Cross, et al., n.d.).

Figure 11 - Faults and plate motions in the San Francisco Bay Region. Source: (USGS, n.d.-a)

The map thus bears the multidimensional meeting point: as an object, it can be folded and unfolded, but as an actant, it imposes a reality. It is at the point of interconnection of several networks, sharing the information collected by some and meant to be read and assessed by others, while at the same time, processing this data through what has been considered a scientific method: systematic collection and verification. Going through this scientific process allows hazard maps a "scientific conscience," providing them the validity to be used.[110] This specific instauration also opens up the possibility of continuity and movement between the realms of the actants.[111] It allows resident of the Bay Area to "navigate" between the faults and assess the danger.

[110] In the case of earthquake risk in the Bay Area, a lot of information can be found online, but as many of the informants told me, only the one produced by USGS are considered scientific enough to be reliable.

[111] *"But what we just said about the spurious distinction between 'physical' and 'human' geography is even truer of the efforts to add the fourth dimension to the 'three dimensions' of Euclidian space. To be sure, once you believe you have frozen the navigational movements in the three dimensions of Euclidian space, it is very difficult to see how you could insert the obvious fact of movement and transformation. But this difficulty vanishes once you realize that in geography – provided you shift to the navigational interpretation of maps – everything is on the move: the navigator in the yacht, the yacht itself, the pencil on the map, the tide, the current, the Nautical Service in charge of sinking the buoys, in brief the whole damned multi- verse. The very idea of a time separated from a space (as if a fourth dimension had to be added to the three of 'commonsense' as if living in a Euclidian space was commonsense!) comes from dreaming over a map too long. Yes, when you engage a map in its mimetic mode, time disappears, but that is because you deal with a frozen image, or synchronic cut (Camacho-Hubner, 2009), selected out of the cascade of*

If the presence of earthquake risk can seem remote, when approaching certain buildings, certain engineering works, the potential threat that an earthquake might occur becomes more pregnant, and sometimes, more visible. The traces of the seismic activity of the region are also to be found in the landscape and have become one of the attractions of for residents and tourists alike. In this case the fault is considered as a natural heritage, an actant among others that forms the specific Californian ecosystem, its geodiversity.

Figure 12 - The San Andreas west of Palmdale, California. One major gouge zone, as wide as an 18-wheeler is long, consists of black clay-like material in the center of this photo (photo taken in March, 2005). (Stierman, 2005)

For inhabitants of the East Bay, the space of risk is, in fact, a space of multiple risks, as the Hayward Fault runs just below the hills in Berkeley and Oakland, which are, as we shall see, subject to sudden and hard-to-control wildfires, as well as potentially dreadful landslides. *"Where I live, the biggest risk is earthquakes because I live close to the Hayward Fault, that's the biggest risk. The others are [that] we live on a hillside, so the other risk is the landslides. So those are the two that I think about"* [S.16] spontaneously explained a resident. Here, the traces of seismic activity are visible to those who know where to look, for instance, at one of the most iconic and controversial buildings on the U.C. Berkeley campus, the California Memorial Stadium. Prior to the retrofitting work done in since 2005, the stadium's tall outer walls were testimonies to the area's seismic activity.

transformations inside which it is inserted and because you have deleted all the transformations undergone by the entities you wish to navigate the yacht, the tide, the reefs, the risks, the race. The very idea of a mobile moving without undergoing any transformation is the result of an aesthetic contemplation of an isolated inscription (Latour, 1986). It is not a property of the world at least not of the multiverse" (November et al. 2010: 596).

3.2.3.2. Visible Trace 2. The California Memorial Stadium.

In 1998, the *San Francisco Chronicle* created a sensation when pointing out that the stadium, which could seat as many as 71,799 people, and occasionally did during college football season, *"has become the biggest risk of massive loss of life from an earthquake in the U.S., if not the world"* (Burress, 1998).

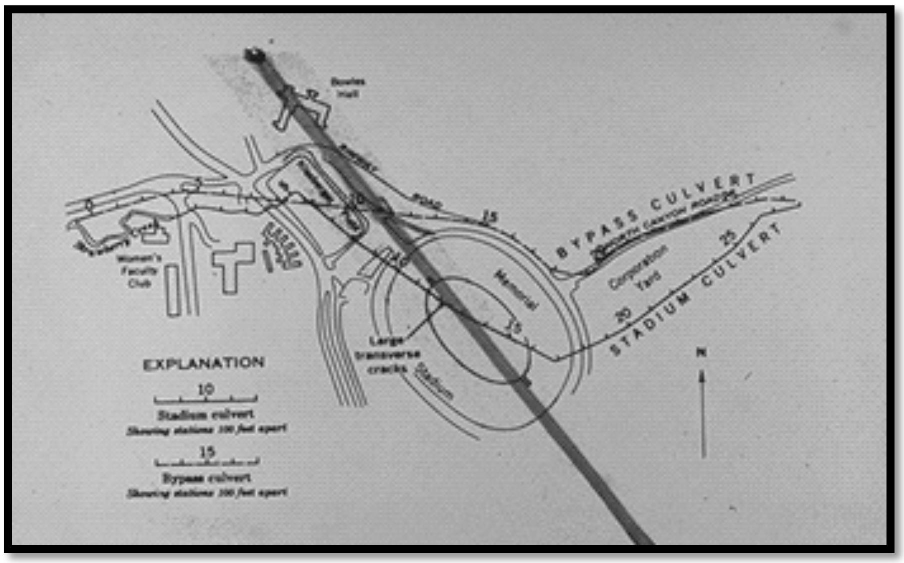

Figure 13 - The Hayward Fault crossing through Memorial Stadium. Source: (http://seismo.berkeley.edu/hayward/ph_stadium.gif)

Since its construction, the Berkeley stadium has been a controversial subject among students, staff, and residents: indispensable to the prestige of the University, it was built in 1923, and has been considered a landmark every since. At the time of its construction, the project was strongly contested by residents of the Berkeley Hills:[112] first, because its construction was done in a canyon that was considered one of the ecological jewels of the East Bay;[113] and second, because it was known that this spectacular geological feature was the result of seismic activity along the Hayward Fault. This activity resulted in the

[112] Among the opponents to the initial construction projects and its retrofitting were several environmental supporters, including several board members of the Sierra Club. According to Daniella Thompson, some members of the Sierra Club, had built their homes in the Berkeley Hills in the late-nineteenth and early-twentieth centuries. Others residents there included scholars of the University of California. John Muir, the President of the Sierra Club, who visited the place, described it as *"a most glorious season of terrestrial grace"* (http://berkeleyheritage.com/eastbay_then-now/sierra_club_leaders.html).

[113] *"The varied and rugged topography of Strawberry Canyon ... has favored the establishment of a rich diversity of plant and animal life, such that Strawberry Canyon today is one of the finest natural areas of comparable size in the Bay Area"* (Garrett Eckbo, 1976, as quoted in http://www.savestrawberrycanyon.org/history.html).

geographical shaping of the Berkeley's hills, and this active fault line continues in shaping the area's terrain.

As soon as the renovation project started, opposition resurfaced. Between December 2, 2006 and September 9, 2008, "tree sitters" opposed the destruction of 90 trees (Fig. 17). During this time, the controversy took on another dimension, when the construction site was revealed to be a burial site and sacred place for Olhone Native Americans (Jones, 2007). Finally, the University project was a bombshell for the greater Berkeley bohemian community, who had been landscaping the area with a great sense of natural preservation.[114] Despite these strong challenges, and despite these claimed interwoven and sometime opposite networks of attachment and/or detachment the stadium was built and remains today.

Figure 14 - Left: Shifting ground: A gap caused by movement in the Hayward Fault is visible when looking up at the stadium from the south end. Photo by Spiral A Design. Source: (Kushner, n.d.). Right: The same outside wall after the retrofitting work. Source: C.Cabasse, 2013

In 2008, engineers in charge of retrofitting the stadium said they solved "*one of the world's great retrofit puzzles,"* and the lead engineer claimed, *"I'll sleep well at night, even if I have season tickets in Section KK"* (Jones, 2008). The solution consisted of slicing portions of the stadium into blocks that rested on plastic sheet[115]. But not everybody was convinced: scientists and activist came back into the debate. In a letter to the Regents of the University

[114] *"Community power and design with nature suffered another blow when the aesthetics of football triumphed at the University and a huge stadium was jammed into scenic behind the campus Strawberry Canyon"* (Walker, 1995).
[115] In C. Jones (2008), "Retrofit Plan to Ride Out Quake at Cal Stadium" (available at http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2008/09/24/MN2L134D3S.DTL).

of California, Berkeley, Professor Emeritus Garniss H. Curtis of Department Earth and Planetary Science stated:

> *As the request for my geologic opinion on the advisability of constructing large buildings in the lower part of Strawberry Canyon and in the next canyon to the north known as Blackberry Canyon came to me on May 4th, I have to be brief and rely on my memory. I shall first say as strongly as I can 'absolutely do not construct any buildings in those two canyons. (Curtis, 2008)*[116]

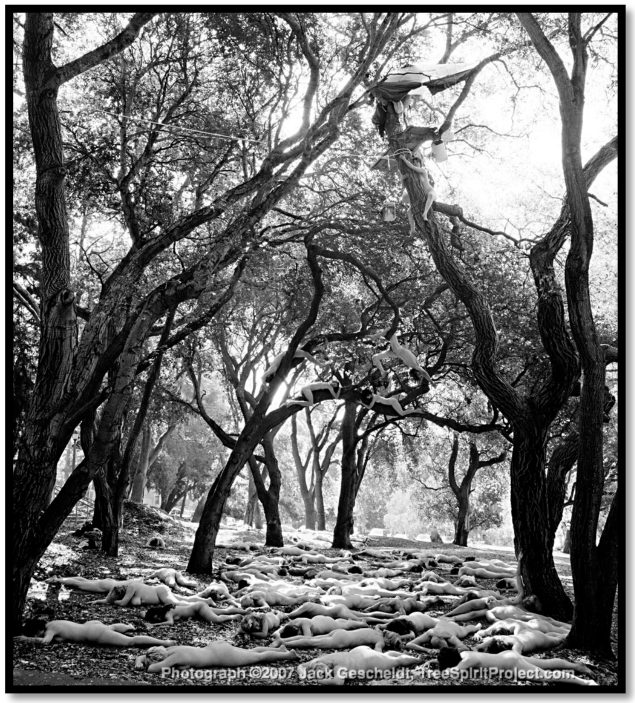

Figure 15 - A Berkeley "tree sitters" action in 2008, some of which also inspired artists and photographers of the tree spirit projects (www.treespiritproject.com), which describes itself as "A celebration of our interdependence with nature. Source: (Kushner, n.d.)

Despite the opposition of activists and advocates, of scientists and political entities, of trees and faults, of descendants of buried Native Americans and living students, the University of California, Berkeley finally evicted the "tree sitters" and started their retrofitting work. The U.C. Board of Regents had already approved $321 million for the project. The stadium was reopened in September 2012, just in time for the school's football season.

[116] The reason for his strong opposition was the high risk of landslides and seismic activity.

3.2.3.3. Visible Trace 3. The Bridges.

Acknowledgement of the ”concreteness,” the specific materiality of risk, is vivid for commuters, who actively use the Bay Area’s civil engineering structures each day. Most of the bridges and tunnels are known by both residents and experts to be particularly vulnerable to earthquakes.[117] *“I drive across the bridge a lot, and I live in the city [San Francisco], so my biggest risks are fire and earthquake”* [M.3], said one respondent. This fear of bridges is rooted in the history of the Bay. The Cypress Street Viaduct, part of the Nimitz Freeway,[118] which used to cross through some of the low-income neighborhoods in Oakland, partly collapsed during the 1989 Loma Prieta Earthquake. That day, the upper tier fell on top of the lower one, resulting 42 causalities.

Figure 16 - The Cypress Highway after the 1989 earthquake. (Source Wikipedia)

The Nimitz Freeway was opened to the public in 1957, and ever since then, it had been criticized for spatially segregating an already underprivileged area of Oakland from the

[117] From north to south, the bridges are: the Carquinez Bridge, the Richmond and San Rafael Bridge, the San Francisco-Oakland Bay Bridge, the San Mateo Bridge, the Dumbarton Bridge, and of course, the Golden Gate Bridge. As we will see later, despite the effort of BART authorities, experts estimate that the underwater tunnel crossing underneath the SF Bay cannot be totally retrofitted; consequently, it might not be one hundred percent safe during a major earthquake.

[118] Some people also discuss the public transportation system’s BART tunnel, which runs underneath the bay, join localities in the East Bay to the San Francisco Peninsula.

more affluent parts of the city.[119] Additionally, the vulnerability of the actual structure had been known ever since seismic retrofit work was done after the 1971 San Fernando Earthquake. During one interview, a respondent recalled,

> *It was known that the freeway might collapse from the '60s and '70s because of two reasons. One, the design, based on future information, it was inadequate. There may also have been some malfeasance in the concrete itself; in other words, the contractors may have cheated on the concrete. They also may not have put in reinforcement bars correctly. They did know the design of the freeway might lead to a high likelihood that it may collapse. They knew that for 20 years … if you don't put enough steel in, then it doesn't help the concrete. If it's not the right mixture and uses lesser quality of cement, it might collapse anyways. They finally declared it to be okay, but what does that mean? I don't know. The contractor cheated, and what's done is done, are you going to go and jackhammer in there? The state would have to come up with more money to do that. […] As far as I know they never tested the materials. They didn't. Probably wasn't the only freeway in California where they didn't. It falls down, 49 [sic] people died and California pays all the victims, we don't know how much because there's a clause in the payment saying they can't divulge that information, the state quieted it up.*[120] *[A.28]*

After the 1989 earthquake, thanks to the mobilization of West Oakland residents, the structure was torn down and a landscaped boulevard was designed to recreate the links between the different parts of Oakland.

Today, the Mandela Parkway stands in place of the former freeway, and locally owned restaurants and vegetable markets on Sundays have given a new face to the space. Still, some stubborn memories remain anchored in the minds of those who witnessed the catastrophe, even long after material traces of the collapsed bridge were removed from the landscape:

> *That Cypress Freeway, as that overpass was called, was a monumental structure in the most literal sense, a gray mass of concrete as high as an office building, and when*

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[119] As one of the resident mentioned, *"Cypress opened the door. It really split the city physically. It was the beginning of the end. It ruined the integrity of the whole area"*("Cypress Freeway Replacement Project," n.d.).

[120] The most visible, and long-term consequence of the Loma Prieta Earthquake has been the construction of a new segment of the east span of the San Francisco Bay Bridge, which began in 2002. Just as the retrofitting operations of the Memorial Stadium, this construction has triggered heated controversies and debates.

I first got there in the early evening I remember also that I looked up and felt dizzy and sick, as though I were staring at a body that had been disemboweled. The ripped freeway had opened a great cross-section of gigantic construction innards that sprawled and jutted and smoked and hissed. Parts of cars were visible inside the striations of concrete and metal, but the whole arrangement made no sense; you couldn't understand what was roadway and what was broken piling, and on the ground were cars upside down and jerked over at weird angles between the fire trucks and improvised emergency equipment, and at one spot below the overpass a crowd of medical workers had gathered at the base of a long ladder that stretched right up into the mess overhead. (Gorney, 2009)

The full impacts of such a tragedy, both in its long and short terms, are difficult to evaluate. They affect both the landscape and the people living in it. Despite the enormous mass of debris left in the middle of Oakland, the consequences of the highway's upper and lower decks' destruction travelled through space. The space of transit became a space of death. Everything was transformed.

The coroner's list was like a census report on the polyglot Bay Area: victims were Asian, black, white, Hispanic. There was a Palestinian, a refugee from Vietnam, Midwesterners, Easterners. Most were not native to the Bay Area: they had come for economic opportunity, for personal or political freedom, for the climate, the beauty. (Reinhold, Navarro, & Rabinovitz, 1989)

Some of the victims were regular commuters, while others just happened to be driving by. In a handful of seconds, their existences – and with them, their movements, and connections to others worlds, others people, goals, and drives – stopped. The role of chance, or fate, or bad luck, with this sudden interruption of the earthquake, created a massive chain of consequences for innumerable people, adding an important dimension to the narrative of the catastrophe:

She [Donna Marsden] boarded the blue and gray Dodge van every weekday morning, and again at 4:40 P.M. in San Francisco for the return home. That day had been no different, except that her husband had taken her to lunch to celebrate her promotion at the University of California at San Francisco. Later, the van traveled the upper deck of the Nimitz Freeway at almost the same time it did every day. Had the quake struck seconds earlier or later, Mrs. Marsden would scarcely have been affected, apart from picking up some fallen items at home. (Reinhold, et al., 1989)

During the rescue operations inside the debris, time and space, life and death, risk and security no longer had the same contours that they used to. Usual objects had to be used in unusual ways, hard decisions had to be made. [121]

The event was broadcasted widely, showing the extremely difficult working conditions of the rescue teams, the graphic images of the consequences of the catastrophe on the structure of the bridge, which included crushed cars, but also human bodies. These images were shared by many: neighbors, families, friends, and, of course, a large, distant television audience.[122] A large community of witnesses had to deal with direct or indirect memories of this terrible event. Indeed, the emotional consequences for the rescue teams have been largely documented, as some have endured distressing and recurrent memories of the experience in the years since:

> *During the rescue work on the collapsed highway, firefighters worked in the pancaking space between the upper and lower levels of the freeways. […] There were strong aftershocks and subsequent compression of the levels. As the space compressed, the escape routes became smaller, increasing the risk that workers would become trapped. Gasoline was leaking from crushed vehicles, increasing the risk of explosions if an extrication tool caused sparks. Personnel were exposed to traumatic stimuli, hearing cries for help became dim as time passed, or witnessing extraordinary procedures such as necessary limb amputation with chainsaw to extricate one of the person trapped. (Myers & Wee, 2005: 185)*

Looking for the traces of risks in the urban landscape opens up the deployment of actants, which contribute to making the complex phenomenon of risk construction visible. These stories of destruction draw a moving definition of the risk. In looking for these traces, we find multiple actants – steel, concrete, contractors, scientific proof, the State, money, information, responsibility, injuries, death, trauma, heroism, malfeasance, miserliness – all engaged in a complex activity that involves disappearance, recalcitrance, appearance, and the transformations of space, objects, memory, and people.

[121] One of the most dramatic stories was the rescue of a young boy, who needed his legs to be amputated in order to free his body from the concrete stones: *"For the journalist who had covered the story, details of the rescue of this young boys are still vivid: "I remember Betts emerging from the operating room twenty years ago to talk to us; it was 4:30 in the morning by that time, and he was in his scrubs, unshaven, gray around the eyes, and worried about shock and toxins that might be released into the boy's lungs or kidneys'"*(Gorney, 2009).

[122] *"I was living in Maine. I once lived in San Francisco and was galvanized by the images on TV of familiar places in ruins. So yes, shock waves were far reaching. San Francisco is one of those "national cities" that everyone identifies [with] – had it been someplace like Topeka or Omaha, the images of ruin would not have carried the shock of recognition in the rest of the country,"* recalls a respondent (J., 2009).

Not all the dimensions of this network are graspable at first, and not all of them move in the same direction. Some of them are measured, planned, and calculated – a commemoration, or the construction of a new bridge, for example. Some meet the stated aim of a particular need: they are part of the controversies; they are involved in moral questions, and monetary valuations. Others are messy, uncontrolled, and can fall into the spectrum of attention, such as memories and feelings. These latter aspects are probably the least visible in the overall landscape; they are the least easy to capture with the scientific tools, but still they exist, and as such, they shape many different spaces and subjects.

In the recent history of California, the status of risk as an "object," or a "thing" in Souriau sense, is an ongoing negotiation. These risks are negotiation between actants, some of which are visible and some not; some standing along, some combined; some that seem strong, others that seem weak. They are hidden, buried, contested, and denied; they are reduced to the potentiality of an expression not fully expressed. As a consequence of these contradictory tensions and interests, the risk of an earthquake, as a reality shared by many, has a hard time to fully exist. To look for the traces of seismic activity in the Bay Area is to require the excavation of past histories, to dig trenches and to study walls, in order to look for the prints left by past disasters.

3.3. Where the Wild Things Are: Looking at Risk and Disasters in the Oakland Hills

I also live among ghosts. For the better or worse, the familiar vanishes, so that the longer you live here, the more you live with a map that no longer matches the actual terrain. After the great 1972 earthquake, Managua, Nicaragua, lost many of its landmarks; people long after gave directions by saying things like, 'Turn left were the tree used to be.' (Solnit, 2010: 6)

Sometimes actants can be hard to trace: they hide behind closed doors, between the lines of the stories, and deep in the recollections of memories. Most of the time they remain visibly unseen; rather, they need to be felt and heard. But they are important. Their manifestations mobilized a range of transitory, seemingly incomplete, and hybrid actants, mostly absent from scientific reports. Despite being concealed, and partly discredited, the 1991 fire transformed the space of the Oakland Hills into a succession different assemblages: the fire itself, the ruins, and ultimately, the rebuilt neighborhood. The history of the Oakland Fire offers a possibility to investigate these combinations of assemblages and to deploy some of the earthquake risk characteristics in the Bay Area. Work of recollection and documentation brings a fascinating body of insights, allowing us to follow the eruption of the fire, almost hour by hour.

On a warm Sunday morning of October 1991, around 10:00 a.m., the wooden houses, the Indian summer, the imported vegetation and beloved gardens, the neighbors, the charming winding streets, the cars, and the fresh pools, were all suddenly replaced by a blaze, residential fire, traffic jams, unbearable temperatures, and exhausted firefighters. The documentation available also provides evidence of the healing powers of narration and art: photography, documentaries, novels, children's books, reports, scientific and journalistic articles, and written notes, all create a patchwork of experiences and perspectives which retrace the transformative power of the fire. To this material, I include excerpts from face-to-face interviews conducted during my field research.[123]

3.3.1. Inquiring About the Traces of the Fire

For those who are discovering the Oakland Hills for the first time, the neighborhood looks like any recently built, affluent area. Contemporary houses, replica styles of traditional ranch or Tudor, Japanese, or Mediterranean architecture, seem to have been indistinctly juxtaposed one after the other, right to the very edges of their lots. The narrow, winding roads going up and down the steep hillsides break the monotony of the seemingly overbuilt area. At street level, little is offered to the view except the multi-car garage doors and, sometimes, professionally designed landscaping. In contrast, when turning toward the west, the direction in which all of the façades face, there appear the magnificent views of the Bay, the Oakland harbor, the bridges, and the city of San Francisco. Except for the "Fire Storm Memorial Garden," which sits along the highway, here again, traces of what happened two decades ago are hard to find.

Figure 17 - Large houses in many styles dot the Oakland Hills which were built after the Oakland Fire. Source: (Schiewe, 2011)

[123] Among the panel of interviewees, the fire has had a particular meaning: some of those interviewed had lost their homes during the events, and many had relatives and friends that had been living in the Oakland Hills at the time of the fire.

Apart from the comments of long-term residents, who call this new Oakland Hills landscape “horrifying” (Schiewe, 2011), it is hard to know that before 1991, the Oakland Hills were a very different kind of space. Before the fire, the wooden houses were typically colonial style, and sat relatively small on their rather large lots. The vegetation was everywhere, and tree canopies and luxuriant gardens gave the place a rural feeling.

Figure 18 - Walter T. Steilberg designed this house in the Berkeley Hills in 1921 for the Sierra Club director and editor, Marion Randall Parsons. Photo: Daniela Thompson, 2005

Following Walker’s typology (Walker, 1995), the pre-fire Berkeley and Oakland Hills were the materialization of the “ecotopian ideal”: a community close to nature, drawn toward Libertarian political theory, and a bohemian lifestyle.[124] The first houses were built by an upper-middle class, and soon drew a population of artists and intellectuals. Because of its spectacular views of the San Francisco Bay and the Golden Gate Bridge, the hills also became a residential choice for affluent families fleeing San Francisco after the 1906 earthquake. In the following decades, residents largely endorsed the ecological principles of John Muir, and were actively engaged in the preservation of great natural landscapes like Yosemite Valley and the area’s large sequoia trees.

[124] Together, these ideas and principles are probably what have earned the community the nick-name of “Nuts Hills,” used by some.

The topology of the hills was scrupulously respected; lots and roads followed the natural perimeters of the creeks and woodlands. The houses also reflected the residents' personal interests and philosophy: they favored a certain austerity in their architectural choices,[125] which was far from the eye-catching Victorian style of early San Francisco. Architects trained on the East Coast and Europe, such as Willis Polk, Bernard Maybeck, and Julia Morgan, were hired to craft the comfortable and – only seemingly (from the outside) – rustic cottages in an unassuming style that remains the Berkeley signature for houses not burned in the fire.

3.3.2. A Surprising Field Research

I found the traces of existence of these houses and the fire that destroyed them in a book, carefully stored in closed, dark room, behind the huge concrete walls of the Berkeley Art Museum and Pacific Film Archive. Here, testimonies of the fire survivors were safely preserved from the ravages of time. These stories had been collected in a "Guest Book" during the exhibition "1991. The Oakland-Berkeley Fire Aftermath: Photographs by Richard Misrach", held at the Berkeley Art Museum and the Oakland Museum of California, between 2010 and 2011.

The pictures, taken in the days following the fire, reflected the impact of the blaze on mundane and familiar objects. Their breathtaking visions of the landscape that vanished under the ashes were so distressing that Misrach said he could not have shown the pictures before: *"I made a radical decision for an artist — to put my work away. But this was in my backyard; it was a major trauma, and people died"* (T. Taylor, 2011). Thus, a part of the history of the Bay Area had been hidden for 20 years.Because of this, the exhibition itself was a different way to experience the disaster, mixing art with community building, oral history, with individual and collective catharsis: *"This exhibition is like no other that I have had […]. I have been moved and stretched emotionally and intellectually. Every new story I hear from people is a little revelation"* (T. Taylor, 2011), confessed the photographer.

[125] Some of these houses remains today, mostly visible in the Panoramic Hills, were residents have fiercely defended their space from encroachment.

For many former Oakland residents, the exhibition worked as a relief, a long-awaited public acknowledgement of the dramatic dimensions of the fire. When the exhibition concluded at both venues, the Guest Book was donated to the Berkeley Museum to be kept in the collection. *"Just as with the Civil War memories, this is a timepiece"*, commented the photographer (T. Taylor, 2011).

Figure 19 - Richard Misrach poses next to one of the most iconic picture of the exhibition. During the exhibition, a three-decade friend of Misrach, who never had the chance to see this picture, claimed the tricycle as belonging to one of his the two young toddlers. Source (T. Taylor, 2011)

This is where I found it: a piece of both art and history in a museum collection. Accessing the book, where the testimonies had been consigned, was like getting access to a well-guarded secret. After entering the museum, the person in charge took me to the storage room. The room had no windows and was closed in by two fire-proof doors.

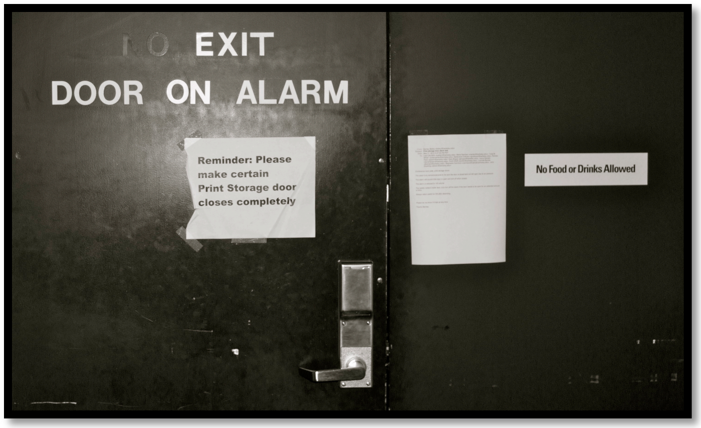

Figure 20 - The door of the storage room. Picture, C. Cabasse, 2011.

Once inside, the dark room looked like a long corridor. The museum collections were stacked on wooden shelves: entirely wrapped statuary, paintings, and curios. The book was waiting for us, thoroughly enveloped in several layers of silky paper and a waterproof piece of plastic. Before removing the last layer, my guide wore surgical gloves, handing another pair to me, and only then, carefully displayed the large black book on the table.

Figure 21 - Discovering the book. Picture, C. Cabasse, 2011

It had the color of ash and the title, “1991,” was embossed on the front cover. Inside, the drawings and comments of visitors reflected upon the multiple perspectives and vantage points from which the Oakland Fire was experienced. *“Now I remember, it was a Sunday”*, recalled one of the anonymous visitor.

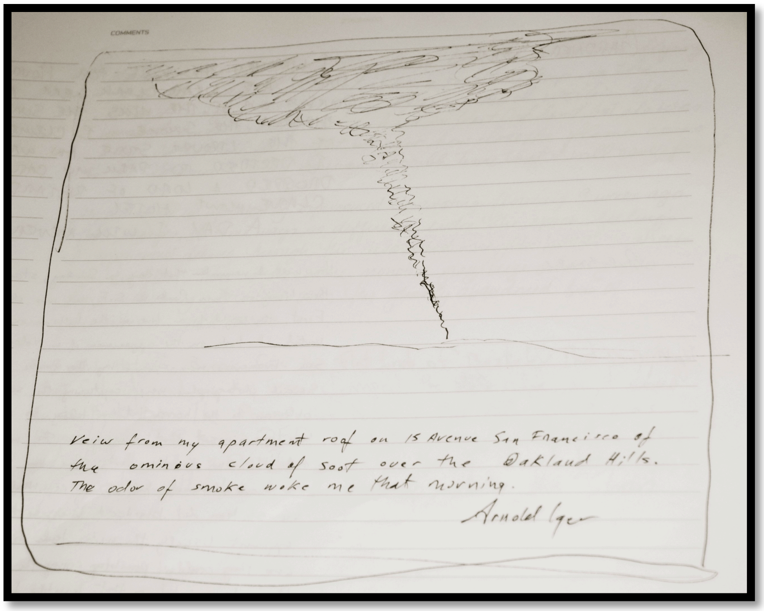

Figure 22 - "*View from my apartment roof on 15 Av San Francisco of the ominous cloud of soot over the Oakland Hills. The odor of smoke woke me that morning.*" Picture by the author, 2011

"We were all humbled and horrified at the destructive power of the fire. It was a somber day," said another commentary. Another, reacting and reshaping the pre-established controversies stated:

> *It was almost tempting to be "unmoved" by the loss of such "affluent" houses and pieces of furniture and luxury. But, no, the loss lays not in the material but the spiritual loss of other beings despite their place in the hierarchical structure. The punctum [sic] of the material in the photographs transcend materiality, and by proxy allow us to feel the presence of loss itself… of losing so much more than material; and the ephemerality of the moments we possess together.*

Here again, thanks to the powers of the pictures and the comments found on the pages of the book, the space of the disaster, the border of the controversies, changed. Pictures of the devastation did not talk so much about the value of the losses, but the loss itself. They focused on the space left empty after objects, actants, were gone: a house, a plastic toy, a life.

I am struck by the disconnect between what fire means and does "in nature" versus in this suburb. In nature, fire brings change, renewal and succession. Here, tradgedy and loss and devastation. This exhibit has caused me to reflect on the incommensurateness [of] nature's rythme of creation and destruction– look how all these trees remains!- and that of human experience. Thank you.

Many testimonies were also about the experiences of the fire, and what it was like on that day to be part of a furiously destructive time. Simply put, they described how it felt.

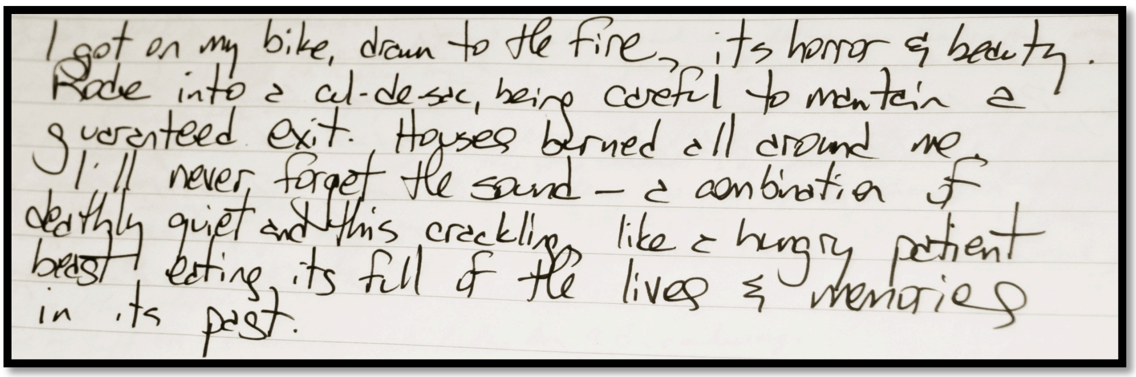

Figure 25. ***"I got on my bike drawn to the fire, its horror & beauty. Rode into a cul-de-sac, being careful to maintain a guaranteed exit. Houses burned all around me. I'll never forget the sound – a combination of deathly quiet and this crackling, like a hungry patient beast eating, its full of lives & memories in its past."*** **Picture C. Cabasse, 2011**

The memories of the fire, the spectacle of the devastation happening right under one's eyes, also brought back testimonies from elsewhere, mixing time and place, references and events, thus spreading the space of "disaster" even further:

My community in Upstate New York exeperiened a devastating flooding 9 weeks ago. These images, in some way so different, evoke the exact feeling I experienced driving through the devastated neig neighborhoods and streets after the flood. There is the same gray beige coloring, the signs searching for lost pets, the ghostly abandoned lots of possessions … Such sorrow."

It also connected people with distant past experiences, building bridges with others' stories, others' times, others' spaces, and others' fears.

> *I had lived in Lebanon in 1975 when the civil war broke out. My family fled the country; I was five years old then. I think on October 20, 1991 I was reliving, living in a war zone…. fire smoke, bombs. That is the only explanation for my drastic response…. FLEE…EVACUATE…. GET AWAY… DANGER… Later my other friends at the International House were laughing about how they hung out outside the dormitory watching the fire and that night they slept in local shelters. To most of them [it] was an exciting adventure from the mundane school life. To me the fire reenacted in me / evoked in me a response to an old trauma – PTSD- that I'll never forget.*

The shared feelings that the pictures of devastations inspired, as well as the possibility to write anonymously about their experiences, also left open passages for the recounting of personal history, poetry, and confession.

> *Fire storm / Flames leapt around my car / A couple roasted like pigs hugging / Mrs D. waving her arms from her porch / To be saved / To catch a lift down the hill / But I sped away / Under the Arc of Fire Ball / When I returned little ribbons of steam / Rose from the ground / Ash fell like snow flakes / The dead were removed / The house stood and leaned like skeletons / I think someone else saved Mrs D.*

The experiences of the Oakland Fire were also shared across generations: "*My Dad was a teen when the fire happened. He lived right below it. When he reads to me a story about the fire – Tikva Means Hope – he is sad,*" wrote a 10-year-old. The fire, the exepriences it yielded, and its diplay, also reminded people of ancient myths like the one about the Indian Godess, Sita, who perished in flames. The experiences of the proximity to death, of course, was often mentioned, as well as the more metaphysical questions that the pictures tackled. Exhortations were made: *"return to god now (Jesus Christ) before it is really to late!"* pleaded one commentator.

The experience of the fire is a collective one that goes beyond the limits of this dissertation, but additionally, the collective experience also moves beyond a narrow understanding of the events of that day. It tells the story of a dispersed "tribe," as an anthropologist would say: it is a story that brings together generations, morals, totems, values, beliefs, celebrations, and a wide range of human emotions including fear, sorrow, remorse, surpise, sadness, curiosity, excitement, and so on. This tribe is like others that form our modern world, one which recognises itself for the duration of an event and which had to find a collective answer to the questions of what really matters, and what should be taken into consideration. Where should we draw the line between what is inside and what is outside our tribe?

3.3.3. Delimiting the Fire

The tentative frame of the event comes from different perspectives: from the visitors to Misrach's exhibition at the two museums, but also from residents both outside and inside the fire zone, risk and disasters agencies, news journalists and scientists, who together focused their attention on it during and after the event. Framing the event was, during its unfolding and even after, a difficult operation. Notions of distance and proximity were mixed-up.

> *All day long the television would show pictures, and the reporters were terrible. They would stand, and they said "We are on Martin Boulevard." Well … Martin Boulevard goes from miles away to very close [to our house], and they never told you the cross street! So it was very difficult to get accurate information that day, but had the fire continued into Piedmont, that mostly would have been a disaster for me and my family. That was a frightening day. It was interesting because at the same time that I was here, in this house, my husband was driving into the real fire zone, with friends, evacuating some of their belongings, and so he kept telling me "it's far away, it's far away," but the helicopters would fly over here and say "Evacuate"… We did have a message to evacuate, so we sent our children with my mother to Walnut Creek, where we knew the children were safe, and we sent a few things, papers and things like that. But once my children, at that time, [they] were maybe 10 and 8, were safe, I felt a lot better about it. To know I only had to move myself and my husband. But that was close, that was the closest we've come, I think, to a disaster, was that day. [S.16]*

The 1991 fire, like the Loma Pieta or the Northridge earthquakes, was a collective event that mobilized, with nuances and degrees, the entire Bay Area. The epicenter of the disaster was, of course, the Oakland Hills, where the blaze of the fire was the hottest. But invisible strings, or reticular connections, were streaming all around to create a new chain of actants.

For professional firefighters and disaster agencies, it was a “century event” (Keeley, 2005). Firefighter units came from Berkeley, Piedmont, Orinda, Moraga, Marin and Contra Costa Counties, San Francisco, and the California Department Forestry. Additionally, fire units, air tankers, and “spotter” aircraft came from as far away as Fresno and Salinas, responding to the alarm through the Alameda County Mutual Aid Coordinator, located in the Lawrence Livermore Laboratory.

Figure 26. The Bay of San Francisco Counties. Source: (Keeley, 2005)

During the fire, the destruction dispersed local families to friends and relatives further away, seeking refuge where it was available. Connections, even distant, even improbable, were activated.

> *I had been in San Francisco the week before and met a graphic designer. And I called her up. I [was] thinking, “Oh my God, this fire is going to go straight to the Bay.” So I called up this woman that I had just met, and I said, “My hill is on fire. Can I come to your house?” And she said yes. Because she could see the stuff floating up. They had pieces of burning paper… she was over by Mount Parnassus by UCSF, and it was so windy, it was blowing over there. [S.16]*

After the fire itself came and went, the recovery efforts immediately went into effect, another moment when the borders of the disaster exceeded the circle on the map. The Red Cross was certainly one of the major actors in the recovery, but so were many neighborhood community organizations and churches all around the Bay Area. For the victims, these organizations brought an influx of donations, from socks and t-shirts to ovens and pots that "*helped us survive in that first year. We weren't alone and we were helping each other,*" as recalled a former Oakland Hills resident.

3.3.3.1. The Fire: a Recollection Attempt

As opposed to the singular form that is used to describe it today – "The" Oakland Hills Fire – there were many fires, many fronts, many actions, and many actants involved. The FEMA report produced after the dust had settled (FEMA, 1991a) established multiple correlations between climatic conditions, vegetation, land development, narrow streets, and previous occurrences of fire and regulatory precautions. [126] The report documents the initial, incendiary moment of origin to be on Saturday, October 19, but then it was rekindled on Sunday, October 20. The report provides written descriptions of the complex layering of the space delimited by multiple boundaries of different types. For the firefighters, the actual, physical terrain was difficult, dry, and steep, with "boxes" and paths which the fire could engulf to become stronger:

> *The terrain […] rises abruptly to form a row of hills called the East Bay Hills or the Oakland Hills, with a ridge line approximately 1,300 feet above sea level. The ridge line runs generally in a north-south direction, parallel to the shoreline of San Francisco Bay and approximately five miles inland. The hills separate the coastal flatlands from the inland valleys of Contra Costa County, and the ridge line establishes both the eastern city limits of the city of Oakland and the eastern boundary of Alameda County. (FEMA, 1991: 5)*

It was also at the interface of several ecosystems that had been transformed over the years, such as by droughts of the previous years, as well as by the importation of invasive, non-

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[126] The FEMA report was realized by a private consulting firm, Tridata Corporation, which according to its website, *"is one of the nation's leading public safety consulting firms. We specialize in research, analyses, and management studies in fire protection and emergency medical services, prevention and preparedness, and homeland security. Our array of fire and emergency research extends across the U.S., supporting the federal government; state, municipal, and local governments; and the private sector"* (http://www.sysplan.com/capabilities/fire_ems/index.html).

natives plants, like the very flammable eucalyptus tree. The economic dimension also played a role. Progressive urban development of the hills and the design of the expensive properties did not allow an efficient fire-protection wall:

> *The homes on the hillside range in value from $250,000 to several million dollars. The steep slopes of the canyon walls present difficult construction challenges. Many were built on platforms overhanging the canyon walls or with multiple levels stepping down the hillside. Garages, sundecks, or swimming pools were often constructed on the top level, with two or more levels of living area below the level of access from the street. Short bridges were required in many cases to span between the street and the garage entrance. Untreated wood shake or wood shingle roofs were common, and no requirements for fire resistive roof coverings or walls were enforced (FEMA, 1991: 7).*

In addition, residents' beloved eclectic vegetation was so dense that it often covered roads and electrical lines. These combined factors resulted in an inferno that led the authors of the FEMA report to conclude:

> *… the fire was beyond the capabilities of the fire suppression forces to control. The stage was set by a number of contributing factors that created the opportunity for disaster. When the Santa Ana wind condition was added to those risk factors, the combination was more than any fire department could handle (FEMA, 1991: 45).*

When the firefighters were called that Saturday afternoon, nothing seemed to be really worrisome. The small fires were under control, and crews left at night, confident that this was a minor event. But on Sunday morning, things took a very different turn:

> *The sudden eruption occurred when a firefighter was digging out a hotspot, near the perimeter, and sparks were carried into an area of dry brush, which virtually exploded into flames. The sudden development of the new fire was witnessed by several individuals, including experienced firefighters, who were able to describe the phenomenal rate of fire growth and spread (FEMA, 1991: 48).*

Figure 27. This map shows the propagation of the fire in its first hours. Between 11:30 a.m. and 5:00 p.m. 3,354 single-family units and 437 apartments burned, or the equivalent of 6,302 km of hillside constructions. The economic loss has been evaluated at $1.5 billion. Among the thousands of people who lived there, the fire killed 25 people, most of who burned to death. Source: (Gabbert, 2011)

The exact timeline during the couple of hours that followed the brutal eruption of the fire is difficult to establish. Actions became reactions to follow the specific deployment of the fire. The FEMA report describes it as follows:

> *The synergistic effects of the wind and the thermal energy released by the fire created unusual fire phenomena that exhibited some of the characteristics of a fire storm on a localized basis, but the term conflagration is more appropriate for the overall situation (FEMA, 1991: 48).*

In the first hours of the fire, the large combination of factors described above created a worst-case scenario for the wildlands and urban interface. Communication between firefighter units were interrupted, the initiated mutual aids between Bay Area Fire

Departments turned short,[127] lives were lost but some were saved; houses burned while people jumped into their pools to save themselves while the fire jumped across the freeway. Finally, the historic Claremont Hotel was saved, as well as the rest of the East Bay, because around 5 o'clock, the wind fortunately stopped blowing. For more than six hours, firefighters were overwhelmed, and anybody who could help did so. The boundaries between safety and danger first responders and the victims, were blurred as the fire transformed reality as they knew it.

The fire was a phenomenon that all of a sudden brought multiple and up until then, dormant chains of actants together in a spectacular movement that surpassed the response capabilities of the firefighters. The wind, the canopy, the decks, the drought, the steeps hills, and all else was turned into a gigantic blaze. Flames could be seen for miles around and the giant cloud forming above the hills was a major source of preoccupation for inhabitants of the Bay Area. From the streets of Oakland to the hills of El Cerrito and San Francisco, everyone was looking toward the fire, toward the phenomenal event that imposed its striking presence.

3.3.3.2. Living Through the Fire: The Emotional Measure of Space

Never in the history of the United Sates did people have to face an urban fire of this dimension (S. Hoffman, 1998). In the scale of one day, the losses and the transformations were tremendous. If some people made it out of the fire, if some houses and some lots were saved, others were not. Assemblages were transformed and categories mixed.

The best way to give life again to the complexity of the event seems to be through the survivors' own words, the literary translation of the survivors' experiences. For residents who were in direct contact with it, the fire was not a scientific event that can be described with objectivity. It was an imposing, breath-taking vision, inspiring distrust and fear, forcing people to make rapid decisions involving their lives and the lives of those around them. The slow pace of the storytelling of the survivors stories allow to pay attention to the diversity of perspectives, and the thickness of those narrated experiences. In these stories, a

[127] Firefighting units from different counties were not able to use Oakland hydrants because of the differences between their hoses and the sizes of hydrant outlets.

world absent in scientific scenarios but is present, in its way, in fictional ones, emerges: [128] the collision between the ordinary and the extraordinary, the transformation of space and subjects.

These fire survivor narratives also express the emotional dimension of going through the disaster. The survivors tell us about the destruction of their worlds, sharing with readers or listeners this sense of loss, chaos, and confusion. Starting with a written, perhaps more distant, account, the following quotations strongly evoke the fire's velocity and its consequences on a once-familiar environment.

In the first excerpt, a survivor wrote a letter to his spouse describing the intensity of the situation and the context in which their house was partially burned. In 2012, a couple of years after her husband's death, the addressee integrated the text as a narrative in a documentary she produced for the commemoration of the twentieth anniversary of the fire. In the second excerpt, drawn from a novel, we find the narrator not at home when the fire starts; she is driving back to save her almost-finished manuscript and some personal items. In the third example, an excerpt of an interview, a person tells the story of the day that her house burned down and how she escaped the fire.

> *Fire rose from the ambers left by a Saturday grass fire caught in a spiraling dust that twisted around the holes of the box canyon, to the East, near the Caldecott Tunnel. Out of control the fire rushed up to the crests of the hills, and with a reversal, flames dove back down. The fierce thrust, five to fifty-five per hour wind, lazed with flames, bends glosses, producing black smoke ballooning upward into sinister clouds. Early that morning, out of the East to the back of the house, I saw a rail of smoke up of the hills, several canyons away and a few hundred feet higher than our house. The smoke huge in quantity moving faster than anything that day could possibly move. It was being blown southward toward downtown Oakland. The wind was hot and steady out of the East, now seems to come up toward us from field behind the back of the house, showing some small fires, real trouble was on its way. Blue sky and dry air suddenly turned to burning orange light, hot sun over heads broken by waves of furious swirling hot winds, loaded with flames. Darkness at noon. The air, a blast furnace. An inferno. Terrifying memories of fires burns in memories of those who live in Northern California. The route 24 Freeway was closed to traffic providing a*

[128] In an interesting move, some of the quotations have a status between several modes or types of narrative: they are journalist accounts rewritten from personal correspondence or diaries, or they are in the form of biographic novels. In each case the literary forms is the necessary condition for the transmission of what matters to the authors: the transmission of an emotion and an experience.

> *command post, for the fire trucks seeding from all over the Bay Area. Young volunteers came looking to help fight the fire. Conditions that day taxed the water supply, caused hydrants to run dry. Narrow winding roads, and down power lines hamper fire-fighting efforts. One house ignites every eleven seconds and explodes. A wild-land fire was rushing up and down and over the walls of canyons jumping the wild route 24 South into the Oakland Hills, turning it into a massive firestorm. Winds and flames blown in all directions, creating destructive chaos, people abandoned their cars to escape on foot as the fire engulfs the hillside neighborhoods. The once blue sky now cooked with chemicals, burning everything to charcoal. Out through the back of the house, I could see trees in flames a few hundred yards away down in the field bellow me. And our roof was burning. At least twenty neighbors appeared to help with fire hoses. The firemen did not even try to evacuate us. They needed help. But at three o'clock they evacuated. One of them told me that saving our house, had saved the neighborhood. (M. Mitchell, 2011)*

With their subjective dimensions, these accounts of the fire tell us about the transformation of the environment and, often, of the narrator. Everyday movements are changed and organized around one predominant fact: the swirling fire, pushed by the Santa Ana wind. The movement of bodies was sprung into action by the urgency of the moment; as well as the movement of 'things' being transformed - mostly into ashes – and the movements of emotions and thoughts. Space was shrunken or extended, as was time: the space of the fire that day was difficult to grasp. In the second excerpt, from a biographical, but fictional book, the narrator is not home when the fire starts. As she has no precise information about it; she is trying to make sense of the disparate, unclear, and sometime contradictory information that she receives through the radio, hearing the disaster in the act of "becoming":

> *I was driving home from funeral ceremonies for my father. […] I turn on public radio for the intelligent voices, and heard that the hills were burning, toward Moraga, toward Walnut Creek. It's not my poor sense of direction, I told myself, but the newscasters in confusion. The perimeters of the fire were different from station to station, from tapped news, to live news. North of the Caldecott tunnel, south of the Caldelcott tunnel, east, west of the Warren Freeway. I picture wildfire far up in the hills – ridgelines of flame spilling down, then running up sere-grass slopes. […] Impossible that it cross ten lanes of freeway and take over the settled, established city. […] Here the winds and all seemed normal; I had no evidence that hurricanes of fire were storming on the other side of the hills but for the radio. "Forty-five houses have gone up to flames." "About a hundred homes." "A hundred and fifty structures have burned." The number would keep going up – nine hundred degrees, the temperature*

of molten lava; twenty-one hundreds degrees, the temperature of kilns, thirty-five hundred houses. "Wind of forty five miles per hour…" "…sixty five miles per hour firewind…" "…record heat and winds" …"foehn wind." "North East wind (…)" "The fire has jumped the junction of highway twenty-four and highway thirteen." "It's blown over and through ten lanes. Ten lanes are not wide enough for the fire-break. It's on side of the freeway." "… dynamite College Avenue … draw the line at College Avenue" "Helicopter and available cropdusters chemical drop the Claremont Hotel" "If the Claremont Hotel goes, explodes, the fire will burn to the Bay." […] I was somewhere in downtown Oakland, and driving too slowly in a complicated traffic […] The sky was black, the sun was red. Leaves of burned black paper wafted high and slow among the buildings. Ashes from a forest of fire were falling and blowing in downtown Oakland. The radio said that Broadway and/or Brodway Terrace was on Fire and that there was looting on Ostrander Street. Parallel Street – Big Brodway terrace for cars, Little Broadway terrace for walking – eucalyptus and pines trees and apple trees between them – a tree high two-streets-thick wall of fire. Mass Fire." (Kingston, 2003: 4-5)

For many residents, adjusting to this changing space became a survival skill. People had to develop special spatial competency both with "the space as they know it," but also, with the space-in-transformation. The third testimony is also from inside the fire zone. This time, the narrator is dealing the need to escape, the urgency and the difficulty to make good decisions and find good ways to through dangers zones.

I have twins, well they had a little birthday party down in Berkeley and I remember taking them to that birthday party and seeing the smoke and thinking what would I take with me if I had to evacuate? And then that [the first fire] got taken care of. And the next morning they had another party to go to and I'm sewing and taking them to their party, and it was early, it was like 9:30 that I had taken them to this party and on the way back I had seen smoke again, and so I called the fire department and I said you know, there's still smoke in the same place. And they're like, "No, no we have it, it's ok." And so I'm like, "alright." My husband's out here gardening, it's getting very windy, and I'm sitting here sewing something for my older daughter. It's getting darker and darker outside, and I'm getting very nervous. My daughter had a friend who lived at the top of the hill. So I called them up and I said, "Do you know what's happening?" and they said, "No no, I'll find out." So he's going out to look. And in about 15 minute later, and this is about 10:00 / 10:15, my neighbor from across the street calls me and says, "What's going on, they closed the tunnel?" He had been playing tennis down by the Country Club, the Claremont. And I said, "I don't know *but I asked a friend at the top of the hill and I'm waiting to hear. "Now this guy says, "I'm not waiting; I'm going to find out." So I'm a little worried and I call, we have a surrogate-grandmother type who lived up the hill, and I was worried about her, and I called her up and I said, "Are you okay?" And her daughter picked up and she said, "Well, we're leaving. We're taking her." And I said, "Okay, that's good." Then immediately I get a phone call from my friend up at the top of the hill. It's black smoke up here, oh… okay. He hangs up. And then I get a phone call from Warren across the street, "It's crested the hill. Get out now." And I'm thinking, "Oh, it's coming from the top of the hill." Well, I'm running out to get my husband […] I'm yelling, "Gordon, Gordon, Gordon!" He's hard of hearing and, you know, the wind is blowing, you can't hear, and he comes running and I say, "Warren says it's crested the hill," and he says," Yes, I saw it, let's go." So he goes in one car and takes the dog we had before this and I tell my daughter, "We need to go." […] And as we backed out of the garage, I remember closing the garage door thinking, "Well, that way robbers won't come in," and I'm backing down my driveway and there is a line of cars going bumper to bumper down the hill. And one of my neighbors smiled and let me in, and we're going down the hill and I see a friend of ours at the top of the hill waiting, and we're saying, "Get in the car!" and they're saying, "No, no, no, we're waiting for my husband, he's gonna come!" When you leave here you'll see that there's a light and it's this funny little intersection. Well it's bumper to bumper. And here is this place that is now a garden but wasn't a garden, and the hill to the other side has a lot of eucalyptus trees. And the wind is blowing and these fire brands are blowing over us and we're stuck at the light because it's bumper to bumper traffic. And I edge up to the light and across the way, here's Highway 13, here's tunnel road, here's the way to go to 24, and here I am. Well on the downhill slope is a grove of eucalyptus. As I'm stuck here, it's like being in the movies, it just went "VOO!" It just burst into flames. And I'm stuck here and it's so hot because it's burning down the hill, I'm in my car with air conditioning, sitting, leaning to the right because I can't sit straight it's just sooooo hot. [The fire] is coming down here. It was so hot I couldn't sit straight. And I'm thinking, "I gotta get out of here. I gotta save my daughter." And here are the flames, and we turn the corner and all of a sudden we see people running. What had happened was by the time I turned the corner, the fire had crossed the road and people couldn't get on. So we turned the corner, still bumper to bumper going down the road to Tunnel Road, which you know is narrow, and it's divided, and I'm thinking, "I can't do this, this is taking forever." Well, there is a place, a cut in the divided road and I turned and decided, "Well, I'll get off the road." And I'm going down this road called Roble Road, really narrow, and then I'm thinking, "Oh God, I'm going right to where the flames are." And I can't turn around, people are following me, and I'm just praying "Please, please, let me get there." So I go down the road and it lets you out near Chabot Elementary School. It's down the hill. And now this is really weird. It's like a curtain.*

Black sky, blue sky. Not filtering just big like a wall. Black sky, blue sky. People standing out by Chabot School with their beer looking at the fire coming in. We get there and we go, "Yay, we're safe." Go around Chabot and go under the [Highway] 24 to go up Broadway, that's the first policeman I see directing traffic. And I just said to my daughter, "We're gonna go pick up the kids." So we go to Piedmont, which is where they were, rushed out of the car, they must've thought I was a crazy lady. I was knocking on the door saying, "You don't know but there's a big fire, I probably lost my house by now." They had no idea. Get the kids in the car and I think, "Where am I gonna go?" So I go to Alta Bates Hospital, which is down in Berkeley and where I used to work. And I said, "At least there, there are phones, there's food." [I] bring the kids in, and my daughter brings her bag with all her stuff in it, and one of the things that I took was my little book, address book. [S.16]

These stories help us to understand the transformation that the fire imposed on that space. Distance, identity, function: everything is moved,[129] and can only be defined when things stop changing. For those in the direct grasp of the fire, it was an important moment for the hybridization of their identities. Suddenly, in the space of a couple of hours, the people directly involved had to adapt to completely new situations and new spaces; they had to become something that they had not been before, and never imagined themselves to be: a victim of a disaster, a rescuer, a volunteer firefighter, a runaway, a survivor, a member of the homeless, a refugee, a community organizer, an orphan, a widow or widower, or a childless parent. The transformation impacted all, without consideration of previous roles or functions. The fire did not discriminate. He, who in a previous moment would have been an expert in a particular role – a policy analyst, an engineer, a policeman, a firefighter - was now running for his life. She, who previously belonged to the ordinary, was now fighting to save a school, or a house. The roles, like the boundaries, became mixed; the lines became blurry: knowledge, power, values – all of these well-established actants, or so they thought – flew into pieces and fell to the ground in an unrecognizable shape for all.

[129] *"It was a windy, hot, dry day, and 2,500 houses went up, just "poof." […] And then there was the rest of day, where it kind of moved slowly, but gradually. Because the wind died down. And it wasn't until the wind died down that they were able to put the perimeter around it, and stop it."* (S.14, 2009)

3.4. Transition 2: transformation of space after the disaster

During the Oakland Fire, the well-known familiar living environment was reduced to ashes. A land of desolation now stood where a lively neighborhood had once been. It left the residents looking for meaning. The chains of signifier and signified were disconnected, interrupted with other images and references. "*You've seen those pictures of bombed-out London after the war, that's what it looked like,*" [S.16] explained a respondent. In her memoirs about the fire, *The Fifth Book of Peace,* writer Maxim Kingston recalled her discovery this new environment:

> *I came out into a changed world. Its color had gone out. Its dimensions had stretched away here, shrunk there. New mountain and canyon vistas as far as I could see. […] What I wanted to see, what used to be, popped in and out of sight, alternated with the real. The hot ground was wreaking mirages that cheated the eye with blear illusions. A thing would appear – a chimney, an oldened wrought-iron gate, a ceramic pot – but it did not cue the next thing, the thing that should be attached to it (house, fence), to appear. Things were out of the order that was in my mind. Memory was off. If only I had paid better attention – I have to be more awake – I would not be losing the detailed world. (Kingston, 2003: 10)*

Loss is what remained long after the last burst of flames was extinguished. Years later, at the time when I was conducting these interviews, people were still experiencing the loss: looking for things that had burned 20 years ago, sometime confusing what belonged to the past, and what exists in the present: "*I found myself going to closets that don't exist anymore and remembering if we still had something. The first few years you kind of forget: 'Oh right, we don't have a big turkey pan anymore! The gravy bowl, too…,' things like that,*" explained a survivor. For the people who lost their homes, they also lost an important part of their lives. A world of ordinary, used, transmitted, familiar, polished, and loved objects, which disappeared in a day. The multitude of the mundane, reliable tools that carried them through their everyday lives, had vanished. Years of patient work molding houses and gardens, and events and routines, had gone up in smoke. The destruction of cherished pictures made one survivor comment that "*even the presence of the absence*" [R.5] was missing. For many, the fire also ruined years of work and ideas. Photographers lost their entire archives, authors lost their manuscripts, architects lost their plans, analysts lost their notes.

> *In the fire I lost my home and my possessions. I lost my clothing, furniture, photographs, heirlooms, artwork, beloved objects, one car, and two pets. Since my office was in my home, I also lost twenty-five years of anthropological research, seven manuscripts not yet into publishers, all my other writings, ideas, projects in development, the slides and photos of travels, lectures and courses and notes, and my entire library. (Hoffman, 1998: 55)*

The fire destroyed the material connection between generations, between residents and the world, and between residents and themselves. For a time, it reduced to zero the possibility of communication and transmission, and dragged the survivors into a situation of distress that, even years later, was hard to explain: "*Describing the devastation both physical and psychological of this kind of loss is like trying to define eternity or infinity. It defies words, evades phrase, and renders mute any and every euphemistic catch all"* (Hoffman, 1998: 55), recalled a survivor. To deal with this immense grief, people called up ghosts, of a sort: "*Even when I was really upset about losing my mom's jewelry and all the things she gave me, I heard her voice in my head telling me: 'it's just stuff,'"* [G.6] said an other survivor whose mother had passed away just months before she lost all of her belongings in the fire. For others, the particular nature of this experience, the bitter emotion that it generated, found a way out through the expression of long-forgotten languages of their ancestors. A survivor recalled that after the fire, her Chinese-speaking mother would tell her, "*Don't* hun *things.": in Cantonese* "hun," *is the word for pain and loss"* (Kingston, 2003). What people soon realized was that with the loss of these objects, the signposts of their previous existences, they also lost much of their entire worlds.

> *We were integrated in a way that I have not seen in other places: rich people and not-so-rich people lived side by side. Some of us were owners, some were renters […] we had blind-chosen one another at random, and were not trying for it, but we'd gathered a community. It is over. No more chances to improve on and appreciate what we were. Too late. I never joined the Christmas caroling organized by peaceful Christina next door. I hadn't gone to any Randy and Sue's Halloween open houses. They went door to door inviting one and all to come trick-or-treat and party. (Kingston, 2003: 18)*

Thus, more deeply, the fire dismantled the foundation of the social and cultural organization of the community. While losing their houses, women survivors also lost their capacities to interact in the public sphere as equals to men. Confronted with the Herculean task of rebuilding the subtle compositions of their existences, as well as those of each member of their families', many women quit their jobs, and spent a considerable amount of time collecting, storing, and sorting objects necessary for their future every-day lives, while men most often dealt with the public aspects of the reconstruction: insurance companies, architects, engineers, and so forth. In a community that had long opted for shared domestic responsibilities, the disaster put many women back into disparaging forms of social organization, gender roles, and values, thus fundamentally transforming them and their families.

> *The women of the community were independent, men equitable, couples by and large egalitarian. People of [the] both genders occupied the same segment of space, public and private arenas, hours of day and night. But for many, progress in carving out a new gender behavior suffered a fifty-years setback. In the shock of loss both men and women retreated into traditional culture; realms and personaes. (Hoffman, 1998: 57)*

As Hoffman noted, *"The return of kinship became, as it had customarily been in our traditional society, women's jobs to facilitate"* (Hoffman, 1998: 58). Women became the connectors within their families, and in the process, lost their social alliances. Here, some chains of action were reconstituted, while others were broken altogether. [130]

> *Every survivor suffered the wrenching shifts in former associations. Friends did not, or could not, offer aid or comfort. Friends grew impatient, proved unsympathetic, disappeared. What did maintain for most were the links that lie more deeply rooted in our society, blood kinship ties. (Hoffman, 1998: 58)*

As a consequence, the drifting Oakland survivors also found themselves more and more excluded from the rest of the Bay Area. The mixed emotions brought up by their situation secluded them from the rest.

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[130] *"Women in our society, as part of our domesticity, act as social connectors. We are, to a large extend, the linesmen of our ties and the 'bondsmen' of our everyday social circles"* (Hoffman, 1998: 59).

At first the oustide community saw us with sympathy. Eventually, when recovery took longer than the day, the weeks or months they envisioned, they came to view us as greedy whiners and underserving receivers of pots of gold. […] As the community separated itself and jealousy erupted, it was often once more the women who bore the brunt of it. […] Targets of wanton envy, we were informed that we had all new things, we would eventually have new houses, and we were 'lucky.' (Hoffman, 1998: 60)

The space of the disaster is a space of loss.[131] It is marked by the web of relations that connects – or have stopped connecting - absents and the new-comers. This is a space where the modes of existence change substance, a space of transformation. It is a space that pushes the capacity of individuals to their limits to think and evolve in a world that they thought they had known. This space is transitory, it is the "in-between," a life lived between the disaster and reconstruction, in-between what was and what will be.

The survivors found themselves in the process of grieving and trying to recover from the disappearance of their homes and their neighborhoods, and the deaths of 25 people. In its destruction, the fire had engaged a displacement of priorities and needs. Every single "thing" had changed: "*The patterns of my days, my plans, my routines were irrevocably ruptured. The warp of my past was torn from the weave of my future. Who I am, what I was, what I intended to do, the fabric of my life, utterly unraveled*" (Hoffman, 1998: 56). With this transformation of the space, large perspectives were changed, a tall system of relations were reoriented, and even the awareness about the experience was questioned:

To be part of a major natural disaster is a humbling experience. As I live the aftermath of the disaster, I find myself in awe of nature, as another human being woven into the web of life on earth. It is the feeling, I think, that binds us together to support one another and to listen to one another's stories. We were not really different

[131] The term "space of risk" was coined by Michael Taussing in his influential and provocative essay that tackled the culture of terror created by the colonial exploitation of rubbers trees in the Putumayo Region in Peru. In the context of Taussing's study, *"the space of death is here the Indians, African and white gave birth to the new world"* (Taussig, 2009: 5). In Taussing's research, the space of death is defined as a web where European and Indian understandings of evil and the underworld, their cultural backgrounds came into contact with one another, and metamorphosed each other: "*The space of death is preeminently a space of transformation: through the experience of coming close to death there well may be a more vivid sense of life; through fear there can come not only a growth itself consciousness but also fragmentation, then loss of self comforting authority"* (Taussig, 2009: 7).

from the medieval peasants in the stable hearing the saga of their clan over and over again. Or the veterans of a war, reminding each other of their miraculous survival . (Adler, 1992: 58)

After the disaster came the time of reconstruction: the recomposition of a neighborhood, which slowly again became reintegrated into the surrounding space. After such a loss, reconstruction was, of course, not easy. The next quotation gives an excellent example of the complex range of emotions that one could attach to their burnt properties.

We didn't rebuild, we bought. We rented in Orinda after the fire and for a long time we didn't know what to do. It was after we were married but before children, but we knew children were in our future and where we lived was not a great place for kids, high in the hills, small house, small windy roads, not great schools, so we always knew we'd have to add-on if there was room, move, go to private schools. So when we rented in Orinda we got to know that community: it had excellent schools and it made more sense for the next phase of our lives. That became an easy decision for us, but then we hung onto the property, maybe because there was an emotional attachment and we didn't know if we were going to do a spec development, build, and then sell it. We couldn't even deal with it because there was still an emotional attachment, so it took a number of years before we had enough of a distance to say, "Yeah, just let it go." But it was still really emotional, selling the land. It made me realize: the economy was such that people started contacting us about selling the land. It was a small, but really special site, and I saw a lot of building going on in the hills I didn't like, building big boxes to the limits. So given that the site was special and the [career] field I was in, I didn't want to just sell it to some spec. developer who didn't really care. We ended up selling it to someone who was an architect-builder and we ended up working together, the realtor understood my concerns and set up a meeting between me and the architect and they were really reassuring me of how they approached design and how they cared about the site and it made me feel better emotionally about selling the land. That was really important. I remember I would drive by the land a lot, watching it being built. For a long time I'd go to the site and we'd kind of walk around and stand there and feel things. Then I started getting numb as my life moved on, I'd drive by the site and there wasn't a lot of emotion. I'd watch them building the house and there wasn't a lot of emotion. One day I drove by and the house was almost complete and somebody saw me outside, one of the builders. He said would you like to come in and see it, and I remember sure, at the moment there was no emotion, so I walked into the house and it was so beautiful, and I just started crying. I realized it was because it wasn't a crying of sadness, it was a

> *crying of happiness. The woman must have thought I was wacko, because she had not lived in the Bay Area, so she didn't really get it: this crazy woman walks into the house and just starts crying and saying over and over again, "I'm so happy for you. It's beautiful and I'm happy for you." It was like closure, it was truly like happiness that somebody took this land and did something really nice with it and it was beautiful and it healed and it was like closure. It completely surprised me, as I'm surprised right now. I've been pretty bland this whole interview, it's like I'm so distant from this experience, I'm surprising myself that describing this moment can still bring this out. I'm completely shocked by why I'm crying right now, but it must say something … [G.6]*

At this point the interviewee asked me to turn off the recording device, leaving open the possibility of interpretations. However the story of G. shows how integrated the connections between space, emotion, and building space can be.

Chapter 4
Living with risks

Myths about earthquake talk about the metaphysical of one time. They let us know about the organization of world, the facts and the values, and how these facts and values are constructed, cared for. The more striking example of theses different chain of actants is probably founded in ancient mythology[132]. The space of the Ohlone[133] tributes is a partially know subject, but this window (Margolin, 2003) toward the first inhabitants of California opens interesting perspectives on the way these populations of hunters and gatherer instaured their own relationship with earthquake. Unfortunately, if historians and archeologist have tried to reconstitute the Ohlone people's way of life, not much is know on this topic. The following story is one of the only notes of the translation of the phenomenon of earthquake in the Ohlone Mythology.

> *Once upon a time, there were no human beings, but there were two spirits, one good and one evil. The two spirits made war upon each other, and at least the good spirit overcame the evil spirit. At that time, the entire world was covered with water, except for two islands, one of which was Monte Diablo and the other of which was Reed Peak. There was a Coyote on Reed Peak. He was the only living thing there. One day Coyote saw a feather floating on the water, and, as it reached the island, is suddenly turned into an Eagle. Spreading its broad wings, the Eagle flew up onto the mountain. Coyote was much pleased with his new companion, and they lived together in great harmony. Sometimes they would make excursions to the other island, Coyote swimming while Eagle flew overhead. This went on for some time. Then they consulted with each other, and decided to make human beings. Together they made the first human beings. Soon the first human beings had children, and the level of the water went down so that there was more land for the human beings. Soon the children of the first human beings had children, and the level of the water went down*

[132] There are many tales and myth about earthquake which are mainly used today as sources of example of false belief. Has we'll see later the frontier between knowledge and beliefs has been evolving following the solidification of seismology. Ancient myth often involves deified animals like frog in China, catfish in Japan, elephant in India or turtles in Native and Latin American traditions.
[133] The group of tributes called Ohlone was one of the densest Indian population Northern to Mexico. Most of them were living in the coastal area between Point Sur and San Francisco.

some more. Then the grandchildren of the first human beings had children, and so on, and the more human beings there were, the more the waters decreased, until at last where there was dry land where there once had been water. At that time, what is now known as the Golden Gate was a chain of mountains, and you could walk from one side to the other side without getting your feet wet. The water that came down from the east had to go out through some other rivers somewhere. But then a great earthquake struck, and chain of mountains was cut in two, forming what we now call the Golden Gate. Then the waters of the Great Ocean and the Bay could at last come together, and the land became as we now know it.[134] *(Harper, 2010)*

The myth of the creation, in the form that is presented here, tells us about the closed interaction between men and their environment and instead of census data, unreinforced masonry building, industry exposure database, estimation of cost of business interruption, the Ohlone myth convene a very different form of collective. The spatial and temporal dimension, although identical to the one presented in the past report, mobilize mountains, sea, sky and animal being, the size of a foot to create a very different sort of collective that the one described before.

Historians (Walter, 2008) have shown that one would call today the non-representational (Anderson & Harrison, 2010) aspect of the earthquake have been incremental in both the prevention and the recovery. Scientific contents event acknowledge that the practices that these belief have generated were actually making sense in what would be called a risk prevention perspective today[135]. According to Mike Davis (Davis, 1998), in the last fifty years, the Big One destroyed Los Angeles about 28 times and is the second deadliest event after nuclear attack and way before the possible catastrophic consequence of pollution, terrorism or even aliens invasions. The everydayness of disaster, this close attention to the details and the relations between the phenomenon, the earthquake, and the transformation of the mundane objects of the environment can be grasp in different way. Scientific scenarios have focused on the elaboration of the concept of risk, defining both the potential

[134] Note from the author "The above tale is adapted from "Tradition of the California Indians," by H. B. D., in Hesperian Magazine, vol. 2-3, (ed. F. H. Day, San Francisco, vol. III, no. 1, September, 1859), p. 326. H. D. B. says this tale came "from the lips of one of our most venerable pioneers, and I give it as I heard it." This tale is cited by Hubert Howe Bancroft in his Native Races, vol. 3, (History Company: San Francisco, 1886), p. 88; and by Alfred Louis Kroeber in his "Myths of South Central California" American archaeology and ethnology Shoshonean Dialects of California, vol. 4, no. 3 (Berkeley: University of California, 1907), pp. 188-189. I have made a few changes based on Kroeber. It is impossible to say now exactly which Ohlone people this story came from, but it would be a people who knew Monte Diablo and Reed Peak, whichever mountain Reed Peak once referred to."

[135] According to the Center for Earthquake Research Information, ancient Peruvian myth told that "Whenever (…) god visited the earth to count how many people were there, his footsteps caused earthquakes. To shorten his task, the people ran out of their houses to shout "I'm here, I'm here!" (incorporating in their myth, the wisdom of leaving their flimsy houses during an earthquake)."

activations, of the chains of actants which will create the earthquake but also the consequences of this event on the mostly on the economical consequences of the event. Fictional writers have bears witness of the more individuals, more personal dimensions of the disasters.

Imaginary destruction of the city structures a narrative around the disappearance of one world. The representation of disasters in the contemporary fictions testify, if needed, of a tight chain of actants than in which scientific scenario take place. As ancient mode of narration, contemporary fictional stories about the Big One remind us of transformative aspect of both risk – in a slow mode and disaster – in the brutal mode. Disasters movies and novels (W. M. Taylor, 2006) picturing this destruction - in various mode but with the same schematic form - might be good starting point to question our relation to the world as-we-know-it. What happen during the earthquake has also been under the scrutiny. In his novel *The Big One* Littlejohn looks at several protagonist before, during and after the earthquake. The event caught each of his protagonists in a moment of his life. The destruction of the environment, the questions that that the protagonist can ask and which form the basis of the understanding

> *As Mike stared out the still uncurtained window, he heard it crack. Then the floor began rocking and leaping as if he were on a wooden boat in a storm. Crashing noises all around him inside the building preceded his awareness of the noises beyond thunder outside, which made it sound as if the city were being suddenly attacked by explosions from under earth. A terrorist attack. No. The floor was still pinching, the walls were still shaking violently to and fro. This was it. The earthquake the paper an TV had been predicting all his life. The Big One. (LittleJohn, 2011)*

As we'll see later the experience of what happens during the earthquake is an important one for the people living in California.

4.1. Seizing the earthquake as a phenomenon

On October 20, 2011 at 2:41 p.m. Pacific Standard Time, just a few hours after the "Great California Shake Out," a voluntary-based earthquake drill, an M4.0 earthquake rattled the San Francisco Bay Area, which was then followed by M3.8 aftershock at 8:16 am. The coincidence of the two events, the earthquake drill and the actual earthquake, generated amused comments from many as well as real concerns about the seismic "status of the region;" after all, the 2010 Haitian and 2011 Japanese earthquakes were still very present in everybody's mind. Traditional media outlets were buzzing, and in the social sphere, tweets were echoing street conversations. On the 27th of the same month, another earthquake hit, a more modest M3.6, but this time, the seismic event occurred directly underneath the University of California, Berkeley campus. Though the shock was low in intensity, it was still clearly felt. One seismologist noted, "*These are gentle reminders that we live in earthquake country"* (Sanders, 2011). In this chapter, I will discuss how the experiences of earthquakes, either direct or mediated, are necessary to fully understand and instaure the complexity of the earthquake phenomenon.

4.1.1. "Did you feel it?"

The perception of the floor, walls, and the surroundings, all moving, the ground falling away under one's feet, along with a definite feeling of spatial disorientation that takes place: an earthquake is happening. The feeling of "solid ground" that is moving is deeply unsettling. While one's hands are gripping something and one's feet are moving, the idea that one is living through an earthquake slowly makes its way through the nervous system. "Earthquake!," but then, "How big?" In a post-earthquake account, the philosopher William James described his own experience of the famed 1906 San Francisco earthquake, and recalled a California friend's warning about the possibility of a seismic event:

Accordingly, when, lying awake at about half past five on the morning of April 18 in my little "flat" on the campus of Stanford, I felt the bed begin to waggle, my first consciousness was one of gleeful recognition of the nature of the movement. "By Jove," I said to myself, "here's B's old earthquake, after all!" And then, as it went crescendo. "And a jolly good one it is, too!" I said.

Sitting up involuntarily, and taking a kneeling position, I was thrown down on my face as it went fortior shaking the room exactly as a terrier shakes a rat. Then everything that was on anything else slid off to the floor, over went bureau and chiffonier with a crash, as the fortissimo was reached; plaster cracked, an awful roaring noise seemed to fill the outer air, and in an instant all was still again, save the soft babble of human voices from far and near that soon began to make itself heard, as the inhabitants in costumes negligés in various degrees sought the greater safety of the street and yielded to the passionate desire for sympathetic communication.

The thing was over, as I understand the Lick Observatory to have declared, in forty-eight seconds. To me it felt as if about that length of time, although I have heard others say that it seemed to them longer. In my case, sensation and emotion were so strong that little thought, and no reflection or volition, were possible in the short time consumed by the phenomenon. (James, 1906)

Taking a broad view, earthquakes are what happen when familiar categories lose their everyday, common properties; when they are moved suddenly and without warning. It is a moment where the "Order of Things,"(Foucault, 1970) the well-established ordinance of the world as we know it, is transformed. Objects, time, values, space, thinking, and emotion: everything changes substance. Every "thing" becomes a mass, moved by gravity; and the human body is one of them. Of course, the process of a rumbling earthquake is, in fact, usually very quick, often not lasting more than couple of seconds.[136] But these few seconds can be life changing. Writing to his brother Henry after earthquake, James declared: *"[It is] impossible not to feel it as animated by a will, so vicious was the expression of the temper displayed, and I see now how absolutely inevitable was the primitive theological interpretation of such disturbance*" (Livingston, 2012). A disturbance so large that it also impacts the categories of human an non-human, physic and meta-physic.

[136] Very occasionally, however, they can be surprisingly long; the Tohoku earthquake, for example, lasted approximately six minutes.

Like counting the distance between the sound of thunder and lightning to guess how far off the lightening is, children in “earthquake country”[137] often learn to count between seismic waves and make guesses about the location of the epicenter. Experience of an earthquake depends not only on its distance from the epicenter but also on the crustal material that seismic waves must travel through. For the observer, the feeling of the earthquake also depends on the type of building he is standing in, and the intensity – or the quality of- his attention to the phenomenon. Some earthquakes feel like a sudden, sharp jolt, which then followed by strong shaking. In cases of extremely violent events, as evoked by James’s recollection, the shaking can be so strong that it throws everything and everybody to the ground. A nearby earthquake will most often feel “sharp” and pass quickly, while distant ones usually generate more shaking that last longer.[138]

Direct experience of earthquakes is one of the ways of knowing what it is to live in a seismic zone.[139] Today,[140] coverage in local newspapers following an earthquake event focuses on witnesses’ testimonies and their descriptions of the intensity, sensations, and consequences of the earthquake within their communities. For instance, on October 20, 2011, on Telegraph Avenue in Berkeley, an employee at a store said, *"[It was] a real quick one, like a bunch of jerking back and forth. It was one strong tremor"* (“Berkeley Earthquake: Much chatter about 3.9 tremblor, but little damage,” 2011). On the U.C. Berkeley campus, a student recalled, *"It was like a sudden jolt, as if someone were to push you from behind. It was a pretty big shake"* (“Berkeley Earthquake Hits During ‘Shakeout’ Drill,” 2011). In a local supermarket on Shattuck Avenue, an employee noticed that the earthquake was not big enough to throw merchandise down from the shelves. Another person, a new resident to the area, who had been visiting friend when the earthquake happened recalled, *“I was surprised to hear people screaming.”*[141]

[137] The expression comes from The Earthquake Country Alliance, *“a public-private partnership of people, organizations, and regional alliances that work together to improve preparedness, mitigation and resiliency”* in Southern California, the Bay Area and the Red Wood Coast. (http://www.earthquakecountry.org/)
[138] Comparing experiences can fuel conversations for a while. For many, it is often interesting to think about and discuss what they experienced: the growing rumble of the P waves or the shock of the S waves.

[139] Of course, the human body does not perceive all earthquakes, and the experience of an earthquake can be indirect. But very small earthquakes, such as those at M2.5 and less, that might not be perceived by the human body, are recorded and are visible on the Real Time USGS maps. Therefore, tremors that are neither humanly perceived nor recorded through instruments do not “exist” as earthquakes.

[140] As we will see later, earthquake accounts have a long journalistic tradition.
[141] C.36, personal communication, October 2011.

The experience of an earthquake - how it felt, where it had occurred, and what damage it caused - are personal experiences, scientifically considered as a fact. The “Did you feel it?” program (DYFI) by the U.S. Geological Survey (USGS) collects real-time information and measurements from common, non-scientific observers of an earthquake. “*The idea of the DYFI program is that citizens use an Internet Web site (http://earthquake.usgs.gov/dyfi/) to report their experiences and observations for any earthquakes that they have felt (or not felt) by answering a simple multiple-choice questionnaire”*(Atkinson & Wald, 2007).

Respondents’ answers are used as a diagnostic of Modify Mercalli Intensity at the observer’s location and later visualized into a map. With the help of the “distance versus intensity” calculation, these personal testimonies are translated into a Community Internet Intensity Map (CIIM). The CIIM records perceptions of earthquake, organizes, and helps scientists to visualize experiences derived from collective feelings, perceptions, and observations of the event. Also called “*felt-maps,*” these community-generated maps are very valuable for the scientific community, *“especially when considering the limited efforts required for implementation”* (Bossu et al., 2011). But as the authors noted the felt map can – at this point – only be used in:

> *areas with significant Internet usage and where there are well-known Web sites providing earthquake information. Also, the ability to tie IP addresses to locations varies with the network infrastructure setup in different countries. The approach complements online macroseismic surveys [e.g., Wald et al., 1999]—where users are invited to fill out a questionnaire—by pro- viding less accurate (the level of damage is not characterized) but more rapid (10–20 minutes compared with 1 hour to a few hours) information on the effects of the earthquake. (Bossu et al., 2011)*

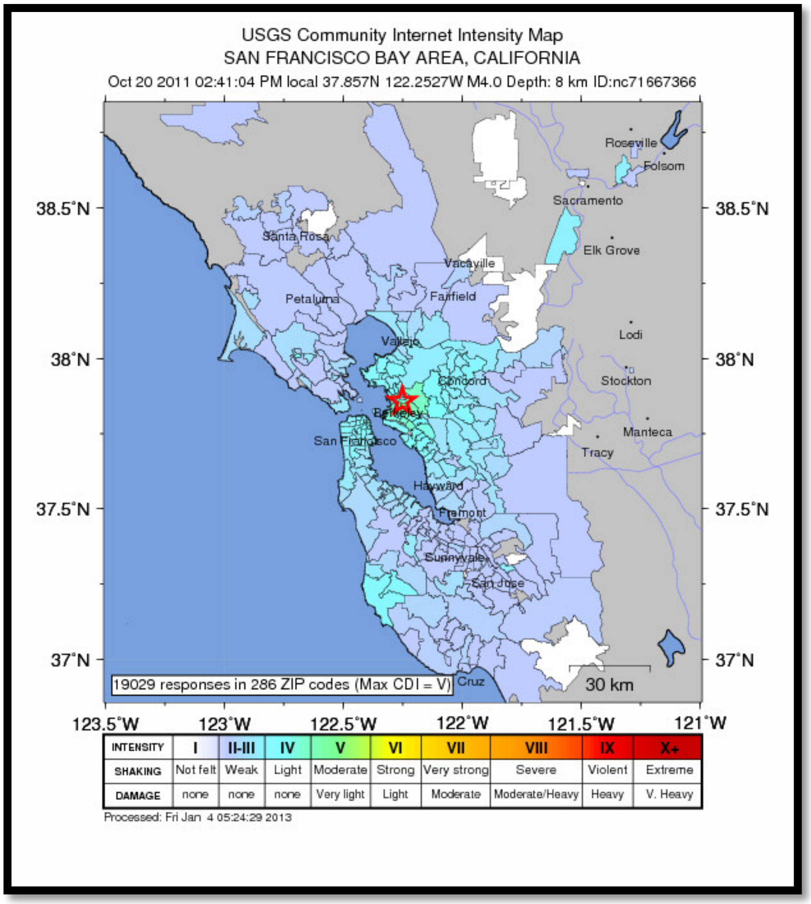

Figure 23 - USGS Community Intensity Map. Source (USGS, 2011)

The Community Internet Intensity Map program first went online in 1997 to assess the scope of earthquake frequencies and impacts of particular seismic events, especially in areas not well covered by the system of seismic stations.[142] During the 2011 California earthquakes, the number of individual, personal responses often exceeded the number of seismic stations and considerably increased the potential of scientific clarity. For example, more than 15,000 persons reported their observations within three hours of the October 20, 2011 quake ("Deep Under Berkeley," 2011).

[142] Modified Mercalli Intensity Maps, which are the precursors to CIIM, have been used in the United States since 1931. *"Typically, this is done by collecting responses to a postal questionnaire that is sent to each post office near the earthquake, and to a sparser sample of post offices with increasing distance from the earthquake. This way of preparing a seismic intensity map can take months to complete"* (Wald, 2001).

Talking about "the feeling" of an earthquake in this context says more about empirical observation than about emotion: the map does not scale states of indifference or emotional fright, but rather, the characteristics of the sensation of the shaking, which are measured on a level from "weak" to "extreme."[143] As a tool, the map allows a representation of the event that is easier to record, archive, and display than scattered, literary accounts of personal experience. These maps have become part of a habitual method of monitoring normal—one could say "healthy"— crustal activity in a seismic region.

USGS's interfaces have changed the way residents understand and react to an earthquake event, as well as the way scientists consider a layman's account.[144] With the recent increase in portable and interconnected devices like cell phones, computer tablets, and laptop computers, sharing information about earthquakes between individuals, the media, and professional seismologists has been transformed. Not long ago, people would turn to the radio or television after a tremor and wait to learn more; today, many quickly connect to USGS website to share their own experiences and help to create the CIIS map of the event. The map is making it clear that, as an object of science, an earthquake needs to be experienced to be understood; it needs to be felt, to be known.[145]

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[143] Also the internet questionnaire is also collecting some information regarding observer's emotional states, thus far, this information has not been taken into consideration when building the CIIS maps.
[144] In the following chapter, I will demonstrate how these maps have also transformed the relationship between scientists and non-scientists regarding earthquake information, generating more data with greater accuracy: *"To date, more than 750,000 responses have been compiled in the United States alone. The DYFI data make up in quantity what they may lack in scientific quality and offer the potential to resolve longstanding issues in earthquake ground-motion science"* (Atkinson & Wald, 2007, p. 362).
[145] As I will discuss later, if the most recent technologies used in early warning are now able to give an estimation of the earthquake intensity using the analysis of energy emitted by its first waves, at the time of this writing, the early warning system is not yet in place in California; It also needs to be noted that during the Tōhoku earthquake, the Japanese early system did not provide adequate information regarding this earthquake's intensity.

4.1.2. Seeing the quake: The indirect experience from elsewhere

Stories, among them earthquake stories, are part of what have created the lore of San Francisco. Seen historically, San Francisco is a city of travelers, of pioneers who made their way, by land or by sea, towards a new place to settle down. The tradition of travelers' tales, the stories of distant areas are all familiar to many San Francisco Bay Area residents. In these stories, tales of the cities[146] destroyed by a natural disaster do not live only in the imagination, or in the hypothetical future. Making reference to past earthquake or destruction happening in others places is no coincidence: anticipating earthquakes is also imagining stories, some of which have been already, partly heard and are known in the greater collective consciousness. Until today, stories of cities that were torn apart by large earthquake capture the attention of residents.

Whenever a major earthquake occurs anywhere around the globe, radio and television frequency signals relay the P and S waves across tectonic plates: information and pictures of the unfolding disasters are transmitted almost in real time and displayed on TV sets or computers. The principle of information selection at stake in international newsroom is a powerful actant when it comes to publishing a news story, and moving an event into "history" by publication – whether by newspaper or other media. According to an often-practiced journalistic rule, a story is evaluated by the following criteria – among others: novelty, controversy, significance (casualties or losses), human interest, and proximity. [147] (Chang, Salmon, Lee, Choi, & Zeldes, 2010) For journalists trying to reach their respective audiences, proximity is not only a matter of metric distance, but also a measure in term of personal interest, the estimation of a bond between audience and event.

By this rule, earthquakes happening in urban or populated areas in other parts of the world receive extensive media coverage in the San Francisco Bay Area. For example, on January 12, 2010, an M7.0 earthquake, 25 Km – 15.5 Miles - west of Port-au-Prince, killed approximately 316,000 people, making it the second deadliest earthquake ever recorded. Additionally, on

[146] In reference to Amistead Maupin's novels settled in San Francisco, which were first serialized and published in Local News papers before being turned into novels published between 1978 and 2014. The title was probably a reference to Charles Dickens' Tales of Two cities published in 1859.

[147] *"Most significantly, such factors as prominence/impact, conflict/controversy, novelty, timeliness, proximity, deviance and human interest have been found to be predictive of weather an international event get covered."*(Chang et al., 2010: 180)

February 2, 2011 in Christchurch, New Zealand, a M6.3 earthquake killed 185 people, that was then followed by a shallow,[148] but still powerful M6.3 aftershock on June 13, 2011. Finally, on March 11, 2011, the M9.0 undersea megathrust earthquake[149] occurred off the coast of Japan, which is considered one of the five most powerful earthquakes ever recorded, since record-keeping began in 1900; a wave[150] generated by the earthquake also hit the Pacific West Coast of the United States, killing one person. In Japan, the cumulative death toll of the earthquake and the following tsunami is estimated to be 15,878 deaths with 2,713 people still missing.[151] I argue here that these events have contributed to both define the earthquake risk and raise awareness of San Francisco Bay Area residents about the dangers of a similar disaster occurring locally.

The Christchurch, New Zealand earthquake is an interesting example of the impact of a distant earthquake felt by residents of the San Francisco Bay Area. *The San Francisco Chronicle*, one of the main local newspapers in the Bay Area, covered the New Zealand earthquake in great detail. Stories following both the immediate aftermath of the disaster and the reconstruction process, focused on the city's identity before and after the event. Spud Hilton, the *San Francisco Chronicle*'s special correspondent in Christchurch, reported on the extent of the damages. It was clear from his stories that he was deeply moved by the spectacle of the torn, ghostly city.[152] As he was comparing what could happen in San Francisco, his hometown, he hoped that Christchurch would soon find a way to reinvent itself, to regain its particular urban feeling, just as San Francisco did a century before:

> *Attempting to gauge what a comparable blow would look like in a U.S. city (based on size, population and landmarks), I envisioned San Francisco's financial district shuttered for a year, Grace Cathedral and St. Mary's both collapsed, Coit Tower in a pile of rubble and AT&T Park seemingly untouched, but red-tagged for demolition. And that wouldn't cover the thousands of homes in the suburbs" (Hilton, 2012).*

[148] Earthquake that originate within 60 Km - 40 miles – from the earth surface.
[149] Earthquake that happen at a subduction zone, where a plate is force underneath by another.
[150] *"One person killed south of Crescent City, California and several boats and docks destroyed or damaged at Crescent City by a tsunami with a recorded wave height of 247 cm. Several houses, boats and docks destroyed or damaged at Santa Cruz, California; Brookings, Oregon; Hale`iwa, Kailua Kona and Kealakekua, Hawaii."* http://earthquake.usgs.gov/learn/today/index.php?month=3&day=11&submit=View+Date
[151] In California, one death occurred as a result of this event, and several buildings were reported destroyed.
[152] *"I had come to Christchurch to better understand how a series of quakes can turn a metropolis upside down"* (Hilton, 2012).

From this and other reports, personal identification of Bay Area residents with residents in New Zealand city was strong; images of the 1906 earthquake, seen in numerous photographs by most Bay Area residents, immediately came to mind. As I personally experienced through discussions with Bay Area residents, empathy toward the destroyed city was also moving: Bay Area residents personally felt the loss of 185 casualties of the New Zealand.

Changing the scale of possible when it comes to disasters, the 2010 Haiti earthquake received media coverage commensurate to the disaster itself: in a word, overwhelming. Just after the disaster, and before the first relief agencies arrived, reporters from news channels from all over the world gathered at the devastated airport of Port-au-Prince. In Haiti, citizen media response had already been on alert when the earthquake first hit, and information circulated quickly through blogs, websites, social media (e.g., Twitter and Facebook), SMS, emails listservs,[153] and news reports. Information delivered through this network was far from simply being anecdotal ("Haiti: Earthquake!," 2010). The "Haitian Blogger,"[154] started providing information immediately after the earthquake began. Line after line, sharing information as it emerged, she slowly drew a picture of the destruction, allowing her readers to take in with her the measure of the phenomenon:

> *General Hospital in Port-au-Prince is down*
> *The Presidential Palace has collapsed - palè a kraze!*
> *President Renee Preval and his wife escaped injury.*
> *No one knows how many dead or injured.*
> *Report from an HLLN[155] member who was on the phone to Haiti told us that: "The road to Delmas 60 has collapsed down the mountain burying many homes. The people are screaming for help. Down the hill closer to Teleco there are a lot of UN troops on the street but that many of the roads are blocked with debrie [sic.] from collapsed homes..."*
> *The aftershocks are still revebarating [sic.] (24 so far according to US Geological*

[153] Just few hours after the disaster, emails began circulating, inquiring about members on email lists and discussion groups living in Port-au-Prince. One arrived in my email inbox that read: *"With a lot of grief we were told that [X] had lost his 4 years old daughter [sic.] and his mother-in-law during the earthquake. [Y], from who we had received an email a minute before the quake, was also killed in the collapse of this building."*

[154] Chantal Laurent is French-Haitian architect and expert in emergency and reconstruction.

[155] Most probably, this referred to The Haitian Layer Leadership Network, but I have not been able to confirm this.

Survey)

People can only see dust -pousyè - dust, everywhere.

Obama is sending in military/rescue troops and humanitarian aid.

Phone lines that are working are: Haiti-tel and Voila.

Digicel (cell) tower is down.

No landlines are working. no radio broadcast, no TV broadcast, no electricity…

Tsunami warning still in effect (canceled per CNN)

All windows are shattered in houses in la plaine

Houses are falling down everywhere.

All the poor living on the mountains, in houses build on the mountains, feared suffered heavy, heavy casualty. Our report is that these houses on the mountains tumbled down, one on top another.

A terrible situation! Devastating. There's NEVER been an earthquake of this magnitude in Haiti. Major aftershocks happening…

Nothing works, no one to assist anyone.

No one knows where necessary personnel are.

As of this writing, State Department has little contact with US Embassy compound

There are about 1000 US personnel assigned to the US compound (our info at the time the US Embassy, the fifth largest US Embassy in the WORLD, was opened 2-years ago in Haiti).

There are 9000 UN troops in Haiti.

The quake was quickly followed by two nearby, strong aftershocks of initial magnitude of 5.9 and 5.5.

The aftershocks were major earthquakes in and of themselves.

Someone in Haiti said to me "The area of Karrefour is destroyed…the population of Port au Prince has just been REDUCED, don't know by about how much. Everyone, rich and poor, build on the mountains, all the mountains are down! This is going back to the ground zero.

This is catastrophic. Changes everything.(“Earthquake Rocks Haiti,” 2010)

Lifelines, significant buildings, destruction, death, anxiety, data, and questions: the space of the city, the space of the everyday, was gone, replaced by a space of loss and death.[156] This blog post, as well as pictures of the destruction that soon followed, provided a dramatic dimension to the catastrophe, unfolding the new geography of Port-au-Prince for distant readers. *“Because I had been there, when I saw those aerial shots I was sick to my stomach as I knew what it meant,”* [K.37] recalled one respondent. Facing the seemingly bottomless pit

[156] The expression is borrowed to Michael Taussing (Taussig, 2009).

of loss and suffering,[157] people in the Bay Area reacted strongly. The emotional impact was fueled largely from testimonies and heart-breaking personal stories which quickly reached a considerable sized, yet disparate audience. *"Right now my heart aches for Haiti, [...] my thoughts and prayers go out to the people of Haiti, and anyone with friends or family in Haiti,"* as one interviewee stated in *The San Francisco Chronicle* ("Haiti: Earthquake!," 2010). After the shock, compassion for the Haitians grew, and people not only sent prayers but also money. In the US, people's response to the disaster was at its measure, and nine billion U.S. dollars collected for Haitian relief.[158]

Reaction to the Haiti disaster also went beyond the delegation of powers (financial and spiritual). People in the San Francisco Bay Area volunteered to work hands-on to help Haitians. The responses took many forms. In Mountain View,[159] which sits in a southern section of the Bay Area (locally known as the "the Peninsula"), a group of engineers working at the Google campus, developed "Google Persons Finder," an open-source project[160] based on the "People Finder" interface format, started after Hurricane Katrina in 2005. The application was launched three days after the Haiti earthquake in English, French, and Creole languages. A registry of missing persons, the computer application was able to aggregate data from many outside sources working with the U.S. Department of State. Several weeks after the earthquake, the same team of Google engineers visited Haiti and subsequently created "Google Crisis Response."[161] These innovative technical tools considerably improved the circulation of information and data between first responders and beneficiaries, as well as amongst local communities. Creating connections was also very important to the Haitian community located in Oakland, California. Local newspapers

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[157] The 2010 Haitian earthquake is the second deadliest recorded earthquake of all time, after the 1556 Shaanxi earthquake, that occurred in China in 1556.

[158] In 2013, questions emerged about the lack of transparency regarding the spending of these funds (Ramachandran & Walz, 2013).

[159] The Google project was not the only crowdsourcing project that reached the U.S. Others examples include a Boston group that allowed geolocate emergency by SMS, and a group of Haitian expatriate that helped to translate data in French Creole into English and Spanish, which was then passed along to appropriate aid organizations. Another company, Ushahidi, was key in crowd mapping. The initiative was encourage by FEMA: *"On the third day, FEMA (Federal Emergency Management Agency) called us to say keep mapping no matter what people say – it's saving lives"* (Morisy, 2011).

[160] http://google.org/personfinder/global/home.html

[161] The Google person finder came under criticisms after the Japanese Earthquake and Tsunami because of its total lack of personal information protections.

relayed stories about the anxiety and despair of families trying to gather information about loved ones residing in Haiti:

> *Longtime Oakland resident Antoine Bellot was at work when he heard the news of the quake, and hoped desperately that that his brother and sister in Port-au-Prince were not two of the untold thousands who were killed, crushed, or buried alive. He had just talked to his brother in Port-au-Prince on the phone an hour before the earthquake, but it would be days before he would hear news of their fate. "I couldn't sleep," Bellot said. "I was watching TV day and night, and I began to even see people that looked like my sister — but it wasn't my sister. It was heavy. I can't even explain it — it was a very painful situation. (Schoneker, 2010)*

The fate of grieving families, those injured in the earthquake, and traumatized survivors, all with no resources to help them, deeply moved local Bay Area residents. To face this tragedy, the SF Bay Area Haitian community got organized, and was soon supported by volunteers and donors from all around the area. The Haitian Action Committee,[162] an Oakland-based organization founded in 1991, focused its efforts on fundraising to assist the search for missing people and to aid communication between victims and families.[163] Several street demonstrations, speeches, and concerts were organized in support of recovery efforts, which were relayed by newspapers, radio, and television channels. The compassion and sorrow for the people of Haiti was visible and materialized in the urban space, but unlike the aftermath of the Christchurch earthquake, resident's identification with the city itself, Port-au-Prince, did not occur. The history of Haiti (Farmer, 2011), the under-development of the country and poor building codes seemed not to allow for a deeper identification with Haiti's capital city: "*I don't think, if an earthquake happened here, it will be as complete a disaster as it was in Haiti, because of the style of most of our buildings, and because most of our buildings are relatively new and built to a fairly good codes,*" [A-M.2] noted a local SF Bay Area resident.

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[162] The Haiti Action Committee and other local groups organized events in the community to help the relief effort in Port-au-Prince. For example, on January 2010 the San Francisco Boys Choir performed at the "Christ the Light Cathedral" in Oakland, California and Pierre Labossiere spoke at a fundraiser at the Black Dot Café. Additionally, the Haiti Action Committee organized a demonstration in San Francisco in downtown San Francisco (at Market and Powell Streets) to protest the U.S. military presence in Haiti.

[163] To date, approximately US$5.2 billion has been pledged, amounting to about 80% of Haiti's entire GDP (Holden, 2011). In 2012, controversies began to emerge regarding how the money that was collected was being spent (D. Sontag, 2012). See also Assistance Mortelle (Mortal Assistance), a documentary motion picture broadcast on Arte on April 16, 2013 (Peck, 2013).

The Haiti earthquake was a moment when, as Susan Sontag has written, we truly regarded the pain of others (S. Sontag, 2004): watching the Haitian devastation was not only looking at the suffering of millions of victims but also, to a certain extent, sharing in their suffering. In the days and weeks that followed the earthquake, residents were deeply moved by the fate of Port-of-Prince and other destroyed Haitian cities. The personal and community initiatives that flourished in the aftermath of the event created new tools, organizations, and routes of communication that had not existed prior to the earthquake. This moment—this "window of attention," as disaster experts called it — left a deep and powerful impression on the public. Two years after the disaster, the emotional aspect of the earthquake could still be strongly heard during interviews: "*It is painful to watch so many people suffering,*" [M.3] pointed out one expert who was still deeply moved by the memory of the images. Through television reports, the disaster had entered the realm of the viewer's experience, operating as a hybridization of their own experience of risk and disaster. As pointed out by another respondent, "*When you talk about damage from earthquake it is not abstract. It became real and its real people who you see, it is real people whom you are engaged with*" [T.5]. Indirect experience, or the experience of those watching victims on television, made a lasting impact: as the danger of death and destruction was both mediated and materialized and made visible.

The last major seismic event that deeply moved residents in the San Francisco Bay Area was the 2011 Japanese Tōhoku earthquake and tsunami, which occurred on March 11, 2011.[164] Throughout the years, California has developed "seismic complicity" with Japan, more than with any other country that sits on the shifting Pacific plates, also known as the "the ring of fire." For many decades, Japan has been known to be at the cutting edge of technology when it comes to earthquake safety, and has long been considered an example for California to follow. Consequently, when the Tōhoku earthquake and tsunami devastated the Fukushima Prefecture, the extent of the catastrophe caught Bay Area residents off guard.

March 17, 2011. The coverage of the Japan earthquake is live on every network channel. Images of the tsunami sweeping away houses and cars, filmed from a CNN helicopter, are taking most of the connected world by surprise. I, like millions of other viewers, am glued to my screen watching *CNN Live*. The cataclysmic dimension of what is happening is breathtaking. The unhindered and seemingly unstoppable brown wave is progressing with unbelievable velocity, literally washing away small cars – like toys - trying to escape a 40.5

[164] As of the time of this writing.

Meters -133 Feet - tsunami wave. From bridges and certain other higher locations, people are watching, pinched faces and anxious eyes. This view of the wave rushing inland is nearly inconceivable. Questions, fueled with disbelief and indignation, emerge: Are they really safe watching a tsunami wave? Is that really happening right now? Can these people survive the wave of water and the debris? How far inland will this wave travel?[165] While the wave continues its way though houses and open fields, what we are really watching is people dying, in their cars, in their houses, live on CNN. But that story, for now, is left untold. The CNN's correspondent diligently comments on the wave, and only the wave. Listening to his report, one could get the impression that not a single living being is there; the cars move by themselves; the houses are empty. This is just a wave … an enormous brown wave, but still just a wave.

April 5, 2011. News reports are overwhelming. For some reasons, it seems that this catastrophe emotionally hits the U.S. harder than the Haitian earthquake the year before. Expert television and news reporters keep talking about the similarity between Japan's building codes and those of the U.S. For many, including myself, feeling safe from natural disasters is gone.

Figure 24 – Notes from research field notes, C. Cabasse, 2011.

For many residents of the East Bay, the area in and around Berkeley and Oakland, first knowledge of the Japanese disaster came largely though emails and tweets exchanged within the diasporic Japanese community, as well as with those residing in Japan. Hitoshi, a San Francisco resident and business owner recalled reading tweets about the event even before television coverage started: *"I really got a sense that something amazing was happening across the ocean"* (Yamada, 2012). To make sure that information was followed up by his readers, he used his blog to post updates and information that were then shared thousands of times. The Japan catastrophe reestablished a link within the Japanese community around the SF Bay Area, as well as with non-Japanese residents: *"The calamity that shook Japan sent shock-waves across the Pacific, acutely felt in the Bay Area, inspiring action, charity and cooperation, opening a new chapter in a relationship bound by history,*

[165] The wave travelled up 10km – 6 miles – inland. A respondent later gave his interpretation of this situation. At the time of this event, earthquake scenarios in Japan had been developed, including a "Tsunami Zone" for evacuation. However, the tsunami wave that hit Japan's coast on March 11, 2011 moved far beyond the assumed maximum line.

immigration, culture, commerce and time," as was optimistically written in a report on philanthropic aid concerning the March 11 natural disaster (Yamada, 2012).

The Japanese Cultural and Community Center of Northern California, which had collected funds in the aftermath of the Kobe earthquake in 1995, was again chosen by the community to collect donations. The Japanese Cultural Center, situated in San Francisco's "Japantown" neighborhood, partnered with a local TV broadcast to launch a telethon. *"With the advent of the Internet and social media, we were shocked at how successful we were initially,"* noted one member. A remarkable 48 percent of the 17.3 million U.S. dollars culled from across the United States for Japan's reconstruction came from the SF Bay Area alone. While, in the U.S. charity concerts were a success, training for first responders and community organizations were provided directly to Japan.[166] Tools developed during the Haitian earthquake a year before were improved upon during this new natural disaster. As Ka-Ping Yee, Google's Person Finder software engineer stated *"After the 2011 earthquake in Japan, photos of handwritten lists of people's names at the shelters were posted online, and volunteers across the Internet entered those names into Google Person Finder to help people reconnect to their loved ones"* (Whitney, 2013). As during the Haitian earthquake, connections across the globe helping in the relief effort, from collecting data, gathering first necessity supply to locating individuals, were made possible because of the physical mobilization of individuals and the use of tools.

But soon enough, a disaster led to another also devastating but in a very different way. The tsunami triggered by the earthquake disabled the emergency generators required to cool the reactors of the Fukushima Daiichi Power Plant in the Fukushima Province, Northern Japan Coast and provoked a partial meltdown in several units of the plant, followed by evidence of explosions and suspected radiation releases. The news of a nuclear threat quickly raised serious concerns across the Pacific, transforming the very nature of the recently made connections. Feelings went from compassion to anxiety when California appeared to be in the fallout zone of a nuclear cloud generated by the meltdown. Since 1986, Berkeley proudly claimed itself a "nuclear free zone," and the concept of nuclear safety had remained one of the major concerns of longtime residents and citizens. After the earthquake, everywhere – customers in supermarkets, drivers in parking lots, parents with their children at playgrounds, people amongst their friends and families – all types of

[166] As happens in nearly all catastrophes of this magnitude, the question of the use of the collected funds becomes an important subject of discussion. We will not address the question here, as we are focused on the "instauration" of earthquake risk in the San Francisco Bay Area.

individuals where sharing information about the potential danger of the radioactive water staging on puddles,[167] and clouds hung over the Bay Area, instilling a certain amount of fear of the Bay Area's food and soil.[168]

To address these concerns, on April 20, 2011, the University of California, Berkeley put together a panel discussion to evaluate the consequences of the Japanese earthquake.[169] That evening, several researchers shared their thoughts in front a large audience. At a time when any proven consequences of the earthquake, tsunami, and consequences of the nuclear meltdown were still very unclear, important discussions started around the question of nuclear safety. Panelists were sharing open-minded opinions about the risks of nuclear exposure in earthquake countries. During the discussion, both a professor of nuclear sciences at the University of California Berkeley (UCB) and a researcher at a private institute made it clear that nuclear technology should be more deeply tied to the democratic process. *"We'll have to make our process clear enough for the public to understand,"* said the former; *"every country (sic) where the democratic system is working is lowering the importance of the nuclear energy, all except France,"* added the latter. The audience applauded, but remained skeptical regarding the capabilities of the Japanese authorities to adequately address the disaster.

While experts in conference rooms were pleading for democracy, the case for science was far from being settled in other public spaces. Some debates were raging about the scientific assertions and assumptions of the possible impact of radioactivity on the Bay Area. Pieces of information were collected by residents from all around the globe in many different languages.[170] Of course, not all of this information was reliable, and while Radioactive Fallout Map (see Figure 27) started to circulate via social media,[171] it spurred a great

[167] It rained for some days after the event.

[168] The "park bench" discussions, which can just as easily occur in local residents' kitchens, suddenly bring a considerable amount of scientific references, but also put into play differing cultures.

[169] Cf. http://events.berkeley.edu/index.php/calendar/sn/ieas.html?event_ID=42584.

[170] "On March 22, France's nuclear safety institute started to release online bulletins in Japanese (Institut de Radioprotection et de Sûreté Nucléaire, 2011)" (Slater et al., 2012).

[171] As Laura Beltz Imaoka (Imaoka, 2013) notes, the use of this map, generated by the United States Nuclear Regulatory Commission as a indicative model, was also done without fact verification or any mention of independent, objective science.

amount of discussion and engendered a massive flow of comments across the Web with – also – a significant of misinformation and toxic posts.[172] But, online and on the ground resident and citizens' concern was real and social media provided a platform for the dissemination of alternative information and independent research (Abe, 2013), in a moment where official information was substantially lacking. (Slater, Keiko, & Kindstrand, 2012).

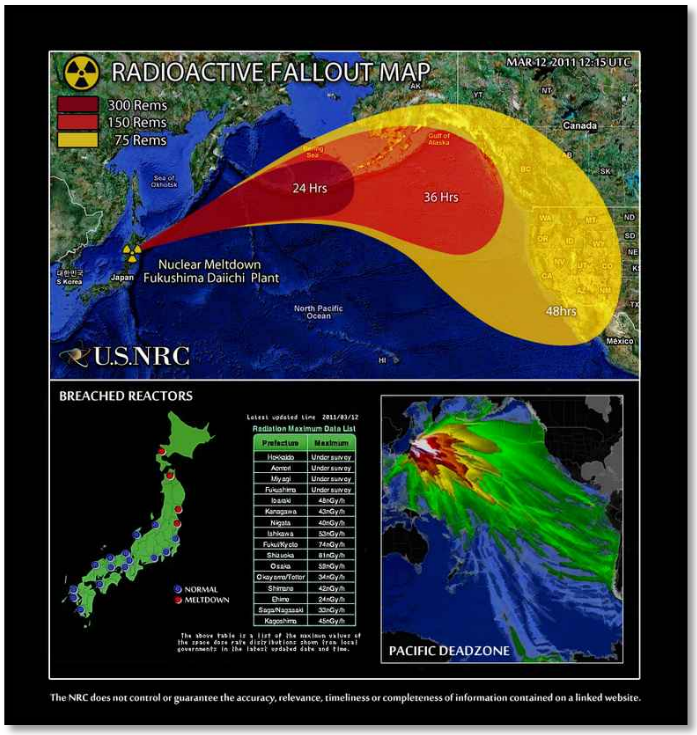

Figure 25 - Radioactive Fallout Map, U.S. NRC.

For several months following the Japanese event, the effects of the disaster created an important transformation in the awareness of seismic risks in the San Francisco Bay Area. One more time, the possibility of a major earthquake became a not-so-distant reality; again, as seen on television and heard on news reports, a natural disaster was immediately visible and comprehensible. The possibility that an equally forceful event could hit California, with immense potential for localized loss and grief, became an entirely plausible scenario.

[172] This map reprinted on millenarist, and extremist blogs, like one called Galactic News, which claims to "consider the future of our world," along with many other websites in the same vein.

New Zealand's, Haiti's and Japan's earthquakes triggered important questions and concerns about potential consequences of a similar event occurring in the Bay Area, as well as the level of preparedness of local residents.[173] The three earthquakes together re-opened a Pandora's box of the potential "Big One," although without any scientifically supported evidence of a connection between the different events.[174] Nonetheless, the series of small earthquakes that rattled the Bay Area the following autumn served as something like an echo chamber, or maybe a distorting mirror, of the anxiety that had been growing for months.[175] As a consequence, when Winchester, [176]stated in his column (Winchester, 2006), that San Francisco will soon experience a large-magnitude earthquake,[177] Bay Area residents were paying attention. As Winchester wrote in his article,

> *It is as though the earth becomes like a great brass bell, which when struck by an enormous hammer blow on one side sets to vibrating and ringing from all over. Now there have been catastrophic events at three corners of the Pacific Plate—one in the northwest, on Friday; one in the southwest, last month; one in the southeast, last year.*

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[173] In addition to the New Zealand, Haiti, and Japan earthquakes, Chile, Argentina, Loyalty Island, Southern Pakistan, Fox Islands, Aleutian Islands, the Kermadec Islands region, Vanuatu, the Fiji region, Eastern Turkey, and the Eastern New Guinea region all experienced several earthquakes at the level of M7.0 or above. Virginia, a relatively earthquake-free state in the U.S. also experienced M5.8 earthquake in 2011. On average, since 2010, there have been between 10 and 22 earthquakes at the level of M7.0 and above, and a whopping 1,550 and 2,494 earthquakes of any magnitude in the world total. However, despite speculation that the number of earthquakes might be increasing, the USGS chart shows a rather constant number of earthquakes for the last 12 years. The increasing number of registered earthquakes is a reflection of the better coverage of various regions by seismic stations: there were 350 in 1931 in United States, they are than 8,000 today. "According to long-term records (since about 1900), we expect about 17 major earthquakes (7.0 - 7.9) and one great earthquake (8.0 or above) in any given year"(USGS, 2013).

[174] These allegations were dismissed by researchers at the Berkeley Seismological Laboratory.

[175] *"The first, and largest, was a 4.0 magnitude quake that hit just before 3 p.m. Thursday and was centered under South Berkeley, according to U.S. Geological Survey. The temblor was followed by three smaller earthquakes in the afternoon — a 1.0 magnitude quake at 3:02 p.m., a 1.8 magnitude quake at 3:09 p.m. and a 2.2 magnitude quake at 4:50 p.m — and a 3.8 magnitude earthquake that hit at 8:16 p.m. that evening. According to the agency, no earthquake was centered in Berkeley on Friday. Just after midnight Saturday morning, a 2.8 magnitude earthquake shook the East Bay and was followed by two more smaller quakes within the hour that were also centered in Berkeley*."(Karlamangla, 2011)

[176] Including: A Crack in the Edge of the World: America and the Great California Earthquake of 1906(Winchester, 2006)

[177] This statement does not contradict recent research. On its website, the USGS precisely states: *"Along the Earth's plate boundaries, such as the San Andreas fault, segments exist where no large earthquakes have occurred for long intervals of time. Scientists term these segments "seismic gaps" and, in general, have been successful in forecasting the time when some of the seismic gaps will produce large earthquakes. Geologic studies show that over the past 1,400 to 1,500 years large earthquakes have occurred at about 150-year intervals on the southern San Andreas fault. As the last large earthquake on the southern San Andreas occurred in 1857, that section of the fault is considered a likely location for an earthquake within the next few decades. The San Francisco Bay area has a slightly lower potential for a great earthquake, as less than 100 years have passed since the great 1906 earthquake; however, moderate-sized, potentially damaging earthquakes could occur in this area at any time"*(Cf. When Could the Next Large Earthquake Occur Along the San Andreas Fault? U.S. Geological Survey. Retrieved 15 March, 2012 from http://pubs.usgs.gov/gip/earthq3/when.html).

That leaves just one corner unaffected—the northeast. And the fault line in the northeast of the Pacific Plate is the San Andreas Fault, underpinning the city of San Francisco. All of which makes the geological community very apprehensive. All know that the San Andreas Fault is due to rupture one day—it last did so in 1906, and strains have built beneath it to a barely tolerable level. To rupture again, with unimaginable consequences for the millions who live above it, some triggering event has to occur. Now three events have occurred that might all be regarded as triggering events. There are in consequence a lot of thoughtful people in the American West who are very nervous indeed—wondering, as they often must do, whether the consent that permits them to inhabit so pleasant a place might be about to be withdrawn, sooner than they have supposed (Winchester, 2011).

The immediate consequence of such an alarmist story – even though scientifically unfounded, despite his claims – sparked particular anxiety amongst the residents of the East Bay. Media, again, played an important role in the transmission of information, and misinformation. As the information was diffused, the earthquake risk became suddenly too real. Surfing on the wave, a website named "quakeprediction.com", which has no connection with the USGS, published even more alarming predictions.[178] *"[The warnings] make me nervous"* (Wang, 2011), said a Berkeley resident to a local journalist. If the false information was relatively easy to debunk, the confusion reached a pinnacle when a San Francisco State University (SFSU) professor, and the Chairwoman of the Department of Public Administration, sent a mass email to her SFSU colleagues, which became "viral" in just a few hours. In the email, she claimed that Berkeley City Hall had been informed by the USGS that a Magnitude 6.0 earthquake had a 30 percent chance of happening within three weeks.[179] Berkeley City Council and the USGS administration reacted promptly,

[178] It is, of course, difficult to show the direct connection between these types of websites. Several of them exist, and, at the same time, Christian millenarian movements during that same time period were advertising on side road billboards, urging people to repent before the soon-approaching end of the world.

[179] *"Subject: earthquake odds estimated sharply up, 30% chance 6.0 or above, next 2-3 weeks. Date: Sun, Oct 30, 2011 9:02 pm. To read and pass on . . . Message below originally came from a student who works for a City Council person in Berkeley. All, FYIOne of the students in my class tonight works in Berkeley City Hall (assistant to one of the city council members); the Berkeley City folks have been getting briefings by geologists (USGS?) on the swarm of earthquakes recently happening directly under Berkeley on the Hayward Fault. She told our class about the content of these briefings. They have been told that what is particularly concerning to geologists is that these earthquakes have been so deep. And because of the type of fault it is, they can somehow tell that these smaller earthquakes (there was a 1.6 about an hour ago plus 2 or 3 in the past few week or so that have been 3.6 or above) build up pressure on the fault, not reduce it. (Go to http://earthquake.usgs.gov/earthquakes/recenteqsus/Maps/US2/37.39.-123.-121.php to see real-time map of the recent swarm, directly under Berkeley on the Hayward Fault.) They are saying that because of these swarms they are predicting there is a 30% chance of an earthquake above a 6.0 magnitude on the Hayward Fault in the next two to three weeks. This is, of course, much higher and concentrated than other predictions have been. They have subsequently been working with their neighborhood groups to help ensure preparedness. So, to be ready, prepare with at least 3-5 days of water (1 gallon per person per day) and food for that period of time. I am going to update our earthquake preparedness kit tomorrow. Be*

reaffirming that the USGS did not predict earthquakes.[180] But it was already too late: the rumor continued to circulate for many days, and it took many newspaper articles and radio reports to calm the situation and expose the misinformation.

The experience of an earthquake is a mediated operation that connects people and objects across disciplinary fields, and established divisions and territories. This collective mediation deploys the large reticularity of earthquake risk phenomenon: the space that it creates, the individuals and non human actants that it is engaging with, and the action that it generates, within the horizon of "the Big One," reaches far beyond the traditional regional borders. During these moments of collective attention, another layer of the space of earthquake risk is taking form, which shapes both the definition of risk and the subject living "at risk." Like the event itself, the stories reaching residents have left marks, hardly visible, yet still definite footprints, in the minds and memories of many.

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*prepared! * Earthquake Preparedness: http://www.redcross.org/www-files/Documents/pdf/Preparedness/checklists/Earthquake.pdf* Earthquake Kit: http://www.calema.ca.gov/PlanningandPreparedness/Documents/BUILD%20A%20DISASTER%20SUPPLY%20KIT%20FOR%20YOUR%20HOME%20AND%20CAR.pdfTake care, G[redacted]. "See also (Pogash, 2011)*

******From:*[redacted] *****Sent:*Monday, October 31, 2011 9:29 AM *****Subject:*Response to email re: Earthquake Preparedness Honorable Mayor and Councilmembers, this responds to inquiries we have received regarding an email that is circulating. Please feel free to share this information with anyone who is interested. Thanks. –C[redacted].*

We understand that after the earthquakes in the last couple of weeks, rumors have begun to circulate that City officials are meeting with representatives from the US Geological Survey (USGS) and it has been claimed that the USGS officials are predicting earthquakes. This is not accurate. The City of Berkeley has not been contacted by anyone from USGS in this regard, and in any event, the USGS does not predict earthquakes. As we all know, in the wake of disasters or even smaller earthquakes such as we have experienced recently, it is not unusual for misinformation to spread. However it is important to remember that while scientists all over the world are working to better understand earthquakes, no one has the ability to either predict them, nor to know whether small shakes are increasing or decreasing the pressure on a fault.

*What follows is a quote from the USGS website: ///"Neither the USGS nor Caltech nor any other scientists have ever predicted a major earthquake. They do not know how, and they do not expect to know how any time in the foreseeable future. However based on scientific data, probabilities can be calculated for potential future earthquakes. For example, scientists estimate that over the next 30 years the probability of a major [earthquake] occurring in the San Francisco Bay area is 67% and 60% in Southern California."/ The USGS does not know if the small earthquakes that shake us frequently build up pressure or release pressure on a fault. For more information from the USGS: http://earthquake.usgs.gov/learn/faq/?categoryID=6 While no one can predict an earthquake in the short term, we do know there is a high likelihood of a major earthquake on the Hayward Fault. The City of Berkeley, like all cities in the Bay Area, strongly urges its community members to maintain high levels of preparedness for all disasters. This includes three to five days worth of supplies, emergency plans for family, neighborhoods and pets, structural retrofits of buildings, and emergency education for everyone in the family. In addition, residents should know how the City will communicate disaster information. Whether we are warning residents of coming hazards or how to respond to current events, the City has several official modes of communication that it may use, including: The Berkeley Emergency Notification System (BENS): http://www.cityofberkeley.info/ContentDisplay.aspx?id=25416 ·1610 AM (some warnings may be rebroadcast on other stations, including KPFA, 89.5) \·_www.CityofBerkeley.info_<http://www.CityofBerkeley.info>(emergency information will be posted on the home page) ·Press releases and media briefings For specific information about how you can be ready for an earthquake, please visit_www.CityofBerkeley.info/getready_<http://www.CityofBerkeley.info/getready>. *******[redacted]* *Deputy City Manager* *City of Berkeley* *510/981-[redacted]**

In the information age, images of ruin and suffering reaching the Bay Area have, each time, caught residents by surprise. These events have opened up the possibility of a disaster occurring in the San Francisco Bay Area, making the presence of an earthquake more real, pressing the soft spots to test for the possibility of destruction, loss of lives and the environment, and the cherished life-styles of many. Fear, anxiety, and compassion: for residents of the East Bay of the San Francisco region, the earthquake had existed through their attention to the events that have hit other part of the globe.

4.2. Emotions that connect

Emotions are an integral part of the experience of living with, and framing the risk of earthquake they define the quality and the intensity of the relations between the everyday life of residents, an earthquake phenomenon, and the possibility of disaster. They attach, give direction to a move, they incline and repulse. They also connect residents with experts and allow for the emergence of particular expertise in the SF Bay Area: an expertise informed by acknowledging the role experience plays in the construction of residents' identities, as well as their professional and residential practices.

4.2.1. Joking about the end of the world

March 29, 2011. The University of California, Berkeley organized an event called "Earthquake, tsunamis and nuclear fallout: Is California at risk like Japan?" Faculty from the Berkeley Institute of the Environment, College of Letters and Science,[181] the Department of Earth and Planetary Science, the Berkeley Seismological Laboratory, and the Pacific Earthquake Engineering Research Center were each asked to make a five-minute presentation on scientifically informed reports of the Japanese situation. That night, the 150 seats in the auditorium quickly filled and the conference was then broadcasted into the lobby for the overflow crowd still outside. The conference offered an opportunity for audience members to ask a question about the risks of earthquakes in the Bay Area and what actions should be taken. It also allowed scholars to discuss state of the art developments in many fields related to earthquake sciences and safety. Some of the elements presented aroused strong reactions, which included surprise, concern, but also laughter.

[181] No misspelling here, "Letters" is plural, whereas "Science" is written as singular. This demonstrates an interesting perspective of U.C. Berkeley's conception of the sciences.

For example, laughter erupted after a speaker explained how infrastructure built in accordance to probabilistic and determinist approaches might not resist earthquakes in worst-case scenarios. Following this statement, people laugh. As he mimicked a sorry face, the speaker added that despite their best efforts, the underwater section of the Bay Area Rapid Transit (BART) commuter tunnel that allows trains to move between the East Bay and San Francisco, might not be 100 percent safe if a major earthquake were to hit. The audience laughed again. He then smiled and joked that he might lose his job after telling such an "inconvenient truth"(Guggenheim, 2006). With that, people laughed even more.

Of course, the fact the BART tunnel underneath the San Francisco Bay might crumble on a train full of passengers is not particularly hilarious, but still, people laughed. This is far from the first and only time laughter has been the reaction to a proposed disaster: making jokes about earthquakes is, in California, a common practice. In the introduction to his 1995 book, Robert A. Stallings quotes the following famous joke about the "ultimate California earthquake":

> *Speaker: I just bought an ocean front property in Nevada*
> *Friend: What are you talking about? Nevada isn't on the Ocean!*
> *Speaker: After the Big one it will be! (Stallings, 1995: 5)*

This joke is one of most recurrent ones about "the Big One," despite – or because of – the inaccuracy of the prophecy. Regional rivalry within the United Sates is another important comic impulse largely used to point to the specificities of the state of California (cultural, politic, and economic), but it seems, also with special irony when it comes to earthquakes.

Another example of California's capacity to use humor when it comes to earthquakes occurred following an earthquake centered in Virginia on August 23, 2011 at 1:51 p.m. Eastern Standard Time. The earthquake, which was felt in 12 states, was the biggest one that the East Coast had suffered since 1944. The event is said to have generated a considerable numbers of tweets and Facebook comments. But so much activity for a M5.8 earthquake was received in California as a manifest case of over-reaction, generating numerous sarcastic comments: "*Hey, East Coast, the entire West Coast is mocking you right now*" said a tweet, while another one questioned, *"Really all this excitement over a 5.8 quake??? Come on East Coast, we have those for breakfast out here!!!!"* The breakfast metaphor went on with another tweet: *"5.8? That's what us, Californians, use to stir our* *coffee with!" Similar* comments continued throughout the day. For example, *"I haven't heard from anyone on the East Coast because they are probably still sitting under their kitchen tables,"* and *"I wouldn't even wake up to a 5.8 if I was asleep"* ("Post Quake, West Coast Teases East On Social Networks," 2011). These tweets received a lot of attention, as they came from largely followed Twitter accounts, and were echoed throughout other online social media. A number of pictures also went viral, some reaching one million "Like" hits, such as the following (Figure [26]).

Figure 26 - Shocking Photos of East Coast Earthquake Devastation. Posted: August 23, 2011

Irony is a question of distance, as another tweet showed: *"Everyone calm down. If this is an earthquake on the east coast we're supposed to react ironically* [emphasis added]*"* (Matthews, 2011). But irony is also a question of degree. If those on the West Coast wholeheartedly joked about the August 23 Virginia earthquake, most of them admitted to unleashing their satirical posts only after being sure that the earthquake did not cause serious damage. On the late-night shows that day, hosts continued to joke about the event. For example, David Letterman on his CBS *Late Show with David Letterman* program pursued the theme: *"They felt the earthquake at Martha's Vineyard. It was so bad, President Obama nearly missed a putt."* Interviewed by a journalist, for an online news media scholar Andrew Lakoff commented that for California residents, *"a perverse consequence of living with the ongoing* *specter of catastrophe, is this sense of pride"*("Jaded West Coast chuckles over East Coast quake," 2011).

As was visible on the occasion of the Virginia quake, this irony and seeming insensitivity are also typical of the stories that California residents like to share about earthquakes. The sense of pride of being an earthquake survivor can sometime be overestimated, according to certain experts, like this structural engineer: *"People who have lived through the earthquake, they think of Loma Prieta as THE earthquake, whereas that was not the Big One. They'll say 'oh well… I survived the earthquake'"* [J.8]. On the other hand, downsizing the event is also a good way to introduce some irony in the discourse: *"I talked to my friend, [and for him], the biggest thing that happened during Loma Prieta, was that he ran out of beer,"* [K.7] as one San Francisco resident, working for a Federal Disaster Management Organization explained me. Memories of the Loma Prieta earthquake are also associated with leisure-time memories for baseball fans: *"The only other earthquake I can think of then was Loma Prieta. I was in Davis at the time. We were watching the World Series,*[182] *and it went off the air. […] In Sacramento there were waves in the pool"* [K.7]. The anecdotical aspect of the stories, their focus on facetious or shallow aspects of the event, which left an untold number of fatalities, causalities, and structural damage, as well as the casual tone used to describe the recollections, show a deliberate attempt to keep the subject of earthquakes from being too dramatic.

4.2.2. Dealing with fear, defining an identity

For much of the California populace, the relationship to earthquake risks is an important element of their identity definition as a Californians, because of their capacity of distanciation[183]. During the course of field research for this project, during interviews some respondents recognized that being a member of the greater Bay Area includes sharing the

[182] The earthquake happened during the third game of the 1989 Baseball World Series; as a result, the earthquake event was broadcasted live on national television. Coincidently, the World Series featured the two major baseball teams in the San Francisco Bay Area, the Oakland Athletics (aka the A's) and the San Francisco Giants.

[183] As quoted before: *"Distanciation in general refers to the stepping back or distancing of the observer or reader from an object of scrutiny. The process of distanciation. It has both a spatial and an emotional side"*(Harvey, 1997).

risks of earthquakes: *"[There is] a certain 'woo-hoo' element, hard to explain, just part of the mentality of living here."* [R.5] This so-called "woo-hoo" aspect recovers a certain amount of detachment towards natural disaster risks, balanced with a strong attachment to the benefits of living in the Bay Area. As expressed by the same respondent, *"I feel I can live here for the rest of my life, and never get bored"* [R.5]. Earthquakes are considered part of the experience of Bay Area life, something one needs to get used to and to adjust to mentally. Long-time resident, writer, and victim of the 1991 Oakland Fire, R. explains:

> *I grew up in California, so I'm used to earthquakes small and large. They just happen; I don't live in fear. I think people that move into the area and didn't grow up with {the earthquake} get freaked out at a small tremor. We have a small tremor, and we're like "Oh, it's an earthquake!" We move on and we don't think about it. [R.5]*

This same type of feeling can be heard in other discussions as well: "*You just thought we'd all be walking around living out of fear?"* asked one provocative respondent, expert in post-disaster reconstruction, rhetorically, *"Is it any more or less dangerous than when you live in hurricane or flood country"* [M.3]. California is not for everybody, and time is an important factor in adapting oneself to California's earthquake. Associated with childhood memories, earthquake have been part of their education for long time residents: "*There was an earthquake in the 5th grade, I remember the teacher standing there saying 'Oh, it's earthquake time everyone, get under your desks'"* [K.7]. Like a language or a particular peculiar practice, newcomers need to get accustomed to earthquakes. As R. pointed, this "woo-hoo" [R.5] mentality does not materialize all at once: "*In their first year in California, new residents get very worried about earthquakes, especially those who come from earthquake-free areas"* [J.13]. Eventually, after several years, if they can bear it, they adjust and begin to behave like everybody else: exhibiting behaviors such as shrugging their shoulders and making jokes. By shaping a residential identity, this particular attachment and distanciation system works as a mark of belonging, which draws – as we saw in the jokes by and on Californians - a boundary line between "us" and " them." Those who stay and can bear to live with the risk versus those who cannot and choose to leave. One respondent, J., who works in a departmental building for the city of Berkeley, recalls:

> *There was a big earthquake in Los Angeles in the '70s and friends of mine had moved into Los Angeles from Philadelphia. They had never experienced an earthquake before and this one was fairly bad. They moved back immediately and they would never come back to California, even to visit! [J.13]*

For long-time residents, the recurrent, unrealized possibility of earthquake risk has removed the concept from the category of "potential danger" to a disembodied narrative. In this perspective, being prepared is considered as an experience of material detachment and a way of beating the odds, explained R., who lost her house in the 1991 Oakland Fire:

> *I know all the things that I should do in terms of documenting my possessions, taking a film of them and keeping it somewhere else. But I think everything is just stuff and the most important thing is your lives. So, even if I lost all my stuff again, it would be really, really bad, but I don't live in fear of it. [R.5]*

Fear is often mentioned, but mostly, only to be dismissed. At the same time, however, for many respondents, fear has a more complicated status. If many agree that they cannot live in a state of constant fear, some admit that the feeling still lays in their minds or guts: *"Living in the Bay Area, anywhere in California, we've all survived a bunch of earthquakes. I think you live in constant fear of the Big One: 'is it going to come in my lifetime?'"* [T.5] as one respondent explained. Fear has different modes of existence: for some, it is quiet, but then the feeling can suddenly erupt as the result of combined action of another trigger, just as it happened in fall 2011. But for many, those residents who are more risk-conscious, fear is built on a definition of worst-case scenarios, as defined, for instance, by one seismologist:

> *I can tell you one big fear, and there is no answer to it. If there's a major earthquake, and it happens in September or October, and a fire gets started, and it's one of those Santa Ana wind days, there's nothing I can do: I can't get out of here. And I don't dwell on it because there's nothing I can do. It's the big fear we all have because there are typically fires after earthquakes, usually not by gas, electrical. (…) We can't put out a big fire. [P.1]*

As we have seen, when it comes to the circulation of information, the role of the media - the immense distortion/echo chamber – increases, empathy and the feeling of vulnerability, playing with the metric distance an building a space of emotions and concerns which, share, or not residents of the Bay Area.

But when it come to making residential choices, to find the safest mode of transportation, or to pick a school for their children that has been properly retrofitted for potential earthquakes, experts and non-experts living in the Bay Area alike face the same problems;

they both must think about some possible "Big One," and for some, this is overwhelming. One respondent, for instance, newly installed in the Bay Area, manager in a humanitarian organization that provides emergency assistance, struggled to articulate the different levels of his interactions with the earthquake risk, which are simultaneously mediated, personal, and professional. What seems to connect this layered experience is the latent anxiety, which during my interview with him, clearly affected both his personal and professional life.

> *I was hired to manage the volunteer program in San Francisco, and then, two years later, I was promoted to this position. So, I came into this job for managing volunteers – but with no experience in disaster or emergency response whatsoever. […] The media are very quick to sensationalize the statistics: the number of people affected, how big it is. It really hit me when I first moved here, but it's even worse now. There are times, when my wife's away with my son – they go to L.A., or they go on a trip, and I go, 'Okay, now it can happen. Go for it now, because I'm on my own.' And I can handle this, but, if it happened right now, I mean, my son's at home with a nanny and another kid, and my wife's in Oakland. We'd have to get home, and it's just… it's scary! But, it just never ends, if you think like that. […] I think the constant struggle for me personally (and professionally) is, I get the idea, I understand the general idea of how to respond. I can do the job. But, I'm not prepared in that I have not [had] a lot of experience doing it. [J.14]*

Fear is a powerful fuel for both action and inaction. When asked about his motivation to work in the earthquake-preparedness field, one respondent answered just one word: "*Fear.*" [J.14] Fear can be contagious and can go beyond the boundaries of professional and personal identities. It complicates the emergence of knowledge as a "bold object" (Latour, 2007), of expert as a unconnected "knowing subject" (Hélène Mialet, 2012a), questioning expertise without emotion, science without experience. Tracing fear in the experts' experience shows the entangled identities between the residential and professional dimension of experience of living in an earthquake country.

The feeling of fear, which, of course, not all in either the expert community or the academic world agree upon, generates a lot of controversy among respondents. As the next quote illustrates, however, fear is not only a unidirectional movement; rather, it is a confused process that can lead to very different positions. The quote bellow, which comes from a risk-prevention specialist, moves progressively from the personal pronoun of “they” to the more communal “we” marks an acknowledgement of the difficulty of keeping fear at a distance, of being only a rational unconnected rational expert. The quote begins with a reference to the fear of flying:[184]

> *This is completely irrational when you look at it: you've got a situation where there's relatively few airplane crashes versus car crashes. People will complain and not wear seat belts in their car; and then, they'll just go “bananas” when there's just one airplane crash, just be completely irrational and fear of flying! And that kind of either inappropriate over-reaction or inappropriate under-reaction is a big problem when you’re dealing with catastrophic events. In some cases we over-react, like in the case of airplanes versus car crashes, or (in the case of earthquakes) we can under-react, and completely ignore things because they somehow feel scary. [J.8]*

For many years, public policies approach of prevention have use fear as an incentive to increase residents’ disaster preparedness plans. However, using fear as a trigger for change has proven largely inefficient. As one expert working to improve NGOs’ and community organizations’ capacities to respond to disasters explained succinctly, *“we are widely in love in this country with using fear and threat to accomplish social change.”* [A. -M. 28] Further, what might work at the individual level, and in particular circumstances, often doesn’t equate to good results when applied to groups. Drawing on the failure of the traffic safety campaigns, the same respondent made the connection between the uses of fear, the form of power connected to it, and the spectrum of action expected:

> *You would only use threat and fear under of a couple of circumstances. One of them is if you actually have the authority and the ability to fulfill of that threat. That is why you know the campaign for seat belt is “*Click it or Ticket.*” You either click it or they will give you a ticket. It works because they can give you a ticket. They could not say “click it or else ... “ and have nothing to back it up ... no one would matter, so it works because there is a threat. Fear works in political campaigns and is used all the time very successfully because they are not asking you to make a behavioral change, all they asking you to do is be afraid of the other guy, and go into that pulling booth and*

[184] In reference to Air France Flight 447, which crashed June 1, 2009 killing all 216 passengers and 12 aircrew aboard.

> *vote against them. You don't have to change behavior, you don't have to shop differently, you don't have to do anything differently, you just have to be scared enough to push the other button. So fear works very well in that sense, but fear has never work well for behavior modification. [A.- M. 28]*

Fear is not loved, to say the least. *"It bothers me when there are some earth scientists whose goal is to scare people when they talk to the public"* [K.11], explained an USGS scientist. As another expert made explicit, a consensus has been reached to "talk straight," in other words, *"to tell [the people] the story but try not to scare the pants off them*" [M.3]. Nonetheless, fear circulates.

Among respondents, the distribution of fear varied a considerably, and despite the rather frightening description of the damage that could be caused by an earthquake, fear of a major earthquake is certainly not the most common feeling by Bay Area residents. However, it is still present and experts have a hard time finding a good way to address it. Scientific probabilities offer a bit of comfort for some, but not for all, as this researcher explains when discussing his own wife's anxiety:

> *I talk about earthquakes a lot. I see a lot about them and I'm quite comfortable with the idea of probabilities. I understand there's a certain probability of an earthquake on this fault and even if there is, there's a probability that the ground shaking won't be at that level and even if it is, there's only a certain probability that my house would be damaged and I'm very comfortable with that succession. For [my wife] there could just be a big earthquake that destroys our house because she's not a scientist or seismologist and doesn't understand the sequence as well or the probability. There's just a big destructive effect and she can't forget about it because I talk about it all the time. [R.9]*

Of course, few people are married to an enthusiastic—perhaps overenthusiastic — scientist, and to the great relief of many residents of the Bay Area, they don't have to think constantly about the risk of large-scale earthquake.

4.2.3. Habit, denial and the un-extraordinary existence of the earthquake risk

Because earthquakes do not happen all the time, “the Big One” neither monopolizes the past nor does it ”colonizes the future.”[185] The relative distance of the danger, and the related feeling of safety or danger that comes from it, plays an important role in how the attention to the risk is felt. The lack of attention to earthquakes can take different forms, which, when examined in detail, provides nuances in people’s understanding of their risks as they live in a seismically active environment.

If big events trigger anxiety, this effect is not the everyday mode of existence of living with earthquake risks in the Bay Area. In normal, everyday circumstances, earthquakes are a very discrete presence in most people’s lives; earthquakes tend to stay dormant for months, if not for years. Most of the seismic movements on the Hayward and San Andreas faults are small enough to go unnoticed, and not all outside-the-norm earthquakes beneficiate from the same media coverage that the Haitian and Japan earthquakes did. This diluted existence of the risk of earthquakes helps many forget about potential dangers. The “risk” as defined by experts, slowly becomes a danger among others, a distant eventuality which a number of earthquake experts living in the Bay Area, themselves, tend to forget.

Earthquake risk competes with multiple other issues for both individuals’ and institutions’ attention. The profusion of risks respondents face is often considered overwhelming — again, for both individuals and organizations — and this in part explains their difficulties to focus their attention on ”only” one risk. In 2010, a respondent was complaining of the lack of funding for disaster and risk management: “*nobody is paying attention to disasters because they [are] all focused on joblessness and financial issues”*[186] [M.3]. Even for those in the San Francisco Bay Area, and even with disaster experts who work in the field, the risk of earthquakes is, sometimes, de-emphasized in light of more pressing issues. One respondent, who actively works in earthquake preparedness, and who has been very concerned by public buildings’ safety during her career, was involved in the seismic retrofitting projects of her children’s school. There, she had to face competing priorities and could only accept it. She recalled:

[185] The expression is borrowed from Beck (2009).
[186] Here, the respondent is referring to the unstable economic situation, which began with the 2008 financial crisis.

I was on the Emergency Preparedness Committee, and we had the Emergency Preparedness Director for the Oakland schools come to a meeting. He looked us in the eyes and said: "In the Oakland school district, I am dealing with children who need to learn to get under their desks when gunfire is happening around them, and how to walk to school around drug-dealers" he said, "so, when you come to me with earthquakes, you have to understand that it's always going to be a low priority, because we have issues that are high-probability, high-consequence events." And you kind of think: "Okay…" [J.15]

Competing priorities might not be the only reason why people choose not to think about the earthquake risk. Looking at their own past experiences, the history of the place, and the environment, residents of the Bay Area draw up their own personal risk maps, and many try to make disaster preparedness plans, which they do not always follow. As this structural engineer explains:

The corollary that's easy to understand is health. My dad had diabetes. He had glaucoma, surgery to his legs: all the horrible things that diabetes can do [to] you… And he eventually died of the ramifications of diabetes. When I'm good, I remember that. When I'm on [a] staircase at the gym, I'm remembering that, when I'm eating …but then, there are times when that candy bar, that pasta just looks very, very good. Because those things are long-term, it's hard to remember. It was very fresh, right after he died, but […] we all have the incredible ability to deny risk. [J.15]

The recognition of an absence of focused thinking, of the inattention given to earthquakes, is often framed using denial.[187] This negation of the possibility of a disaster is part of the history of the Bay Area, as I have discussed in Chapter One. It is also an important frame that helps understand how contemporary residents "deal with" — or, in this case, consciously or not, refuse to deal with — the risk of a major earthquake.

Talking about risk and disaster in an economically, socially, and culturally dynamic place like the San Francisco Bay Area in 2009 could almost seems like a lake of politeness toward an place that has so much to offer: vibrant city life, major universities, Silicon Valley, the spectacular landscape, and the temperate weather. Coming to the Bay Area from Europe

[187] This is also discussed by Anthony Oliver-Smith *"Disaster exposes the way in which people construct or frame their peril (including the denial of it), the way they perceive their environment and their subsistence, and the way they invent explanation, constitute their mortality and project their continuity and promise into the future"* (Oliver-Smith, 2002: 6).

with my dissertation project, I was surprised to discover that what I thought was a problem, or at least, could be problematized, was not even considered relevant by many respondents: *"Most people that I know don't think about it that much or they think about it and worry about it but I don't think it affects the way that they live their lives with that much,"* [M.3] as summarized by the first disaster expert living in San Francisco whom I met upon my arrival in the Bay Area. During interviews, the shorts and "closed" responses came back often: "*it is not something that I feel concern with,*" [M.3] and "*That does not affect my day-to-day thinking at all*" [G.6]. For many residents, the earthquake risk, blended with everyday environment and habits, seemed to be diluted by the presence of friends and family. "*No, I don't think about that at all, I've lived in California my whole life, so it's not even part of my thinking*"[G.6], answered one respondent rather sharply. *"It's my home, my friends are here. There's a certain embedded sense of stick-around,"* [R.5] described another when talking about her attachment to the place and why, despite having lost her home in 1991, she decided to stay in the Bay Area.

Figure 27 - Notes from research field notes, C. Cabasse, 2011.

As opposed to the denial that I described in the first chapter of this research, the reluctance to look at — or the deliberate lack of attention to — earthquakes sits in the grey zone of knowledge, the zone where imagination, emotion, experience, and scientific knowledge are combined. A zone where habit, the repetition of movement or thoughts, is shaped.

Understanding the risk is at the cost of an hybridization between forms of knowledge, as made clear in the following quotation of a longtime expert, who is complaining about the lack of understanding of her fellow residents: *"They don't understand because it is about an event that hasn't happened yet, and they can't imagine that this {a large size earthquake} will happen to them"* [M.3]. People do not fully comprehend the problem, not because they do not know, not because they denied it, but because they cannot imagine. Because it is difficult to project oneself into the future, into time that they have not yet lived or situations they have not yet experienced. The quotation that follows shows experts themselves having difficulty articulating the complex relations between knowledge and experience:

> *I think that human beings are fascinating. And, I'd do the same thing, though. […] If you don't have the knowledge of something, you fill it in with personal experience. And so, it's: "My grandmother went through the 1906 earthquake, I went through the 1989 earthquake," and — despite the fact that they didn't experience a very severe*

> *earthquake ground-shaking — they supplant what should be knowledge, with experience. And they tell themselves, "I'm okay." [J.15]*

Earthquake risk is a phenomenon of changing nature, substance and existence. Earthquakes are defined as high risk, low probability events. The low probability, this relative distance to the potentiality of the event makes a space for jokes and humor in relation to the potentiality of catastrophe. The high risk, as we have seen, reluctantly opens the door for the potentiality of a space of loss.

Respondents have explained with a lot of details the nuances of this blurry territory and the ways in which experiences transform their professional identities. When confronted to possibility of large earthquake, aware residents evaluate and compare the urgency and the potentiality of danger. They also assess their vulnerability and their capacity for resilience acknowledging the complexity of the exercise, like tightrope walkers tracing their path between science and experience. As one resignedly commented, *"uncertainty opens the door to emotion. It's not always bad, but it could be better"* [D.21].

The use of denial covers several meanings, several ways *not* to deal with the meaning and the consequences of living in an active seismic zone. Whether residents turn the question around and laugh, or whether they either accept or refuse to address their own fears, they utilize different strategies to address the risk. These strategies convers several meanings, several ways to *"not deal with the question of natural hazard,"* which enter the — *"blessed,"* as William James would have said (Latour, 2013) — grey zone of our awareness. They allow the development of a mundane quality of everyday life. Does this mean that risk itself is denied or not addressed? The answer is no. Instead, I argue the opposite. These indirect, non-scientifically based, seemingly futile, and messy ways to relate to the risk, in fact, speak to only that: that earthquake risks are very real and catastrophes are entirely possible.

4.3. Hybrid knowledge

If everybody and everything is, to a greater or a smaller degree, at risk in the Bay Area, living with the threat of an earthquake is more an adaptive process than a static, predefined paradigm. Acknowledging this dimension opens up possibilities to go a step further. To grasp passing, evanescent, reality-based earthquake threat, experts, residents, and expert-residents have to pay attention, to remember, to imagine, and to learn. They must define what their values are and to be able to evaluate the costs associated with those valuables. They have to listen to their emotions and make assumptions based, sometimes on scientifically established statistics, sometime on chance. They also have to accept that, sometime, they rely on something else than science. In this chapter, we will see how this way of thinking establishes a new "normal," as defined as living with an earthquake threat, which can shed light on specific, localized definitions of risk and knowledge while also stressing its limits.

4.3.1. Knowing the risk

When it come to earthquake risk, "knowing" is a complex operation. Utilizing hierarchical categories, comparing, and discussing the risks allow to envision the potential dreadful consequences of a large-scale earthquake, but also re-place it in a time frame of a individual life spam. As discussed by a respondent living in San Francisco involved in risk prevention and the development of building codes:

> *With earthquakes, they're so rare and extreme that to understand them, you have to think of them in the spectrum of everyday risks, monthly risks, and yearly risks. These all get compiled together and, most people, whether they articulate it or not, they're aware of that difference. You rarely find people that dumb that they don't understand risk in their daily life. [It] doesn't mean they always make the informed decisions, but they have an innate understanding of the rarity of things. [D.21]*

As we have seen, the safety measures advocated to prevent major damages incase of earthquake concern the field of the domestic life. A space where, experts living in the Bay Area have to make the same day-to-day decisions than anybody else: choosing a house, a school for their children, or a transportation system to go to work. And like anybody else, experts-residents also must make their decisions based on the amount of information available; evaluate a complex web of actants,[188] and imagine — if they can — the worst for their families. *"I own a 1908 house that I upgraded. My house is retrofitted and very well built, on good soil. I am personally at less risk that other people"* [M.3], pointed out one respondent, who also confessed,

> *Post-Loma Prieta and after the fire, I was very conscious of making a family disaster plan, which we always have. Everybody always knew what it was. My nanny thought I was out of my mind, but I was very … [trails off]. Everybody had to learn the rules: "This is what you do in case of an event, this is where you go." I had a very, very explicit family disaster plan, and I made sure everyone remembered it. [M.3]*

The seismologist and his wife, who does not share his ease with earthquakes probabilities, made a different, much more radical choice: *"We bought a brand-new house because it's up to the modern standards. The number one way to be safe against earthquakes is being in a modern house."* [R.9] A third expert, interviewed in her office in the College of Environmental Design at U.C. Berkeley, justified,

> *I should have a safety pack but I don't, which is silly given that I've lived through a fire and I know all the things that I should do in terms of documenting all my possessions, taking a film (sic) and keeping it somewhere else. I'm probably a little bit more aware of where all my photos are, and what I might grab in a fire, if I have to leave. I also think everything is just stuff and the most important thing is your life. So, even if I lose all my stuff again, it would be really, really, really bad, but I don't live in the fear of it. [G.6]*

Experts deal with the earthquake possibility in different way, as do other residents of the Bay Area. As recalled a one-time non-expert resident, now an expert in the field, the risk of an earthquake, is not, and never was, "a given"; but has been progressively instaured by researches, practices and attentions: "*I'm from Massachusetts and New York State. When I*

[188] We will discuss these in greater detail in the following chapter.

moved here, it was the 1970s; [The idea of a major earthquake] wasn't in anybody's awareness." [J.12] This ongoing instauration was not a one-way street, but rather, a slow elaboration of the capacities needed to understand both earth science and resident behavior, and many things in-between; often in a reflective way. Experts often coming from the perspective of "hard science," learn at their own expense how to be not only rational subjects but also beneficiaries of their own expertise. In the process, they learned to deal with, and even to respect, residents' understanding and practices: *"If it does not make sense for the people to retrofit their home, then it does not make sense by scaring them into doing it,"* [D.21] summarized one respondent, a structural engineer by training, who here echoed this common Bay Area sentiment.

Moving away from the easily-taken-for-granted discourse regarding the lack of preparation and the irrationality of the residents (Geschwind, 2001; Stallings, 1995), and also taking their distances with infructuous attempts to detach irrational thinking from idealistic, "pure" scientific knowledge, these experts accept that several *"frames can be considered rational yet lead to radically different solutions"* (Von Winterfieldt, Roselund, & Kisuse, 2000, p. 35). And as the previously quoted respondent noted, taking this perspective open up large possibilities:

> *We need to define what is rational by what people do, rather than decide what's rational and say that they're not being rational. They are the definition of rational, and therefore we have to rethink what rational is [emphasis added]. [D.21]*

Opening this black box also changes preconceived narratives about people's relations to risk,[189] and in a broader sense, their understanding of individual and collective dynamics. As a respondent who has been working for 30 years in the field of hazards mitigation and long-term disaster recovery planning recalled, the process of defining the risk of earthquake was often full of surprises:

> *We did a male survey of people in the mid 1990s. It was intended to find out why people would choose do structural retrofit in their homes, and as part of that, we wanted to see the correlation with whether or not people have done the Red Cross*

[189] In the literal sense, see for instance Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming (Oreskes & Conway, 2011).

kind of things, like food, water, and first aid. And it turned out - as a side-line, because we also asked their age and income - that the more educated you are,[190] *the less likely it was that you're going to have food, water, [and] first-aid training; and the less likely it was that you would have made the structural changes to retrofit your house, regardless of income! [Laughs] And we thought, "Okay … Somehow, when people get a lot of education, they tend to have more blind faith that the utility companies are going to come through and they're going to have food and water. And [they think] they don't need to do this, because they know that their house is going to fall on the ground and therefore they're going to fix it. Whereas the other group, which was less well-educated, was convinced that it was going back to that basic survival training." We were trying to hypothesize why this was going on, the basic survival training that they knew: that food and water were important on a day-to-day basis because they're having to deal with it weekly, as they did their budgeting. And therefore: "I need to make sure that I have set aside a little extra so that I will have food and water in case of any emergency, not just a disaster."*

Listening to the people they interviewed, accepting graciously to get surprised, or even challenged, and reframing their hypothesis, Bay Area experts worked in alongside the researches taking place in the social sciences that favored and validated their own approaches.

For instance, despite the lack of extensive risk preparedness — at least, to the degree that experts would have wished for — when the Loma Prieta earthquake hit, research conducted by the UCLA Institute for Social Sciences Research showed that "*there was little evidence that people panicked [during the earthquake]*" (Bourque & Russell, 1994). More recently, studies have also tended to confirm that residents' awareness of earthquake risks have continually grown during the last several decades,[191] conducting experts to expand their understanding of the conceptual framework used by residents.[192]

Building on their own experience, experts of the Bay Area were also starting to redefine normal, which often is for people not living in an earthquake country, a world without

[190] Again, please note the change of the personal pronoun as she discusses this history.

[191] The first study, conducted in 2009 by "Issues & Answers," a market-research industry group, by the Bay Area chapter of the American Red Cross (*Bay Area Preparedness Study- Executive Summary*, 2009).

[192] See Von Winterfieldt et al., 2000

hazards. Understanding that the earthquake risk overlaps situations previously though without connections – like science and experience - they framed the contours of a situated but moving norm of “living with earthquake”, which never seems to reach a perfect and definitive conclusion.

> *Everybody expects that if there is a major earthquake, things are not going to be as normal. So, it’s okay if you take three days before going back to work. If you have to spend some money to patch up cracks and repaint, that’s fine. Sometimes, engineers always show you the pictures of the damage because we can always do better and prevent that damage, but most of the time we should be looking at the pictures and saying, ”So what? Is that acceptable or not?” [D.21]*

Of course, following argumentation also changes the perspective of the risk itself:

> *If you imagine an event and think you can recover, you don’t need mitigation. You can trade off between mitigation, responding, and recovery. That decides how we plan mitigation, which ones we prioritize, why some makes sense in some places but not others, why it makes sense for some organizations but not [for] others. The reason individuals don’t do mitigation is because they understand they’ll be able to recover. [D.21]*

This line of reasoning is one that another respondent followed. Having experienced the 1989 Loma Prieta earthquake, she seriously considered moving away from California:

> *And then I realized: no. If I move back to Kansas where my husband is from, there are tornados and that freaks me out even more. And there are hurricanes on the East Coast, which is where I’m from. And so I realized I just have to prepare. And so that’s when I went out and got my little backpacks, filled those, and did the things I needed to do, to make sure I would be as prepared as I could be. And then, there comes a point in time where there’s nothing I can do about it. [R.5]*

The limits of this non-coercive model, this mental exercise relying only on personal understanding and imagination of the earthquake, surface questioning both residents and expert’s capacity of action.

You can present the information: "This is what your highest risk might be," but what would you think? It depends on what your experience is. If you've experienced an earthquake, you might think that's your highest risk, even if there is dry brush in your backyard and it's the middle of August and wind is blowing. And people who have been through firestorms and [have been] burned out of their house[s] and had [them] rebuilt, that's their number one risk, even if they're sitting on the earthquake fault. It's counterintuitive sometimes to realize your number one risk, so we try and present the information and that's pretty much all you can do because then the information is there: that's what it means, and this is what you can do about it. [D.21]

Knowledge is supported by the capacity to imagine the unthinkable, and to expect and accept the consequences of a large scale earthquake. As a result of this hybridized risk, residents and experts accept, and even come to expect the possibility of building and infrastructure destruction, and the ensuing economic loss. To a certain extent, some of them also accept the possibilities of large number of fatalities:

[A good] analogy for a damaging earthquake is the 1995 Kobe earthquake; there were about 6,000 fatalities. That was on a fault directly beneath the city, [and] that's why it's a [good] analogy for an earthquake on the Hayward fault. [R.9]

But in face of such statement, experts' open secret is that many preventive action cannot be accomplished preemptively. We remember the case of Bart train, mentioned earlier. In such cases, experts have to recognize that their scientific knowledge and their capacity of action to prevent damages are limited, and that a potential future earthquake can go way beyond, or be just very different, from anything they had planned for. The seismologist respondent below makes the "uncertainty factor" clear:

I don't expect my house to collapse, maybe some windows, but I expect the electricity and power and water go out. We will have no money because the electricity will go down and affect money machines. I don't think we'll have 200,000 or more people killed, but I expect quite a bit of damage, it will take some time to bring back the infrastructure. There's a lot of old infrastructure here, the water systems under the streets, the sewer systems are all old. There is no real good way to go in and replace all that in advance. [P.1]

Instauring the risk of an earthquake is a mental exercise that allows experts to improve their knowledge about residential practices in a space of risk; and residents' capacities to define – specific and personal – knowledge of the danger that they must accept. This never-ending work-in-progress is continually renegotiated, moving the cursor of acceptability. When new building construction is planned, when a child is born, when a new scientific discovery is unearthed, when a new law is voted upon, or when the time comes to choose a new house, all of the micro-events that had previously been balanced, must be reprocessed.

The instauration of the risk is not the implementation of risk zero safety, and how could that be ?- but the renegotiation about what is an acceptable level of threat that people can afford, knowing that what can be done might never be sufficient to cope with the extent of the damage and destruction. Instauring the risk in defining a new norm of what is acceptable when living-with-the-earthquake, endlessly rephrasing the question: *"ask yourself <u>if</u> you have <u>a</u> risk, ask <u>what</u> you have <u>at</u> risk. Just the awareness is important* [emphasis added]*"*[D.21]. In many ways, the incapacity to think *of* the danger frames the limits of this tightrope-walking mental exercise. How, then, do experts and residents articulate the known and the unknown, and how does that articulation add another layer to the instauration of earthquake risks?

4.3.2. Attending uncertainty: about fate, chance, and the metaphysical dimension of the risk

As we have said, experts and non-experts alike have to articulate knowledge with an absence of knowledge. The dimensions of the "living with an earthquake" experience are never the same. They are embodied in and individual's life history, and within the larger framework of their values and concerns and to articulate imagination and knowledge. "Living with" is also a metaphysical experience where experts and residents' actions meet their limits: a space where chance, God, luck (good or bad), and statistical odds can coexist with others actants.

"Luck," like the deus-ex-machina in Moliere's plays, appears at detrimental moments. For seismologists, luck plays an important role in the combination of the earthquake's timing and location with human activity. If an earthquake happens during a busy workday rush hour, the potential for a large numbers of causalities is heightened. However, if the earthquake happens to be far from a densely built environment, the amount of damage and the number of causalities are not likely to be significant. When looking at past events, seismologists consequently emphasize the role of "luck" when discussing assumptions regarding possible future events:

> *We were very lucky [in 1989], because [the earthquake] happened on the day of this game between the Giants and the A's. Everybody stopped work and went home to watch. Normally at 5:00 in the evening, the freeways would be full of people, but they were empty. Instead of having 200 or 400 people killed in the collapse, it was only 40 or 50. We weren't the epicenter region, the earthquake did not happen in Oakland or SF, it happened somewhere else.*

If "good luck" plays an active role into better ending, Fortuna, the capricious goddess can, also, bring bad luck. The daily newspapers accounts describing the last moments of victims of the Cypress Freeway collapse in 1989, referred to the tragedy with the vocabulary of fate and destiny: *"… had the quake struck seconds earlier or later, Mrs. Marsden would scarcely have been affected, apart from picking up some fallen items at home"* explained an obituary in *The New York Times*, dedicated to 11 of the 42 people who died that day. (Reinhold et al., 1989).

Fate and chance play an important role in the shaping of the personal dimensions of an event. But fate is not so easy to accept as explained another respondent, a victim of the Oakland fire in 1991: *"what was also complicated in this situation here was [that] fate was pretty indiscriminate."*[R.5] For Oakland fire survivors, the difficulty of accepting fate was deeply entangled with the collective response to the successive, and unknown phases of the reconstruction:

> *There would be six houses on a block burned, one house didn't burn. The person in that house was feeling very lucky and also had a lot of guilt for surviving; until the neighbors start building these big houses where everything's brand new. And suddenly you're looking around your old house … The same for the one house on the block that burned and everybody else's house was fine, that person would feel like a victim: 'Why me?!'. Then they build this nice house and their neighbors see it. There were a lot of waves of resentment. It was emotionally complicated. [R.5]*

In this next respondent's case, the sense of belonging to a "common humanity" changes the understanding of fate implying a fair acceptance of human experience at large, which includes – but not only - natural disasters. For this former political activist, now in his eighties, who faced the anti-Communist McCarthyism witch hunts of the 1950s, natural disasters are considered less dramatic, or remembered as less traumatic, that what his family endured during the years of his political persecution. The fact that he lost his home and all of his belongings in the 1991 fire does not have the same weight in his memory as the decades of physical and psychological harassment, and the infringements into his and his family's rights:

> *It's hard for me to think of risk in a conventional sense, because, even though I had personal experiences that involved fire and many houses burned down in 1991, including ours, somehow that never registered in my mind as any kind of unique experience. It was unpleasant, but I didn't feel personally victimized in any unique way. I regarded that kind of risk as something that all human beings face, one way or another. So, I didn't spend a lot of time bemoaning that kind of risk and that was true of my family, my wife, and the children. The only times in our lives where we felt uniquely at risk was the political experience. That's something of which the children were also aware, even though they were very young. [L.18]*

However, in a place where "*there are approximately 282 Evangelical churches, 93 mainline churches, 54 Roman Catholic churches, 27 uncategorized churches, 17 Orthodox churches, 28 other that either do not fit in the previous categories or could not be determined, 56 Buddhist temples, 17 synagogues, 5 Hindu temples, 5 mosques, 4 interfaith centers, 1 Shinto temple and 1 Bahai temple as of December 31, 2011*" (Svoboda, 2011),[193] all within the city of San Francisco only, luck, fate and chance are also deeply attached to a larger spiritual dimensions.

In a poem in memory of one of the youngest victims of the 1991 fire, which was based on the eulogy given in a San Francisco synagogue, the Hal Wingard wrote: *"And those who must cry / Can never know why / It's they who must bear circumstance / No way to explain /*

[193] The map appears with following disclaimer: *"This map is provided as a public service by YWAM San Francisco. The information provided was researched through public sites and is for informational purposes only. The research for this projected concluded on December 31, 2011 and is currently updated periodically, but may not be accurate beyond that date and is subject to change without notice. YWAM San Francisco is not responsible for misinformation, or misrepresentation that is presented here. This map is a work in progress, and we encourage participation, so please email us if you find any missing, wrongly stated, wrongly categorized, etc. information"*(Svoboda, 2011).

To those with the pain / It's all only matter of chance." [194] As the prayer is translated into a poem, the words destined to grieving devoted audience are hybridized with other form of metaphysic to give a larger dimension of the experience of the "living with", in a space of risk which overlaps a space of loss and death.

Earthquake, fire, their past occurrences and their future potentialities are always situated within a larger network of actants to the list of which, fate, destiny and deity presences need to be added. For experts living in the Bay Area they represent the missing link between the known and the unknown, shaping the dimension of their experience but also tracing the limits of science as the only resource to face the threat.

Powerful actants, luck, fate and chance, do not only emerge when disasters hit; rather, they stay hidden, invisible, until they are called again to shed light on the past or to support an optimistic version of the future. Having been exposed to the fire disaster, a respondent stated: *"… I'm hoping that I beat the odds and that it doesn't happen to somebody twice … ."*[195] [G.6] In planning for the next disaster, Hope, also becomes an important ally. The one that might be able to win Fortuna's favors, to gain time for instance as the next respondent, expert in post disaster reconstruction explains: *"You know, the hardest thing is to get people to do something and hope that you have enough time that you are actually able to accomplish something before another event happens.*" [M.3]

Here again the strong presence of past events, the indirect experience of disaster can be felt: "*We have built for earthquakes*," added another expert, "*and hopefully we'll not be like Haiti."* [S.16]

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[194] Copyright 2009, Estate of Hal Wingard; In memory of Segal Livnah, who--on October 20, 1991--lost her life in the Oakland fire. November 17, 1991. Words, based on the eulogy delivered by Rabbi Martin Levin, Monday, November 4, at Temple Emanuel in San Francisco, completed November 15, 1991, on a USAir flight from San Diego to San Francisco.

[195] In full she stated: *"So maybe I'm hoping that I beat the odds and that it doesn't happen to somebody twice, it's really interesting that I know a lot more about what you should do and I haven't done any of it, just too busy or in denial. You think it can't happen to you again, maybe I feel I'm now immune."* [G.6]

4.4. Transition 3: the transformative aspects of an earthquake

The everyday, frequent association with — even “yet-to-be” — earthquakes is an experience strong enough to hybridize knowledge; and simultaneously, change the nature of expertise. For the expert community, living through the oblivious moments of everyday life in a seismic zone, as well as sharing the common fate of a potential threat is a transformative experience.

> *As a seismologist, I individually think of earthquakes from a purely scientific perspective. That obviously builds into understanding what the likely effects of earthquakes are. As an individual and regular person living in the Bay Area, I am interested to know the kind of very real impact an earthquake would mean for me. I think that’s an important combination, a lot of seismologists are spread around the world working on earthquake hazards wherever they are, but actually living in an earthquake zone forces you to combine the scientific aspect [with] the personal and societal aspects. [R.9]*

Living with the risk of earthquakes, waiting, as well as planning for the next “Big One,” allows experts to step back and add a layer of lived experience to their scientific knowledge. Thought as advantage rather a weakness this new layer of experience is considered part of the earthquake as a risk.

> *I don’t know if basically it changed me, but I know that I been in number of damages caused by earthquake shortly afterward. I find that those trips had a major effect on me, in term of considering how serious earthquake risks are, and their consequences. I think it took me to look at what the consequences are in society and the value that society has. [T.3]*

As William James suggested in 1906, waiting for and experiencing disasters might transform individual psyche. Connecting not only science and concerns but also the past and the future, collective and individual experiences and various forms of knowledge; direct or indirect experience of earthquakes have strong impact on human soul: “*The tough thing* *about earthquakes is that you don't get warning. Maybe that does, or doesn't change our psyche about it,"* [S.16] as one respondent, a victim of the fire and, for many years, involved in disaster prevention for the city of Oakland, reflected. In *After the Quake* (Murakami, 2002), Murakami's characters live through what psychologists call a *"post-traumatic experience,"* which unfolds in several steps. As psychoanalysis T. Rosbow develops *"first, strangeness—the loss of the familiar; second, the past intruding into the present with the physical/emotional sense of being 'shoved;' and third, most importantly, the sense of randomness that follows in the wake of traumatic events, which wipe out our needed sense of predictability and order*" (Rosbrow, 2012, p. 221).

In the Bay Area, many people were deeply shocked after the Loma Prieta Earthquake, in a similar way as Rosbrow describes. As one respondent observed, "*After the 1989 Loma Prieta earthquake, about three days after, I woke up in a sweat. Like, 'Oh my God, I have to get out of here!*'" [R.5]. In the novel *After the Quake*, the description of the effects of an earthquake on the characters portrays the *"mysterious and profound way"* in which those changes operate (Rosbrow, 2012, p. 216). For some of the interviewees described how the symptoms – she calls "it" continued for years, lying latent in the back of their mind. During one interview, a respondent who had been called to evaluate the damages of the 1989 earthquake, recalled:

> *I didn't realize that I had a very mild case of PTSD, Post-Traumatic Stress Syndrome [sic], after Loma Prieta. We were running on adrenaline for months … I had a much higher level of … I don't know, I don't have it anymore. But I did have it. And I didn't recognize it. They did a little bit to help us, just a tiny … [trails off]. It wasn't like there was counseling or anything. They had a debriefing. […] It wasn't until I felt better [that I realized I had a PTSD]. You don't know how sick you are until you get better, right? I had a higher level of anxiety and some sleeplessness; the level of fear was a lot greater, and helplessness. You know, like, what can we do? [J.8]*

The emotions provoked by the experience of the disaster are deeply anchored in people's narrative of their life history, as the recollections from fire victims, during the photo exhibition related in the first chapter, made clear. Often described as a trauma, the experience of disaster creates a discontinuity of normal life in individuals, which calls into existence something about the possibility of loss and death that was not present on this scale before the event. This new presence can be felt at different intensities, and if it is often soothed by time, it can also come back, brutally and without warning.

During an interview with a respondent, who was recollecting the difficult process of selling the land where her house had once stood before the 1991 Oakland fire, she recalled the moment when she saw, for the first time, the newly built house completed by the buyers of her land. That day, she was deeply moved, in a positive way, by the sight of the property, inhabited again — as a promise of continuity and happiness — on land that she had cherished for many years. She recalled that she had not expected to be caught by such strong feelings at the time; without noticing it, she remembered she started to cry at the moment she saw the new house. And as she was telling me her story, more than 20 years later, tears again were rolling down her cheeks, and she asked me to stop recording:

> *It completely surprised me, as I'm surprised right now. I've been pretty bland this whole interview, it's like I'm so distant from this experience, I'm surprising me that describing this moment can still bring this out. I'm completely shocked by why I'm crying right now, but it must say something about… [trails off]. [G.6]*

For earthquake experts in the Bay Area, most of whom have personally experienced a natural disaster, their unique understanding of the intensity of what such events can call into existence is the place where their practices take root. Even if, for some, the burden of this knowledge is deeply haunting.

> *I was in Iran,*[196] *standing in front of a school where 600 children died. You know, its gives new meaning about your original question: "What is risk?," and what do we do about it?" You can look at a building and say: "Typical, unreinforced masonry building in stone, floors not tied together, and during [the] shock, the floor has collapsed, that is an interesting mechanism … ." The floor has collapsed. The problem was, it was 15 minutes before lunchtime and there were 600 children in there. [T.3]*

To fight the feeling of helplessness aroused after catastrophes, and the feeling of helplessness which can also be present waiting in fear for a disaster that might come, experts of the Bay Area have decided to dedicate their time to prevention and rescue preparation. Finding their own resilience, they have discovered a way to avoid being victims of the risk of a great earthquake.

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[196] The Bam earthquake in 2003 was extremely destructive. Measuring M6.6, the earthquake that hit Iran killed 26,271 people, and injured about 30,000 more.

> *I tell you, whenever there is a small one, I always think: "Is this it?" I think, simply because I know more about earthquakes, I just have to go to work then, I have to start to help my community put things back together again. I will be less a "victim" in an earthquake, than I will be part of the recovery. And, you know, maybe that's part of it too? There was a horribly helpless feeling after 9/11. What could you do? You can't go to New York and start pulling bodies out of the wreckage, because there are none. Whereas, after an earthquake, I have the ability to put on my hard hat, put on my boots, and go out and help people. It's a very different experience. [J.15]*

Experts in the Bay Area might not want only to be moved when the tectonic plates move. Some recognize their strong attachment to earthquakes, an attachment that takes on, in their own words, the vocabulary of addiction and dependence:

> *K. calls us "Earthquake Junkies"! That's what he calls us. It's the Earthquake Junkies. The people who are, let's say very concerned, conscious, obsessed, whatever you want to call it, you know! [J.8]*

Here again, if humor is used as a favored way to describe the tasks at hand — one could also say, their mission — these experts have defined for themselves; an acknowledgement of the motives for their actions is rooted in the memory of past earthquake experience. Moved — or even driven — by their emotions and their experiences as residents, theses experts, as we will see in the next chapter, have defined the scientific contour of their practices. Evaluating at the center of network of attention, which as we have seen, can stretch from unawareness to obsession, these experts are able to articulate dimensions of the condition of living with uncertainty which for most is often thought of as separate, without consideration for messier, but also a more complex instauration of the phenomenon of earthquakes.

Earthquake preparedness is an instauration in the Souriau sense and Earthquake Junkies are defined as much by the extend of the their knowledge that by their attachment to make the Bay Area earthquake resilient. In the figure of the amateur, emotion and technic are not opposed and but they are interdependent. The next chapter will detail some of the technical aspect of the earthquake prevention in the Bay Area. Inheritor of a empirical scientific tradition, we will see how they are pursuing the decade long objective to built a earthquake resilient Bay Area. Caring about details, being able to articulate the different scales of intervention – from the seize of a beam to the larger political impact of earthquake preparedness, earthquake experts are complex figures for whom experiences inform and even drive the scientific practice engaged in the earthquake preparedness and disaster mitigation.

Chapter 5
The case for not letting San Francisco Scramble

In the 20 years following the 1989 earthquake and the 1991 fire, which separates the event from the present, the contours of the disaster have changed and the story of the risk of earthquake in the Bay Area has acquired, with some new chapters, and with some shaded variations, an intensity which speaks to long-term effects. For those who lost a loved one in the 1991 fire, or their house, the story can still be very vivid, sometimes causing a shortening of breath or tears that were once thought to have dried. Some actants are, of course, gone, long replaced by new ones, while others have just changed substances and forms. The ramifications of the event still need to be traced, and in the process, the reticular chain that we are following will tell us about the constructions of space and risk in the Bay Area.

After the 2011 Japanese Tōhoku earthquake, Simon Winchester,[197] stated in a *Newsweek* column entitled "*The Scariest Earthquake is Yet to Come*,"[198] that after the series of earthquakes that hit the "Pacific Ring of Fire,"[199] San Francisco should expect, sooner, rather than later, a large-magnitude earthquake along the San Andreas Fault.[200] As we will

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[197] Simon Winchester, A Crack in the edge of the World: America and the Great California Earthquake of 1906 (New York: Harper Perennial, 2006).

[198] Simon Winchester, "*The Scariest Earthquake is Yet to Come,*" (Winchester, 2011). These allegations were dismissed by researchers of the Berkeley Seismological Laboratory.

[199] *Around this Ring of Fire, we have the 2010 Haiti and Chile earthquakes, the 2011 Christchurch Earthquake in New Zealand, and the Japan earthquake. However, despite speculation that the number of earthquakes might be increasing, the USGS charting of these events shows a rather constant number of earthquake for the past 12 years. The increasing number of registered earthquakes reflects better coverage of territory by seismic stations: there were 350 in 1931, and more than 8,000 today. "According to long-term records [since about 1900], we expect about 17 major earthquakes [M.7.0 – M.7.9] and one great earthquake [M.8.0 or above] in any given year"* (http://earthquake.usgs.gov/learn/topics/increase_in_earthquakes.php, accessed on March 15, 2012).

[200] This statement does not contradict recent research. On its website, the USGS states: *"Along the Earth's plate boundaries, such as the San Andreas fault, segments exist where no large earthquakes have occurred for long intervals of time. Scientists term these segments "seismic gaps" and, in general, have been successful in forecasting the time when some of the seismic gaps will produce large earthquakes. Geologic studies show that over the past 1,400 to 1,500 years large earthquakes have occurred at about 150-year intervals on the southern San Andreas Fault. As the last large earthquake on the southern San Andreas occurred in 1857, that section of the fault is considered a likely location for an earthquake within the next few decades. The San Francisco Bay area has a slightly lower potential for a great earthquake, as less than 100 years have*

see, the statistics on earthquakes are well-known, and Winchester's claims are only one of the most recent statements on the topic, over which much ink has been spilled. The claims can be summarize as follow. First, residents of the Bay Area have settled, and continue to do so, in a place where they should not have in the first place (Reisner, 2003), mainly because of its geological characteristics. Here, as but one example, the seismic activity is closely associated with the difficulties of obtaining a proper water supply. Second, earthquake-risk experts seem unable to relay their information to the general public (Geschwind, 2001).

How can such an important message, "be prepared," fail to reach its audience so badly? As Stallings underlines it, *"With the possibilities of negative consequences from a future catastrophic earthquake seemingly as great as those from street crimes, epidemics, and others publicly recognized risks of the day, why has the earthquake threat attracted so little public attention and concern?"* (Stallings, 1995: 193). In the brochure entitled "Putting Down Roots in Earthquake Country,"[201] the USGS provides a map indicating the possible shaking levels around the SF Bay Area. The brochure specifies that soft soils, unlike bedrock, have the tendency to amplify and prolong shaking. It then goes on to say that most of the built urban areas of the greater San Francisco Bay have been constructed on these exact, dangerous soft soils.

passed since the great 1906 earthquake; however, moderate-sized, potentially damaging earthquakes could occur in this area at any time" (http://pubs.usgs.gov/gip/earthq3/when.html, accessed on March 15, 2012).

[201] Edited by the Southern California Earthquake Center (First Edition, 1995; Review Edition, 2003. 32 pages, available in English, Spanish, Chinese, Vietnamese, and Korean.

5.1. The Tip of the Iceberg: Big One Scenarios

Earthquake risks are made visible by maps and scenarios which circle, define, and evaluate potential for disruption, destruction, and death. As plays, sketches, and scripts, scientific scenarios assemble actants, and then look at the ways these actants interact with one another. They give "life" to a phenomenon that has not yet happened, but one that could in the future. Once instaured, these scenarios become actants on their own, calling for various actions and policies. As illustrated by the following quotation, scenarios make the large network of interdependencies and the need of translation between each step, each actant, visible. In summarizing their 30 years of predictions in this field, the authors explicitly discuss these interconnection:

> *Drawing on new data and new methodologies, we have concluded that there is a 0.62 probability (i.e., a 62% probability) of a major, damaging earthquake striking the greater San Francisco Bay Region (SFBR) over the next 30 years (2002–2031). Such earthquakes are most likely to occur on seven main fault systems identified in this study, but may also occur on faults that were not characterized as part of the study (i.e., in the "background") […]. Our results come from a comprehensive analysis lead by the USGS and involving input from a broad group of geologists, seismologists, and other earth scientists representing government, academia and the private sector. The results of this study are appropriate for use in estimating seismic hazard in the SFBR, and estimating the intensity of ground shaking expected for specified "scenario" earthquakes. In addition, they provide a basis for calculating earthquake insurance premiums, planning and prioritizing expenditures for seismic upgrades of structures, and developing building codes. (USGS, 2003)*

Earthquake science in the twenty-first century is de facto hybrid, combining both science and hypothesis, using primary sources of information to develop further forms of knowledge. To understand the complexity of putting all of these elements and their variabilities together, most of the scenarios have focused on precise objectives: the modelization of economic losses (Kircher et al., 2006; Grossi & Zoback, 2009), the readiness of infrastructures and lifelines (Maffei, 2010), building constructions (Poland, 2009), the recovery capacity of local governments (Min & Perkins, 2008), or global prevention policies

(Poland, 2009). All of these scenarios foresee the potentially devastating impact an earthquake can have on water supplies (e.g., the main water pipes are crossing the Hayward Fault[202]), as well as electric and gas distribution.

5.1.1. Grasping the earthquake phenomenon

Scientists and experts now agree that earthquakes in the Bay Area occur primarily because of the accumulation of "strain energy" caused by northwestward motion of the Pacific Plate away from the North American Plate, which moves in a southwestwardly direction towards the Mid-Atlantic Ridge.

However, despite decades of research, estimations of earthquake risk for the Bay Area is still a difficult task, mainly because defining a definitive earthquake pattern has proven to be a very complex. Combining approaches — empirical laboratory experiments and theoretical conjunctures — scientists have tried to explain the presence of "earthquake clusters": the high frequency of earthquakes followed by prolonged periods of little activity. As one group of researchers stated:

> *Between 1836 and 1911, moderate earthquakes were common in Northern California, and shocks of magnitude 6.5 to 7 occurred every 10 to 15 years. However, from 1911 to 1979, no temblors of even moderate magnitude occurred. In 1979, a new period of high earthquake activity, similar to the period prior to 1911, appears to have begun. The magnitude and year of each quake are shown. (Some magnitudes are recent updates based on the latest U.S. Geological Survey data). (Thatcher, Ward, Wald, Hendley, & Stauffer, 2001)*

With sufficient data, earthquake clusters are simple enough to graph. But charting the absence of earthquakes during the last several decades has tended to worry scientists more

[202] The Hetch Hetchy system is complex gravity-driven network of pipes, dams, reservoirs and tunnels that was completed in 1934 between Yosemite Valley and San Francisco. The water system collects water from the Tuolumne River and delivers 260 million gallons (or 984,207 cubic meters) of water per day to costumers in the Bay Area. Because of its age, the system is considered very vulnerable and can cause service disruption.

than calm them: even if very large earthquakes are rare, moderate earthquakes, due to the build-up of strain energy, still have potential for a great amount of destruction.

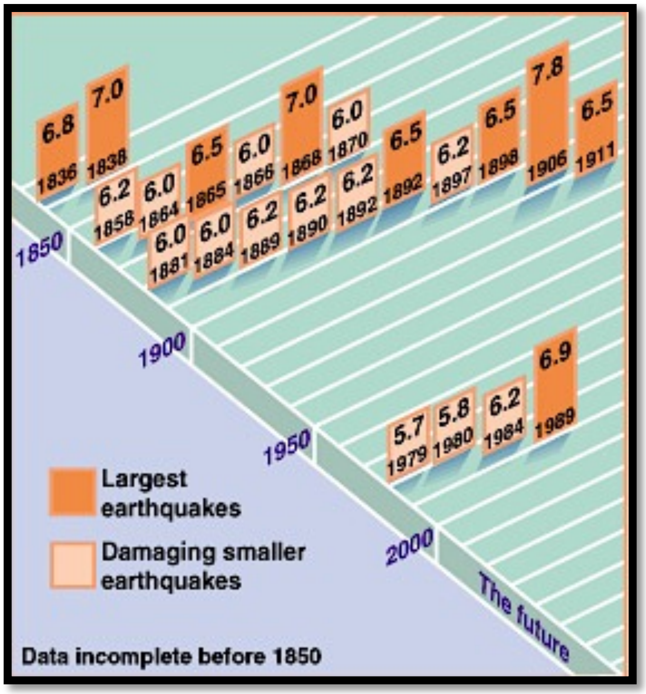

Figure 28 - Timeline of earthquakes in the San Francisco Bay Area show the 69 years gap between 1911 and 1979 which corresponds to a relatively calm moment in the seismic activity of the region. (Thatcher et al., 2001)

As explained in one USGS report which was presented to evaluate earthquake probabilities in the San Francisco region:

> *Our analysis suggests a 30 years probability of an earthquake M 7.5 or larger striking the region is only 0.l0 (0.02 to 0.20). Only the San Andreas and San Gregorio faults, both lying west of San Francisco Bay, have sufficient length to generate such a large event. [...] We estimated the probability of a moderate earthquake (M6.0 to M6.7) over the next 30 years to be at least 0.80 (at least four times as likely to happen as not). As the recent past has demonstrated, earthquakes of this magnitude and smaller can produce significant damage over localized areas (USGS, 2003).*

Because of the density of the built environment in the San Francisco East Bay, probability estimations have been developed for both the San Andreas fault and the Hayward Fault.

The last major earthquake on Hayward Fault was in 1868, with an established recurrence pattern of 140 years. In 2008, experts estimated that the Hayward-Rodgers Creek Fault system had a probability of rupturing of nearly 31%, and that the probability of an earthquake measuring M.6.7 or more within the next 30 years was estimated to be 63%.

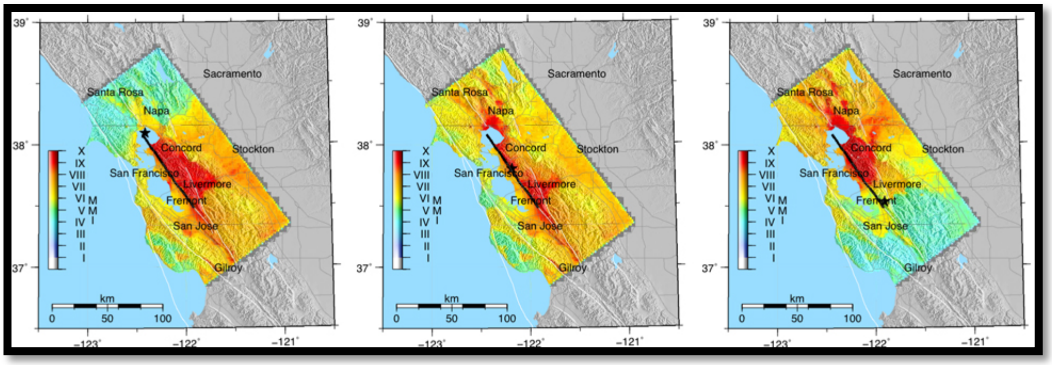

Figure 29 - The Modified Mercalli Intensity (MMI) Scale from three earthquakes for a magnitude 7.05 on the Hayward fault. The different scenarios correspond to different hypothetical locations of the epicenter of a potential rupture (Aagaard et al., 2013).

The other major fault line that causes a great deal of concern is the San Andreas fault, which has an estimated risk of rupturing at 21%. Previous major movements of the San Andreas Fault were responsible for the M.7.8 1906 earthquake and the M.6.9 Loma Prieta Earthquake in 1989. Smaller faults, including the Calaveras fault in the East Bay and the San Gregorio fault along the San Francisco Peninsula have an average 6% to 7% probability of striking sometime in the coming 30 years.

The two maps (above and bellow) helps us visualize ground movement for both the San Andrea fault and the Hayward fault, featuring the ground acceleration provoked by either partial or a total fault rupture. As the maps show, the intensity of ground motion can greatly vary from one point of rupture to another. However, for both faults, the largest ground motion movement is triggered when the rupture point is situated north of the East Bay.

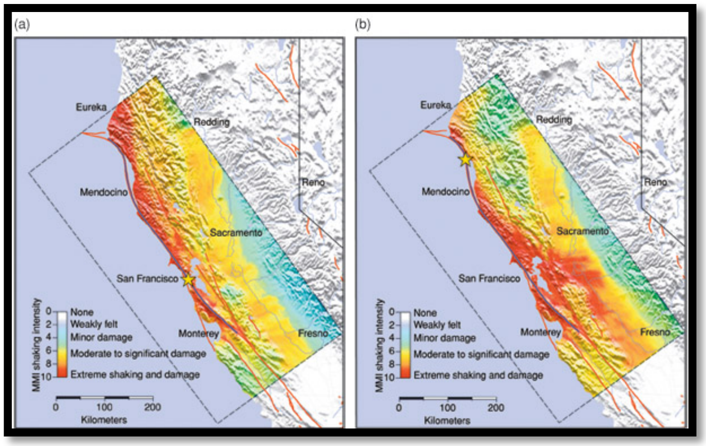

Figure 30 -: The Modified Mercalli Intensity Scale is used to depict shaking severity in two magnitude 7.8 earthquake simulations.[203]

Earthquake risks are also difficult to grasp because they can happen in heavily built metropolitan areas, which adds to the complexity and consequences that can result after an earthquake on a heavily built-up environment. If many scenarios use historical earthquakes as starting points to evaluate potential damage, ((inst), 2006; Fehr, 2006; Heller, 2006; C. Kircher, Seligson, Bouabid, & Morrow, 2006; J. B. Perkins et al., 2006), they also point out that the Bay Area's population is now 10 times bigger than it was in 1906, and total property value is currently estimated to be at least 500 times more.

As of 2013, the population of the San Francisco Bay Area is estimated at 7.4 million people living in 2.7 million households (ABAG, 2013a). The regional economy in 2009 was estimated to be $300 billion. [204]

The San Francisco Bay Area hosts six refineries, large roads crossing the faults take an estimate 250,000 to 300,000 commuters across the Bay Bridge every day (ABAG, 2013a;

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[203] *"(a) One simulation shows the perceived shaking experienced from Eureka to Fresno during the 1906 San Francisco earthquake, with the historical epicenter (denoted by the star) located about 3 kilometers off the coast, along the San Andreas fault. (b) Another simulation shows a hypothetical magnitude 7.8 earthquake that starts near Cape Mendocino in the north and ruptures to the south. Although the epicenter is farther away, the shaking experienced in San Francisco and in the Sacramento–San Joaquin Delta and Central Valley regions is much greater"* (Heller, 2006).

[204] It worth noting that most of the reports evaluating the risk of earthquakes, including not only those in the Bay Area, focus mainly on the economic data to picture what is commonly called "socio-economic." Figures include growth, employment and unemployment, value of retail loss and properties, and other estimated losses.

Arrietta Chakos, 2011; Hinman & Hutchinson, 2005; Poland, 2009). The major commuter train system, Bay Area Rapid Transit (BART), also crosses the fault system, using numerous tunnels to shuttle people around the bay and back and forth between San Francisco and the East Bay through a tunnel siting on the floor of the San Francisco Bay (Grossi & Zoback, 2010). Finally, some of the most sensitive industrial and scientific installations of the region are also located very close to the faults system.

> *The high tech industry drives employment in the South Bay, while the University of California and two national laboratories drive employment in the East Bay. In the North Bay, tourism, agriculture, and distribution and manufacturing dominate employment. The Peninsula receives spillover from San Francisco and the South Bay. Its economy is largely high tech and biotech. Major employers on the Peninsula include Oracle, Stanford University, and United Airlines (due to San Francisco International Airport). (Perkins, 2005)*

As a result of all of the factors listed above, many scenarios show that *"of all American cities, San Francisco is probably the most vulnerable to catastrophic disaster"* (Paxton, 2004b). In addition, the author explained:

> *Our housing stock is the oldest in the West. Much of the city was built on sand, landfill, and other non-compacted soil, which is subject to liquefaction. And with 75 percent of the rental housing stock covered by rent control, much of the housing stock is poorly maintained. All of these factors exacerbate the dangers inherent to being precariously straddled between the San Andreas and Hayward faults (Paxton, 2004b).*

Focusing on precise evaluations of buildings in San Francisco, researchers have estimated that between 7,000 and 10,000 commercial buildings would be destroyed in the event of a major earthquake, and transportation, electricity, water, and food system would be either be partially or totally interrupted (ABAG, 2013b; Bonowitz, 2009a, 2009b; Tierney, 2000).

Reports have consistently shown that the economic fallout of a significant earthquake could over-stretch the capacities of local and federal government responses (J. B. Perkins, 2005; Poland, 2009). In the case of one simulation of a large earthquake occurring along the San Andreas Fault, *"it would result in $260 billion of damages to residential and commercial* *exposures, of which $50 to $80 billion would be covered by property and workers compensation insurers"* (Bradford, 2006; Grossi & Zoback, 2009) other estimations state that there could be more than 6,000 fatalities[205] (Maffei, 2010; J. B. Perkins et al., 2006).

In the case of the Hayward fault, calculations have been made according to two possible scenarios: either a rupture of the entire fault, or a partial rupture of just the southern segment. According to different scenarios regarding this fault line, the total economic loss is estimated to be between $95 billion to $190 billion. In addition, projections for the loss of employment is estimated to 3.4 million job lost, though this number will need to be re-evaluated in light of the 2008 financial crisis (Hutchings, Mieler, & Brechwald, 2013).

To obtain these results and figures, scientists have collected, analyzed and crosschecked their data. Operating in a process of constant translation, changing scales and aggregating material, they produce reference documents that define the earthquake risk as the state of knowledge at certain moments in time. One of these important documents is the USGS Seismic Hazard Map.

5.1.2. The Hazard Map: Getting concerned about earthquakes

Scenarios are not the final step of the construction of earthquake risks; instead, they are just a starting point. The USGS Seismic Hazard Map is a good example of a progressive instauration of risk by different actants. The Hazard Map sits at the nexus of geophysical data regarding movement of the earth's crust, and the definition of seismic risk. The map makes visible information collected by some researchers to many others through the scientific method: systematic collection, standardization, and multiple verifications. This capacity of data translation and communication makes it a pivotal actant of risk definition. Its final production brings together a long chain of facts and figures, tools, funding agencies, political will, and organizational cooperation that is the familiar path of major scientific research (Lynch, 2012).

[205] Estimation based on the number of fatalities caused by the 6.8 (Moment Magnitude Scale) Kobe Earthquake in 1995.

The Seismic Hazard Map is a major instrument of risk prevention that feeds policy planning at the federal level: it is included in recommendations by the National Earthquake Hazard Reduction Program[206] (NEHRP), and as such, it plays a significant part in the creation of buildings codes[207] by the Building Seismic Safety Council[208] (BSSC), retrofitting guidelines designated by the Federal Emergency Management Agency (FEMA), and is used for designs for public infrastructure projects.

It has been used by both private and public institutions for earthquake prevention purposes. As one of the major instruments of federal risk prevention policies, it has been embedded in the design of several federal and state programs. The map is also an important source of information for the financial sector: the California Earthquake Authority (CEA) uses it to define premiums for state insurance program and financial companies, such as those who oversee pension funds in order to evaluate risk in their portfolios.

The Hazard Map objective provides "*the scientific basis of seismic provision in building codes enacted throughout the United Sates to prevent loss of life and limit damage during large earthquakes*" (Filson, 2003: 2). The map, which displays ground motions for various probabilities in different parts of the Unites States, is a reference document that summarizes years of research, data collection and cross-referencing.

The 2008 version of the map is based on the successive accumulation of data, corrections, and new measurements done since it first publication in 1976. In regards to the previous version of the map, the one in 2008 incorporated new elements concerning the model of the faults — in particular, the probability of larger earthquakes based on the long-term

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206 "*The activities of the Program shall be designed to: (A)[…] research and develop effective methods, tools, and technologies to reduce the risk posed by earthquakes to the built environment, especially to lessen the risk to existing structures and lifelines; (B) improve the understanding of earthquakes and their effects on households, businesses, communities, buildings, structures, and lifelines, through interdisciplinary and multi-disciplinary research that involves engineering, natural sciences, and social sciences; and (C) facilitate the adoption of earthquake risk reduction measures by households, businesses, communities, local, state, and federal governments, national standards and model building code organizations, architects and engineers, building owners, and others with a role in planning for disasters and planning, constructing, retrofitting, and insuring buildings, structures, and lifelines through: (i) grants, contracts, cooperative agreements, and technical assistance; (ii) development of standards, guidelines, voluntary consensus standards, and other design guidance for earthquake hazards risk reduction for buildings, structures, and lifelines; (iii) outreach and information dissemination to communities on location-specific earthquake hazards and methods to reduce the risks from those hazards; and (iv) development and maintenance of a repository of information, including technical data, on seismic risk and hazards reduction*"(112th Congress 1st Session, S.646 To reauthorize Federal Natural Hazards Reduction Programs and for others purposes, In the Senate of the United States, March 17, 2011).

207 The building code has been adopted by 37 states, including California.

208 The BSSC, established by the National Institute of Building Sciences, develops and promotes building earthquake mitigation regulatory provisions for the whole nation.

history of earthquake magnitudes in various regions — and changes to the model of ground acceleration.[209]

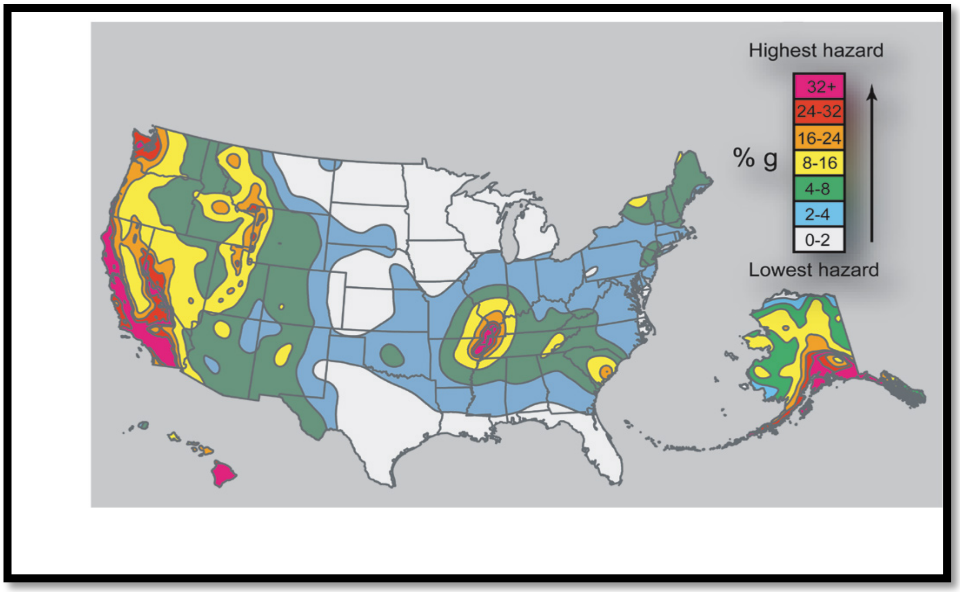

Figure 31 - USGS 2008 National Seismic Hazard Map. (Petersen et al., 2011)

The National Seismic Hazard Mapping Project (NSHMP) works to combine and evaluate actions of the already intricate associations of human and non-human actants: faults, earthquake ground shaking, geodesy[210] and seismicity,[211] seismic soils, near-surface conditions, and energy attenuation, and of course the researchers that make them visible. NSHMP relies on a progressive improvement of knowledge about past earthquakes, known as paleoseismology, to gain a better understanding of the physics involved in the earth's crust. It has also an extensive used of new technologies, such as global positioning systems (GPS) and visualization. The production of the map is a process of several steps, the first of which is that NSHMP experts gather to "*discuss progress on the map, input data and procedures used in the process*" (Petersen, 2008: 9).

[209] The 2008 version includes new data on the subject of fault slip rates, paleoseismologic data from fault trenching studies, earthquake catalogs, and strong-motion recordings from global earthquakes.

[210] Geodesy is a branch of the earth sciences that deals with the question of measuring the earth. Amongst other work, it focuses on crustal motion.

[211] Seismicity refers to the geographic and historical distribution of earthquakes.

Following an initial meeting by NSHMP experts, the Working Group on California Earthquake Probabilities (WGCEP), the California Geological Survey (CGS) and the Southern California Earthquake Center (SCEC) together determine the most accurate methodology for earthquake forecasting. The map is revised approximately every six years by NSHMP, always updated with new developments in seismic research. Each version of the map incorporates new elements related to models of the faults, such as the probability of larger earthquakes based on long-term histories of earthquake magnitudes in particular regions, and changes in various ground-shaking models.[212]

Example of modifications to the Californian section of the Map:[213]

1. Revised earthquake catalog and accounted for magnitude round off and uncertainty.
2. Constrained model to fit within two sigma historical or observed seismicity rates (suggested by WGCEP—Science Review Panel):
    2.1. Reduced moment rate on faults by 10 percent to account for aftershocks, foreshocks, after slip, and smaller earthquakes;
    2.2. Reduced earthquakes M6.5 in smoothed gridded seismicity to one-third the rate to account for earthquakes already modeled on faults (generally not applied outside California);
    2.3. Implemented a branch of Gutenberg-Richter Model with b=0, which is consistent with modeling of several of the large multisegment ruptures on the San Andreas system;
    2.4. Eliminated the epistemic magnitude uncertainty, which is accounted for by implementing the two magnitude-area relations.
3. Implemented four new recurrence models for Southern California Type-A faults from WGCEP based on moment-balanced models, paleoseismic recurrence models, Ellsworth Type-B (Ellsworth, 2003) magnitude-area relations, and Hanks and Bakun (2002) magnitude-area relations.
4. Developed new multisegment ruptures for several California Type-B faults.
5. Implemented new SCEC CFM model for geometry in Southern California.
6. Revised slip rates for sections of the San Andreas fault, San Jacinto fault, and nine Type-B faults.
7. Developed new zones of distributed shear in Southern California and revised geometry in Northern California.

Figure 32 - Significant Change in the National Seismic Hazard Map in (Petersen and al., 2011).

The map works like a transmitter, opening a window of continuity, and movement[214] between the realm of every day life and the realm of possible events, scenarios. In the next section, will how experts making these maps and scenarios work. During my field research,

[212] The Next Generation Attenuation Relation (NGA) was implemented by the Pacific Earthquake Engineering Research Center (PEER) and conducted ground breaking (so to speak) discoveries in ground motion.

[213] Significant Change in the National Seismic Hazard Map in (Petersen and al., 2011).

[214] This movement is an also active connection between the forms of knowledge, methodological epistemologies, and disciplinary field research.

the term “earthquake junkie” was heard with some regularity, but who are these so-called Earthquake Junkies?

5.1.3. An “earthquake junkie” at work

Stallings (1995) has defined them as claim-makers: scientists and experts writing up scenarios and reports, drawing maps, participating in panels, sitting on committees, being involved in congressional hearings, and being interviewed by nationals news organizations.[215] Geschwind (2001) has looked at them through the lens of their specific organizations as they work to consolidate their capacity to transform state regulations with what he has defined as “progressive vision.” Meanwhile Coen (2013) has focused on their empirical practices and their definitions of seismic science. Earthquake Junkies fit into all of these categories. As we will see, they are officially designated scientists and non-scientists alike, advocates, progressives working in a specialized field of hybrid earthquake science.

Indeed, the collaboration of earthquake professionals and their work to solve questions goes far beyond the walls of any particular ivory tower. Earthquake studies are produced by many groups and organizations: “*state geological surveys, university researchers and research consortia, state and local government agencies, and non-profit and others organizations of the public sector*” (Filson, McCarthy, Ellsworth, & Zorback, 2003).[216]

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[215] According to his research, they are composed of academics (28.05%), the federal government (33.84%), state and local governments (10.37%), international agencies (2.44%), the non-profit sector (12.50%), the private sector (10.67%), and politicians (2.13%).

[216] The earthquake models have been developed by Caltech scientists in collaboration with U.C. Berkeley and Stanford University. In addition, the Seismo Lab at U.C. Berkeley has developed close research collaborations with Universities in Europe (e.g., ETHZ, Switzerland). State agencies include: California Earthquake authority (CEA), the California Emergency Management Agency, Shakeout- The drill, the Earthquake Country Alliance, the National Science Foundation, and the National Earthquake Hazard Reduction Program. In addition, professional associations also play important roles in both in research and outreach. For example, EERI (the Earthquake Engineering Research Institute) gathers most of the structural engineers interested in earthquake safety and uses its publication “Earthquake Spectra” to reach out to other experts; the Association of Bay Area Government (ABAG), SPUR, and San Francisco Planning and Urban Research Association, and private research organizations like the URS Corporation, an engineering firm, or the RMS Risk Modelization Company over the years have recruited some earthquake experts trained at U.C. Berkeley or Stanford. For decades, the private sector has also been involved in reflections about risk prevention (specifically, large corporations like Pacific Gas and Electric, Chevron, Google, and others) as well as public utilities, have also been a part of the discussion Other organizations involved in these discussions include EBMUD (East Bay Municipal and Utilities District), the National League of Cities, the U.S. Conference of Mayors, the National Association of Counties, amongst many others.

Earthquake experts also work in interdisciplinary fields — they are seismologists and earth scientists, social scientists, structural engineers, architects, urban planners, but also policy analysts, lawmakers, buildings contractors, and first responders. They work together to produce the "*best available science*" (Petersen, 2008) of earthquake analysis and natural disaster relief.

5.1.3.1. The organization

Interdisciplinary working groups (WG) are the always-moving forms of organizations producing earthquake data for broader earthquake communities. They are responsible for the production of reports, facts sheets, and maps. Indeed, the work of data compilation needed to evaluate earthquake risks is colossal: during the last few decades, each Working Group (WG88, WG90, WG99, WK02, WK08) has gathered together about 100 scientists to focus their attention on earthquakes (USGS, 1999, 2003).

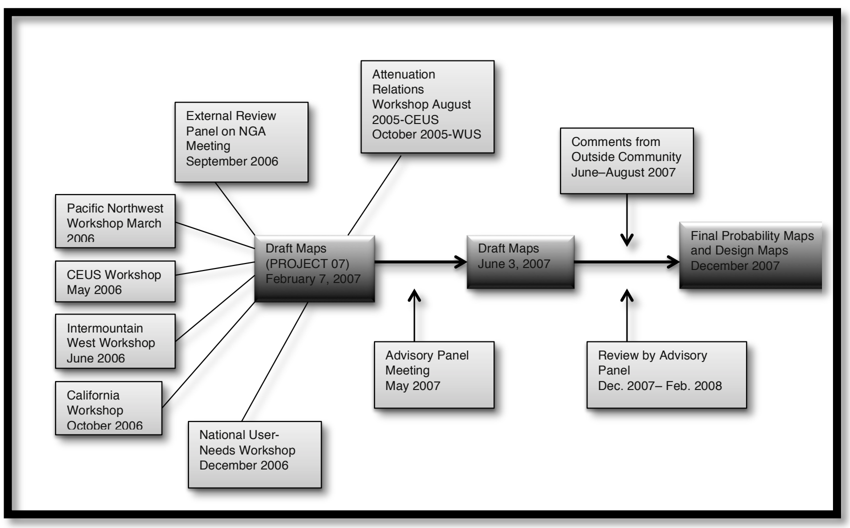

Figure 33 - Process for developing the 2008 USGS National Seismic Hazard Map. CEUS, Central United States; WUS, Western United States.

As the diagram shows, individual California scientists, engineers, and policy makers, coming from a wide number of academic institutions, the private sector government agencies, together with the Working Group on California Earthquake Probabilities (WGCEP), the California Geological Survey (CGS), and the Southern California Earthquake Center

(SCEC), all work to determine the most accurate methodology for developing an earthquake forecasting model. Together, they contribute to the creation of the establishment of the USGS National Seismic Hazard Map, which continues to be updated.

The data production completed by these WGs relies on public funding, which for several decades has received grants and cooperative financial agreements to be able to create and assess their data.[217] Following the San Fernando Earthquake in 1971, the U.S. Congress voted to create the National Earthquake Hazard Reduction Program (NEHRP) which pulled together four federal working agencies to deal with issues and definitions of earthquake risks: the Federal Emergency Management Agency (FEMA), the National Institute of Standards and Technology (NIST), the National Science Foundation (NSF) and the United States Geological Survey (USGS).

In California, the USGS, and its local branch, the California Geological Survey (CGS), FEMA and its local branch Cal-EMA, the Seismological Laboratory at the University of California, Berkeley, and the Lawrence Livermore National Laboratory (LLNL) were amongst the first to produce fact sheets and earthquake probabilities. The following diagram introduces the agencies present in 2008 and the process of data validation of the NEHPRD program.[218]

[217] The National Science Foundation is a fundamental player in the development of earthquake research for the U.S., announcing a budget of more than $30 million dedicated to risk and natural hazard research. In 1986, NSF awarded a five-year grant to the State University of New York at Buffalo to establish the National Center for Earthquake Engineering Research (NCEER). This grant was renewed in 1991. Another five-year grant was awarded to establish the Southern California Earthquake Center at the University of Southern California. In 1997 the NSF funded three earthquakes centers to conduct joint research: The Pacific Earthquake Engineering Center (PEER) sits at the University of California, Berkeley, the University of Illinois-Urbana, and the State University of New York in Buffalo. Acknowledging the challenges of earthquakes in urban area, the NSF has invested $2 million a year for five years in each of the three centers (http://www.nsf.gov/news/news_summ.jsp?cntn_id=102833). New research continues to be important today. After the Haitian, Chilean and Japanese earthquakes, the NSF awarded three Rapid Response Research (RAPID) grants to gather more information about these earthquakes. Most of this research was created by consortium of institutions, including, for instance, Ohio State University, California Institute of Technology, the University of Hawaii, the University of Memphis, and UNAVCO Inc. in Boulder, Colorado. The NSF also supports others programs like the Incorporated Research Institutions for Seismology (IRIS), which also participates in important research efforts (http://www.nsf.gov/news/news_summ.jsp?cntn_id=116870)/). One of the most important funding providers is the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES), which focuses on earthquake and tsunami loss reduction as it pertains to the U.S.'s civil infrastructure. Additionally, the NSF has also had a major role in the founding of the National Earthquake Reduction Program.

[218] To reiterate, the NSF is the National Science Foundation, and the NIST is the National Institute of Standard and Technology.

5.1.3.2. Hybrid science and hybrid experts (2)

If scenarios are the necessary actants of earthquake risk definition in the SF Bay Area, they are also the result of scientific practices and standards developed in their own times. Such a complex integration of data does not work well together without individuals who can established and maintain the connections between data production and its applicable use, as well as to follow the processes of scientific validation.

For some experts in the Bay Area, the schematic organization of groups presented in the diagram above would certainly not work without the energy and dedication of many concerned and motivated professionals, and according to the following respondent, active member in many of these working groups:

> *It doesn't work, because if it did, you wouldn't need people like me. All these advocates, the only reason we exist it is because it doesn't work. There are some broken connections or some that never existed. [D.21]*

During my many interviews it became more apparent that, in these committees and working groups, science is a result, not only of the correlation of objective data collected by instruments but also of long discussions, arguments, and a finally, consensus. The previous respondent continue:

> *Not everything in public policy has science behind it but at least it has consensus. Even if you haven't reduced that epistemic uncertainty, you've got everyone agreeing: it's ok. That's fine, until the next earthquake when they don't feel comfortable anymore. In a way, it's important to have consensus if you don't have science. [D.21]*

Committees and working group also have to deal with changing factors, integrations of new techniques, and new discoveries. No change is small, and everything, from the size of the nails in a building to the quality of the material used to construct beams, can transform — for the better or worse — a reaction of a building to a significant earthquakes.

> *We don't have good wood anymore. It's mostly green and farmed. It's as cheap as possible and it's not the same quality [as] when we cut down old forests. Only the*

> *people who observed the wood 30, 40 years ago would recognize that difference. I wouldn't recognize it. [D.21]*

As this respondent, who works as a structural engineer, and is very active in creating public policy blueprints explained, building public policy on consensus is imperative when conditions of validation cannot be tested. Here, often, the problem is one of public works and residential buildings: in these cases, consensus is often founded not on prior experiences, but instead on theoretical hypotheses:

> *We were talking about the big towers near the [Bay] Bridge, have they been tested? How do you test a 60 story concrete wall? That's why buildings are different from automobiles and computers and chairs: you can't build a prototype. It's very important to bring the same kind of thinking to it, but eventually recognize the difference between testing something that has a prototype and something where you have to take a chance. The real world is not our laboratory and we cannot experiment with real projects, that's why we have to be extremely safe. [D.21]*

In a field were innovation has been the key in the last few decades, the insight regarding innovation is difficult to achieve, that is, until the next earthquake. As the expert interviewee above said, "*If someone has a new idea, where's the experience with it?*" [D.21]. Seismology and structural engineering also have to deal with still undiscovered aspects, — what some experts describe as principles of "uncertainty."

What is discussed in the working groups and committees is a combination of computer-generated data with empirical knowledge. The experts' science is a blend of theoretical scientifically verified knowledge, along with public consensus, hypotheses, abstractions, and direct observations. This is heard by the following respondent:

> *We learn from past disasters, there are also resources such as lost estimations for future disaster scenarios that can be generated by modeling. There is expert opinion we often rely on. If we're not sure how risky a situation is, we can create a committee of experts. We have world-renowned experts who volunteer their services. We go see for ourselves and travel around the world looking at disasters, not just earthquakes. Disasters that would be relevant to California's situation, like Hurricane Katrina. There are a lot of parallels even though the triggering mechanism is different. Recovery issues, emergency shelter issues, market share losses. We take classes; we read and use the internet. We go to conferences. We have mentors and students. [M.3]*

Without a doubt, the creation of a relatively new science is a long process, and pertinent knowledge can come from many different sources, materializing in a large number of forms. For experts and scientists working on earthquake definitions, the world becomes a de facto laboratory, one in which their experiences and understandings of ramifications regarding risk prevention and disaster mitigation is determinant.

To answer the question, *"How did you get your knowledge of risk and disasters?"* a long-time expert, who participated in the writing of several reports, answered clearly: *"through experience"* [T.4]; another expert added that there is *"no substitute for seeing actual damage"* [D.21].The earthquake community in the Bay Area relies on the hands-on competencies, and true-life experiences of its members to make this schematic organization function efficiently and usefully. Asked how he navigates and collects relevant information within this complex network of organizations, commissions, working groups, and so on, another respondent involved in drafting legal recommendations answered with a laugh:

> *People I rely in people! I will use the network to know where people work and I listen to their experience. I also scan the literature […] and I participate in organizations like FEMA and others that give information. This is the kind of work that I do, I look for information and I comply. [T.4]*

Because much field research has been conducted following the "snow ball method,"[219] where one interview lead to another through and make possible to follow the actants, I noticed that individuals with a long-term activity in the seismic field were often referred to as important resources for the all community of earthquake scientists and experts. This observation can be heard by people who refer me to additional experts for information on a specific topic: *"He is the wisest of all,"* [J.14] said one respondent of another authority. Indeed, legitimacy inside this extended community has been an important aspect of cohesion and respect amongst many professionals working in the field: "*You know she's been in this field a long time. […] So she's very good.*" [R.5], as one interviewee said to me at one point.

[219] See this dissertation's Introduction regarding the methodology.

The recognition of a community of experts is part of a broader acknowledgement of the ability for many to work together and to solve the multiple issues that earthquakes pose to Bay Area residents. *"He's totally into it, he is devoted, you know, and he spends a ton of time on this, it's a passion of his, it's really great"*[J.14], as one explained. Within this context, experts themselves redefine their definitions of expertise, recognizing the multidimensional aspects of knowledge needed to build a fuller understanding of earthquake risks.

In so doing, they put into circulation the division between experts and amateurs, which is a trend that was developed at the very beginning of California seismology. During my field research, people would often refer to a specific example of this fluidity; this is heard, for example, in the following story told by a USGS scientist:

> *The city of Berkeley 20 years ago there was a mother whose daughter was in school and she asked the school how safe the building is and they couldn't answer, at the time I'm not even sure she was employed, she's basically a mom, she caused most of the buildings to be retrofitted and some to be condemned and she ended up working in the city offices as assistant state manager after all this. She's still very active but she's at Harvard, she got into it just because she asked a question about her daughter's school, now 25, 30 years later she's one of the experts. She was very involved in getting Berkeley city hall retrofitted and fire stations and schools, it really does take individuals to go and make things happen. [K.11]*

Scenarios are the visible parts of earthquake experts and scientists' "best practices." They are the end results of many different pieces of knowledge, which have been discussed, vetted, and balanced to the point that they can be considered strong enough to be good actants in the context of risk prevention and seismological knowledge. During that long process, categories of knowledge and subjects that were once thought immutable are transformed to help produce the best science possible.

5.2. A Step further: Operations of Translation

Generally, one can say that to know what a being is, you have to instaure it, even construct it, either directly (happy are those, in this respect, who make things!) or indirectly through representation—up to the point where, lifted to the highest point of its real presence and entirely determined by what it thus becomes, it is manifested in its entire accomplishment, in its own truth.

Étienne Souriau

Building upon the necessity of this hybridization of science and experience, it is necessary to focus on three other operations of *"translation"* which address questions of territories of experience, general practices, and knowledge. As Michel Callon writes, *"Translation is a process, never a completed accomplishment, and it may […] fail"* (Callon, 1986). In this section I focus more precisely on three operations that allow for the emergence of earthquake risk analysis in order to see how different forms of data collection and interpretation have shaped our understanding of the risks of earthquakes and the various methods established to mitigate their negative effects.

5.2.1. Translation 1: From event to knowledge

As one seismologist at U.C. Berkeley stated, "*in seismology, discoveries are driven by events, by big earthquakes*' [R.9]. As discussed above, the work of translating earthquakes into scientific experience is a long process.

In fact, it was only after tectonic plate theory[220] was accepted in the 1960s that seismologists have been – and still today, are only partially able to – describe and explain

[220] The theory of tectonic plates in between 1956 and 1967 (Frankel, 2012) validated that earthquakes are the results of movements created by the accumulation of energy in the always moving earth crust.

the mechanisms that trigger an earthquake.[221] The history of seismology, starting at the beginning of the twentieth century in California, has been a long history of instauration of a clear — or, given various limitations, the clearest, possible — science.

In California, the first "Big One" was an 1868 earthquake,[222] which held the title for decades before the 1906 earthquake hit. In the still very rural Bay Area, this earthquake produced little damage and was left relatively undocumented. However, the first seismometers were installed in the Student Observatory on the University of California, Berkeley campus a decade later, in 1887. As one seismologist discusses this history,

> *The first seismic networks were global seismic networks, there would be an observatory, and the first seismic observatory in the western hemisphere was here in Berkeley. That was in 1887 or something like that, the way that seismology started was you have a few seismic observatories around the world and between them you can detect big earthquakes. [R.9].*

After the 1906 earthquake, the Lawson Commission's report was the first full-scale attempt to comprehensively document an earthquake: *"It afforded an exceptional opportunity for adding to our knowledge of earthquakes"* (in Lewis, 2008), noted geologist Andrew Lawson, Head of the Commission. Lawson, who was Chair of the Department of Geology at the University of California, Berkeley at the time, dispatched teams on foot and horseback to explore the fault, from Humboldt County in Northern California all the way to Coachella Valley, south of Los Angeles. By 1908, Lawson had graphed almost the entire San Andreas Fault while looking at the 290-mile rift caused by the 1906 earthquake. He then produced careful, detailed report which included the elastic–rebound theory, which was, an important step in instauration of the earthquake as an object of science:

[221] Some of the earliest known scientific comments regarding earthquakes occurred in the mid-1600s. Most historiography on seismology starts at after the Lisbon Earthquake in 1755. In the early 1800s, the first observations conducted by seismologists helped to define what is still today called the P and S waves. In 1857, the Naples Earthquake gave scientists the opportunity to make attempts at observational seismology. Following this, the first seismographs were built in Italy and in Japan by British scientists. In 1897 the first seismograph of North America was installed near San Jose, California, which later recorded the 1906 San Francisco earthquake.

[222] Most of the documentation about the 1868 earthquake, and the earthquakes of the nineteenth century were produced in the twentieth and twenty-first centuries. Part of the reason for this is that the seismic science of the time was less developed in the U.S. than either in Europe of Japan. The second reason might be that, even if known as the Great San Francisco Earthquake (until 1906), that earthquake happened in relatively low-density areas. However, the Hayward earthquake made engineers realize that they needed to build more resistant structures.

> *According to these theory, earthquakes were due to sudden the sudden release of strain that had been gradually built up by the constant creeping of the earth's surface near a fault. In his contribution to the commission final report Harry Fielding Reid had argued that there are indeed been a gradual distortion of the earth's surface near the San Andreas's Fault during the late nineteen century, just as the elastic rebound theory called for (Geschwind, 2001: 60-61).*

Before the publication of the Richter scale in 1935, and the increasing instrumentation of known, active faults, or even the more recent computerized modeling techniques, seismologists have relied on many eclectic methods of analysis. At its nascence, when science relied mainly on the description of trained observers, no detail was too small; no nuance in the experience of a felt earthquake was considered too trivial, in the construction of this new science. Operations of translation, from an observed event to "scientific" knowledge, prevailed in the recognition and definition of earthquake risk.

> *By the early twentieth century, the availability of seismographs allowed many earth scientists to dream of turning their discipline into a quantitative, objective science, modeled by physics. They transformed what counted as evidence of the earth's history. Out went data filtered by human bodies; in came the hard evidence of seismographs and accelerometers. (Coen, 2013:20)*

The human body was the first agent of translation, before the use of machines. Whether interpreting their own observations or relying on the traces of a seismograph, seismologists made connections in order to established relations between experience and science. They learned how to *"read"* an earthquake (November et al., 2009) — to give sense to feelings and traces regarding a particular seismic phenomenon.

In 1931, Harry O. Wood, who had been working for decades with eyewitness earthquake observation reports – also called "felt reports", published the "Modified Mercalli Scales" with Franck Neumann. This new scale was designed to make reporting easier, define the earthquake with degrees and thresholds, eliminating ambiguities, but also to *"insert explicit statement about the mental states conducive to certain reported effects"* (Coen, 2013: 258).[223]

[223] The Modified Mercalli Intensity Scale is still used today in the Shake Map, also known as the "Did You Fell It?" map.

Magnitude 1.0 – 3.0

I. Not felt except by a very few under especially favorable conditions.

Magnitude 3.0 – 3.9

II. Felt only by a few persons at rest, especially on upper floors of buildings.

III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.

Magnitude 4.0 – 4.9

IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motorcars rocked noticeably.

V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.

Magnitude 5.0 – 5.9

VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.

VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.

Magnitude 6.0 – 6.9

VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.

IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.

Magnitude 7.0 and higher

X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.

XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Figure 34 -Abbreviated Modified Mercalli Intensity Scale – with correlation in Magnitudes.

The work of translation was an important one, and Wood struggled for a decade to find the appropriate vocabulary to describe the variously seen, felt, and heard effects of earthquakes:

> *Though I have worked hard on this scale, it is still contains inconsistencies […]. I have never experienced an earthquake in which all work of construction were greatly damaged or destroyed, but such earthquake have occurred. Such fault slip as occurred in 1906 or in 1915 must be indicative of great energy whether or not productive of great intensity. There were anomalies in 1906 and in any experience there always are …. No scale is or can be perfect, but before we adopt this one or accept any other change we must do our best to adjust the definition and eliminate any absurdity, bearing in mind that some anomaly will always be found. (Wood as cited in Coen, 2013:260)*

Based on the scale described above, Wood developed a large cooperative network of informants, the *"citizen-observer,"* as Coen (Coen, 2013: 256) describes them, many of whom were women. Working hand in hand with reporters, Wood was also very impressed by the quality of the observations that newspapers published: *"I find that several of the newspapermen have in Imperial Valley had printed very good accounts of the recent shocks and they appeared to be very interested in the whole subject"* (Coen, 2013: 257). During his active years, Wood maintained a large correspondence with observers, graciously answering their interrogations, adding to their comments, and more importantly, encouraging them to pursue their own observations.

These efforts paid off after the Santa Monica earthquake struck in 1930, when more than 300 hundreds reports were sent to the researchers from *"private individuals, postmasters and other public officials, and representative corporation cooperating with the Survey"* (Wood as cited by Coen, 2013: 256). Nonetheless, experts with little experience dealing with public participation started debating the validity of this method of data accumulation, as well as questioning the scientific basis of the results.[224]

At the time of the publication of this scale, seismography was very much considered an imperfect science. Wood and Neumann noted that, *"though the importance of the factor of acceleration is recognized, we have as yet no satisfactory definition of intensity, no formula expressing earthquake violence in term of ground movement"* (Wood & Neumann as cited in

[224] As Coen states, the controversy follows the line of a Kantian definition of science (Coen, 2013: 254).

Coen, 2013: 259). For this reason, Wood encouraged the young Charles Richter to focus on this particular problem: namely, creating a mechanical equivalent of intensity. In 1928 – just as occurred nearly a century later, during the 2011 Fukushima Earthquake – plate movements were found to be too strong to be registered by seismographs.

Several years after the Long Beach earthquake of 1933, Richter started to think about a scale of measurement that would help reduce misinterpretations of the size of an earthquake, as well as to make better and easier comparisons between earthquakes. Coen noted the Richter Scale, which originally was created for local, relative and subjective uses by earthquake eyewitnesses, later became a universal and absolute measure of the violence of all earthquakes. The 1933 Long Beach earthquake was also a wake-up call for the seismology community, who realized that this particular earthquake had been far more destructive than it should have been and *"It was clear to Wood that foolish building practices were to blame"* (Coen, 2013: 261). Wood, used the term "apparent intensity" (Coen, 2013: 261) to describe that the amount of damages from this earthquake were not necessary correlated with the force of the earthquake.

In the first part of the twentieth century, Wood and Richter have been responsible for providing an interpretative framework for earthquakes; in other words, they allowed for a way to translate a particular earthquake into words and then place it on an intensity scale. A century later, this interpretative move is still a work in progress, as contemporary seismologists, using new technologies, continue to revisit past events and engage again with both scientists, expert and with the public. During one of our meetings, a seismologist of at the Seismological Laboratory at U.C. Berkeley recalled:

> *The 100th anniversary of the 1906 Great San Francisco Earthquake and the 140th anniversary, in 2008, of the 1868 earthquake on the Hayward Fault have been the occasion for experts and non-experts to meet and both develop new models and improve reach-out activity toward the population. These commemorations have been also [225] to develop 39 scenarios involving different earthquake features (such as variable magnitude, distribution of slip, location of the epicenter and speed of propagation) and their consequences in the Bay Area. Along with giving more fuel and data to work with, these scenario have also reinforced feelings of uncertainty of the future and the necessity to pursue the work and reach out to the research community. [P.1]*

[225] USGS, URS Corporation, Lawrence Livermore National Laboratory (LLNL), Stanford University, and U.C. Berkeley.

Despite the tremendous progress realized in the last century regarding the understanding of earthquakes, a lot remains to be done. Instrumentation has taken upon eyewitnesses' felt reports, but despite this considerable progress, earthquakes remain hard to grasp. As one seismologist confessed:

> *We think we understand where all the faults are so we know where they're going to occur, but both the Northridge and Loma Prieta earthquakes occurred on unknown faults. That was a surprise to me professionally. [R.9]*

5.2.2. Translation 2: Monitoring the earth's crust

In the last few decades, the development of seismology has brought together a number of disciplines that have joined forces to better understand the unfolding nature of earthquakes. In 1998, the NSF established the collaborative Network for Earthquake Engineering Simulation (NEES) with 14 research centers that share centralized data repository and earthquake simulation software.[226] To guarantee progress, this research consortium has heavily relied on the networks of seismographs and GPS devices, which have been used continuously since the 1960s. As one researcher explained:

> *What is called the modern seismic era is based on regional networks that started in the 1960s, 1970s. That's what detects earthquakes; that's what allows us to understand the distribution and recurrence interval of earthquakes. [R.9]*

Today, these programs gather an impressive amount of data — shared across laboratories and universities — on a number of aspects of plate movements. Most of the data are collected through instruments that have been installed across California in the last few decades. This network is largely the result of advocacy actions taken by earthquake researchers after some of the last major California earthquakes:

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[226] Cornell University; Lehigh University; Oregon State University; Rensselaer Polytechnic Institute; SUNY, Buffalo; University of California, Berkeley; University of California, Davis; University of California, Los Angeles; University of California, San Diego; University of California, Santa Barbara; University of Illinois, Urbana-Champaign; University of Minnesota; University of Nevada, Reno; and the University of Texas, Austin.

The infrastructure we use for seismology and physical networks have significantly improved after the last big earthquakes. The network we have today came in following the 1989 earthquake. In Southern California, they have a much bigger network because their most recent earthquake was in 1994. [R.9]

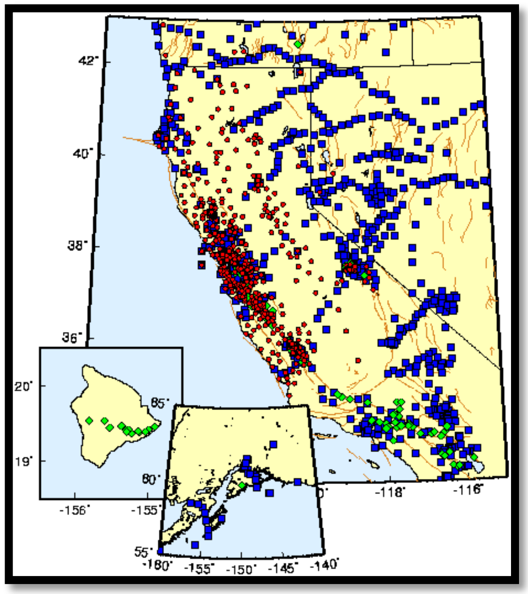

Figure 35 – Map showing the location of stations whose data are archived at the NCEDC. Red circles are seismic sites; blue squares are GPS sites (both continuous and campaign); and green diamonds are the locations of USGS low-frequency geophysical experiments. (Northern California Earthquake Data Center, 2013)

Although most of the instruments that help define and forecast earthquakes in California have been installed along California faults, the research network that uses this data overlap their large geographical boundaries. Further, most of the data collected in California have been made available to researcher worldwide. Today, data used by earthquake scientists come from different systems of measurements: as will see, each system allows us to look at the faults from different angles and perspectives, and again, utilizing different scales.

5.2.2.1. Tool Box

As other types of science progresses, seismology benefits from developments made in other domains. Introduction of more sophisticated computers have deeply transformed the nature of this research, relying more on today's algorithms than on yesterday's field trips made by horseback. As one expert explained, being able to collect data and translate it for so many actors has been a turning point in understanding the mechanics of a given earthquake:

> *Understanding the [earthquake's] process is not being purely random, but there's this kind of machine behind them. From that point, we do a good job of understanding how the energy is radiated during an earthquake and being able to both predict earthquake scenarios and the distributional ground shaking. For earthquakes that have just happened, we are also able to collect data, combine them with physical models and map them to compare what we thought the ground shaking was. [R.9]*

The data provided by this network is utilized by interdisciplinary programs, like the ones developed by The Pacific Earthquake Engineering Center (PEER). PEER illustrates the diversity of competencies engaged in earthquake research: geotechnical modeling, performance-based seismic design methods and tools, testing and characterization of structural foundations and systems, soil mechanics and bituminous materials.

In Northern California, collecting and treating seismological and geodetic[227] data is an activity shared by several institutions, including U.C. Berkeley's Seismological Laboratory and the USGS, grouped together under the umbrella organization called the Northern California Earthquake Data Center (NCEDC).[228] Data are collected through 11 networks which produce other types of information: maps of strong ground shaking, "seismo-cams," earthquake reports, waveform data, and so forth. All of this information is grouped into a catalog of locations, magnitudes and phases, moment tensors[229], as well as the Townley-Allen Catalog, which is based on newspapers accounts covering the long period between 1769 and 1927.

Other, more local networks, like the Bay Area Regional Deformation Network (BARD), started in 1991, is a network of 32 continuously operating GPS receivers at various sites in the Bay Area and Northern California that measure slip occurring on various fault lines. As it states on their official website: *"The primary goal of the network is to monitor crustal deformation across the Pacific-North America plate boundary and in the San Francisco Bay Area for earthquake hazard reduction studies and rapid earthquake emergency response assessment"* ("Bay Area Regional Deformation Network," 2013).

[227] Geodetic study measurement and representation of the earth, like crustal motion.
[228] The Southern California Earthquake Data Survey covers the southern part of California.
[229] Mathematical representation of the movement of fault during earthquake.

The Berkeley Digital Seismic Network (BDSN) also includes stations that record data for the "Mini-Plate Boundary Observatory Project," which looks at plate boundary deformations. Here again, the presence of heavy instrumentation is essential for the success of earthquake measurement. As one seismologist shared:

> *When I say the network, I mean the physical seismic network. Berkeley runs about 50 seismic stations across northern California. They are all these seismic stations throughout the region and they all stream their data back to here [the Seismological Laboratory at Berkeley]. That's just a physical infrastructure, it's like a telescope, but it's just collecting data, so some of the funding is just to run that network to collect that data. [R.9]*

To get even more measures, those coming from deep underground, the Plate Boundary Observatory Network (PBON) has been installing borehole strain meters to measure very small changes at depths ranging from 100 meters (328 feet) to 250 meters (820 feet), as well as continuous GPS measurements around the Bay Area.

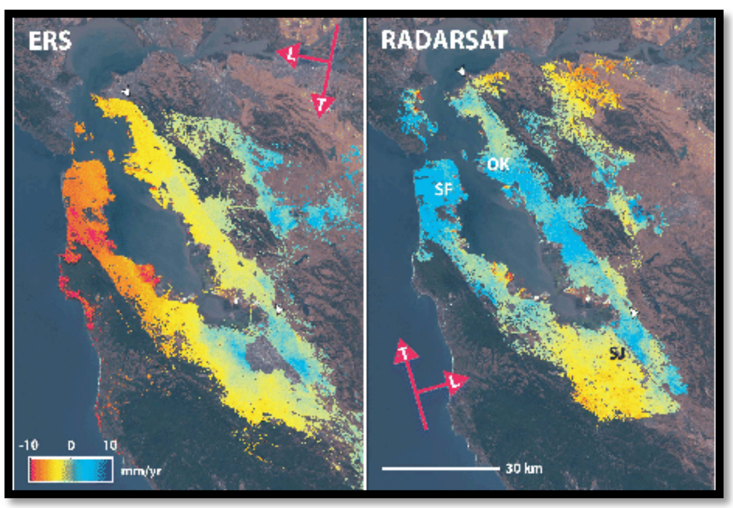

Figure 36 - PS-InSAR velocities for the San Francisco Bay Area.
Red colors indicate the motion of the ground away from a satellite; blue colors show motion towards a satellite. Where a feature has the same color in both datasets, surface deformation is vertical; and where colors are opposite, deformation is horizontal. Pink arrows indicate track (T) and line-of-sight (L) directions for each satellite. White arrowheads show the location of the surface trace of the Hayward fault. [SF - San Francisco, OK - Oakland, SJ - San Jose (Source: U.C. Berkeley Seismological Laboratory).

Earthquake researchers also use satellite technology: LiDAR (Light Detection and Ranging) and InSAR (Interferometric Aperture Radar) provide information to refine earthquake probability estimations. LiDAR,[230] which is used in aircrafts and combined with GPS technology, is a system that allows for the detection of a topographical system. In 2012, LiDAR revealed previously unknown faults near Lake Tahoe.[231] The InSAR system is satellite-based radar, which evaluates ground surface movement and its transformations. The combined data have allowed seismologists to distinguish different fault motion speeds across the Bay Area. Especially adapted to take measurements in urban areas and in challenging conditions (e.g., bad weather or at night), they have opened up new ways to look at seismic movement.

Seismic movement — or "creep" — is especially important with the Hayward Fault, which, unlike the San Andreas Fault, releases stress through slow and steady motion that causes deformation in street curbs and buildings.

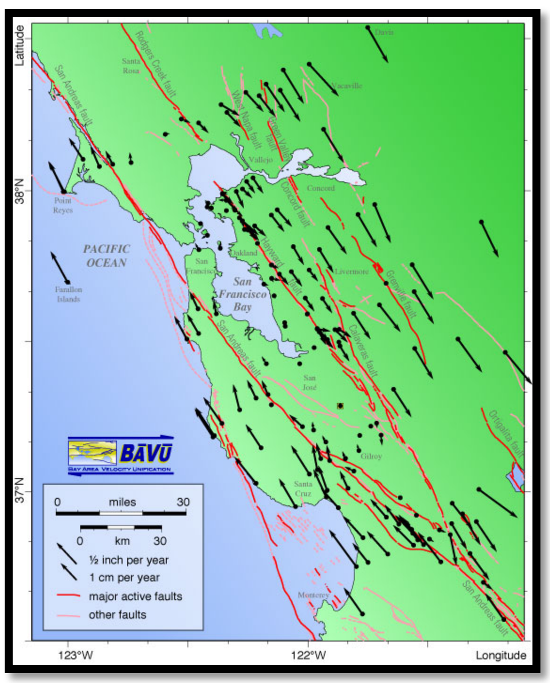

Figure 37 -Bay Area Velocity Unification: Velocity in the San Francisco Bay Area. (Bavu, n.d.)

[230] Also called LADAR (Laser Detection and Context in Military Contexts).
[231] LADAR Technology Reveals faults Near Lake Tahoe. Released: 5/23/2012 2:33:42 PM, U.S. Department of the Interior, U.S. Geological Survey, Office of Communications and Publishing, http://www.usgs.gov/newsroom/article.asp?ID=3218#.T_9bBXCiqjw

Finally, looking at building reactions to earthquakes, the Advanced National Seismic System (ANSS) has placed seismic monitors on several thousand buildings which report information such as soil conditions, distance from ground ruptures, and the length and intensity of shaking from tremors. These devices, designated to provide extra information on effects such as high amplification of seismic waves, also help to improve future designs of seismically sounds buildings.

5.2.2.2. Failures of translation: The Parkfield Experiment

Being able to translate the earth's movement into data is not an easy operation and heavy instrumentation in the field does not always help: in fact, in California, most of the recent earthquakes have happened along previously unknown fault lines – the Coalinga earthquake in 1983, the Whittier earthquake in 1987, and the Northridge earthquake in 1994, as well as with small earthquakes that went undetected by the technology of their times. Nonetheless, most earthquake scientists remain confident that this enormous body of data will help them define, and even improve, earthquakes forecasting.

However, as I will next discuss, the experience drawn from Parkfield Experiment tends to show that this large amount of data collection does not always bring the expected results. Being forced to give up the 1970s dilatancy-diffusion hypothesis,[232] earthquake researchers have now returned to empirical research, but this time, with as many instruments as possible.

Geologist discovered that close to the town of Parkfield, California, on a segment of the San Andreas Fault midway between Los Angeles and San Francisco, M5.5 earthquakes struck at regular interval in the years 1857, 1881, 1922, 1934, and again 1966. Because the 1934 earthquake was believed to have happened a decade "in advance," researchers thought they had found a place where recurring patterns could be, if not proven, at least tested. As the following diagram shows, the wave forms recorded in 1922, 1934, and 1966 suggests that the ruptures happened in the same part of the fault.

[232] "The dilatancy–diffusion hypothesis was one of the first attempts to predict the form of potential geophysical signals that may precede earthquakes, and hence provide a possible physical basis for earthquake prediction. The basic hypothesis has stood up well in the laboratory, where catastrophic failure of intact rocks has been observed to be associated with geophysical signals associated both with dilatancy and pore pressure changes. In contrast, the precursors invoked to determine the predicted earthquake time and event magnitude have not stood up to independent scrutiny"(Main et al., 2012).

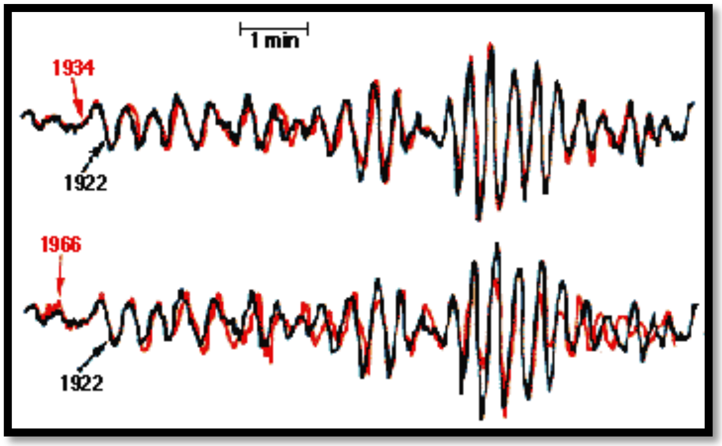

Figure 38 -Recordings of the east-west component of motion made by Galitzin instruments at DeBilt, the Netherlands. Recordings from the 1922 earthquake (shown in black) and the 1934 and 1966 events at Parkfield, California (shown in red) are strikingly similar, suggesting virtually identical ruptures. (Source USGS)

Earthquake researchers, who were interested in looking at the precursors of earthquakes, predicted a 90% to 95% chance of a M5.5 earthquake occurring between the years 1983 and 1993. Waiting for this earthquake, they installed seismometers, creepmeters, and strainmeters along this part of the San Andreas Fault.

> *As a prediction experiment, the principal goal of the Parkfield study is a detailed description of the final stages of the earthquake preparation process; observations at Parkfield should aid in the evaluation of the feasibility of intermediate- and short-term earthquake prediction elsewhere. Furthermore, the detailed history of strain accumulation and release over a complete cycle that is being recorded at Parkfield should provide the basis for testing and refining models for earthquake recurrence on plate boundaries (Mulargia, 2003: 305).*

This experiment, which was also designed to be one of the first steps towards an early warning system, was design to provide information to the Governor's Office of Emergency Services. Unfortunately, the setting failed to produce the desired results. As one historian writes:

> *The coming Parkfield earthquake promised to provide valuable data on earthquake precursors. In order to record these data in sufficient detail, earthquake researchers turned the Parkfield fault segment into the most densely instrumented segment in the*

> *country. To their great chagrin, however, the expected Parkfield earthquake by the end of 2000 still had not occurred. (Geschwind, 2001: 216)*

The USGS, who installed the instrumentation of the fault, was strongly criticized for its incorrect prediction, which was called "*the geophysics' Waterloo*." In fact, some went so far as to predict the "*defeat*" of science[233] (Mulargia, 2003: 305). However, since the first instrument installations, Parkfield has remained a site of experimentation. In 1994, a working group concluded that despite the lack of an earthquake at Parkfield, the experiment has not yet failed and should continue to be pursued as *"Parkfield remains the best identified locale to trap an earthquake"* (Mulargia, 2003: 305).

In June 2004, the USGS and NSF started another program: the San Andreas Fault Observatory at Depth (SAFOD) program**.** In September of that same year, the long delayed M.6 earthquake finally struck near Parkfield, 16 years too late, proving one more time that earthquakes are difficult phenomena to grasp and to "trap."

5.2.2.3. New developments, old patterns

In the last few years, the introductions of new software and new communication technologies have opened up a new chapter in earthquake technology: the possibility early warning systems.

> *What we're working on right now is the idea of being able to do that [early warning system] before people feel the shaking, so when the earthquake begins you detect the initial low amplitude shaking close to the epicenter and predict the total area that's going to experience the shaking. [R.9]*

In September 2013, the Governor of California, Jerry Brown, signed a bill which requires the Governor's Office of Emergency Services to develop an early warning system while the state continue to search for the 80 million dollars needed to finance this operation. Led by the Seismological Laboratory at U.C. Berkeley, this new development will rely on recent capacities to process and communicate data through contemporary telecommunication

[233] In an article entitled *"Small earthquake somewhere, next year – perhaps,"* a journalist from The Economist wrote: *"If the earthquake comes there without warning of any kind, earthquakes are unpredictable and science is defeated. There will be no excuses left, for never has an ambush been more carefully laid for such event"* (Mulargia, 2003:305).

means (e.g., cell phones, internet broadcasts, and other dedicated communications systems for special users, such as airports, trains, utility companies, and so forth). For researchers, the implantation of an early warning is:

> *A fundamental change in seismology. […] What this would do is it would take our products, what the seismology community is doing with this data and it would appear on everybody's cell phone, so the impact of seismology on society would be huge because, all of a sudden, everybody's getting this information, whereas at the moment, the way that society interacts with seismology is passive. Seismologists come up with estimates of ground shaking and then it's the engineers that take the ground shaking and use them in buildings. This would be a direct communication between seismology and the community as a whole so it'd be a big change. [R.9]*

At this stage, the project is being developed mostly in collaboration with large corporations and utility companies around the San Francisco Bay Area including Google, Chevron, PG&E, and BART, amongst others.

Looked at through the lens of history, the early warning system is another major step in the earthquake researchers' dream to anticipate — predicting or forecasting — seismic events. Simultaneously, it is also another major step in the history of the legislative effort to assess and deal with earthquake risk.

5.2.3. Translation 3: A step towards safety?

Defining earthquakes via instruments has often been found to be more complex than expected, and failures described in the previous sections are strong examples of the difficulties in embracing the complexity of earthquake phenomenon. However, despite these earlier disappointments, experts' continuous efforts to understand the mechanisms of earthquakes and their consequences for built environments have created and developed further the regulatory apparatuses designed to strengthen building construction codes in California, and to avoid – as much as possible – major damage caused by an earthquake.

The story of earthquake hazard mitigation in twentieth-century California, then, is the story of the Progressive impulse among a small group of California scientists and engineers and the persistence of that impulse even after other reformers had become disenchanted with the state. (Geschwind, 2001)

Published regulations for building construction are most likely those things that have contributed the most to earthquake safety in the Bay Area. But, considering the limited audience that such publications reach, their important impact remains largely unknown by the general public.

5.2.3.1. Creation of a legislative body

At the beginning of the John Fante's 1939 novel, *Ask the Dust*, the narrator, Bandini, describes his anxiety in front of a large concrete building, which were very common in Los Angeles before the WWII: *"These people walking in and out of huge concrete buildings — someone should warn them. It would come again; it had to come again, another earthquake to level the city and destroy it forever. It would happen any minute. It would kill a lot of people, but not me"* (Fante, 1939). To avoid such a tragedy, and for nearly a century afterwards, governments — local, state, and federal — have taken important actions to minimize damage, injury, and death.

Earthquake experts have been long been advocates of regulatory solutions to minimize risks caused by unsafe buildings. Structural engineers first began to organize after the 1906 San Francisco earthquake. At a time when city officials were trying to erase the marks of the earthquake, engineers and seismologists were trying to slow down the real estate businessmen's appetite for increased space and resources.[234] For these earthquake experts, it was also important to take actions that were not taken after the 1868 earthquake: namely, the study of the earthquake phenomena, mostly in order to improve building designs.

Within a couple of years, seismologists and engineers started to work in tandem to increase the number of safely built buildings in California. To accommodate this objective, Professor Lydik S. Jacobsen invented the first "shaking table" at Stanford — a large platform on a

[234] The construction of the city of Chicago inspired the reconstruction of the San Francisco, including the use of steel frames and masonry in-filled walls.

wheel that could vibrate — and the professional organization of structural engineers was founded in order to share resources and knowledge.[235]

The event that gave some visibility to earthquake experts and allowed their wish for safer buildings to be constructed was the M.6.4 Long Beach earthquake on March 10, 1933 at 5:55 p.m. The earthquake struck Southern California, and while damages were limited, they overpassed the admitted level of destruction for an earthquake of this magnitude, especially in schools: a total of 15 of 32 Long Beach schools were badly damaged. Newspapers relayed the outrage of parents. Harry Wood, told reporters that,

> *The practical lesson of the recent temblor, as of all others, […] is build well and choose or prepare strong foundations. Design for strength and [construct] conscientiously using good materials. Avoid what experience has shown to be faulty (Geschwind, 2001: 107).*

The event marked the first modus operandi between organizations that still continues today: the work by joint committees that move progressively from the local level to the state, then up to the federal government. The same year, in 1933, discussions were held which ultimately led to both the Field Act[236] and Riley Act,[237] two laws that focused on the safety of public buildings, and attempts at trying to avoid the proliferation of unreinforced masonry buildings.[238] Since 1933, more that 80 laws have been passed in California to promote earthquake safety and mitigate damage and injury.

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[235] In 1930 the Northern California Association of Structural Engineers was officially launched with 31 members. Soon the Northern and Southern Associations joined forces to form the Structural Engineer Association of California (SEAOC).

[236] Assemblymen C. Don Field, a Republican, prepared the Field Act. For Turner, "The Field Act transferred the regulation of public school design and construction from local governments to the State's Division of Architecture. Its enforcement on over 70,000 school construction projects since then has generated significant improvements in the practice of earthquake engineering" (Turner, 2004:4). As we will see later, the Field Act was seen to be a protective shield for many Californians regarding the soundness and safety of their children's schools; unfortunately a large-scale investigation conducted by California Watch revealed that the Field Act was, in most schools in California, not enforced.

[237] Approximately 10 to 15% of California's buildings were constructed before 1933, at a time when few cities had buildings codes. The Riley Act "requires local governments to have building departments that issue permits for new construction and alterations to existing structures and conduct inspections. Permit fees paid by building owners generally fund the work of local building departments. The Act also set minimum seismic safety requirements that have since been incorporated into all building codes." Western Sates Seismic Policy Council. (http://www.wsspc.org/policy/California.shtml)

[238] *"An unreinforced masonry building (or UMB, URM building) is a type of building where load bearing walls, non-load bearing walls or other structures, such as chimneys are made of brick, cinderblock, tiles, adobe or other masonry material, that is not braced by reinforcing beams. The term is used in earthquake engineering as a classification of certain structures for earthquake safety purposes, and is subject to minor variation from place to place. URM structures are vulnerable to collapse in an earthquake. One problem is that most mortar used to hold bricks together*

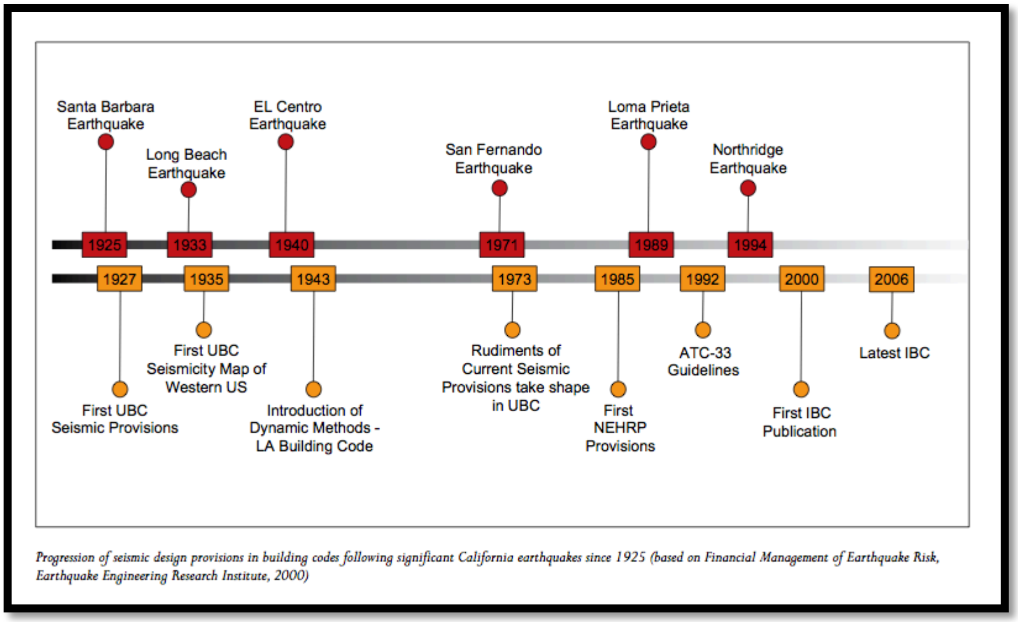

Figure 39 -The Chain Of Knowledge. (Fehr, 2006)[239]

Addressing what has became a common concern in California, the first seismic code, known as the Building Code of California, was published in 1939,[240] after more than 10 years of work by small committees.[241] The expanding needs of the Bay Area for building regulations in the 1940s[242] was the result of a real estate boom then occurring all over the state.

Thus, together with seismologists, structural engineers significantly participated in the development of the earthquake field. With the influence of these professionals, lightweight concrete became the preferred material to use with steel-framed buildings; with this, the standardization of structural requirements was on its way. In the following decades, the building codes became progressively stronger according to new discoveries after each earthquake. As one structural engineer recalled:

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is not strong enough. Additionally, masonry elements may "peel" from the building, and fall onto occupants or passersby outside." (Wikipedia, n.d.-g)

[239] The present scheme focuses on the evolution of the buildings codes, which will be fully developed in the third part of this dissertation.

[240] A first edition of the Uniform Building Code was published in 1927. The eastern part of the United States has had their building codes in place since 1914.

[241] It is interesting to note that committees remain the principal form of organizations for structural engineers and the seismic community in general. Most of the reports that have been produced in recent years have been done so via committee consensus.

[242] The Vesano Building Code, named after Harry Vesano, former Director of Public Works in San Francisco, was published in 1948.

Some engineer realized that if you have a frame where you have two columns and a beam, the beams have to be enormous and the columns are enormous. When you get that big, the welds between the beams and the columns don't work. When you optimized, you're creating a condition where it can't work in [earthquake] conditions. After the earthquake, engineers noticed that [damages] might have to do with that. All our code provisions were written on the presumption that beams and columns were everywhere, but they didn't speak up in advance. [D.21]

Until the 1970s local authorities published their own building codes, drawn from recommendations by U.C. Berkeley specialists, together with local amendments. The California Building Standards Code (California Code of Regulations, Title 24) was created in 1978 as an amalgamation and reorganization of existing codes. In 1986, the State of California passed the "Unreinforced Masonry Building Law" (SB 547), which required each jurisdiction in California's "Seismic Hazard Zones" to reduce unreinforced masonry hazards, which remains today to be one of the most hazardous buildings in the event of earthquakes. Over the last few decades, California's buildings codes have continued to be revised several times, and are currently published on a triennial basis.[243]

Part science and part experience, the buildings codes today are subject to the criticism and discussion, taking place in private and semi-private settings with a large number of committees:

The creation of the building code is generally consensus processes. It comes out of committee, and it has good things and bad things. Policy in the end is how good a building should be has not been resolved; it's being debated today. The answer is it's as good as it used to be. We avoid dealing with that policy in the building code. We don't know what fine means but you'll be fine, the purpose of the building code is to comply so you're legal and can't be sued. If you want to do something outside these rules, you can do that but you have to prove its equivalent. If you build across the bridge you'll see some of those tall buildings, the engineer came a few years ago and said: 'we want to use a new system'. […]. The engineer comes and says we're going to do higher than 240 feet and its equivalent and it started a discussion in city council

[243] As on expert recalled: *"Something else that's been done in the United States is that we used to have three building codes, we used to have one for the Northeast, for the South, and one for the West. And after Loma Prieta, FEMA said, 'We can't deal with three codes, we go around the country trying to assess buildings and there are different codes so, uh, we now have the international building code and it is the code that's used throughout the country. So that's changed."* [T.4]

about the code and how to benchmark it. That's a question that's never been solved. [D.21]

For researchers, the buildings codes have had a considerable impact on the evolution of the built environment of the San Francisco Bay Area. However, some research has shown that the building codes, as good as they could be, were often not enforced by local building departments(R. Burby & May, 1998). For the structural engineer Fred Turner, "*The greatest challenges to California's building departments continue to be: 1) The lack of public awareness and political support for effective code enforcement; 2) The risks of existing vulnerable buildings in earthquakes; and 3) The need to enhance staff sizes and qualifications to keep up with phenomenal growth*" (Turner, 2004: 10). Turner, now in charge of a state organization dedicated to earthquake prevention explained that the process of making law is a very long one:

> *[After] the 1971 San Fernando earthquake, the State of California realized that hospitals are facilities that really should be standing up after an earthquake. And they transferred the design of hospitals to an agency called OSHPD - Office of State Planning and Health [sic].*[244] *Every hospital has to go through a plan-check and a design-check by OSHPD. New hospitals are doing pretty well, but we still have this huge inventory of hospitals that were designed before [1971]. Finally, 1989 happens, the Loma Prieta earthquake, and once again, people are thinking, "okay, our hospitals are still vulnerable…," and so they started to – this is just the State of California – create a group that looked into a Senate bill. They eventually passed SB1953,*[245] *and came up with deadlines for when you need to evaluate your hospital, when you need to have it "life-safe," and when you need to have it meet full code. And this was 20-some-odd years after the 1971 earthquake. So, if you look at [it], from start-to-finish, that's a 50-year process, almost. So it's huge. But that came from the*

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[244] Office of Statewide Health Planning and Development.

[245] SB 1953 was, in fact, written in 1994 after the Northridge earthquake as the continuation of the Alfred E. Alquist. Also known as the "Hospital Act". *"The Alfred E. Alquist Hospital Seismic Safety Act ("Hospital Act") was enacted in 1973 in response to the moderate Magnitude 6.6 Sylmar Earthquake in 1971 when four major hospital campuses were severely damaged and evacuated. Two hospital buildings collapsed killing forty- seven people. Three others were killed in another hospital that nearly collapsed. In approving the Act, the Legislature noted that: '[H]ospitals, that house patients who have less than the capacity of normaly healthy persons to protect themselves, and that must be reasonably capable of providing services to the public after a disaster, shall be designed and constructed to resist, insofar as practical, the forces generated by earthquakes, gravity and winds.' (Health and Safety Code Section 129680) When the Hospital Act was passed in 1973, the State anticipated that, based on the regular and timely replacement of aging hospital facilities, the majority of hospital buildings would be in compliance with the Act's standards within 25 years. However, hospital buildings were not, and are not, being replaced at that anticipated rate. In fact, the great majority of the State's urgent- care facilities are now more than 40 years old."*(California Seismic Safety Commission, 2001:3)

top down. And the reason that it takes so long is that it's outrageously expensive, it's billions of dollars. [J.15]

Structural engineers and seismologists are very active in the adoption of state laws that require California to build more earthquake-resistant buildings, specifically through housing policy, good governance, and infrastructure policy (ABAG, 2013a). But these processes often span the career of any single individual, meaning that they need to be carried over by one generation of passionate advocates to another.

5.2.3.2. Cities' resilience

Since the time of the last few major earthquakes, Earthquake Junkies have been working on setting standards for Bay Area municipalities, looking at local past disasters, but also with a broader view of other significant events which have transformed our understanding of many different types of risk and disaster: the Kobe earthquake; the events of 9/11; Hurricane Katrina, and recently, the Haiti, Christchurch, and Fukushima natural disasters.

As working groups are at the heart of defining earthquake risks for scientists, the committees have become flexible enough to be able to consistently translate potential hazards into possible real-world risks. Two specific organizations involved in the definition of resilience in the San Francisco Bay Area are the Association of Bay Area Governments (ABAG), an advisory organization and regional planning agency that was originally formed in 1961, bringing together representative from the nine counties that surround the Bay Area, and SPUR, previously known as the San Francisco Planning and Urban Research Association, a non-profit research education and advocacy organization. This last organization was originally formed after the 1906 San Francisco Earthquake by city leaders looking to improve housing quality.

5.2.3.3. The regional level: an example of infrastructure

Since the 1970s ABAG has been working on various comprehensive regional plans, including those, but not only, relating to earthquakes and other hazard-mitigation plans. For several decades now, the organization has been working closely with other regional agencies and in partnership with city and county governments. As it pertains to earthquakes, AGAG's goal is "*to maintain and enhance a disaster-resistant region by* *reducing the potential loss of life, property damage, and environmental degradation from natural disasters, while accelerating economic recovery from those disasters"*(J. Perkins & Hutchings, 2010: 2). As one long-time specialist of Bay Area disaster preparedness in the Bay Area explained, the organization of the committee was specifically created to allow for an overlap between actors, in order to have information circulate more fluidly between the all the those involved in disaster mitigation:

> *The two ABAG committees are meeting jointly […]. One [is] called Lifeline Infrastructure and Hazards Committee, which consists of representatives from transportation groups, water people, people who work for water districts, [and] there's a couple emergency managers that also sit on the committee. The other one is called Earthquake and Hazards Outreach Committee, and [it] deals with housing public business outreach and so on. We have residential retrofit contractors, structural engineers who deal with building, [and] also have a couple emergency managers […]. Not that much overlap, those are my two specialty committees. There's the Regional Airport Planning Committee which is the joint committee of ABAG and MTC [or Metropolitan Transportation Commission] and BCDC [the Bay Area Conservation Development Commission]. They deal with the airport issue. If we get this Caltrans [California Department of Transportation] and airport, it will go to the Lifeline Committee. If we get money from PG & E to look at the housing soft-story*[246] *issue, that will be dealt with by [the] Earthquake and Hazards Outreach Committee. If we get money to do disaster recovery, that's more RPC, the Regional Planning Committee. RPC is 50 percent elected officials, high-level people in local government. They're different people, but there's a little overlap, you need some overlap so you have people who say, "Oh, I was there, this is what happened." It's not just the staff person saying, "Oh, that committee said this"; they can say, "Oh, I chaired that committee." That's why we have elected officials chairing committees. When I go down and have these meetings because we're writing these recovery plans for SF and Oakland, those are completely different people with a few exceptions. The person that's reviewing the housing section in San Jose for the San Jose Committee […] is the same person that sits on Earthquake Hazard. [J.8]*

[246] *"A soft story building is a multi-story building in which one or more floors have windows, wide doors, large unobstructed commercial spaces, or other openings in places where a shear wall would normally be required for stability as a matter of earthquake engineering design. A typical soft story building is an apartment building of three or more stories located over a ground level with large openings, such as a parking garage or series of retail businesses with large windows."* (Wikipedia, n.d.-d)

This circulation of information is important because mitigation is about making choices and defining strategies. ABAG and the various local governments of the Bay Area follow the recommendation of the Stafford Act,[247] which *"defines mitigation as 'any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.'*[248] *As mitigation activities are undertaken, the risks associated with disasters decrease"*(J. Perkins & Hutchings, 2010). Consequently, the ABAG framework for research and its recommendations of policies has followed two different, but complementary perspectives on how to deal with disasters:[249]

> *1. We can increase emergency response capability. Thus, more damage needs to occur for those capabilities to be exceeded. Large incidents become manageable emergencies.*
>
> *2. Projects can be undertaken to prevent or lessen the impacts of future incidents, reducing the need for larger and larger response capability. Homes can be moved from areas suffering repeated floods. Buildings and infrastructure can be built to reduce expected damage in earthquakes. Wood shakes on homes in woodland areas can be replaced with asphalt shingles or tile. These actions are called mitigation. (J. Perkins & Hutchings, 2010: 1)*

Altogether, as is clear from the various descriptions above, dealing with disasters is a complex operation which needs to take into consideration not only the hazards in relation to just one element, but also the strong interdependencies of all actants.

The following drawing helps to visualize those interactions as they regard infrastructure and lifelines. Lifelines and infrastructure tend to be situated in the same location. Water, sewers and gas pipelines, and communications and electrical cable have been buried under

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247 *"The Stafford Act is a 1988 amended version of the Disaster Relief Act of 1974. It created the system in place today by which a presidential disaster declaration of an emergency triggers financial and physical assistance through the Federal Emergency Management Agency (FEMA). The Act gives FEMA the responsibility for coordinating government-wide relief efforts. The Federal Response Plan implements include the contributions of 28 federal agencies and non-governmental organizations, such as the American Red Cross. It is named for Sen. Robert Stafford (years in Senate 1971 – 1989), who helped pass the law. Congress amended it by passing the Disaster Mitigation Act of 2000, and again in 2006 with the Pets Evacuation and Transportation Standards Act.*' (Wikipedia, n.d.-e)

248 Source: 44 CFR, Section 201.2, pertaining to Section 322 of the Stafford Act, 42 U.S.C. 5165.

249 As discussed in the Introduction of this dissertation, I use the ABAG definition for a "disaster" as the following: *"A disaster is a natural or man-made emergency whose response needs exceed available resources. When local government resources are exceeded, the California Governor's Office of Emergency Services (State OES) is contacted and the Governor is requested to declare a State Disaster. When State resources are exceeded, State OES contacts the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) and the President is requested to declare a National Disaster. This Presidential Declaration triggers funding resources for the public, the state, and local governments to use for clean-up, repair, recovery, and mitigation"* (J. B. Perkins, 2005).

local roads. A rupture in a high-density, extremely interconnected system can rapidly lead to one problem after another — a cascade effect. In addition, lifeline systems are also connected through a system of dependencies: for example, electricity is heavily used in the transportation of water; the capacity to deliver fuel can impact back-up generators for critical operations facilities; and so on. Acknowledging this interconnection is also acknowledging the multiple actors that will come into play: local governments manage water and transportations, whereas private companies manage gas, communications, and electricity.

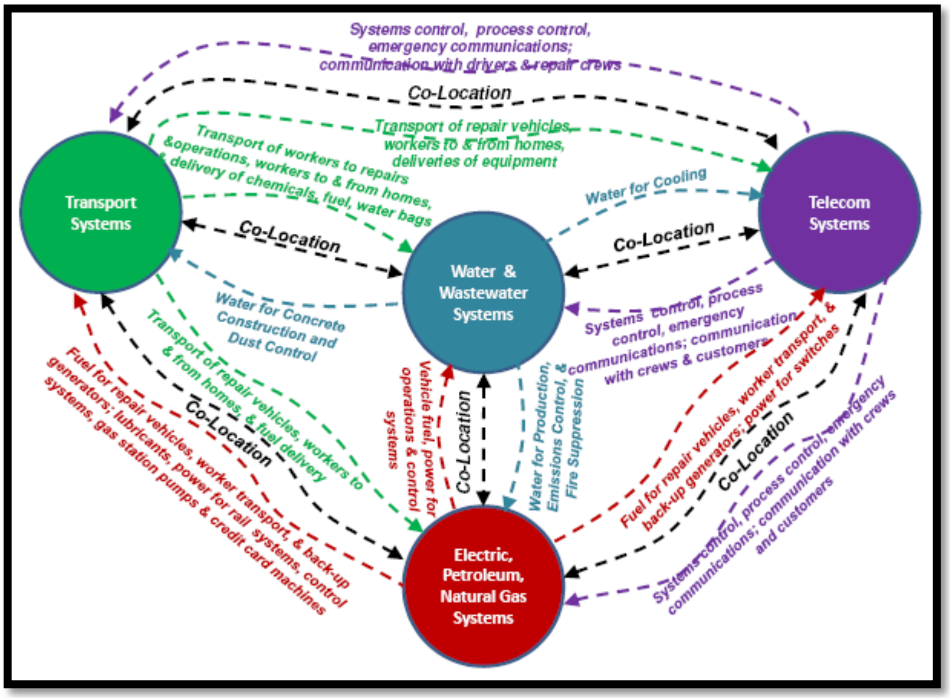

Figure 40 - Transportation System Interdependencies with Other Infrastructure Systems. Arrows point FROM one system to another indicate that one system supplies another with a service (J. Perkins & Hutchings, 2010)

Cities, counties, and infrastructure providers have worked together to take necessary steps to avoid the possibility a chain reaction of events occurring from a single incident. Unfortunately, many of the recommendations strategies made by ABAG remain underfunded:

> *Assess the vulnerability of critical facilities owned by infrastructure operators subject to damage in natural disasters or security threats, including fuel tanks and facilities owned outside of the Bay Area that can impact service delivery within the region. Note - Infrastructure agencies, departments, and districts are those that operate*

transportation and utility facilities and networks remain underfunded (J. Perkins & Hutchings, 2010).

In-state research and planning have developed step-by-step guides to facilitate the resilience objectives of Bay Area cities when addressing land-use planning and recovery, financing, community building, the diffusion of information, and when making recommendations for cities that wish to take initial steps in the proper direction (SPUR, 2013).

5.2.3.4. The local level: the example of soft-story buildings

In April 2013, on the highly symbolic anniversary of the 1906 earthquake, the San Francisco mayor finally signed the long-awaited, mandatory, soft-story retrofit program, a law that forces homeowners of the 2,800 buildings considered structurally unsafe in the event of an earthquake to reassess their properties. This measure is designed to directly impact the resilience capacities of the 58,000 people and 2,000 businesses currently using these buildings.

Soft-stories buildings are the most common structures in San Francisco, where the apartments buildings have large, open spaces reserved for storefronts or garages on the ground floor. Consistently, these buildings have been pointed out as responsible for major damage and casualties during previous earthquakes. As one engineer stated: [The] typical San Francisco building would have parking on the ground level, […] so mostly what you saw [with previous earthquakes] was [that] the ground floor collapsed over, and the three or four stories above pretty much come straight down. [J.12]

Figure 41 -A soft-story building damaged after the 1989 Loma Prieta earthquake. Source: California Watch.

For a decade, together with unreinforced masonry buildings — brick building that have not been braced — soft stories buildings have been the major preoccupation of structural engineers and urban analysts. A researcher who worked on the building assessment for a regional planning agency noted:

> *16,000 housing units fell down in the Loma Prieta earthquake, they were older homes that were not bolted to their foundation or had crawlspaces where the outside wall was not properly braced. [J.8]*

As the following expert recalled, organizations like ABAG or SPUR work as facilitators, and help push for good practices on official committees:

> *There is an organization called SPUR. They have a couple of meeting but they also bring people that have common interests together. So public work structure for small cities will work together and they will share information. Members of city councils will work together; I think that is a very important organization for diffusion policies from city to city. When a city like San Francisco is addressing the earthquake safety of small residential buildings, the members of the SF Board of supervisors will sit down with members of the city council of other cities [to discuss the issues involved …]; that is how those idea [are] diffused. [T4]*

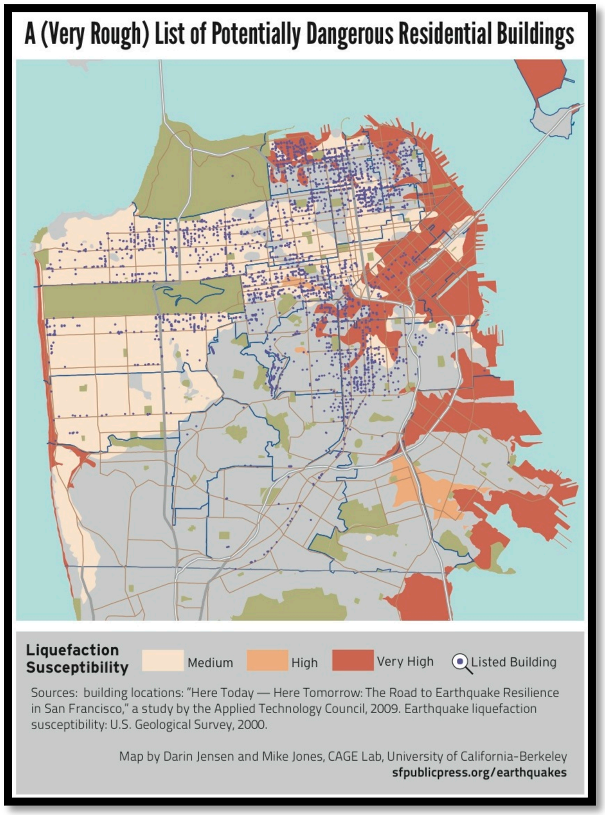

Figure 42 -Map of potentially dangerous residential buildings in San Francisco. Cartography by Darin Jensen and Mike Jones, U.C. Berkeley CAGE Lab. Source: "Building locations: 'Here Today — Here Tomorrow: The Road to Earthquake Resilience in San Francisco,' a study by the Applied Technology Council, 2009. Earthquake liquefaction susceptibility: U.S. Geological Survey, 2000 (Arroyo, 2013b).

Here again, the objective is to build resilience through data collection. ABAG estimates that across the SF Bay Area, 139,765 units (see table below) would probably collapse in the event of a major earthquake, or, at the very least, would not meet the "shelter in place standard," meaning that a house is so badly damaged that its occupant would not be able to continue residing there. Active mobilization through committees has been the earthquake experts' answer to the apparent previous lack of interest for earthquake safety. Through mobilization and earthquake-information advocacy, they have been able to *"mobilize public opinion or the political process in pursuit of their goal"* (Geschwind, 2001).

After the signature, in 2013, of the Soft-story Ordinance Bond,[250] San Francisco Mayor stated:

> *In order to be a truly resilient City, we must protect our residents and make sure their homes are safe after a major seismic event. This mandatory seismic retrofit program will protect San Franciscans, protect our housing stock and ensure San Francisco can rapidly recover from the next earthquake. Today, we renew our commitment to making sure that disasters such as the 1906 Earthquake and Fire do not devastate our City again. (Mayor Lee & Supervisors Sign City's Mandatory Seismic Retrofit Program For Soft Story Buildings, 2013)*

But with more than 55,000 resident living in these soft-story buildings, the road is still long before all San Franciscans can live in a safe house and, if wake up in the middle of the night by the next Big One, exclaim as James did in 1906: *"By Jove, here's (this) old earthquake, after all! And a jolly good one it is, too!"* (James, 1906).

[250] Mayor Edwin M. Lee signed the Mandatory Soft Story Ordinance, San Francisco's recently approved Ordinance No. 66-13 which requires the retrofitting of all buildings with the following characteristics: Wood-frame structures; those containing five or more dwelling units; those having three or more stories; and those permitted to be constructed prior to January 1, 1978.

5.3. A transition still to be built: between science, expertise and public mobilization

Even as it becomes more and more complex, seismology remained a science of observation, prevention was always a central preoccupation and the need of interdisciplinary work, translation, and connection acknowledged early on. Indeed, questions of resilience and vulnerability of the Bay Area are not recent. After the Great San Francisco Earthquake in 1906, Andrew Lawson, who was Chair of the Department of Geology at the University of California, Berkeley, dispatched teams on foot and horseback to explore the San Andreas Fault, from Humboldt County to Coachella Valley in South Los Angeles. He also gathered scientists from major academic and scientific institutions across the United States. At the time of the report's publication, they had re-created almost the entirety of the San Andreas Fault, and its interactions with varying soils and different types of built environments. The report also pointed out the vulnerability of – then and future – buildings in the Marina District, a San Francisco neighborhood built on soft sedimentary soils.

This specific area would eventually be badly damaged, eight decades later, during 1989 Loma Prieta Earthquake. Despite this considerable step – this revolution, some would say – at the time of the Lawson Report, seismology was still a young science. It was not before the middle of the twentieth century – and after 50 years of controversy – that the development of tectonophysics finally allowed the confirmation of the theory of continental drift and the definitions of specific seismic zones. Today, the progresses of seismology, as a science have been considerable, but the voices of the scientists who made that possible and who are advocating for more residential measures are still hard to be heard in the political arena.

In 1964, a magnitude 9.2 earthquake hits the Sate of Alaska, causing considerable damages and 139 casualties, and attracted the interest of several U.C. Berkeley faculty members from the department of civil engineering, planning, and architecture who started thinking about what damages an earthquake of this dimension could cause in the Bay Area. In 1968, a monograph, *Earthquake Hazard in the San Francisco Bay Area: A continuing Problem in Public Policy* (Steinbrugge, 1968) looked at potential consequences of a similar earthquake occurring in the Bay Area. The book drew the attention of then-California senator Alfred Alquist. It is said that the Joint Committee on Seismic Safety for the State of California was first borne from a dinner at the Faculty Club on the Berkeley campus (Arrietta Chakos et al., 2002).

Three years later, in 1971, after a devastating earthquake hit the San Fernando Valley, Alquist introduced the Hospital Seismic Safety Act, which passed in 1972, and the Alquist-Priolo Earthquake Fault Zoning Act, which prohibits “the siting of most structures for human occupancy across traces of active faults that constitute a potential hazard to structures from surface faulting or fault creep” (“Alquist-Priolo Earthquake Fault Zoning (AP) Act,” 2012). 1972 was also the year when then-California Governor Ronald Reagan established the Governor’s Earthquake Council, which was then followed, in 1974, by the Seismic Safety Act—the bill that created the Seismic Safety Commission.

Once these first connections between the sciences and policy makers were established, questions were raised on two grounds:

- What are the earthquake predictions for Southern and Northern California?

- What should be done to avoid causalities and damage?

The earthquake problem was taken seriously in the following decades, but as no serious earthquake occurred, concern began to fade away. The 1970’s were a very active period, as R. 28 recalled:

> *Little known and less remembers was the initiative of Jerry Brown, then in his first two terms as Governor in the late 1970s and early 1980s in the creation of the Governor's Earthquake Taskforce comprised of 400 "experts" on 40 committees that were tasked to assess the risk and response capacity of the state and local governments and to develop plans to fill the gaps. The Governor directed the State Geologist, James Davis, to create scenarios for the most likely earthquakes in southern and northern California that would enable the Task Force committees to focus on the impacts of the earthquakes. These (eventually 7+) scenarios were pioneering efforts to quantify the impacts of the ground motions on structures, lifelines, infrastructure, hospitals schools etc. and painted a picture story of what an earthquake like 1857 or 1906 would be like in today's physical environment. The Task Force went away but the scenarios remained and became the basis of planning and advocacy for two decades, when they were superseded by more detained scenarios produced by HAZUS. (I served*

to represent government emergency management on the committee). (Personal Communication, 10.03.13)

However, things changed drastically in 1989, when the Loma Prieta Earthquake hit the Bay Area and killed 63 people. Fear of natural disasters then spread even further two years later, when the Oakland Fire destroyed 3,500 single-family homes and killed 25 people. Suddenly, "the possible" had taken concrete form; the true-life scenarios were real and close—too close. These two events generated a lot of stories, sorrow, concern, and attention.

The Bay Area was in a state of shock and residents felt the full sense of the fragility of life. These events also brought to the front lines a new generation of concerned citizens – average lay people – who wanted to know if, and how, their communities and their city would be able to face future earthquakes or other major natural disasters.

The early 1990s in the Bay Area are what people in the field of disaster studies call "a window of opportunity." Community organizing was big after the Oakland Fire, and a lot needed to be done at every level, from the individual up to the State. Eventually, the residents of this largely educated, liberal neighborhood did what it took to improve their resilience, and to avoid future, similar dramatic events. In the city of Berkeley itself, people gathered together and started to ask questions, make phone calls, and exhume reports and documents long forgotten by city officials. Through their efforts, they quickly made solid, long-term relationships with renowned seismic-safety experts.

The then-mayor of Berkeley had long been an advocate for seismic safety and brought together many experts and laypeople who were interested in the topic. Integrating a new profile, the expert community pursued its seismic-safety advocacy. In just a decade, Berkeley residents voted in several measures, which all together, allowed more than $350 million from local taxes to be used for municipal safety improvements, including seismic retrofitting of city buildings and various school safety programs (Arrietta Chakos et al., 2002). Some have said it was one of the most important "self-inflicted" increases of local taxes in the history of the United Sates.

There is no doubt that these actions were made possible by the social and political context in which they occurred. For several decades, Berkeley, and the Bay Area at large, had been known for its strong attachment to a lively democratic tradition, even within the walls of City Hall. In this "Atmosphere in which leaders take responsibility for reducing risk"

(Arrietta Chakos et al., 2002), it comes as no surprise that what could have been considered mainstream discourse on risk and risk behaviors elsewhere was seriously challenged by social science researchers in Berkeley.

Despite a lack of thorough preparation when the Loma Pieta Earthquake hit – at least, to the degree that experts would have wished – research conducted by UCLA's Institute for Social Sciences Research (Bourque & Russell, 1994) showed that: *"there was little evidence that people panicked [during the earthquake]. Most moved to a protect location or stayed in place. People at school and work were more likely to take action to protect themselves."* By contrast, historians working on the 1906 Earthquake have shown that local authorities more promptly panicked than the residents of the time (Hansen, 1989; Solnit, 2009; Tobriner, 2006).

To return too more recent times, others researchers have debunked the myth of the "irrational" resident. One piece of research, for example, conducted by the Pacific Earthquake Engineering Research Center, concluded that:

> *… Resistance to implementation of earthquake ordinances by individual homeowners may not be irrational, but merely due to a decision frame that is different from those of an economist or engineer. Understanding the decision frames of people who eventually have to pay the cost of the regulations, and providing appropriate incentives for implementation should therefore be an important part of both regulatory and economic analysis (Von Winterfieldt et al., 2000).*

In the 1970s, social sciences researchers tried to evaluate the public's response to earthquake predictions. Results of this research consistently showed that residents did not pay a lot of attention to earthquake predictions, and of those that did, only a few of them prepared themselves properly for an earthquake's possible consequences. Reading these results, researchers concluded that people did not fully understand earthquake risk: *"public perception of seismic hazard rarely conform* common sense*,"* as one study from 1982 stated (quoted by Coen, 2013: 273), questioning - in an interesting, rhetorical manner - the definition of "common sense," which is usually understood as perception and understanding derived from experience.

In the Bay Area, the case for residents' lack of "common sense" was carried further by an eminent professor of at Berkeley, Aaron Wildavsky (1930-1993), who was appointed as Professor in the Political Science Department in 1962, and later chaired that same department. A specialist in budgetary policy, Wildavsky was also co-author, along with Mary Douglas, of the important book *Risk and Culture* (Douglas & Wildavsky, 1983). As a respected professor, Wildavsky had trained and was a mentor to many researchers who later became prominent professionals working in the field of risk and disaster studies. During a discussion with one of his former students, one person explained:

> *Aaron Wildavsky was my mentor; he was a very respected and very kind person. However, like many of his students and colleagues from the first years of his career, I did not follow him when he took a very reactionary turn in the 1980s and the 1990s. [L.30]*

Indeed, during the 1980s Wildavsky became a controversial figure when he became associated the "Merchants of Doubt," a community of scientists recruited by the tobacco industry to muddy discussions regarding potential carcinogenic risk of cigarettes [251] (Oreskes & Conway, 2011). At the time of his earlier work, Wildavsky's arguments were backed up by a nascent theory termed "Prospect Theory," which was developed by another prominent figure of the Bay Area, the Nobel Price recipient and former U.C. Berkeley student, Daniel Kahneman (Kahneman & Tversky, 1979).[252]Researchers, while drawing conclusions about the public's biases and failures of understanding, never questioned the fact that most earthquake predictions done by scientist throughout the twentieth century were proven to be either partially or totally inaccurate (Mileti & DeRouen Darlington, 1995).

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[251] Wildavsky was a supporter the Advancement of Sound Science Coalition, a "front" group established by the company Philip Morris, which was a consultancy company for the tobacco industry in 1979.

[252] *"Prospect Theory is a behavioral economic theory that describes the way people choose between probabilistic alternatives that involve risk, where the probabilities of outcomes are known. The theory states that people make decisions based on the potential value of losses and gains rather than the final outcome, and that people evaluate these losses and gains using certain heuristics"*(Wikipedia, n.d.-c) It is interesting to note that Kahneman and Tversky's Prospect Theory has somehow escaped the control of its authors; a recent commentator noted, "it is important to emphasize that the goal of the heuristics-and-biases literature is emphatically not to show that people are fools, or that they are systematically irrational. On the contrary, Kahneman and Tversky emphasized that the relevant heuristics are efficient and generally work well.20 But in the laboratory, at least, people who use the heuristics sometimes blunder, and it is the blundering that has attracted the most academic attention (Sunstein, 2002).

The development of an instruments-based earthquake science was considered too complex to share with the general public, and *"many of the scientist and the engineers who began to worry about seismic hazards in the 1970s had little hope of explaining the risk to the public. Seismic Risk was defined as a cost benefit calculation made by seismologist and engineers,"* as Coen wrote. As a consequence, Coen recalled, the researchers recommended *"vigorous public information and education campaigns […] that eliminate the biases introduced when the public interprets information"* (Coen, 2013: 273).

Thus, when the Parkfield Experiment began, the Director of the U.S. Geological Survey very publicly made the prediction of an earthquake on April 5, 1985. As one researcher recalled:

> *The statement forecasted an earthquake of magnitude 5.5 to 6.0 in the next several years (1985-1993) with more than a 90% probability that it would happen, and the forecast also stated that there was potential for this quake to be magnitude 7. The release of this prediction was a major media event, and California's Office of Emergency Services eventually prepared and mailed a brochure describing the prediction and recommended action to the more than 122,000 central California households within the extended area at risk, assuming a magnitude 7. (Mileti & DeRouen Darlington, 1995)*

In this case, researchers found that the public's response was mostly positive, and that *"no negative societal impact were observed"* (Mileti & DeRouen Darlington, 1995). Later, the USGS, who had already spent nearly $19 million on this project, went as far as to issue a public warning that a powerful earthquake could hit on a precise day. On October 21, 1992, Parkfield's local newspaper, *The Post and Courier*, stated that, *"prompted by a 4.7-magnitude quake Monday night, the State Office of Emergency Services warned residents in a 30-miles radius of a 1 in 3 chance of a large earthquake by Thursday night,"* (The Post and Courrier with A.P., 1992) and also noted that this was the only time the USGS "*has issued a formal earthquake prediction specifying time and magnitude"* (The Post and Courrier with A.P., 1992).

On the day of the expected earthquake, the reporter sent to cover the story could only state that, "*the warning did not deter residents form their routines, despite a wave of reporters and televisions crews"*. The quotidian activities of this rural town remained the same: *"one woman hosed down the yard outside her trailer. Another made soup for a family. A farmer* *drove his tractor along the road"* (The Post and Courrier with A.P., 1992). As we now know, no earthquake occurred that day, or any other day, up until September 28, 2004.

The Parkfield Earthquake was a non-event, yet it still helps to create awareness. Despite the difficulties to instaure earthquake risk with the help of instruments, the National Earthquake Hazards Reduction Program launched a series of community programs to increase the public's awareness of possible risks; these turned out to be far more successful than had been expected. Starting with the Southern California Earthquake Preparedness Project, a small group of nine people came together to begin to think about how to translate the fragile body scientific data into efficient public policies, emergencies responses systems, and community resilience.

Together, FEMA and the State of California founded a project that was built on the theoretical framework of human behavioral change. With this, a lot of money was then invested to push for what was considered a necessary step to reduce city vulnerabilities in California. Three majors groups of stakeholders were identified: local governments, businesses, and the general public. To reach out these stakeholders, several products were developed, one of which was a book entitled *Marketing Earthquake Preparedness* (Brady & Eisner, 1986), and provided a useful script for local governments and municipalities to help get the word out.

One of the experts involved in preparing Parkfield residents for the possibly earthquake was my interviewee "R." An architect by training, R. had studied at Berkeley in the 1960s, and during his years there, he had been inspired by the work of Saul Alinsky, a Chicago native and community organizer, who had written the book *Rules for Radicals* (Alinsky, 1989). First active in the labor movement, Alinsky had worked in some of Chicago's poorest neighborhood in the late 1930s and rapidly had become an inspiration for activists and politicians alike.[253] While preparing Southern California for a potential earthquake, the

[253] Inspired, but also criticized, Alinsky's followers redefined the objectives and methodologies of community organizations and mobilization. In an article for Illinois Issues in 1988, Barack Obama wrote: *"In theory, community organizing provides a way to merge various strategies for neighborhood empowerment. {Organizing begins with the premise that (1) the problems facing inner-city communities do not result from a lack of effective solutions, but from a lack of power to implement these solutions; (2) that the only way for communities to build long-term power is by organizing people and money around a common vision; and (3) that a viable organization can only be achieved if a broadly based indigenous leadership — and not one or two charismatic leaders — can knit together the diverse interests of their local institutions.} This means bringing together churches, block clubs, parent groups and any other institutions in a given community to pay dues, hire organizers, conduct research, develop leadership, hold rallies and education campaigns, and begin drawing up plans on a whole range of issues — jobs, education, crime, etc."* (Obama, 2008).

advocacy and community organization background of this former radical student, now a professional, came into play. As R. explained, Alinsky's work made a difference:

> *We wanted to empower people. We wanted them to feel they have the control of the situation. We would go from city to city and talk to the building department people, show them our scripts and propose to talk to their supervisor or to city council. We offered them a "planning partnership" which helped them identify the buildings, infrastructures and systems at risk and what could be done to be improve their organization and their capacity to face a disaster. [R.29]*

Focusing on a very different approach than the ones favored at the time, this team brought together scientists and senior political staff to explain what an earthquake would look like for each institution that they worked with, including: *"a Southern California County (San Bernardino County), a large city (Los Angeles), a small city (Westminster in Orange County), and a corporation (Security Pacific Bank)"* (Geschwind, 2001: 217).

As R. recalled, these meetings included a lot of coffee, and a lot of listening, even more so than talking. Their motto was "do not focus on *you should,*" but rather, help people and institutions understand what could happen and how they could take steps to mitigate risks. Most importantly, they provided a safe environment to think about the "unthinkable" — the injuries, deaths, and financial devastation that a large catastrophe could provoke. This group's focus was to act as a translator for the government people and private institutions, *"making sense of the language of engineers"*(Chakos et al., 2002: 7), with a very strategic perspective:

> *For each of these institutions, project staff members worked together with emergency preparedness personnel to develop a detailed response plans and contingency plans for a large earthquake. Once these prototype plans had been worked out, they could then be transferred to similar entities across the region. In this manner, earthquake planning increased significantly in Southern California, because individual preparedness offices now had detailed models of emergency plans […] available to them. (Geschwind, 2001: 217)*

Within just a few years, the team was involved in shaping earthquake preparedness plans for San Francisco, Berkeley, Oakland, Santa Cruz, Palo Alto, and Santa Barbara. In each of these cities, they focused on what they termed "sweet spots" — places and institutions that were supposed to be protected by law, and which would accommodate vulnerable populations including schools, hospitals, and government buildings. The project was so successful that it was next reproduced in other parts of California.

Thanks to the domino effect, as the work of this small team reached out to more communities, many cities started to take concrete, visible actions. In one article, three experts — two of whom were respondents for this dissertation — recalled how proactive the city of Berkeley, and its residents, had been when approached regarding the question of seismic safety:

> *In four local elections Berkeley voters have approved over $390 million in local taxes to fund mitigation projects. In addition, the City now rebates 1/3 of its real estate transfer tax, up to a maximum of $1500, for seismic retrofit— Goldfarb was the swing vote in agreeing in 1991 to increase the transfer tax only if the Council agreed to the rebate. As a result, over 39% of Berkeley's 22,000 single-family residences and over 30% of small multi-family buildings now have improved seismic resistance, at a cost to the City of over $10 million in foregone taxes. The Disaster Council—like the Seismic Safety Commission at the state level—has kept earthquake safety on the agenda of the City Council. (Arrietta Chakos et al., 2002)*

In addition, these campaigns, the implementations of prevention, and the educational programs of the late 1990s have also engaged public workers with concrete aspects of earthquake risk — the safety of their office buildings, their responsibility vis-à-vis the public, and so forth. In so doing, they have helped build awareness by making the materiality of earthquake risks visible. The following respondent, a librarian for the city of Berkeley, benefited from these programs; she recalled:

> *What I saw in Berkeley was much more about prevention and how to respond to disasters that came out of that situation. Where I work, they started having regular sessions, not just drills, but they take everybody through the building, and show them where all the emergency exits are, what to do you in case of an earthquake or a fire, what your responsibilities about getting people out of the building, how to deal with people in wheelchairs and that kind of thing. I don't remember having anything like that before the 1989 earthquake. [A-.M.1]*

Finally, following the 1989 earthquake, large public and infrastructure works began, which made the potential risks even more visible for residents of the Bay Area. As one respondent commented:

> *The concern that the Bay Area's residents had since the Loma Prieta earthquake within infrastructure is visible. They've seen the signs, gone through the disruption, getting the toll bridges and interchanges on highway bridges retrofitted. Their bills for water [were] increased to pay for upgrades to the water system. They've seen the fares and tolls and their property checks and bills change to pay for the retrofitting of the BART system. They've seen [that] this not only hit them personally, in terms of money, but they've also seen the construction happening. I think there is a larger group of people who understand they have to retrofit their homes than used to be the case. In terms of non-infrastructure, the things that have to be done by the individual to their own home, I don't think this is obvious. [J.8]*

The considerable work of education and outreach conducted by this branch of Earthquake Junkies — this major translation badly needed to reach people who are "at risk" — has relied on the idea that tailored recommendations gleaned from constant field work, create better preparedness. Outreach and education has been progressively included in more and larger programs concerning infrastructure and public works. Thanks to the work conducted by many committees, the progressive instauration of a network of concerned experts has allowed for the development of risk awareness utilizing the background of the scientific community. Grounded in the experience of waiting for the next big earthquake, this community of Earthquake Junkies has succeeded in making disaster-mitigation regulations a major political subject over the last few decades.

Does this mean that the Bay Area is now ready for the next Big One? The answer to this question is, of course, very complex. In the late '90s, the team of nine, then called the Bay Area Regional Earthquake Preparedness Project (BAREPP), was integrated into the Governor's Office of Emergency Services, and according to R., who was then managing this entity, it slowly, but surely lost a certain degree of its freedom because of the political directions given by then Governor Gavin. Not being visible in the media was detrimental for this group which for decades had been the very vocal advocate of the disaster preparedness community. Soon enough, one of the ricochet effects of the events of 9/11 was a dismantling of previous disaster preparedness, as well as the responsibilities of responders for certain organizations nationwide. This included the field of earthquake preparedness: "*It was an overnight change,"* recalled R. Within months, BAREPP's library in Oakland was shut down and twenty years of documentation and archives were thrown away. In 2003 California Governor Arnold Schwarzenegger took office: *"he said to the people of California 'If you need something call me!,' which doubled the amount of work"* [R.29]. As R. recalled this call largely disturbed the organization of the group, forcing them to answer any kind of calls, not all related to earthquake preparedness. The expertise and dedication of the BAREPP was not considered capital anymore and diluted for personal political agenda of the California Governors.

As the earthquake became a very low priority in the political arena, for a decade or more the message from local governments was essentially "*You're on your own.*" Experts worried about a total disengagement of California and federal government support. During this time, they were hoping that the actions taken during the '90s would be enough to limit the effects of major catastrophes, including any large-scale earthquakes (Arrietta Chakos, 2006).

Today, after 30 years of working in the field of disaster preparedness in the Bay Area, R. has retired, and the work of information and advocacy is pursued by the new generation of Earthquake Junkies, working with dedication to maintain the level of awareness necessary to good earthquake preparedness. Large highly technical projects, like the early warning system, are still pursuing to the work of translation initially begun several decades ago. But as R., the scientist leading the project, stated, *"In fact our project has very little, very little of the social part of the question."* [R.9] Another scientist added that outreach and public prevention remains poor relative to action, and thus, for many different reasons,

> *All these things, it is all political. (A) We were never trained to do this, so we're not that good at it. (B) Frankly we don't have that much time to do it, we're still doing research, going and meeting with all these groups and educating people takes a lot of time. Having people who could go and work with these different groups and interact with different groups, that would be great. But again, that comes back to money and finding a way to do that. That would be the primary way that I think this could be improved, by having persons who could engage all of the groups and their job would simply be to work, [to] build the collaboration. [J.15]*

To answer those critics, some of the Earthquake Junkies want to focus on what *has* been accomplished, and what a new generation of Earthquake Junkies is still out to accomplish. In 2011, in an article called "Getting a Jump on the Next Big Disaster," Chakos wrote, "*The best disaster preparedness in the world is happening in San Francisco, which has quietly developed public-private partnerships that can swing into action and save lives when and if the predicted 'Big One' hits*" (Arrietta Chakos, 2010).

In this piece, she argues that the Earthquake Junkies are still in, and that, astonished by the failure of Louisiana's disaster preparedness in its answer to Hurricane Katrina, Bay Area disaster managers have learned their "ABK," meaning "All but Katrina." In addition, they have also learned that strong community organization is fundamental to disaster preparedness and efficient recovery.

> *Elected officials debate mandatory safety improvements for apartment buildings that could collapse in an earthquake. San Francisco risk managers and their insurers map disaster-related financial recovery plans. Earthquake engineers strategize with regional utility companies about how to get the lights back on, the water flowing, and transportation moving after the next disaster. Youth leaders connect area residents to their web 2.0 neighborhoods. S.F. State University student organizers survey the Excelsior and Castro neighborhoods on disaster-readiness, part of the Neighborhood Empowerment Network program" (Arrietta Chakos, 2010).*

Taking the opposite tack of what Mike Davis recommended in his famous article *"The case for letting Malibu Burn"* (Davis, 1998), San Francisco Bay Area Earthquake Junkies have decided to forcefully work against letting San Francisco and the Bay Area scramble during the next earthquake. Working in committees, finding consensus, these experts provide and promote the best earthquake science and preparation possible. In so doing, they have worked "with" the earthquake; in a way that William James would have thought useful. Coming from Stanford, where he was staying at the time, the pragmatic philosopher traveled to San Francisco just after the 1906 quake, preoccupied with *"subjective phenomena exclusively"* (James, 1906). Interested in deciphering the "nature of agency," from the perspective of his own consciousness, the known science of his time, and the collective reaction to this major event, in many ways James paved the way for current practices utilized by today's Earthquake Junkies:

For 'science,' when the tensions in the earth's crust reach the breaking-point, and strata fall into an altered equilibrium, earthquake is simply the collective name of all the cracks and shakings and disturbances that happen. They are the earthquake. But for me the earthquake was the cause of the disturbances, and the perception of it as a living agent was irresistible. (James, 1906)

More than a century later, the multiple dimensions of the "perception of the [earthquake] as a living agent," and its slow instauration among the San Francisco Bay Area, is what Earthquake Junkies continue to explore as they await the next Big One.

Waiting for the Big One and not letting San Francisco scramble is a collective endavour that since the time James visited San Francisco after the 1906 earthquake has mobilized concerned scientists, experts and citizen. As I was approaching the end of this researches the discussions that R. 28 had gave, in a way that was maybe even more emphasized the strength of this attachement to the idea of preparedness that is carried and transported through time and space. R.28 was introduced to me through a common connection who mentioned that he was very involved in the Disaster Risk reduction of the Bay Area, that he had worked for several non profit and states agencies, had tied important contacts with Japan experts over the years. Our contact also mentioned their "old professional age" and the fact that, despite a life dedicated to develop risk awareness, public knowledge of the earthquake risk was still low "despite highly qualified professional, scientific and technical commitments to the subject". He also mentioned that R.28 was "very much a Bay Area resident, and advocate" (personal communication, 09.4.13).

When I met R.28, he had decided to "really" retire, which for him means to try to let go, as much as possible what had been a life of work and dedication, often interrupted with a considerable amount of frustrations and deceptions, coming both from the scientific and political world. R.28 trained as an architect during the Free Speech Movement had been influenced by the work of Alinsky. As he recalled his stepping into the field of earthquake preparedness had a lot to do with the impact that the previous generation of experts had on him:

California was 'blessed' with engineers and geologists, not just in the Bay Area, and created the modern science of seismology and structural engineering at Caltech,

> *Berkeley and Stanford. These were bigger than life people that included John Blume at Stanford, Henry Degenkolb, a Structural Engineers in SF, Karl Steinbrugge a Structural Engineer who worked for the Insurance Services Organization and taught at the architectural school at Berkeley, Bob Olson a Political Scientist who headed the CA Seismic Safety Commission for its first 20 years, Henry Lagorio, as Architect on the Faculty of Berkeley who championed designing (architectural) for seismic forces, Bruce Bolt at the Berkeley Seismological Laboratory, Stanley Scott at Berkeley's Institute for Governmental Studies who pioneered seismic public policy initiatives, and the members of EERI in northern and southern California who created the seismic code provisions that eventually found their way into the Uniform Building Code. Steinbrugge, Lagorio and Scott were my mentors and got me interested studying earthquakes. It all happened here because there were mentors and leaders. (Personal communication, R. 10.03.13)*

During more than three decades, he became one of these Earthquake Junkies, participating in multiple programs and initiatives from the Parkfield experiment, to the development and management of the Bay Area Regional Earthquake Preparedness Project, working as Regional Administrator for the California Governor's Office of Emergency Services, and being appointed Visiting Scholar and Professor at the Center for Disaster Reduction Systems, Disaster Prevention Research Institute in a Japense University. During his active years he also managed California Integrated Seismic Network, a state funded dense urban seismic network in northern and southern California through funding to the California Institute of Technology, California Geological Survey, and the University of California Berkeley Seismological Laboratory used for researches and predictions and worked in several NGO and FEMA. In addition to that he co-wrote books and articles which mainly focuses on the best way to engage with a larger public and develop a material that can be helpful to develop a better preparedness.

At the time of our discussion he was working hard to identify the next generation of Earthquake Junkies researchers and experts to whom he could transit his knowledge and would make them the challenge that had been his for decades. As we were reflecting his trajectory he wrote: *"My career in community work, teaching, research and trying to fit into the state bureaucracy seemed today like 35 years of chaos. The logic only appears in hindsight"* (personal communication, 09.25.13). I hope by this work having contributed to bring this collective experience to visibility and inscribing in a larger effort to make San Francisco a place *of action, where all are concerned together (…). At San Francisco the need will continue to be awful, and there will doubtless be a crop of nervous wrecks before the weeks and months are over, but meanwhile the commonest men, simply because they are men, will go on, singly and collectively, showing this admirable fortitude of temper. (James, 1906)*

Chapter 6
A Conclusion

As I am finishing this work, the instauration of the earthquake risk continues. In 2014, a new hypothesis emerged: the San Francisco Bay Area might not be facing one, but in fact, several earthquakes in its future. *"Everyone is still thinking about a repeat of the 1906 quake,"* said author David P. Schwartz, referring to the San Francisco Earthquake, which, as previously discussed, had a magnitude of 7.9 had sparked a massive fire, killing 3,000 individuals, *"[b]ut what happens if every five years we get a magnitude 6.8 or 7.2? That's not outside the realm of possibility"* (Audi, 2014).

The year before, after decades of latency, San Francisco City Council had finally signed the long awaited Soft-story Ordinance Bond[254] (Arroyo & Grady, 2013; Arroyo, 2013a; BONDS, n.d.), and Governor Jerry Brown ordered the Office of Emergency Services to develop an early-warning system. Senator Alex Padilla, who had been the sponsor of the latter bill, became interested in the early-warning question while visiting the California Institute of Technology a couple of years ago, he stated, *"California is going to have an earthquake early warning system, the question is whether we have one before or after the next big quake"* (AP, 2013). The $80 million that the system will cost has not yet been found.

The future will tell if these initiatives have been a important steps toward earthquake preparedness for the municipalities of the Bay Area that have been built during the last 150 years are sitting right above a complex system of active seismic fault lines. As we said earlier, two faults seem to be more at risk than others: the Hayward Fault, which runs through the East Bay, underneath the cities of Richmond, El Cerrito, Berkeley, Oakland, San Leandro, Hayward, Fremont, and San Jose; and along the Pacific, the San Andrea Fault, which runs on and off of the shores of Marin County, San Francisco, and the San Francisco Peninsula. Additionally, because earthquakes can also trigger landslides and fires, the multiple areas

[254] Mayor Edwin M. Lee signed the Mandatory Soft Story Ordinance, San Francisco's recently approved Ordinance No. 66-13 which requires the retrofitting of all buildings with the following characteristics: Wood-frame structures; those containing five or more dwelling units; those having three or more stories; and those permitted to be constructed prior to January 1, 1978.

built upon made, soft ground or in zones prone to wild fires cumulate risks. In 2010, 7.88 million people were living in one of 12 Bay Area's counties. Among them, earthquake experts and non-experts alike shared the same "risk."

Despite recurring, alarming predictions, large earthquakes and fires are, in fact, very rare. Not totally forgotten, but not totally present either, their existence – to use Souriau's vocabulary (Latour, 2011a) - seems incomplete or partial, that is, until they become destructive and - way - too real. Several decades of hard work in various scientific fields – collecting data, advocating, training, crafting ordinances, bonds and codes, and evaluating impacts and consequences - have given more substance to earthquake risk's existence. The earthquake as a phenomenon, in the Souriau sense, transforms the way we understand space, the way we think about security and safety, the certitude that we have in science and the understanding of expertise. But like a work of art - which was the example given by Souriau - the risk of an earthquake, can also fail to exist; in this case, the failure is not only the failure of definition, but moreover, a failure of instauration.

In this work, I have argued that earthquake risk in the Bay Area is collectively instaured by risk-aware residents and experts who called themselves the Earthquake Junkies. Describing these moments of instauration, I have shown how a network of attention to earthquake risk has been built along different lines, allowing for the coexistence between expertise and common knowledge, science and experience. In the sense this instauration falls within this context of a redefinition of the concept of expertise.

Following the different modes of existence of the earthquake, we have seen that it is through the personal, intimate, experiences of living with the earthquake that experts-residents or experts-amateurs finally give a moral perspective on what they describe as an "addictive" attachment to the acts of risk prevention. In the process, the question of knowledge has been raised many times. This is not only because earthquake science is still in the process of emerging – what science is not? – but also because of the division between the knowledge of what has been considered valid and invalid. Crossing together concepts and methodologies used by seismologist to measure the perception and theoretical reflection, which draw a continuum between James pragmatism and ANT, we have deployed another example of the making of a scientific though: this movement which transforms experts into amateurs. Finally what has emerged from this field research is a figure of the expertise and the earthquake scientist who is borrowing for the portrait of the expert-amateur defined by researchers in ANT, becoming an activist, a stockperson, engaged in an ongoing dialogue with the communities he is serving.

Reflecting on Mialet's description of Stephen Hawking collective practices (Mialet, 2012a), Micheal Lynch recently stated that previous understandings of expertise have been staying "*far too distant from (…) networks and singular circumstances"* and have therefore *"stated intention to treat expertise as real is a general position statement rather than a demonstrable finding."* As oppose to these static definitions, he argued that Mialet's work allows us to see that:

> *The identity and authority of an expert is not a consequence of verbal attributions made in isolation. Instead, it is a continual project, involving many participants working in organized, embodied, and intimate ways within specific institutions. (Lynch, 2014)*

"Waiting for the Big One" is paying attention to the creation of the idea of risk. Earthquakes produce movement: the movement generated by the tectonic plates, of course, the movement produce by the different instauration of the earthquake phenomenon, and finally the movement provoked by the mobilization around an organized project of earthquake preparedness. Following James's observations after the 1906 Earthquake, I have shown how these multiple dimensions cannot be reduced. Rather, each influence another, creating a unique form of relationships and knowledge that together encapsulate the ways in which people "wait" for the next Big One.

We have also shown that while instauring the risk of earthquakes, Earthquake Junkies also instaure a collective, common world of shared existence and experience. It is the experience of living with the earthquake - of waiting for it, fearing it, remembering it, and getting ready for the next one - that gives sense to these complex sets of actions and allow different earthquake ontologies to emerge, resulting in making the definition of the earthquake risk and expertise, and finally the instauration of a collective space of risk - a "we" which is not the community that Saul Alinsky dreamt about, but something else - a world composed of beings and experiences.

Reconsidering the articulation between expertise and laity, between knowledge and "non knowledge," has been one way to also question "the economy of risk," to use a Boltanski and Thevenot's expression (Boltanski & Thevenot, 2006). These reconfigurations of the moral and pragmatic figure of the expert and practice of expertise are calling for more investigation when confronted to the figure of the public as define by revisited by contemporary scholars.

> *The public is conceived as a collective instance potentially constituted by those who are affected by problems, suffer the indirect consequences of interaction and are interested to master them. The defined exploration of the "consequences," for further treatment of the problems, soon constitute the operator of the political experience through which a community oriented toward it own perfection ideally get determined. In the way, trough the model of the scientific inquiry, it requires, up-front, the training of the scientific capacity of all as much as each can participate, under the form of the public, to the realization of an ideal of regulation and conformation of the community.*[255] *(Stavo-Debauge, 2004)*

The Earthquake Junkies of the Bay Area are not an isolated tribe with bizarre practices, they are not a peculiar public. As I was discussing these questions during the 2013 4S Conference in San Diego, Scott Frickel, then Associate Professor at Washington State University, who himself had to relocate to Seattle after Hurricane Katrina ravaged New Orleans, and whose work on expertise has become seminal in the field (Frickel & Bess, 2007; Frickel, Campanella, & Besse, 2009), remarked that many - if not most - researchers involved in the study of risks and disasters have a deep emotional and intellectual connection with their subject of research. I could not agree with him more. Genuinely bricoleurs, full time residents, dedicated scientists, concerned citizens, empathic researchers, the Earthquake Junkies are part of a larger community, navigating between scientific conferences and city halls meetings, who is reshaping the definition of knowledge by reconnecting scientific knowledge with experience.

255 "*Le public y est conçu commeune instance collective potentiellement constituée par ceux qui sont affectés par des problèmes,subissent les conséquences indirectes d'interactions et sont intéressés à leur maîtrise. L'exploration réglée des « conséquences », en vue d'un traitement des problèmes, constitue dès lors l'opérateur de l'expérience politique par laquelle se détermine idéalement une communauté orientée vers sa propre perfection. En cheminant à travers le modèle de l'enquête scientifique, elle exige, en amont, la formation de capacités spécifiques de tous en tant que chacun participe, sous la forme du public, à laréalisation d'un idéal de régulation et de conformation de la communauté*" (Stavo-Debauge, 2004).

Coming back to the Michel Serres' quotation that opened this work, where he said *"I am bridging the hard and the soft"* (Serres, 2006: 77), this work is an attempt to look at the diversity of earthquake existences. This work has been an attempt to sew together objects, thoughts, and theories that are all part of the instauration of earthquake risk. In this context, the goal of this work has been to capture the complexity of the relationships to risk from a perspective which has tried to be neither moralist nor normative. A second objective was also to find a way to describe, in theoretical terms, what I observed in my field research. In this sense, if the organization of this work presents the theoretical part first, it is done with the purpose of following the academic model of thesis writing, but it does not fully inform the multiple movements back and forth between books and the transcripts of my interviews..

This work has been empirical, in a Jamesian sense, looking at the density of experiences through the relation, the distance, between actants. Following the programmatic research agenda defined as "pragmatic sensibilities", we have followed:

> *a certain interest for the exploration of a world in transformation, sharing the desire to describe it more finely et to find for that the tools and the concepts susceptible to take seriously what change and what provoke change.*[256] *(Cantelli, Pattaroni, Roca, & Stavo-Debauge, 2009)*

The condition in which the field research is conducted does have consequences on the obtained results. As a resident of the Bay Area since 2008, I have had the time to be shaped by the risk of a local earthquake while simultaneously trying to define it. Revisiting these last years in my mind, it has become easier for me to identify the transformations of the understanding of living with this risk at different moments. From totally skeptical to very concerned, from very detached to extremely involved, I have experienced the different stages of attention to risk. Living in the Bay Area and conducting research on risk presented the opportunity to experience this intermediate layer of knowledge personally. Sharing the everyday-ness of the potentiality of a disaster, being attentive to the details of the relationships between the different dimensions of earthquake risk, and the transformation

[256] *"D'une certaine manière, nous voulons défendre l'idée que les sensibilités pragmatiques se rejoignent avant tout dans un certain intérêt pour l'exploration d'un monde en transformation, partageant une envie de le décrire plus finement et de trouver pour cela les outils et les concepts susceptibles de prendre au sérieux ce qui change et ce qui fait changer"* (Cantelli et al., 2009).

of mundane objects of the environment, have taken the form of a "questioning situation" (Stengers, 2009.)

This proximity between my own experiences and the subject of my research forced me to reopen the discussion of common assumptions in the scientific world about the ignorance, foolishness, or irrationality of residents living in risk-prone areas. In the Bay Area, the people with whom I interacted every day – the ones who I interviewed, my friends or my colleagues at the University of California, Berkeley – were not at all ignorant, foolish, or irrational. But still, they were living in a high and dangerous seismic zone. This apparent contradiction was somehow reinforced in a context where the definition of risk was challenged by the experts themselves, where my naïveté was sometimes mocked with crude irony during my interviews, where the diversity of experiences and forms of knowledge mobilized by the earthquake community did not seems to present any homogeneous perspective.

Doing so, I have tried to build a theoretical framework in which the different epistemologies and ontologies of the people whom I have met, and who have given me their valuable time, could be engaged in an active discussion. It is therefore symptomatic that the main inspiration of this work comes from a field that specializes in mapping controversies. Coming for the field of Sciences and Technologies Studies and Geography, informed by Anthropology, the second chapter provided the necessary theoretical framework to develop my project. In this chapter I showed how, in order to understand the complexity of risk as defined both as an event, a cause, a probability or a statistical expectation and the ways in which decisions are made under the previously cited conditions, it needs to be considered as an actant, in the ANT understanding of the term.[257]

Looking at the first Disaster Studies, developed in the United Sates in the early 1950's, I have been interested to see how these first systematic approach targeted for military purpose did only partially survive the end of the programs. Looking at the ways the

[257] "*In non-technical contexts, the word "risk" refers, often rather vaguely, to situations in which it is possible but not certain that some undesirable event will occur. In technical contexts, the word has several more specialized uses and meanings.*
Five of these are particularly important since they are widely used across disciplines:
1.Risk: can unwanted event which may or may not occur.
2.Risk: the cause of an unwanted event which may or may not occur.
3.Risk: the probability of an unwanted event which may or may not occur.
4. Risk: the statistical expectation value of an unwanted event which may or may not occur.
5. Risk: the fact that a decision is made under conditions of known probabilities ('decision under risk' as opposed to 'decision under uncertainty')" (Hansson, 2012).

definitions of the concepts of risk and disaster have been mobilized, I have been looking at the ways in which a continuum of definitions, from the most determinist to the most constructivists, has organized the relative position of the actants at play.

I have later argued for a understanding of risk and disaster that offered the possibility of developing a contemporary, pragmatic approach to the concept of risk, following the path opened up by James when he visited San Francisco after the 1906 Earthquake. As a reminder of this approach, I have used James's quotations as a thread to walk me through the different aspects of the earthquake, which I needed to consider together:

> *For "science," when the tensions in the earth's crust reach the breaking point, and strata fall into an altered equilibrium, earthquake is simply the collective name of all the cracks and shakings and disturbances that happen. They are the earthquakes. But for me the earthquake was the cause of the disturbances, and the perception of it as a living agent was irresistible. (James, 1906)*

As much as Hansson's definition of risk seems to be able to capture the different "mode of existence" of risk – "an unwanted event which may or may not occur, […] the cause of an unwanted event which may or may not occur, […] the probability of an unwanted event which may or may not occur, […] the statistical expectation value of an unwanted event which may or may not occur" – my field research has also demonstrated that the "question of known probability" and the "decision under uncertainty" (Hansson, 2012) were not distinct and opposed regimens of knowledge, but rather, it could be described as a continuum that included different forms of legitimate, but also contested knowledge. To trace this continuum, I have used the concept of "instauration," developed by the French philosopher Etienne Souriau:

> *Instauration and construction are clearly synonyms. But instauration has the distinct advantage of not dragging along all the metaphorical baggage of constructivism — which would in any case be an easy and almost automatic association given that an artwork is so obviously 'constructed' by the artist. To speak of 'instauration' is to prepare the mind to engage with the question of modality in quite the opposite way from constructivism. To say, for example, that a fact is 'constructed' is inevitably (and they paid me good money to know this) to designate the knowing subject as the origin of the vector, as in the image of God the potter. But the opposite move, of saying of a work of art that it results from an instauration, is to get oneself ready to see the potter*

as the one who welcomes, gathers, prepares, explores, and invents the form of the work, just as one discovers or 'invents' a treasure (Latour, 2011a: 10).258

The field research also made clear that earthquake scientists and geographers, as researchers coming from the empirical sciences who are forced to deal with the materiality of their object of study, have also long taken perceptions and emotions seriously, not as a by-product that needed to be "cleaned up," but as legitimate actants in themselves that need to be given full attention. The work of Nigel Thrift and non-representational theory, which I discovered in the course of my work, allowed me to find a path to reconnect to some of James's pragmatic insights with my geographical, spatial thinking anchored in the geography of risk.

Starting with the hypothesis that earthquake risk is a complex, and not always visible object, the third chapter questioned the actual, true visibility of this risk. Looking for traces of earthquakes in the landscape, through the memories of long-time residents and via commemorations, I have argued that earthquakes have had a strong influence on shaping the space of the San Francisco Bay Area, but that this influence often remains invisible.

In this chapter I also challenged the assumption that risk is "*the fact that a decision is made under conditions of known probabilities*" (Hansson, 2012), showing how the controversies about the space of risk in the Bay Area have tended to erase the traces of risk from the landscape. Focusing on discontinued dimension of the risk I shown that the earthquake is not easily visible in the actual landscape: made invisible in the early 20th Century to avoid having investors be turned away, the contradictory definitions of risk and disaster in the last decades have made difficult the possibility of commemorations and remembrances.

Looking at the invisible transformations that cohabitation with the risk of earthquakes creates, this chapter is also at the cross section between territoriality, science, and action. This place in not coincidental; in fact, it was probably one of the most important results from my fieldwork. I discovered the transformative experiences of past and distant events that Earthquake Junkies have that keep them so deeply rooted and attached to their subject of research.

[258] "*The French legal term for someone who discovers a treasure is actually the 'inventor'... French is constructivist by construction!*"(Latour, 2011a: 10).

The hypothesis of the fourth chapter focused on the experiences of living with earthquake risk, and its capacity to transform the categories of knowledge, experience, and subjectivity. Here, I argued that the "quality" of the idea of an earthquake – as a potential concern or a threat – can only be found while looking at the density of experiences and in the everyday coexistence with active seismic faults. Looking at the different existences of the earthquake phenomena allows us to approach the elusive quality of this risk, but also its performative dimensions. In this chapter, I have tried to understand how, in the absence of the Big One how does the earthquake exist for residents. Indeed, if the Big One remains on the horizon of the possible, earthquakes still come in all shapes in the Bay Area contributing to define in a kaleidoscopical way the multiple existences of the earthquake.

Building on Souriau instauration, I have focused mainly on the immaterial dimension of the earthquake existence, looking at the earthquake as a phenomenon able to transform the world as we know it. The deployment of the immaterial dimensions of the earthquake led me to consider the unexplored field of emotions and perceptions that are connected to the idea of an earthquake. Thus, in the Latourian definition of the mode of existence, this third chapter is about habit, or [HAB]:

> *Habit is the technical term that has been chosen to designate a mode of existence* [HAB]*, which is characterized by the designation of a movement directed towards the course of action and therefore away from the preposition. Philosophers of habit, few in number because it has been seen as a doxa, and a form of ignorance, due to its implicit nature, have always insisted on the fact that courses of action require additional adjustment in order to be carried out.* (Latour, 2014)

Looking at what is often considered a too messy material for research, I have examined the moment when knowledge get hybridized by the mundane experience of habit, as these actants present a "radical alterity" (Latour, 2014). The first part of this chapter looked at other forms of earthquakes, like very small earthquakes that people feel far more frequently than larger ones. Because they "touch" residents, these events trigger actions and reflections about what the Big One might look like.

In this chapter, I also looked at a certain particularity of San Francisco Bay Area, namely, the capacity to make fun of the idea of earthquakes, big and small, and also the gentle chiding of people who have a serious fear of earthquakes, which I argue are also part of the earthquake mundane existence. As much as the memory of the Oakland Fire was hidden in the museum archives, the awareness of the earthquake, the deep understanding that the Bay Area could be destroyed in couple of seconds, lay hidden inside the ability to joke about such events. Humor acts as distanciation; it translates the interwoven processes of close or distant attachment, characteristic of Bay Area residents' ability to "deal" with earthquake risks. Distant earthquakes, like the ones in New Zealand, Haiti, or Japan bring the possibility of earthquakes terribly close, while jokes gently keep the real possibilities and realities at bay.

Looking at the earthquake as a mediated event, this chapter also questioned the usual distinction between science - "good information" - and lay knowledge content - "bad information." Researchers in the field of Media Studies have long noted that the internet is a space of contested knowledge (Abe, 2013; Seidman, 2008). In the context of this research, it was interesting to see how citizen-science and blogs have played very important roles in informing the public about the multiple and complex dimensions of potential catastrophes, while incorrect – or partial - information was relayed by traditional media and even sometime university professors.

As echoed from the previous chapter, which emphasized the transformation of space during and after a disaster, the third chapter also addressed the transformation of residents when confronted by the potentiality of the destruction of their familiar environments, or worse, the deaths of family and friends. Some people have recognized the highly emotional impact that past disasters have had on their psyches: how deeply structuring those experiences of death and destruction have been in their lives – whether because they decided to engaged fully in avoiding such events, or because they fundamentally have changed their lives so as to avoid dealing with this form of major destruction ever again.

The third hypothesis of this work questioned the ways in which this hybridized knowledge creates forms of engaged expertise, which has had the effect of constantly reshaping the urban space of the Bay Area, as well as the subjectivity of experts in the field. For decades now, earthquake scenarios have defined the scientific existence of earthquakes. In this chapter, we have looked at the many ways in which scientific communities have framed this existence. Doing so, we have deployed part of the very dense network of activity, which has been crystallized in the definition of the earthquake map. We have also seen how, in the course of this process, the definition of science and expertise has become hybridized.

In this last chapter, I have developed the scientific apparatus, which has been mobilized in the last few decades to better define earthquake risk. I have shown how the definition of risk is a collective endeavor, which requires the energy and dedication of many scientists and experts. As opposed to the argument that earthquake scientists look at the world from an ivory tower, this chapter has shown how experts engage with their object of study, tied to ethical considerations.

The earthquake-risk scenario focuses mainly on calculations, whether they concern the probability of a fault rupture, or the insured or uninsured costs incurred for a particular rupture in a given place. Scientific scenarios use data and facts, and then these are elaborated on according to the scientific process (Daston, 1991). They brought together the actants in order to estimate their interactions and their potential dangers – the strengths or weaknesses of the soil, buildings, and infrastructure. To obtain their objective, these scenarios focused their attention on the interactions of tectonic-plate movement (Modified Mercalli Intensity, magnitude, liquefaction); consequences of plate movements (fire-related damage, floods, landslides); potentially aggravating factors (wind conditions and other adverse meteorological conditions); and on buildings (retrofitted, not retrofitted, soft-story, unreinforced, masonry); public facilities (schools, hospitals, state and federal buildings); infrastructure (water, sewer, gas, transportation, bridges, piers, tunnels); population (prepared or not, injured, dead, displaced, or traumatized);[259] the economic situation (sales, taxes, revenue, insurance, mortgage defaults),[260] all just to name a few. And this does not take into consideration some of the cumulative effects of some of these aspects occurring together at particular moment in a particular event.

In the final chapter, we have seen how scientific knowledge about earthquakes is embedded in a larger set of political preoccupations about the safety of Bay Area residents. Successes and failures of science cannot be evaluated without looking at the work – often invisible – done by community mobilizers. In the case of the Parkfield Experiment, for

[259] The population of the Bay Area is estimated to be 7.4 million residents in 2.7 million households.
[260] Projections of those employed are estimated to be 3.4 million with jobs. The regional economy has been, in 2009, estimated to be approximately $300 billion.

instance, residents were sensitized to the risk of earthquakes, and other hypotheses have emerged from the ones which were invalidated. Taking all of this a step further, we have seen how these pieces of information were later translated into an apparatus of regulations and laws that were specifically designed to avoid damages during the next major earthquake.

In this work we have examined the necessary operation of translation between the tools used to define and measure an earthquake and the individuals who are living in risk zones. Looking at these varied aspects of the instauration of earthquake risk, we have shown that this instauration is a co-construction of both the risk and the expertise – the scientific knowledge and the complex experience of living in earthquake country. In order to consider the different dimensions of experience, this work has looked at the invisible actants – "the traces" discussed in the third chapter, which both define epistemic territories, cultural practices and more broadly the border of a space of risk and disaster, sometime hidden and then made visible again, sometime blurred and sometime irrefutable.

The instauration of the earthquake also continues to transform the individual lives of concerned people. In a sense, the career evolution of some of the people whom I have interviewed when I began this research have also tended to prove that scientists and experts move along a network in which they maintain a strong connection both with their experiences as residents, with the local, state, and federal institutions in charge of managing seismic risks.

Since the time of my interview with one of my interviewees, J.15, who at the time of our talk was so engaged in trying to improve the seismic resistance of the schools in her district, has now become part of the California Earthquake Authority, the organization founded in 1996 by the California Legislature to develop earthquake insurance policies. Another interviewee, T.4, after working for 45 years in earthquake preparedness, and who had been helping a California Legislator draft earthquake-preparedness bills, has since become the President of the Earthquake Engineering Research Institute, and now also works as senior consultant for GeoHazards International, an NGO involved in seismic-risk mitigation around the world.

More recently, the Northern California Chapter of the Earthquake Engineering Research Institute has presented a special award to my interviewee, J.8, for "Lifetime Achievement in Earthquake Risk Reduction," along with a "certificate of appreciation" from the Association of Bay Area Governments and a proclamation from Oakland Mayor Jean Quan. Another individual, A.28, a community organizer for more than three decades, has been working most recently with both the city of Palo Alto and U.C. Berkeley to assess resilience in the case of major earthquakes. Another person, D.21, who has been a member of San Francisco's Community Action Plan for Seismic Safety and part of the team developing the FEMA P-807 Guidelines (Guidelines for Seismic Retrofit of Weak-Story Wood-Frame Buildings), is now working for the city of San Francisco on their "soft-story" retrofit program. M.3, who participated in the U.C. Berkeley earthquake preparedness project, and who has written widely on disaster recovery, has received the Green Star Award from the United Nations for her work in the post-disaster reconstruction projects in China and Haiti, and additionally, in 2013, she received the U.C. Berkeley Chancellor's Award for Public Service for Research in the Public Interest. R.8 has pursues his vision of an early-warning system, and gained state and national recognition when he helped pass Senate Bill No. 135, which states:

> *The Office of Emergency Services, in collaboration with the California Institute of Technology (Caltech), the California Geological Survey, the University of California, the United States Geological Survey, the Alfred E. Alquist Seismic Safety Commission, and other stakeholders, shall develop a comprehensive statewide earthquake early warning system in California through a public-private partnership. (Padilla, 2014)*

Of course, many others have been active as well. My interviewee, A.M 20, has been continuing her work on emergency preparedness with the California Public Health Systems Research organization and the California Emergency Services Association, and also by giving lectures at U.C. Berkeley and working as part of a community advocacy team to make emergency preparedness accessible to non-profits. R. 28, despite being "really retired," as his LinkedIn page indicates, continues to be passionate about training the next generation of Earthquake Junkies. And R.5 has become a writer; she has written about change and transformation in a 2014 piece entitled "The Next Big Step":

> *It's been the story of my life: unexpected deviations from The Plan, unintended consequences, and things that seem to work themselves out even when the best laid plans have gone astray. […] We moved into this house as a family of four in 1984. By 1986, we were a family of five. And in 1991, the place burned to the ground. We rebuilt in the same spot, and as project manager of the rebuilding I had a hand in every element that went into the new house. Now, over twenty years later, our three kids are grown up and married with families of their own. The house that once felt so big can no longer accommodate our growing crowd on those too-rare occasions when we all get together. Just thinking about packing up and moving leaves me with*

> *feelings of dread (and denial at the inevitability of it), but a big change also carries with it a certain air of excitement. I'm just not sure I'm ready to make that change quite yet. (Nye, 2014)*

In-between earthquakes, life goes on: kids have grown up living with earthquake risks their whole lives. This is also instauring the earthquake. Since I live in this environment too, and have also experienced the joy of having a family of my own while working on this research, everything that I have learned from my field research has made me reflect deeply on what exactly the risk consists of, and who are the experts, and how to create good risk-prevention policies, all while packing the disaster kits that my kids' schools ask for each year: a stuffed animal, a family picture, a bottle of water, two cereals bars, and a red flashlight.

I might have become an Earthquake Junkie.

Appendix A - Some definitions

These definitions are reproduced from USGS Earthquake Glossary (USGS, n.d.-b)

Active Fault: a fault that is likely to have another earthquake sometime in the future. Faults are commonly considered to be active if they have moved one or more times in the last 10,000 years.

Creep: slow, more or less continuous movement occurring on faults due to ongoing tectonic deformation. Faults that are creeping do not tend to have large earthquakes.

Crust: the crust is the outermost major layer of the earth, ranging from about 10 to 65 km in thickness worldwide. The uppermost 15-35 km of crust is brittle enough to produce earthquakes.

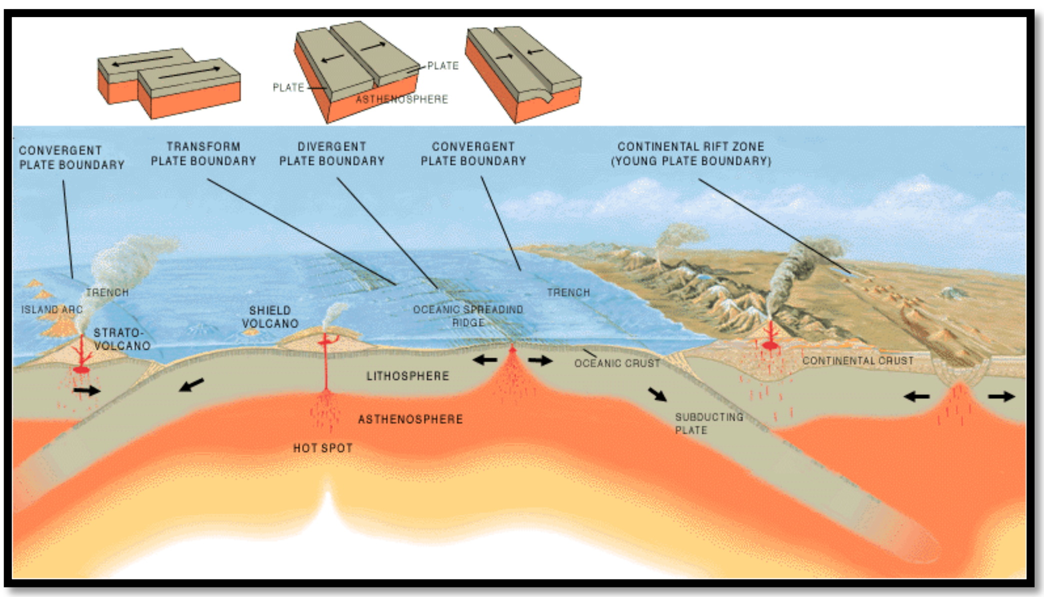

Figure 43 - Tectonic Plates Boundaries source : (Wikipedia, n.d.-d)

Displacement: displacement is the difference between the initial position of a reference point and any later position. The amount any point affected by an earthquake has moved from where it was before the earthquake.

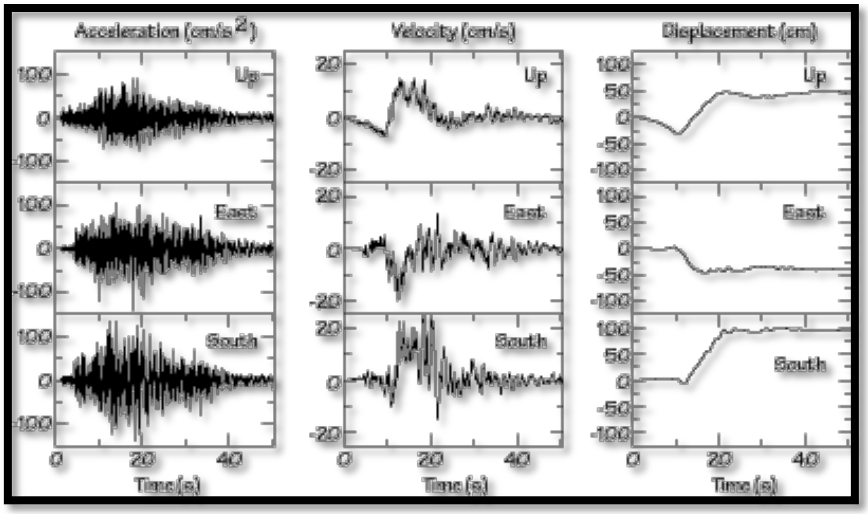

Figure 44 - Acceleration, velocity, and displacement records. (USGS, n.d.-b)

Earthquake: Earthquake is a term used to describe both sudden slip on a fault, and the resulting ground shaking and radiated seismic energy caused by the slip, or by volcanic or magmatic activity, or other sudden stress changes in the earth.

Earthquake fault; A fault is a fracture along which the blocks of crust on either side have moved relative to one another parallel to the fracture.

Earthquake risk: Earthquake risk is the probable building damage, and number of people that are expected to be hurt or killed if a likely earthquake on a particular fault occurs. Earthquake risk and earthquake hazard are occasionally incorrectly used interchangeably.

Earthquake hazard: Earthquake hazard is anything associated with an earthquake that may affect the normal activities of people. This includes surface faulting, ground shaking, landslides, liquefaction, tectonic deformation and tsunamis.

Epicenter: The epicenter is the point on the earth's surface vertically above the hypocenter (or focus), point in the crust where a seismic rupture begins

Geology: Geology is the study of the planet earth- the materials it is made of, the processes that act on those materials, the products formed, and the history of the planet and its life forms since its origin.

Geophysics: geophysics is the branch of earth science that employs physical measurements and mathematical models to explore and analyze the structure and dynamics of the solid Earth and similar bodies and their fluid envelopes.

Geodesy: geodesy is the science of determining the size and shape of the earth and the precise location of points on its surface.

Geomorphology: geomorphology is the study of the character and origin of landforms, such as mountains, valleys, etc.

Ground failure: the term ground failure is a general reference to landslides, liquefaction, lateral spreads, and any other consequence of shaking that affects the stability of the ground.

Ground motion: ground motion is the movement of the earth's surface from earthquakes or explosions. Ground motion is produced by waves that are generated by sudden slip on a fault or sudden pressure at the explosive source and travel through the earth and along its surface.

Intensity: the intensity is a number (written as a Roman numeral) describing the severity of an earthquake in terms of its effects on the earth's surface and on humans and their structures. Several scales exist, but the ones most commonly used in the United States are the Modified Mercalli scale and the Rossi-Forel scale. There are many intensities for an earthquake, depending on where you are, unlike the magnitude, which is one number for each earthquake.

Landslide: a landslide is a movement of surface material down a slope.

Liquefaction: a process by which water-saturated sediment temporarily loses strength and acts as a fluid, like when you wiggle your toes in the wet sand near the water at the beach. This effect can be caused by earthquake shaking.

Lifelines: lifelines are structures that are important or critical for a community to function, such as roadways, pipelines, power lines, sewers, communications, and port facilities.

Magnitude: the magnitude is a number that characterizes the relative size of an earthquake. Magnitude is based on measurement of the maximum motion recorded by a seismograph. Several scales have been defined, but the most commonly used are (1) local magnitude (ML), commonly referred to as "Richter magnitude," (2) surface-wave magnitude (Ms), (3) body-wave magnitude (Mb), and (4) moment magnitude (Mw). Scales 1-3 have limited range and applicability and do not satisfactorily measure the size of the largest earthquakes. The moment magnitude (Mw) scale, based on the concept of seismic moment, is uniformly applicable to all sizes of earthquakes but is more difficult to compute than the other types. All magnitude scales should yield approximately the same value for any given earthquake.

P wave: a P wave, or compressional wave, is a seismic body wave that shakes the ground back and forth in the same direction and the opposite direction as the direction the wave is moving.

Plate tectonics: plate Tectonics is the theory supported by a wide range of evidence that considers the earth's crust and upper mantle to be composed of several large, thin, relatively rigid plates that move relative to one another. Slip on faults that define the plate boundaries commonly results in earthquakes. Several styles of faults bound the plates, including thrust faults along which plate material is subducted or consumed in the mantle, oceanic spreading ridges along which new crustal material is produced, and transform faults that accommodate horizontal slip (strike slip) between adjoining plates. (See also "This Dynamic Earth: The Story of Plate Tectonics".)

Paleoseismicity: paleoseismicity refers to earthquakes recorded geologically, most of them unknown from human descriptions or seismograms. Geologic records of past earthquakes can include faulted layers of sediment and rock, injections of liquefied sand, landslides, abruptly raised or lowered shorelines, and tsunami deposits.

Richter scale: the Richter magnitude scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude; as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.

Ring of Fire: the "Ring of Fire", also called the Circum-Pacific belt, is the zone of earthquakes surrounding the Pacific Ocean- about 90% of the world's earthquakes occur there. The next most seismic region (5-6% of earthquakes) is the Alpide belt (extends from Mediterranean region, eastward through Turkey, Iran, and northern India.

S wave: an S wave, or shear wave, is a seismic body wave that shakes the ground back and forth perpendicular to the direction the wave is moving.

Seismicity: seismicity refers to the geographic and historical distribution of earthquakes.

Seismogram: a seismogram is a record written by a seismograph in response to ground motions produced by an earthquake, explosion, or other ground-motion sources.

Seismology: seismology is the study of earthquakes and the structure of the earth, by both naturally and artificially generated seismic waves.

Subduction: subduction is the process of the oceanic lithosphere colliding with and descending beneath the continental lithosphere.

Tectonic: tectonic refers to rock-deforming processes and resulting structures that occur over large sections of the lithosphere.

Tsunami: a tsunami is a sea wave of local or distant origin that results from large-scale seafloor displacements associated with large earthquakes, major submarine slides, or exploding volcanic islands.

Tectonic plates: the tectonic plates are the large, thin, relatively rigid plates that move relative to one another on the outer surface of the Earth.

Figure 45 - Tectonic plates around the globe (USGS, n.d.-b)

Waves: a body wave is a seismic wave that moves through the interior of the earth, as opposed to surface waves that travel near the earth's surface. P and S waves are body waves. Each type of wave shakes the ground in different ways.

Appendix B - List of interviews

P.1	Researcher earth science	Berkeley, California	Pers. Communication 2010
A.-M. 2	Homeowner	Berkeley Flats, California	Ibidem 2010
M.3	Urban Planner	San Francisco, California	Ibidem 2010
T.4	Consultant	Mills Valley, California	Ibidem 2010
R.5	Oakland Fire Victim	Oakland Hills, California	Ibidem 2010
G.6	Architect	Lafayette, California	Ibidem 2010
K.7	Cartographer	San Francisco, California	Ibidem 2010
J.8	Geographer	Oakland, California	Ibidem 2010
R.9	Seismologist	Berkeley, California,	Ibidem 2010
B.10	Social Worker	San Francisco, California,	Ibidem 2010
K.11	Cartographer	Oakland, California	Ibidem 2010
J.12	Engineer	Berkeley, California	Ibidem 2010
A.13	Dean	El Cerrito, California	Ibidem 2010
J.14	Community organizer	Oakland, California	Ibidem 2010
J.15	Structural Engineer	San Leandro, California	Ibidem 2010
S.16	Communication Officer	Oakland, California	Ibidem 2010
E.17	First Respondent	San Francisco, California	Ibidem 2010

A.-M.20	NGO Coordinator	Oakland, California	Ibidem 2010
L.18	Oakland fire victim	Oakland, California	Ibidem 2010
F.19	Seismologist	Sacramento, California	Ibidem 2010
S.20a	Architect	Oakland, California	Ibidem 2010
G.20b	Community Organizer	Moraga, California	Ibidem 2010
D.21	Structural Engineer	San Francisco	Ibidem 2010
J.22a	Contractor	Berkeley, California	Ibidem 2010
H.22b	Contractor	Berkeley, California	Ibidem 2010
K.23	Homeowner	Berkeley Hills, California	Ibidem 2010
P.24	Seismologist	Paris, France	Ibidem 2010
X.25	Policy Analyst	San Francisco. California	Ibidem 2010
C.26	Temporary resident	Paris, France	Ibidem 2010
M.27	Project Manager	Oakland, California	Ibidem 2010
A.28	Community Organizer	Oakland, California	Ibidem 2013
E. 29	Architect	Oakland, California	Ibidem 2013

Appendix C - Interview guidelines

Re-inventing space: How to live in risk and post-disaster areas?

A study on the political, territorial and personal consequences of living in risk and post-disaster spaces.

Introduction – Presentation

What should I know about you? (background, position, relations…)

Knowledge building – definition

What is your definition of a risk?
How is your definition of a disaster?
Could you tell me on which resources your knowledge is built?
Have you noticed that your definitions have changed?
If yes - What have/could make them change?
What is the role of the media this?

Network/ stakeholder's collaboration

Could you give me a list of the risk managements/ disaster mitigation stakeholders or group in your area?
Could you draw a diagram to show me how they interact?
How involved are you with these groups?
How have your collaborations evolved through time?
Do you work with non-institutional agencies?
If yes, who are they and how this collaboration is organized?
Do you think those collaborations could be improved? If yes, why and how?
Where does funding of your organization come from?
What influence does that have on your activities/policies?

Territorial aspects: scales and politics

What impacts do you think risk prevention and disaster mitigation have on your living environment?
Do you think the different dynamics (social, politics, environmental or economic) are coherent or do they contradict each other?
What are the priorities?
What is the influence of risk and disaster on the politics of the area?

(optional) Reconstruction and recovery

For you what does that mean to reconstruct?
Can you tell me more about the reconstruction process (who was involved, what responsibilities, what timing, the organization)
Were you part of the reconstruction process?
How would you assess it?
What is the time scale that seems the most adapted for the risk mitigation and disaster recovery?

Facing risk and disaster

What are the main risks and disasters that you face in your immediate environment?
Is everyone facing the same risks/disasters?
Have you had to face a disaster or a major risk? If yes, what happened?
Do you feel you were prepared enough to face such events? If yes, how?
Have your ways to understand risks and disasters changed following the event?

Living with risk and disaster

Did/do the events change something in your life? If yes: for what reason and in which perspective? (everyday practices, rules and procedures, knowledge and responsibility)
Do you think you still have some stigma from this event?
In which extent do you think your experience could be related to others situations of risks and disasters?
Were you helped during this time (if yes, by whom)?
Would you say that you have been traumatized by the experience?
Are you scared about some issues related directly or not to this event?
What is the role of memory about risk and disaster?
Do you think this aspect is taking in account in its real measure in the politics of risk and disaster?
What should be improved?

Thank you for your time!

Appendix D - Interview Transcript J.M.

C.: Would you just introduce yourself and tell me what I should know about you.

J. M. : Yes, so my name is J. M. and I am structure engineer and I currently work for myself, here, at home. And I am a consultant, so I do a variety of design and analysis jobs. Predominantly in, I would say the seismic fields, but you know, not always, sometimes I'm doing structural engineering that doesn't involve seismic, but, uh, predominantly because it's here, most of my work, it's here in the Bay area and it involves some level of earthquake engineering.

C.: Um, yes, and um, how do you define the risk?

J.M. : Um…

C.: It's a straight question…

J.M.: Well, for me personally

C.: For you as a person and maybe also as an engineer

J.M.: You mean earthquake risk specifically ?

C.: It's open...

J.M. : Ho, interesting,… um, I think that as an American I probably have a higher risk from a …(laughs) health issues, (laughs) and from getting in an automobile every day, but as a person who lives and you get can almost throw a baseball and see where it falls, but we certainly have risk to…uh, predominantly damage, not necessarily injury, from earthquakes. (1:40)

C.: And what would be a disaster for you?

J.M. : A disaster would be … hum… That's interesting because heu… …we certainly didn't experience a disaster in Loma Prieta, you know, we really, because we were so far away, but we did, we were close to a disaster during the 1992 (sic) fire, because we had lived in the fire zone and so we had friends there, and you know, we didn't know that the fire was going to stop that day, and..

C.: You were living here at this time?

J.M. : Yeah, yeah, and so, you know, all day long the television would show pictures, and the reporters were terrible -- they would stand, and they said “We are on Martin boulevard”. Well, Martin boulevard goes from miles away to very close, and they never told you the cross street, and so it was very difficult to get accurate information that day, but had the fire continued into Piedmont, that mostly would have been a disaster for me and my family, because that was a, that was a frightening day. So, you know, a fire, a conflagration would be a disaster …if a plane went down in the neighborhood, that is certainly a disaster, I think we’re relatively immune from flood here, so, um, (3.08)C.: Just about this fire, on this day, were you prepared to evacuate? Or were you

J.M.: We were.. it was interesting because… at the same time that I was here, in this house, my husband was driving in to the real fire zone, with friends, evacuating some of their belongings, and so he kept telling me “it’s far away, its far away”, but the helicopters would fly over here and say “Evacuate”…

C: Oh, so you did have a message to

JM: we did have a message to evacuate, so we sent our children with my mother to Walnut creek, where we knew the children were safe, and we sent a few things, papers and, you know, things like that, um but he kept telling me that it was, you know, that, because he kept driving in and saying, you know, it’s far away , but um, absolutely, once, once my children, at that time were maybe 10 and 8, (4.09), once they were safe, I felt a lot better about it, you know, to know I only had to move myself and my husband, yeah. But that was close, that was the closest we’ve come, I think, to a disaster, was that day.

C. C: And do you know who was telling you from the helicopter to evacuate?

J.M. : Um, who would they have been? That’s a very good question. I don’t know if it was the police or..? I can’t remember that day who finally took over, you know, it was the Berkeley and Oakland fire departments, I Service, um, so they may have used a police helicopter, because they would have a microphone, so that’s probably my guess. I do, you know, we had helicopter flying over all day long who picking up water in Lake Merritt and I forget where else they were picking up water, and so you know, you could see these giant helicopters flying with these water buckets all day long, and um,…you know, smoke, horrible smoke everywhere; it was just, you know, it was really an amazing day.

C.: And did some of your neighbors evacuate?

J.M. : I think they did, certainly, people who were closer, I think, actually had police people coming knock on their doors, yeah, so what we did is we had the cars, pointing outwards, we had, you know, we were ready go if we really felt that the, um, the fire was getting closer. (silence)

C: Um, yeah.

J.M. : That was quite day.

C. C: I can imagine. How did you get your knowledge about risk and disaster?

J.M. : Well, I think you, it's interesting, I don't know that my college, or university experience talked that much about it. You know, engineering is very focused on the technical. There is some discussions in the Masters program because there, usually there are seminars (6:06) so that there's an opportunity to hear from professionals, so you get a little better perspective of the professional experience rather than just a technical.

But I think when I joined the Structural Engineers Association and the Earthquake Engineering Research Institute, and worked, I worked for a group of called(??) engineers, those, the combination of those three, I think, um, kind of broadened my experience, my engineering experience to looking at more than just engineering and looking at the effect, of the effect that our profession can have on our community, which is to remediate risk, to alert to people of risk [6:56] but I don't think earlier in my career there was a lot of discussion of risk.

C. C: So when you are talking about the effect that your profession can have on the community, could you develop that? (7.04)

J.M. : Well, you know, it's interesting, because I was telling somebody one day, and I said that "I think about earthquakes every day", and then recognized that average person does not. And, you know, when I drive to the grocery store I cross the Haywood fault and I know that very few people are sitting on the overpass and thinking "the fault is right there, for us" (laughter). You know, ... as an engineer I'm very much aware that it's there.

Today I was doing shoring for construction. Well, I'm thinking about "You don't have to design shoring for an earthquake happening at that time because the likelihood is very, very, small for it to happen during construction, but for a moment I thought about, you know, what's the stability of the shoring during an earthquake and so I – you know, it's, there isn't any step in my professional life where I don't think about, you know, what the effect of an earthquake on a structure. And I have a volunteer job that I'm doing right now with the Piedmont Unified school district, where I'm assisting them as a volunteer in managing a seismic program, where we're retro-fitting the schools. So, you know, it's just a constant part of my life, and I'm also the… um, what am I? I'm the Assistant Chair, Vice-Chair, I think it's called the Vice-Chair of the Northern California chapter of the EERI (or ERI). And so, in that capacity I'm thinking about earthquakes and risks.

So, um, but as an engineer you can sit and think about it all you want. If you don't convey the risks and assist the community to understand the risks, then we don't make progress.

C. C: What would you call “understand the risk.”

J.M. : Well, I think that, um … the average person has their own personal experience, and so they have Loma Prieta. Many people have Loma Prieta, the ones who lived here. And, for many of them, they think that is, that was the earthquake, and that, they looked around, and they say “Okay, my house did okay”, and the Bay Area “did okay” -- “We had some damage, you know, the bridge, the freeways, but my life, you know, was not horribly disrupted, so we’re okay.” And they don’t understand that if the Haywood fault earthquake happens, that the ground-shaking will be so much severe, that it will be an entirely different experience for them. They will experience the loss of power, um, you know, most people won’t lose, won’t have structural collapses, but, you know, serious, serious damage. You know, I did a lot of post-earthquake evaluation after the North Ridge earthquake, mostly residential, and so I saw what houses looked like after the earthquake, and, you know, I don’t think people realize that, you know, when people recommend that you bolt heavy pieces of furniture to your wall, that you make sure that your house is bolted, make sure that, you know, there’s no large things, particularly in the children’s rooms, over their beds, um, you know, all those things, those kind of small things that can do – um, because unless they are made aware of the risk, and made aware of the types of mitigation that they can do, a lot of people won’t go looking for that themselves. And then there’s the big issues, of course, because there are very, very seriously deficient structures: masonry, non-ductile concrete – so that’s a whole other level. That’s the pot, the kind of public policy level, is, is something that I think professional engineers are involved in, and need to be involved in.

C. C: So, they are doing a lot of lobbying to um ..

J.M. : I, um, through the EERI, I, um, have been in contact with one of the city council members, in Oakland? She’s, she’s very well-informed, and she’s been working on improving the mitigation efforts of the city of Oakland? And so, I’ve been, uh, assisting them in various ways. Um,

C: Do you have her name? Because I’ve also had

JM: Oh, Jie Kwon.

C: Oh yes. Okay.

JM: Did you talk to her?

C: No, I met Sue …

JM: You met Sue Pepper! They’re wonderful.

C: Yeah, yeah.

JM: Yeah, so I try and help them whenever I can. I attend Sue's meetings, when she, you know, and I spoke at a community meeting, with Sue Pepper, where she talked about what the city would provide for people- for homeowners, and I talked about the seismic risk. Um, I, you know, through the volunteer work with the school district, people know that I'm an engineer, and so, when I'm asked to speak at any public event, about earthquakes, I go. Because I think it's very important that people understand the risk and understand what they can do about it.

C: Do you think that there's a, I'm bringing this (??)[11:56] – do you think that there's a, I want to call it, 'denial' – would you say that?

JM: Yes, I think that human beings are fascinating. And, I'd do the same thing, though. Um, because if you think about, you know, the corollary, I think, that's easy to understand, is health. You know, my dad had diabetes. Had glaucoma, um, surgery to his legs, you know, all the horrible things that diabetes can do you, and he eventually died of the ramifications of diabetes. Well, when I'm good, I remember that. When I'm on staircase at the gym, I'm remembering that, and when I'm eating …but then there are times when, you know, that candy bar, that pasta, just looks very, very good, and, because those things are long-term, you know, it's hard to remember. You know, it was very, very fresh right after he died, but, you know, the human capacity for denial is very very strong. And also, I read this very very interesting article, because I was looking up um, the kind of thing you're studying, how people deal with risk. And so, why is it we don't, um, that denial can be so strong, and it said that one of the things that we could do is that if they, if they don't have the knowledge of something, they fill it in with personal experience. And so it's "My grandmother went through the 1906 earthquake, I went through the 1986 earthquake", and, despite the fact that they didn't experience, perhaps, the ground-shaking that they could in a very severe earthquake that's nearby, to them, they supplant, you know, what should be knowledge, with experience. And they tell themselves, "I'm okay". Which I think is what we do every day when we get in a car, isn't it? We say, "I drove yesterday, and I was okay", "I drove the day before and I was okay", and therefore, "I'm going to get in the car today, and, you know". I think when people pick up that cell phone, to text, they're thinking to themselves that "Well, I texted the other day and I didn't get into an accident." So, you know, being human, I think, we all have the incredible ability to deny risk.

C: This is very interesting.

JM: When I spoke, when we were passing the bond measure, to do the schools, I went to a number of groups, and I spoke. And there's one group, and these are predominantly college-educated, I wouldn't say affluent, but you know, economically not dis-advantaged, let's say, okay? But educated people, and there were people who were listening to what I was saying, and they were processing it, and there were people who were listening to what I was saying, and they were saying "um, I need to know more about it", and then there were people who were just saying, flat out, “Look, we don’t have the money to make all the buildings safe, so, why bother? When I’m on the Bay Bridge, I’m at risk, when I’m in a masonry restaurant I’m at risk.” And I was just flabbergasted that people wouldn’t think that the appropriate thing to do would be triage, you know. You do the schools first, you do the hospitals, the police stations. Make sure your children are safe, make sure older people, make sure incapacitate people – to me, that’s just, that’s what you do. And then you start to pick away at, you know, the most serious buildings, and you work towards a solution. But there were people who were willing to just say “Ehh”.

C: Yes, it’s very interesting. Do you think that they were kind of overwhelmed by the risk?

JM: I think they can be.

C: Yes, um

JM: Yes, it can be, yeah.

C: “If I’m not alive tomorrow, I don’t know”

JM: Exactly. Because you could think about it, you could get up in the morning, and you’re dentist has told you that if you don’t floss you’re going to lose your teeth, and you’re old obstetrician has told you that if you don’t do this, you’re going health is going to go to hell, and, you know, your internist said that, you know, if you don’t lower your cholesterol you’re going to have a heart attack (laughs), and then you’re worried about your kids, yeah. And, then I’m supposed to worry about my house, something bolted. It’s just kind of bom, bom, bom. So, absolutely, I think it’s overwhelming sometimes.

C: And, as you said, I mean, from the other people, the timing is very important. [16:13] A risk now…

JM: Yes, absolutely. It’s long-term. High-consequence, low-probability. Yeah. High-consequence, low-probability, is a very difficult thing to get people involved in. You know, I, my children went to the Oakland schools for, well my son went for one year – we lived in Oakland. And I just, I’m a person who likes to volunteer, and so I was on their um, emergency preparedness committee, and we had the emergency preparedness director for the Oakland schools, come to a meeting, and he looked us in the eye, and he said “In the Oakland school district, I am dealing with children who need to learn to get under their desk, when gunfire is happening around them, how to walk to school around drug-dealers.” He said “So, when you come to me with, you know, earthquakes,” he says, “you have to understand that it’s always going to be a low priority, because we have issues that we’re dealing with, that are, you know, not low-probability. They’re high-probability, high-consequence events.” And you kind of think “Okay..”..

C: Yeah.[17:18]

JM: Yup.

C: Yeah. Um, I mean, what is your definition of change?

JM: I'm sorry, what has changed?

C: Your definition of risk and disaster have changed, through time, experience..

JM: Oh, very definitely. I mean, I think, um, you know you are the mother of two, twenty-something-year-old boys. (laughs) So, to have been raised in a household of girls, and then have two sons, and a husband who is every bit the risk-taker his sons were, I mean, just that personal experience, of human beings, and risk takers, was an eye-opener for me. You know, they're so much more apt to take…personal risks, so, and then, I think, even though I'm a woman, and I'm not a real risk-taker, I would say, just, you know, in age, of course, you see yourself change. Um, we were talking about that just the other day – when you're a skier, when you're in your twenties, you know, you get up there, when, at 8, and you ski till 4, and you ski through lunch, and you just don't think about getting hurt. Well, when you're in your fifties, and you think, if I broke my leg and I had to be off my foot for 3 weeks, it would make work very difficult. You know, and so, that perception, just in terms of your responsibility in life, changes. And in terms of earthquakes, …um, I think, as I've matured as an engineer, my pict – the picture becomes bigger? You know, when you start out, you're just doing calculations on one little piece, and then you, you're, then you're looking at the big picture. And the big picture, for me, includes not just, let's say, the one building I'm working on, or my own home, but it includes the community, and the state. So, very definitely, my perspective has changed.

C: If you see me smiling when you're talking, it's just because a lot of things you say remind me of a personal experience.

JM: Yes?

C: It's not like I'm smiling, oh hohum, you know (laughs)

JM: Not a problem.

C: Um, okay, now we're going to talk a little about network and stake-holder.

JM: Okay

C: So, the kind of organization that we can see, or maybe it's not so clear, you tell me, and so, could you give me a list of the people involved in risk management uh, in the area.

JM: Okay. Risk management. So, there's the public arena, so that would be, you know, federal, state, local governments all have responsibility. Um, the, every municipality has to have a general plan, and they have to have a safety element in it. And, I wish I could remember all the names of those. I was just searching through this book on the Haywood Fault, and um, it's,

C: What is it?

JM: It's for EERI, it's a, book on the Haywood Fault, and so on the earthquake. And so I did do a lot of investigation into kind of local and state planning. I haven't memorized anything, but, you know, [20:39] effectively, the State of California, the federal government and the State of California um, have laws now, about, if you want to receive, if you're an agency, and you want to receive post-disaster funding, assistance, you need to have a disaster plan, to begin with. And so there's lots of agencies that kind of manage that. Um,

C: When you say "Agency", is there?

JM: The California Office of Emergency Services, FEMA, obviously, has management duties. Since, uh, um, since the Twin Tower disaster, um, all of that comes under the heading of National Security now. So that's kind of the public level. Um, and then, my experience has been, is that there are organizations like the University of California, California State Universities, community colleges, large companies that have lots of buildings, typically have um, what are they called, not maintenance, but facilities managers, who um, typically are responsible for risk management for their facilities. And it will include a lot of things, from hazardous materials, to you know, safety of the workers and guests, and then, earthquakes. And then, of course, you get down to the personal level, and you know, parents, parents are risk managers.

I'll tell you something that's very interesting. In being involved in the schools, I did, for free, I did an evaluation of all of the schools, and I said, "These are the ones that you need to retro-fit, and these are the ones that you need to study further, and these are the ones that are okay." And then we got, we passed a bond measure and then we got all these professionals involved, and, one of the buildings that we said, you know, really, should be torn down, was at an elementary school, and one was at a high school. The parents at the elementary school were very, very insistent that we move the children out and put them into portables, whereas, the children, the parents of the high school students, were not as insistent. They were more willing to take risks with teenage children, than they were with young children. I thought that was very interesting, that your perspective – and as one mother put it, she said "The first day you hand your teenage child the keys to the car," she says, "all the risk changes." You know really have, you're transferring some of that parental responsibility onto the child. And I thought that was very interesting, you know. And right, obviously, it has to be that way. You can imagine, you know, when you've got the baby that you don't leave out of your site, and now I've got twenty-year-olds, that I check in with, you know, every so often. It changes dramatically, as a parent. And then, as an individual, um, like every individual, and there are some who do better than others. There are some who get into a car after a few drinks of alcohol, and others who would never do that. Um, I'm afraid of heights, so I tend to be a little conservative where other people are not (laughs), you know? Like, my husband is like a billy goat, he'd go up on the roof and do something, and, you know, man, before I'd go up on the roof I'd make sure that the ladder is really safe, because as an individual, the variety of um, management, is pretty, it changes dramatically.

C: And, what, I mean, would you be [24:36], would you, it's a difficult question, but um, would you be able to see the relation between the (??) that you took? So all this,

JM: The relationship?

C: Yeah, how do they deal or don't deal with each other, what is the nature of the

JM: Well, that's interesting, because, um, in the State of California, for financial reasons, um, all the people who are, well, it is an interesting dynamic, in that some stuff goes up, and some stuff goes down, right? So, um, a disaster happens. Let's say, the 1971 uh, San Fernando earthquake. The State of California realizes that hospitals are, are facilities that really should be standing up after an earthquake. And so, they um, transferred the design of hospitals to an agency called OSHPAD, OSHPD, Office of State, ha, this is, Office of State Planning and Health, something, you're going to have to do the leg-work, because I can't, I'm horrible at that kind of – okay, so, every hospital that's designed has to go through a plan-check and a design-check by OSHPD. That's 1971. Um, so all new hospitals, you know, are doing pretty well. But we still have this huge um, inventory of hospitals that were designed before then. So, finally, 1989 happens, and that's the Loma Prieta earthquake, and once again, people are thinking, okay, our hospitals are still vulnerable, and so they started to – this is just the State of California – um, started to create a um, a group that looked into a Senate bill, and then they eventually passed SB1953, and came up with deadlines for when you need to evaluate your hospital, when you need to have it 'life-safe', and when you need to have it meet full code. And there was 20-some odd years in that, but, it was 20-some odd years after the 1971 earthquake. So, if you look at, from start-to-finish, that's a 50-year process, almost. Or, you know, at least 40 years – no, 50 years. Um, so it's huge. But that came from the top down. And the reason that it takes so long is that it's outrageously expensive, it's billions of dollars. Um, and then, you know, you look at the bolting of houses, okay? If you build a new house, your house absolutely has to be bolted to the foundation, and it has to meet the code. But if you look at this beautiful community here, there are hundreds of houses in this community that are not bolted to their foundations, because they weren't required to be bolted when they, um, were built? They weren't required to be bolted when the person sold it? Um, they never change occupancy, it's always going to be a house, it's always going to be a residence, and so there's no law. And so, unless the owner is somehow made aware of the risk, and the owner buys into that risk, and recognizes that for, actually, for a very little amount of money, they could mediate their risk, that house remains un-bolted. So, if, you know, we say that's triage, where we attack the hospitals, lots of work on police stations and fire stations, um, some work on schools, not as much as should be done, and then there are whole other categories of buildings that remain vulnerable to earthquakes, and they're all voluntary – it has to be, you know, some cities, like Berkeley, had an, um, a cost-reduction, when you bought a house. You had the transfer tax, you know, when you bought the house? It was reduced if you made sure that the house was bolted to the foundation. So, there's some cities that have, you know, made inroads, but um, it varies dramatically. And when it goes bottom-up, rather than top-down, it is due to um, usually it's, there's and event, like the North Ridge earthquake, or the Loma-Prieta earthquake, um, we get some help, sometimes, from international earthquakes, but not as much, because people are very good at saying "Oh, that was there." "Haiti, you know, terrible construction. China, terrible construction." You know, it's easy for people to do that. But when it's here in California and it's, you know, our buildings, we get a little bit of help. And then, the structural engineering community, and some public policy people who are 'aware', kind of push it back up again, and then we get laws, but um, there's a lot that just doesn't happen because there's just not a lot of money. For example, here in the Bay Area, we have a soft-story, well, in California, soft-story is a big issue.

C: What exactly is 'soft-story'?

JM: Okay.

C: Because I've heard about that a lot.

JM: Yes, no, it's very easy. A soft story is, I'm trying to find a picture, I can even send you one, is, a typical apartment complex, right? Where it's 3-stories, and you pull up to your apartment complex, and you drive right underneath it, and you park your car. And that whole front area is open, because everybody can park their cars. But then there's two stories of apartments above. Well, by not having any wall, or frame, in that front part where you drive in? That's the soft wall, and so, in an earthquake, you have all this mass on top, with these two-stories of apartments, and you don't have a really good system down below to resist the earthquake forces, and, you know, you can, in those cases you can get very serious damage, and sometimes collapse.

C: Um. Okay, what you call the pancake-effect, or something?

JM: Yes. Well, the two stories on top come down, and, you know, and there's some really dramatic pictures from North Ridge, and you can just see the cars sticking out on the bottom, because, of course there was this parking. There was an unfortunate um, soft-story building in North Ridge, that had actually, some living spaces on the first floor, and so some people were killed, because it came down – it didn't just squish cars, it squished, you know, someone's apartment. So those are pretty serious issues, and um, there's no State requirement, that you evaluate or retro-fit, but most of the cities have gone as far as doing inventories, where they've gone around and they at least have a sense of which buildings are dangerous.

And many of them have done that with volunteers from the Structural Engineers Association, SEA, and from EEI, and so lots of voluntary effort, on their part. And, there's, Fremont is one of the few cities that has an ordinance, requiring people who have soft-story residential buildings, to retro-fit them. Berkeley has a voluntary ordinance. Now, Alameda has just put together a voluntary ordinance. Jie Kwan and Sue Piper are trying to get an Oakland ordinance going. They're very hesitant to do it, a mandatory, because it's um, it's unfunded, you know. Especially in this economy, to ask a building owner to do something that's very expensive would be very unpopular. Um, but little by little, it's kind of seeping in. And San Francisco is trying to put together – they would like to do a mandatory, because they have a very serious issue over there. And if you combine that soft-story building with um, the soft-soil? You get the kind of damage that you saw, over there in the Marina district, during the earthquake, yeah.

C: So, the, um, the link between people who make policy [32:45]

JM: Right.

C: Is what you want to think about.

JM: Yes, right, and it's very tenuous. Because, there's a woman in San Landro, she's a state senator, Ellen Corbitt, she's always been a proponent of earthquake measures, but she's only useful to us as long as she's in office. And so, while she's in office, she pushes for something that's expensive for her constituents, you know, like, a soft-story ordinance or something, they could throw her out of office, and then we lose her. And so, it's a very tenuous relationship, and, um, obviously, we get a different governor every 4 or every 8 years, we get different mayors every 4 to 8 years, so, in terms of elected politicians, you know, you develop a relationship, and you try to hold onto that, but you have to be careful not to push them so hard, because they need to be able to do things that are um, they need to be able to stay in office, in order to help you. It's a very interesting relationship. And then, the government, you might make inroads, and then all of a sudden, the gulf oil spill, or um, you know, the 911? Well, you know, when the government has to deal with something like that, it's like, they can pull resources from other things. So they may pull resources from earthquakes. So, I wouldn't say it's a consistent support system. It can change dramatically. We have a really great law in California -- it's called the Field Act, that requires schools to be constructed to a higher standard. And, just recently, there was a state senator who was going to repeal the Field Act, and take it out of hands of the state and give it back to the cities, and he, finally, he withdrew the bill, but, um, you know, he just said that it was too expensive. And so the other thing, you know, with the economy. With a great economy, you can get a lot more support for things. Right now, it's very difficult to ask anybody to do anything. (laughs) So, um, I do know, I would say, within the last, I would say, at least the 80's, 90's, and the, that the professional organizations understand that they need to stay in touch with public policy makers, and they need to lobby. And to keep, you know, the information flowing.

C: And did this relationship between um, the organizations and the persons making [35:35] (??), how has it evolved? Since, 20 or 30 years?

JM: Yes, I would say that it it's um, once again, I would say that the '71 earthquake was a big marker. You know, I got out of college in '78, so I wasn't kind of 'there' for that experience, but my understanding is that um, they would certainly have been involved before then? But that was a huge turning point. Because that was a good-sized earthquake, it was in the San Fernando Valley, high population center. The 1906 earthquake relieved stresses up here in the north, northern part of the state, and so we've had kind of a quiet zone? But we've had some earthquakes in Los Angeles that have kind of reminded people of what needs to happen. I will tell you, that the other thing that I think is very important, is that structural engineers, and I'm going to critic California – I hope I'm not slighting someone, but I believe that it was started in California – a system called performance-based engineering, have you heard of that?

C: Yes, but um

JM: Well, I mean, essentially, what it is, is an attempt to come up with a vocabulary for professionals, that translates to damage. If I tell you that I'm going to design your, you want me to design your building, and I'm going to design it to code. Well, you can have a sense, you might have, in your mind what 'code' means, and I'll have in my mind what 'code' means, but 'code' doesn't necessarily mean that there's no damage. Um, the reality is that most of our codes, our new codes, will design a building that's designed to provide life-safety, but may have so much damage that it's a financial loss. But, if I come to you, and I say "We want, I want to talk about your building, and I want to talk about what you want it to look like after a pretty-good earthquake that's nearby". And I'll say "I'll assume that you don't want it to collapse. If it's a barn-building, maybe we could say, okay, "Near collapse". You know, because there's no people in it during the day. If it's a, you know you're designing a school or a hospital or a police station, then you're talking about, you know. Well, actually, let me go back. If it's a nuclear facility, and we're designing it, we don't want ANY damage. (laughs) None, zip. You know, essentially, you build a bunker. Um, and then you, a kind of step down from that, is a hospital, where you want the lights to flicker, the generators to kick in, everybody to kind of go "Was that an earthquake?", and then keep working. You want the police stations, the police and fire stations so that they can do their job. They may have some minor damage, but they can do their job. Um, schools, you want children to absolutely be safe. But once again, you may have damage that needs to be repaired. And then you have the personal homes and personal buildings, you know, there's a lot of discussion about what somebody would expect from an earthquake, and there's a, you know, correlating cost. So that was the attempt of performance-based engineering, was to come up with a discussion that was not "Oh, you're building an H.25G", or, you know, because that stuff is worthless, to the public – worthless. And, um, that was, I think, a huge direction. And, I'll tell you, it's not something that's easy for engineers to do, because engineers like to say "Oh, you have the design spectrum, and it meets H.25G" and, you know (laughs). Or they might want to say "It meets code." And that's all they want to say. Um, but it was a very bold move to introduce a vocabulary where we could talk to non-engineers, and talk about what we want, in our community, what kind of resiliency we want, in our community, after an earthquake.

C: And um

JM: That started in the 80's.

C: And, who started it?

JM: I think, the Structural Engineers Association of California, is my recollection.

C: And, how do you work with other scientific people, I mean, with meteorological people, seismic people?

JM: You mean the really, the

C: Because you have the same kind of, need of translation and

JM: Well, you know, there are a lot of organizations um, here at UC Berkeley, there's one at SUNY Buffalo, um, lots of earthquake research groups, and um, I think they're extremely careful now, to make sure that they hire, not only brilliant engineers, but good communicators, because it's so important. I think the medical profession figured that out a long time ago. They call it 'bedside manner'. Well, essentially, it's our bedside manner. It's how we communicate issues. I know they're not health issues, they're structural issues, to the patient. And, in this case, the patient is not the building, the patient is the owner, the occupant.

C: Very interesting. Do you think that this collaboration, all this interaction could be improved?

JM: Yes. I think, and I base this on the fact that my son, David, just graduated from college, 2 years ago, in engineering. And so, he had a chance to do, you know, our engineering program, in the 70's, and, you know, I was an employer, when I was at DAYCO (Day-Colman?) [41:34], and so I certainly saw what people were coming out of school with. And then, I had a chance to see David's education. And, I was very impressed with the University of Colorado, Boulder's engineering program, because, I think they stressed two very important things. They stressed teamwork, and they stressed communication skills. And, I've seen times, in engineering programs, where, you know, they were not paying attention to those things. And um, part of it is – did you major in engineering?

C: No

JM: You go through four years of engineering. My son Ryan, when he went to school, he went for communications. So, every semester, he's figuring out what he's going to take. Well, David knew what he was going to take every year, because you always take a computer class, an engineering class, a math class, and a science class, every semester. And you can imagine, when it's all filled up, for four years, there's not a lot of room, and so, they try and make sure that, in that engineering curriculum now, are classes that are on, at least, the human skills. I mean, there isn't an engineer, there are very few engineers, they're out there, they're the guy that worked for that company for forty years, and he just sits at his desk and he does calculations. But, most of the time, I mean, the first thing you learn when you get to be in an engineering office, is, if you want to make it, be successful, you have to learn how to manage people, and how to manage projects. And to do that, you need communication and teamwork skills. And those, they'll be on the office walls, as well. Um, to be a good manager, is not just managing the people, but to be able to go out and deal with the owner, the architect, the um, the team, and the agencies that regulate, you know, the design of construction, and, so this skill is really, really important. And I think that, I think there's still engineering programs that don't get it.

C: Um, that's interesting, because they, Colorado also has a very strong program in risk

JM: Yes, they do. They do. We were really pleased with that school for our son. It was fantastic for him. And they had an outstanding relationship with industry, as well. Which was fantastic when he went to look for a job, and, you know, it was funny, when he was a freshman, you think, freshman year, do I think, why am I majoring in this? Do I really want to do this? And every week, he had a seminar, it was only one unit, but every week, a professional would come, from outside, and talk about what they did for a living. And it was kind of like, where he just got recharged and energized again, and like "Okay, that's cool". Somebody from NASA came in, and somebody from, you know.

C: That's really what I want to do, yes.

JM: Yes, so that was really very well done, yes.

C: And so the education, in the way you understand, has really changed a lot.

JM: I think so, I think so. Yeah. I think that, um, you know, at the same time, when I started out, I also realized that there were a lot of engineers who, who didn't know how to be businessmen. You know, they were all men at the time. And so, it was the same problem, is, they kind of sat behind a desk and wait for someone to come along and ask them, and then, like many industries, all of a sudden you found yourself having to compete. And so, engineering firms are hiring, you know, marketing directors, which is huge, it was new. You know, and a lot of them didn't like it, they thought it was, I don't know, it kind of belittled them or something. I don't know, I think it's funny, that um, sales, sometimes people think that salesmen are something less than human? But the reality is that all of us, you know, I mean, you're not successful unless you're somehow selling your service, your product, or you know?

C: That's the, always a difficult interaction, between the technique and the sales thing. [45:47]

JM: Well, when I think about it, one of the things that I've learned to do, is to talk about money. You know, and for a lot of people, um, now that I work for myself, it's me, who sends out a proposal and says "Look, my services are worth $5,000 dollars" and I have to be able to say that, and I have to say "Well, that wasn't in the proposal, and now you've asked me to do it, and it's going to cost me money", and, that's another thing. People think that talking about money is sort of 'cheap', but the reality is, that's all, that's what we do! (laughs) That is what makes you a professional, is that you're being paid for your services. And um, you know, there were a lot of engineers who were not good with that, either. And, frankly, I think that, you know, that they've allowed themselves to be, to remain underpaid. If you design a new building, typically, a structural engineer will get about 1 to 1 ½ percent, of the construction cost of the building. If then, within a year, they sell that building, the realtor will get 3% of the VALUE of the building. And you tell an engineer that, and then "Well, you know". It's just insane, it's just insane. But, they're not good salesmen.

C: Yes, but, the question is, why um, why is it so difficult for salesmen and technicians to get together?

JM: Well, I think that there's a certain type of personality that goes into engineering, yeah. I mean, it's a little bit like, you know, you take a brilliant uh, athlete, and you tell him, look, you need to know something about business. And they'd say "Why?", and you'd say, "Well, you're going to make a lot of money, and somebody is going to take you for all your worth. And so, you need to know about business, so that you can manage your own affairs." And it's the same with an engineer, you know. "Okay, you're a great engineer, you're very technical, you're brilliant, but if you don't know about these other skills, you will not be successful." And then, it kind of applies to, you know, if you can't interact with your immediate community, you know, how, then, are we going to take our message, our very important message, to the broader community. Which is, you know, how are we going to explain earthquake risk, and explain earthquake risk mediation. It's, and, unfortunately, there are, in fact, people in the profession who, who do it well, and they tend to find their niche, and they run for the president of the organization, and they – thank God for them, because you have to have somebody out there who's uh, who can speak fluently, about earthquakes.

C: Yes, it's very interesting, yes, for a different reason, but also a technical person in a world of sales, it's a funny (??) kind of talk the same language [48:38] (laughs) and I think it's a really something, in terms of what I do, it's something very interesting to try to dig out for, why, and I can see that's happened everywhere, all the time, but

JM: Well, you know, my oldest son, is an artist, and he works for an ad-agency, so this is very interesting. Because, he, apparently, there's a man at work that's having some trouble getting along, and he happens to be a manager, and so the company hired one of those, I don't know what they are, mediators, not really a mediator, but somebody to come in and do a seminar on getting along with people. And they had these four cards, and they had graphics on the front and they had words on the back. And they described, it's very much like a Myers-Brigg's test? Where it describes a personality type? And they had four of them. And they were, you know, green, blue, orange and yellow. And you, my son said, put them in order, with the pictures of the one that describes you the best, and then you flip them over and you read the words, and then you kind of refine it, and then you go, this is the one that defines me, and then there some other words, and then you kind of zone in and go "Okay, well this is the one that's, this is the one that's most like my personality." And, you know, it's um, not every person just one of them. You may be, like 75% this, and 10% this, you know? How we have? And, he said, when he did the four of us, he did my husband, he did me, he did himself and he did his brother, we're all different. And Robin and David and I are all engineers, and Ryan is an archi, an artist. Well, Ryan was the orange – he was the risk-taker, and the, you know, 'out there' personality, you know, everything is big, and moving constantly. And our David, who was the, he was the engineer, you know. And when you look at their personalities, that was the way it was. When Ryan was a little boy, it was, any person he say, he would talk to. And, you know, if you were in the bank, waiting in a line, he would talk to everyone in the bank, and, or, if you went to get ice cream, you know, even when he was you know, little. And David was very shy, and um, you know, you could just tell, what they were going to do. But, fortunately, you know Ryan knows, in addition to being that kind of 'out there' person, he also needs to have discipline. He has to have that (??) [51:04] out of his personality, and David understands that he can't just be an engineer who sits at his desk, he needs to be able to communicate. And so, he's actually joined a, a leadership program within his company. And so, it's kind of interesting, I mean, that's exactly what I'm talking about, is those, those strong personalities. And if you don't help people develop the full perspective of what a person should be, then you don't get the successful person that they should be. And the engineering profession has to battle that. I mean, there's no television program with engineers in it (laughs). There's Dilbert, you know the Dilbert cartoons in the paper? He's a really nerdy cartoon? I mean, if they have someone over at, there is a television show in the United States on, but they're like, nuclear scientists. And they're just weird, you know. And so here's the engineering profession, and you get some weird guy, who's going to stand up and tell you, you know, what you're supposed to do. And, it's a battle that we have to fight. I think it helps quite a bit to have women, you know, in the profession. I think that helps quite a bit, boy, because when women entered the profession, I'm telling you, these guys had to learn a whole new set of rules. (laughter) You know, the construction industry, to have women involved?

C: Were you one of the first ones? Early on?

JM: Well, very early on, yeah. Oh, I can remember, I mean, the things people said to me that, nowadays, would be illegal to say, you know. Just, so, but I think, you know, as a whole, the engineering profession very much understands, now, that, that we need to stand up and be leaders in risk mitigation. Yeah. You can't depend on the earth to shake, because it doesn't happen enough. (laughs)

C: Uh hum. So, were you, so were you, or maybe, where does the funding of your organizations come from?

JM: Okay. So, um, why don't we do EERI, Earthquake Engineering Research Institute. They get, um, membership, from their members, and they are, they're predominantly funded by FEMA, and NEES, do you know NEES? I don't know exactly what it stands for: National Earthquake Engineering something.

C: Is there a third organization?

JM: I'm not sure if there's a third organization. But, um, but, it might be like NEHRP, or something. It's like N.E.H.R.P. But essentially, they're all government agencies that were tasked with mitigating risk, yeah. And there would be similar agencies for flood, and similar agencies for um, hurricanes, in the United States. And then the Structural Engineers Association is funded only by members.

C: And, how does that influence the way you work, and what you do?

JM: Yeah. In order for EERI to continue to get government funding, they obviously have to meet the needs of the government. And um, I was trying to look that up. That's the National Hazards something…(paper moving). Um, National , no, no, no. It's the (paper moving)….okay. Disaster Mitigation Act, of the year 2000. I think that there were things before it, but it was kind of um, so the Disaster Mitigation Act was in 2000, and then, after 9/11, they combined everything into the Department of Homeland Security.

C: And then, I've seen that, in document [55:46], but I never get to um, to the idea of, what does that mean, in life..

JM: It's required, state and local communities, to have a hazard mitigation plan, in place, by November 2004. That's the one, that, to be eligible for federal pre-and post-hazard mitigation grant funds. So, um, so EERI has a board of directors that draws from the professional community, so it will have engineers, um, social scientists, you just, you kind of, it's a multi-disciplinary group. And they will look at what they want the organization to do, and they have to balance meeting the needs of group, of the members, with meeting the needs of the funders. And, um, and so, just by self-selection, typically, the, those two correlate very well. And that, when you join the organization, you are, typically, interested in what the organization is doing, so um

C: So there's no inter- (?)

JM: No, the interesting thing though, there is a pool within the organization about whether or not they should be doing multi-hazards? And um, whether or not they should do more international, you know. We have international chapters, and meet the needs of more that, you know, just earthquakes in the United

States. That’s a, there’s a group that is interested in that. But that’s really the only pool, um, most of what’s being done, I think, meets the needs of both those groups.

C: And, the fact that, did the merge between the, the Mitigation Act and the Homeland Security, did that have an effect somehow?

JM: It, you know, there were a lot of people that were very concerned that, um, earthquakes would take a back seat. And, um, and, if you think about it, we had two thousand and, was it one? Yes, 2001, we had 911, then we had, you know, I would say that, you know, that the financial situations, like 2007-2008, so that’s kind of a double-whammy, those two, because, anytime that there’s, you know, an economic crises, these kinds of things take a back seat. I think there’s going to be other people who are going to be able to answer that question for you, as to whether or not there was a real serious, um, yes, because there were people who were very, very concerned about FEMA going into homeland security. But, then Katrina happened. That was actually good for earthquakes, because FEMA got such a black eye, from Katrina, that I think um, that they had to really refocus, and refocus on disasters.

C: Because they were too focused on terrorism?

JM: Um, I think that, they just got too political. And I think that, frankly, that the FEMA director at that time, who was incompetent? I mean, I think it was just …there was a classic bureaucracy, that wasn’t ready to work, and they recognized that they couldn’t blame it on “An act of God”. This was, and it was, these things, they happen like NOW, and then everyone sort of sits around, waiting for help. Those make you look the worse. If it’s something where you can’t get to them – an avalanche, where you can’t find the bodies, or you know, I mean, there are some disasters that, that take a long time, but earthquakes and hurricanes and things like that, they happen, and then, they stop happening, and then, by God, you’d better get in there and do something about it. And they didn’t, so yeah, I think that helped earthquakes. Hurricane Katrina refocused the need for FEMA to be a competent organization. And I, you know personally, there are serious issues.

C: So, you would make a difference between um, I don’t know, certain events that happened, that did not take more

JM: Yeah,

C: stretch

JM: Yeah, yeah. I would, because I think that, um, I mean, obviously, when these things happen, they destroy infrastructure, and so it’s difficult to move, but it’s not like a winter storm, where it starts and then it goes on for two weeks. I mean, if the newscasters were able to get in, into the hurri, Katrina, into New

Orleans, to take pictures of people sitting on roofs, then, by God, rescuers could have gotten in there. And I think it's the same with earthquakes, that if you can get all the newscasters in there, right, taking pictures of buildings that are down, you should be able to get the National Guard, or somebody in there, to help people find survivors. And I think that's what people would expect, that "If it can be on my TV, then somebody could be there helping them, yeah."

C: Are you okay with the time? Okay, then we're going to talk about um, scares and politic? So, um, this question is more for people that are not involved in risk policy management, but, um, so, I'll make it two questions. The first one is, can you see the impact of the risk policy prevention in your own environment? And, do you think that other people can?

JM: Okay. I definitely can see it. Part of it was this project that I'm writing – I'm updating a book that EERI wrote in 1995? I'm updating it, it's on the Haywood Fault. And so, in research this book, I, I really had to familiarize myself with what CalTrans, and BART, and the University of California, and um, you know, some of the fire districts and police districts have done, so I, personally, am very aware of what's being done and what needs to be done. I think that in the general population, it varies dramatically. And, I think that there are, it's a spectrum, and you'd find people who think that everything is just fine, but certainly, no one would, you know, "Somebody's taking care of it", and then there are people who think, "Everybody is a corrupt idiot", and the whole place is just going to collapse. So, and there's probably a nice group in the middle that realizes that some stuff has been done. And I'm sure that it's probably a pretty good Bell curve, is what I would think.

C: And, what do you think would be visible for the population, what kind of?

JM: Oh, the bridge, certainly. Um, I think that, for example, if you are a Kaiser member, o.k., but if you were, the Kaiser Oakland is rebuilding, and I would think that they, though I'm not a Kaiser member, but I think that they've sent out a lot of information saying "Look, we're re-building because of earthquakes", and so, I think that there's these little 'flashes' that happen, and it's kind of only if they really touch you, that you notice? Um, you know, an election comes along, and they ask you for money to retro-fit BART, and you might understand. But I don't, I don't think the average person knows that the East-Bay MUD seismic program is finished? And that the BART program is not? And that, CalTrans has done most of the, I mean, not the big bridges, but most of the small bridges and most of the columns? And that now, all they have to work on is the big bridges? So, that kind of detail, that I know, because of my research and because I'm an engineer, I don't think the average person knows. But, there might be 'flashes' of people who do know.

C: And, do you think, maybe, there should be more communication about that?

JM: Well, that's what we're attempting to do. Well, this book will go on, on the EERI website.

C: But, I guess, this book, concerns more, people who are already aware..

JM: I think it, I wrote it, the intention was to write it for the non-professional, but I mean, seriously, unless somebody has a very, you know, excited interest in the Haywood Fault, nobody is going to go online and read it, unless somebody has got a report to do for high school, or something. (laughs)

C: Put (??)

JM: Yeah, yeah. Exactly

C: A special interest.

JM: Exactly. You know, I mean, we hope to get some say, out there, in the public. And, also, we're going to put together a power point presentation, so that members of the organization can take it out to the rotary clubs, and the chambers of commerces, and you know. So we hope to get a lot of information out there, but it's tough.

C: So you, you are working on this kind of product, in fact.

JM: Uh hum. I'm going to be involved in the mark – not the marketing, but in the publication, no, the advertising of the book, yeah. We do get a little help, in the Bay Area, around, it used to be in April, because it was the anniversary of the 1906? But now it's typically in October, which is the anniversary of the 1989 earthquake. So, the news kind of gets a little bit interested, then.

C: A sort of push. Do you think that a different dynamic occurred, in this area, (????), of people working together? Or not?

JM: In some cases, very well. But that's the intent, of the EERI, is to be multi-disciplinary, and to um, there aren't as many people in the social sciences, social scientists, who are involved, but we have some really dynamic, bright people from, particularly from universities, who are involved in the EERI.[1:06:45] And, um, I think, certainly within the organization, I think we work well together. There is an attempt…. I'm trying to think, I'm trying to give you an example. San Francisco has the CAPS program, which is a, the city's, which a group put together, essentially it's a group that's looking at earthquake risk for the city, and I think they, um, included economists, social scientists, so I think they recognize that it's more than just a technical problem. Um, the University of California has a really dynamic, Merrick Mario (??) [1:07:38]

C: Yeah, I met her.

JM: Yeah, who brings, you know, a perspective that's very very important. She's from the chapter that's in here, it's on housing and recovery. Yes, because, you know, it's what I always used to tell young engineers, is the building is never the client, there's always a person involved. And, you know, Mary (??) reminds us of that, because she's looking at the effect on people, the effect on housing, and recovery, and that's very, extremely important. So think, there's, there's inroads, there are organizations that are doing really well.

C: And, in general, in the political area, are there ways that they've found to work together?

JM: Um, let me think. I have an experience with um, well I have the experience of the Piedmont schools, and we try to include a variety of people on the committees. So that we understood exactly what the community needed to hear, and that was an eye-opener for me. There are times when people say, kind of, "Huh, I never would have that somebody would have thought that." Yeah? So that's very important. And, I know that Sue Piper and Jie Kwan are not technical people, and so, you know, everything that they put together is, you know, well-balanced. So I think, um, yeah, I think there's at least an attempt.

C: Yes, some people are working very hard to (??) [1:09:10]. Um, what is the (??) influence of politics in the area? Do you talk about it?

JM: Well, I think that if a person in this area runs for office, whether it's a local office or, you know, the governor of the state, if they're not aware that it's an issue, at some point they will be made aware. I mean, I'm trying to think, you know, which, Schwarzenegger has vetoed some things that I'm not too happy about, but, um, I think, you know, if you on the local level, you've got somebody, like in a little town like Piedmont. And the person is, they think, okay, "I'm going to be the mayor, and I'm going to balance the budget". Well, all of a sudden they get the general plans put on their desk, and they realize that that they have to put the general plan together. Well, part of the general plan is the safety element, and part of the safety element is earthquakes. Well, fifteen years ago, when I wrote it, I was on the committee that was looking at it, and it was just GARBAGE. They said that all the buildings that are in Piedmont are on bedrock, and so there won't be any damage. It was just ludicrous – it was just silly! And I went to the city council meeting, and I stood up, and I said "This is just ridiculous! You know, I don't know who you hired, but they didn't get it right." And they were just like "Go away." Well, I don't think you could say that now, you'd have to look, re-look at it. You'd have to get it right. I think that there are enough people looking that you have to get it right, now. And so,

C: Wait. At this time, these people were like, making this, oh

JM: In order to look at earthquakes in the city, they were going to have to spend money, and they didn't have the money, and so they didn't, you know, it was "out of sight, out of mind." Yep, yep. And I don't know that, in the Bay area, that you, at any level, that you can do that anymore. I think that there's enough understanding, that you cannot do that anymore. And it may be that a politician doesn't have earthquakes arrive on their desk until they've taken the office? I mean, there's very few that will run with any kind of a platform that includes it. Um, you know. So, essentially, they try and reflect the interest of the public, yeah. But then, you know, you'd be, somebody would be, I forgot what his name was, what was the guy that was the mayor of New Orleans, you know?

C: Yeah.

JM: Yeah, you know, I'm sure that when he ran, he realized that hurricanes were an issue, he realized that, you know, flooding was way up there, but I'm sure that that was not first and foremost in his mind, but then, all of a sudden, one day, he woke up, and he was dealing with one of the biggest disasters in the country. So, on some level, you know, they have to be aware of it. But, once again, high-consequence, low-probability!

C: Yes, I think that when I heard, it was a very strong …um, reminder for people, that you cannot just put the question aside.

JM: Yeah, yeah. Very much so, yeah. And I know that Neuscombs (??) came to our conference, and he said that he is behind the soft-story issue. And he said that he thinks we should have a mandatory ordinance, and we should have it soon. BUT, now he's running for lieutenant governor, so, whoever comes in next, you don't know.

C: You have to (cut??), I mean

JM: Yeah, yeah.

C: And it's a very long process. And what is your role here, in terms of insurance and all that?

JM: The insurance is fascinating. I used to ask, I said, "Why is it that insurance companies aren't interested in what the real building looks like?" I signed up for earthquake insurance, about ten years ago. And, it, you know, this part of our house is really vulnerable – it's all glass! And I know that, and anybody who'd walk in here who's an engineer would know that, and they never sent anybody out, and they gave me the insurance! And we're, you know, really close to the fault, and I kind of laughed about it. Um, and someone explained to me, that the way insurance works, is, that essentially, you just need to get a really big pot of money, and it needs to be well-balanced. So that, you know, the risk is really high here, but it's not high here, and then, for something else, it's high here but it's no high here, and you know, that's how it works. And so, the details are not as important as the, what's it called, the actuarial, or the con, statistical stuff. And there are insurance companies that just pulled out of California after the '94 earthquake. Allstate, I think, said "Don't write any more earthquake …", because they saw the writing on the wall, and they realized. But, to this day, if you get insurance, there are many, many insurance companies may ask you on a form, I would say that, it varies. Like, there's one insurance company that will say "Is your house bolted?" And you, as an owner, could say "Yes."

C: But they wouldn't check (??)

JM: Exactly. And then, for a friend of mine, and I actually filled out and stamped a form for her that said "Yes, I've observed bolts." So that's a whole other, different company. And they actually gave her a price reduction. But they're not -- I don't think they're typical. And so, I'm kind of amazed, that, in this area, you will still find companies that are just looking at, that kind of actuarial picture, and they don't look at the details. Now, ironically, the, if you, if I get called in to look at a building? Typically, it's the building, it's by a lender,

C: I'm sorry?

JM: It's by a lender, by a bank or a

C: Oh, yeah.

JM: So, you know, there's a process of looking at buildings, and giving them a seismic rating. It's typically for the lender, and not for the insurance company. And most of that is, when the lender lends, they lend, and they, they essentially, they own that property, and so they're more interesting in the real risk. But insurance companies, um, I would say that they are not a big player right now. There is always talk about, you know, getting more involved, but…. Like, we would love to have a rating. Like, you know, you can have a 5-star restaurant? Structural engineers, there's a group of structural engineers that's saying, "Wouldn't it be great if you could say, 'Well, my house is a, you know, it's this for fire, and it's rated this for seismic, and it's rated this..'" so that somebody knew, right off the bat, that somebody had looked at that. Because then it would bring value. But, as of right now, that house across the street is probably worth 6 million dollars. And, I think that in an earthquake, that it's going to be very severely damaged. And, I don't think that if someone were to buy it, that they would even look at that. It's just amazing. I mean, that's 6 million dollars! (laughs) Oh well.

C: And have you seen the owner, you tell him that it's not safe?

JM: No. No, because it's not, it's kind of not like in the discussion. You know, the Opus-buro Act (??) means that, if you move into an area that's next to an earthquake, they have to notify you. But there is no law that says that, unless you change the occupancy of the building, that anybody has to look at the seismic. So you can have a deadly building, in downtown Oakland, that's a store, and I change it to a housing place, the city is going to make me upgrade it. But, if I keep it a store? I don't have to do anything to it.

C: So, if I lived here, if I came here, knowing nothing about renovation and code and things like that, nobody would say anything.

JM: No. And if you'd asked, the manager would know nothing about it.

C: Well, he would say it's okay.

JM: Yeah, well that's swell. I can tell you, Rob and I, my husband's an engineer, too, so we went down – have you been to Hertz Castle?

C: Oh yeah. That view

JM: Oh yeah, it's a gorgeous place. But it was built in like, the twenties, right? And I walked into it, and this person has the nerve to say, "Um, Julia Morgan was such a great architect that this building would meet current code." And we looked at her, and we go "No it wouldn't!" What kind of a comment is that? (laughs) It's just silly. But there are people who get it into their minds, you know, that this is a really strong building. Or, I don't know

C: Because it looks strong?

JM: I don't know what it is! They get, or, people will tell me "My house is on rollers", which means, that it's base-isolation. Well, I think there is only one house in the state of California that's on base-isolation. And I know it's not this person's house, and I just kind of look at them and I go "Okaay". Or, for a while there, when I was first starting my practice, um,

C: Do you mind going in the house? (??)

JM: Exactly. (C is laughing) Exactly. There's only like, three buildings in the state of California that were base-isolated. Three.

C: What is base-isolated?

JM: It's a, it's a system where you can

C: You can check and then

JM: Yeah. The move, kind of independent, the earth can move underneath them, and they don't move that much. It's a pretty good system, but, you know, it's expensive. And it's new, I mean, it came out in the eighties. And people are telling me that their building is on rollers, which means base-isolation, and I look at them, and I think, okay, there's only three in the state of California. There's a hospital in L.A., one in Fremont, and one in San Francisco. And this isn't it! So, it's like, you believe what you want to believe.

C: Well, it could also mean that people are getting the wrong info

JM: They're very definitely getting the wrong information. It's a realtor, or it's a building owner, or, yeah. And they don't know. But, if there was a system, where, you know, you'd have a kind of, certify, like LEED, you know? LEED Gold, LEED Platinum, is environmental, that there's a system, and it's, you know, papers and papers of somebody filling something out, that says that I, that the building has been built to very high standards, for environmental reasons. And they will give it a certificate, and they'll say it's LEED um, LEED Gold, LEED Platinum, LEED Silver, LEED Bronze, or something like that. Well, we were saying that we need a seismic thing that's similar. That says 'Seismic Gold, Seismic Platinum, Seismic Silver', and you know, because then you would know what somebody who knew what they were talking about, had looked at it.

C: And why do you, because of something, I was reading an article about the European Union trying to pass something like that, kind of a Red, Green light, about, um [1:19:47] about food, if this is what you'd get in your food, this

JM: Oh. Okay.

C: This food is, calorie, what it

JM: Right.

C: And, the lobby, um, doesn't want it. So, that they, they came up with a different proposal, which is

JM: Watered down?

C: Yes, lowering everything.

JM: Yes.

C: And giving the proportion in different reference, and extracts, and so.

JM: Yes.

C: And so, you see, you'd have the same kind of

JM: Yes, we would be, it would probably be building owners, and building managers that would, because there's some cost. Um, you'd have to hire someone to look at your building, and so the same people that, that don't want to fix their building, if it's a soft-story, would be the people who would be arguing against it, yeah.

C: Because, you don't have, a, how does it work, when you want to, to build a building? You need to have, to be, to follow the code, and you have someone to check that

JM: Yes

C: already,

JM: Yes, yeah. The problem is not new buildings, the problem is existing buildings. Right? And there's such, you know, this community was built up after WW2? We have buildings that are old enough to be at risk. Yeah.

C: Okay. But if you have some more time, but I don't want to take too much time with, but after two sets of questions about living in a risk area? So it's more personal?

JM: Sure.

C: And, about recovery, which would be the way

JM: Okay.

C: Um, So, what are the main risk and disaster you are facing, as a person.

JM: Right. Um, I think….clearly, we're in an area that could be at risk to a fire again, but, I think it's similar to an earthquake, that it's a low conseq – low-probability event. So, I would say, earthquake, yeah. Yeah, earthquake.

C: And you have (??) [1:21:46]

JM: Well, obviously, yeah. I'm thinking, but I think, um, you know, any health issue would be a personal disaster, so, I think a REAL disaster has to involve the community, and so I'm thinking earthquake, yeah.

C: Do you think everybody is facing the same, um, risk?

JM: No. Nope, because the stark truth is, that at the end of the day, they vary. And if you live out in Sacramento, it's less of a risk than if you live here, so no.

C: Uh hum. And did you have to face a disaster, or major event?

JM: Um, I think the only thing that came close to was that fire, yeah.

C: Um, did you feel that you were prepared enough, to such an event?

JM: Um hum hum. No. I mean, when that fire hit, essentially, if the wind had not died down, it would have just kept going. We, as a community, were not prepared for that.

C: And do you, do you have a reason for this?

JM: You know, I think it happened in the twenties, that there was a fire like that in the Oakland Hills. And, you know, just people leave their jobs, you know, human beings are fine. Um, it was a windy, hot, dry day, and 2500 houses went up, just 'poof'. And it was just, there were two different fires that day, there was kind of the, the first kind of fire, that killed 25 people? Where the people couldn't get out of the way. And then there was the rest of day, where it kind of moved slowly, but gradually. Because the wind died down. And it wasn't until the wind died down that they were able to put the perimeter around it, and stop it. And so, um, I'd say the fire departments, the police departments, um, homeowners, were absolutely not prepared. And I don't have, it's, you know, we don't have trees that hang over us, so there are some things that we can do, as a homeowner, but, in terms of defensible space, homes are so close, that, you know, it really is a community effort. So, um, it can happen again.

C: Do you think people are more prepared?

JM: I think that the fact that those 2500 houses that were, when they were re-built, they were built with more fire-resistant materials. And that the Oakland police and the, Oakland and Berkeley fire fighters have implemented ``defensible space`` programs, where they actually drive through the neighbourhood. And so I think, I think they probably have, um, communications and disaster plans that are better, so I think it`s better, yeah.

C: …Did this event change something in your life? Did you change your everyday practice in a way, to

JM: I will tell you, was it Sunday? It was windy and hot? And there isn`t a day like that that goes by, and I don`t walk outside and think about that fire. So, um, yeah, it did. It did, and I would, I really looked at my insurance, and I really did come to terms with, that you can lose everything. I have good friends who had lost everything. And so I went through that with them. And so, yeah, it did.

C: And you, I want to go just a little bit. For the end, is there anything that you can think of, in your everyday routine, that is dealing with this kind of event? Or, the fact that you live in an earthquake area?

JM: Yeah, I think that, um, I`m not really good at it, but I think about, every time that my car gets below a quarter-tank, I remind myself that if an earthquake were to happen, that there would be no gas stations. Um, I think, on a day-to-day basis I think more of earthquakes, than the fire. Because I don`t think that I engage in any risky behaviors that would cause a fire, so I didn`t have to change anything there. And um, we did change the roof on our house, to a more fire-resistant, so, you know, but the earthquakes, I think, are every day. And that`s probably mostly because of what I do for a living.

C: Yes, for people working in the risk field, it`s

JM: Yeah. Well, you can imagine if you were a physician who dealt with um, heart attacks all the time – it would be hard to go into a McDonald`s and watch people eating French fries, you know? Right? Whereas the rest of us are just

C: Yeah, it`s true.

JM: Yeah.

C: Um, to what extent, do you think, this situation that you KNOW, of earthquake and fire, can be related to other, um experience of living through a disaster, or living in risk? Do you understand the question? I`m, I`m trying to think, can we compare the different risks? Can we compare the different disasters? What do you think?

JM: How interesting. Um, I think that, because I am an earthquake engineer, I have a better understanding, I certainly have an understanding of how this house will perform? And what my, kind of, personal life would be like. Um, if there`s another disaster, I`d think I`d know less about it, but I feel pretty that I know what this community`s going to look like after a big earthquake. You know, a fire, I wouldn`t know which way it`s going to go, a plane, obviously, you don`t know where it`s going to go down, a terrorist attack, you know, all those kinds of things have many more um, variables for me, just because I am an earthquake engineer.

C: So, you wouldn`t compare um, a terrorist attack and an earthquake, in terms of what effect

JM: Effect?

C: effect on the population.

JM: Well, I think that if a terrorist attack happened in San Francisco, and it, you know, I would imagine, that if you were to interview people in New York, they have a whole different, and in Washington, D.C., they will have a different experience. Because that day was so far from me. And I remember how horrible I felt that day. And now, trying to imagine that happening in my CITY? You know? Um, so I think that every single one of them is different. For example, if there`s an earthquake, I know that my Mom`s house will have very little damage, out along the creek, and Rob and I we could always just pick up and, shoot, we could walk to Walnut Creek if we needed to. Um, and I, you know, it`s funny, but I included in that, because I know my son, David is in Houston, and you know, you have, once you know that your kids are okay too, it`s a whole different thing. Um, now if something happened, if a disaster happened in San Francisco, it would affect me because it`s my community, right? You know, like all the disaster that happened was far from this house, but I experienced, very severely, the 1989 earthquake, because my community was damaged. And, till I knew that Ryan was okay, it would be, you know, a pretty awful experience. So, I think that, I think all of them would be different. Is that what you mean?

C: Yeah, yeah. I`m, I`m just thinking about what you`re saying, is that the, the game (??) of distance that you have with an event can make it conceivable or not. And, for you, an earthquake is very conceivable, for someone living in New York, terrorism is very conceivable.

JM: Yeah.

C: But then, you are right, I should go to New York and conduct interviews with people, to

JM: Well, I can imagine that it`s different, yeah.

C: In which way is it REALLY different? Because, is it in the form or in the content? Do you know what I mean?

JM: I will tell you what happened is, that day, my son came home from school, and he said, because he had been over lifting weights. And he said ``Turn on the TV``, and we turned it on right as the second tower fell. And there was this incredible sense of disbelief, as a structural engineer, that here was this structure. Now, I recognize, kind of, the mechanism that makes it fall, but, as a human being, that something that big can come down. And then you wonder, because it`s not that, then, 911, that day was that day. So, you don`t know, ``Are there really 5 more planes in the air?`` Are they headed for the Carnelian, you know, the Bank of America building? You know, you don`t know how that day is going to completely finish, yeah. And so, to experience that, and then I, I translate that into now, I experienced it that way, to then know that it was in your city, that it was a block away, that it was, you know, and, if you were in New York, you`d pretty much knew somebody who had some real personal experience with it. So I have to imagine that it was a very different experience to be in New York, and to not know what more was going to happen. Yeah, than we experienced here.

C: Because, in the case of an earthquake, when an earthquake happens, you know that it`s done, or?

JM: Um,

C: Finished.

JM: Um, well, as it was happening, I knew that my home was safe. I knew I knew my children were safe, I knew my husband was safe. And, it`s interesting, because once I hear epicenter, magnitude, I can have a sense for, you know, I know that all Richmond has not fallen down. You know, whereas, you know, somebody on the other side of the country thinks that all of the Bay area had fallen down. So, I think, just being more knowledgeable about earthquakes – I tell you, whenever there`s a small one, I always think ``Is this it?`` You know? And so, certainly, as it`s happening, there`ll be a whole world of, how big is it going to be, how long is it going to last, but once I get more information, I think, simply because I know more about earthquakes, that, frankly, I just have to go to work then, and I have to start to help my community put things back together again. I will less a `victim` in an earthquake, than I will be um, part of the recovery. And you know, maybe that`s part of it too? Is, there was a horribly helpless feeling after 911. What could you do, you know? You can`t pick up and go to New York and start pulling, you know, bodies out of the wreckage, because there are none. Whereas, after an earthquake, I have the ability to put on my hard hat, put on my boots, and go out and help people. So, I think it`s a very different experience.

C: Whenever you have the capacity to do something..

JM: I think, yeah.

C: Um hum. Talking about recovery, what does it mean, to you, to recover? To reconstruct, and to recover.

JM: Yeah. Well, you know, it`s interesting, because, because I studied this so much, um, if you look at the character of the buildings that are in the fire zone up here, and, you`re not from the area, right?

C: I live in (??) [1:33:18]

JM: Because it’s so different from what was there before. I mean, before they were Mabeck, and Julie Morgan, and these incredible architects, and um, it was a very different place. And, because of the insurance settlements, a lot of the houses are a lot bigger. There’s less vegetation, of course, because the vegetation is younger, and very, there’s obviously defensible space. Um, lots of tile roofs. You know, it’s a different character. And so, one of the things that we, as earthquake professionals, try to explain to people is that after an earthquake, an earthquake has the potential to do the same thing. It has the ability to change the character of the community. And if you like the character of your community – you're not living in a slum, that, you know, you'd like it to be bull-dozed anyway, then, you want to do something to protect it. Because, there are buildings that, if they are severely damaged, they'll have to be torn down. So you lose the architectural character of that building. Um, it comes back as a modern building. It doesn't come back, necessarily, as the 1930's Art Deco, so, so that, and I should have started with, obviously, there's rescue, is what happens first. And I don't to so much rescue, because I'm not certified as a rescue person. But, I am certified to be a person who can go around and help, tag buildings, red, yellow and green. And also, I've done a lot of, what I've typically done, after earthquakes, is work for um, insurance companies. Where you go in and you help them assess damage. So that, that's kind of a long-term process. So there's right after the earthquake, where you're gathering facts, is one piece, and then, kind of, the long-term is a different piece. So you, you kind of shake yourself off, and you try to get as much information as you can, and then you want to make sure that everybody is safe, and then you, as an engineer, you know – I remember, in '89, we sent, once again, my kids went out to Walnut Creek, and Rob and I went to work, because there were a lot of people who needed us to look at their buildings. And, um, that helps quite a bit, because you're involved. But it will be, it will be sad to me, that some of the character of the place that live, will change. Because that happened in '89. Some of it was for the good, some of those ugly freeways. It's very unfortunate that people had to die, for them to come down. But, there are times when some of the beautiful buildings – there were two gorgeous churches, in Oakland, that the Catholic Church decided they couldn't afford to, to strengthen. And so they tore them down, and then they put up, you know, these ugly, modern ones, that, you know, the community is not the better for, it's the worse.

C: And for the (??) [1:36:16], what you just said, about the space, it's so important.

JM: Yes, it is. I mean, you could imagine, Paris. Paris is not in a high seismic zone, but, you know, the beautiful, 4-story area in the downtown has just this incredible character. And if you were to tell people that there's a disaster that could come it, that threatened that, you know, they would understand that immediately. But that sort of thing exists everywhere. Every community has its own character. And you know, it's like New Orleans. The Bourbon Street area, and the, some of the older homes' areas were higher up, and they weren't damaged. And some of the areas that were damaged were some of the lower, you know, they were disadvantaged areas. But to those people, it was their home, and it was their Aunt's home, and it was the corner grocery store. And I think people forget that, that it's not just bricks and mortar, it's the fabric of our lives, it's where we live.

C: And, talking about Oakland, it, and, how would you define Oakland before, and Oakland now, is?

JM: Um, well, '89, also, there was also an economic downturn, in the downtown. The downtown just looked like a deserted, horrible place. Boarded up buildings – there were boarded up buildings in downtown Oakland for 15 years. There's one building that was just disgusting, because, you know it didn't have the vibrancy to, you know, to have to want somebody to come back in, and rebuild. And people forget that too, when things are so badly damaged, it's hard for people to get that spirit up to go back in and rebuild. Um, it's like the day of the fire. Rob and I would have been perfectly happy if this house had burned down and we'd get to rebuild. Does that sound funny? But I wouldn't want to lose all my stuff. We kind of laughed about how, we've always wanted to, you know, remodel this house so much that it would have been okay, but when I think about that gorgeous home over there, and that tree and those two homes up there, I mean, the whole neighborhood, it's like, why would to live there? It's like a wasteland. And, an earthquake has the potential to do that.

C: What is the time-scale, that seems to you, reasonable to set up to deal with risk and disaster?

JM: Hmm. It would be a long-term, for the rest of our lives. Because, here's one thing, is, we, the engineering profession and public policy starts with life safety. So we're trying to mitigate all the serious life-safety issues. I'd love to say that, in 50 years we really did feel that the majority of buildings, majority, would afford life-safety. But, then the other question is, you've got the economy of the area, you've got the character of the area. If I tell you that no one is going to die or be seriously hurt, or very few, but once again, there'll be so much damage that you'll still have to tear down buildings. So, it's kind of like, it's that, you know what triage is, well, obviously, you're French, you know what triage means. And we usually hear it in health care. The nurse comes out and she says "Okay, you have a heart attack, you can't breathe, you've got a broken leg. Well, we'll do the 'you can't breathe' first, and then we do the heart attack, and then we do the broken leg." And it's the same way. We look at what's going to kill somebody, let's fix that. What do we want to have open for hospital and police and fire, let's fix that. And, little by little, the circle goes out, until, hopefully, you get your arms around the whole problem. Well, now we've fixed 'nobody is going to be killed or hurt', but this is still going to be so badly damaged, we'll have to tear that down. And, you know, my sense is that the time-frame to not only get life-safety taken care of, but to really make a community that can bounce back, is a very long term. And it won't happen before, I think, the Haywood Fault let's loose, so. But we're still working at it.

C: That's interesting, to know that you're working on a 50-year time

JM: Yes, exactly, exactly.

C: It's a little bit different.

JM: Yeah, but I mean, it's like a career, it's a career. Yep, I won't, it's like the person who tries to cure cancer. Will it happen in their lifetime? Probably not. Maybe they'll develop a drug that, that alleviates one type of cancer, or that makes like better for that group, but I think that it's a very long-term project – because it's so costly.

C: Is you husband doing the same thing that you do?

JM: My husband used to be a design engineer. Now he works for a company that creates the software that engineers use. So his business is a little different.

C: But he's still involved with

JM: Yes, yes.

C: Okay. You have already talked a little bit about it, but what is the role of memory, in this question of risk and (??) [1:41:35]

JM: Yes, it's very important. It's kind of like, we think we have our own memories, but a lot of our memories are, sort of collective memories, right? Because you have your grandmother's memories, and your mother's memories. Um, it, with earthquakes, as I said, there haven't been that many here, but I have had the privilege of doing post-earthquake evaluations, so my collective memory includes my relationship with the people that I met in North Ridge, and in Big Bear, and you know. And I remember what they say, I remember them talking about waking up – because North Ridge happened in the dark. And you wake up, and all your furniture that you thought was there, there and there, is now all over, and the television, you didn't know, is right in front of your door. So, there was this elderly man who was blocked in his bedroom, because he couldn't get out. And, um, so it's very important, because it's part of your, it's, yeah, I think that it's very important.

C: So there's a kind of oral history of

JM: Yes! Yes. And I remember the pictures that people would show me of what their living room looked like, after the earthquake. You know, people who would show me, describe to me what their kitchens looked like. You know, every cupboard opens up, you know, and you've got the pickles and the mustard, every dish, you know, you've got your grandmother's dishes, your mom's dishes, your wedding gifts all over the floor, and you walk in there and you have to pick all of that up and start over again? I'll tell you, the people who do better? People with young children. Because you can't go "Mommy is going to be really sad for ten days." Your child goes, "What's for breakfast?" And you say, "Okay". That was my experience, after the fire. Because people who had children were much, much better prepared, because they had to be. And they had to find a place for their kids to live, they -- and I knew people who weren't, who didn't have children, who moved in with like a cousin, and wallowed around for a while. But, my friends with children, they rented a house, they talked to their insurance company, they talked to an architect. They had to keep going, they had to find out where school was going to be held. I think it's really interesting.

C: You are probably in a different kind of set up, and

JM: Very different, yeah. It was very interesting.

C: Well, thank you.

JM: It was wonderful to talk to you. I didn't get much of a chance to hear about you, though.

C: (laughs) It was great to talk to you too,….(continues)

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