POLITICS OF MEASUREMENT

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WHAT IS IN THE AIR? OR HOW WE GET TO KNOW WHAT WE KNOW ABOUT INVISIBLE THINGS

The Tōhoku earthquake and the subsequent nuclear explosion that happened on 11 March 2011, constituted a disruptive experience for many people in Japan and elsewhere. Since the Tōhoku disaster, a lot of questions have been raised in writing and thought, attempting to grasp what happened that day and what the event's social, environmental and political implications might be. There have been dozens of symposiums, regularly held seminars, many books published and movies made, all attempting to make sense of and deal with the natural disaster and/or the nuclear accident. These varied responses and mediums address the human consequences or political inconsequence at hand, and often the intertwining of the two. Four years after the disaster, however, it is clear that what happened was not a single disruption that left behind traces, but is rather a continuous disruptive experience that is saturated with measurements and experiments of diverse kinds of effects, and has resulted, as we shall see, in a form of "calibrated sensitivity" (Dettelbach 1999: 503): a sense of feeling and knowing strongly connected to the peculiarities of radionuclides (those entities that one can't see or touch or hear) as well as to the peculiarities of the land, time and place where radionuclides express themselves.

Being an anthropologist of science, I started a project on the measurement of air following the disaster, aimed at scrutinising how people learn about their new environmental situation as a consequence of what happened when the earthquake, the tsunami, and then the nuclear explosion occurred. To discuss this particular aspect, I met with groups of governmental experts, citizen association members as well as farmers who have been working on producing reliable numbers – and beyond, reliable knowledge – on the basis of where to undertake actions in their lives.

Because the event and its impact is still happening, and continuously since March 2011, people in the Fukushima area have had to learn *to live with* a new state of their surroundings.

In order to comprehend what happened, I felt the need to move myself away from what was addressed in the most direct manner by the disaster. Contrary to a feeling of urgency and irrevocability that often goes with analysing disasters, I decided instead to follow the invitation of the philosophers Philippe Pignarre and Isabelle Stengers or the sociologist Bruno Latour and to *slow down* the speed of thought: "This is precisely because it is urgent – or critical or dramatic – that we should take our time and think slowly." In what follows, I will therefore try *to think with* (instead of thinking *about*) what happened, through analysing the measurements occurring in the Tōhoku environment as well as various historical moments when the measurements of air acquired significant and explicit political dimensions.

Life with Measures

What environment have people lived *in* since March 2011? At first glance, it is obvious that life after the Tōhoku disaster is overwhelmed with measurements and numbers of all sorts: reports and balance, graduations, mapping, monitoring… These are all very diverse kinds of measuring and numbering operations that fix thresholds, establish scales and standards in order to evaluate the danger of a given situation (Houdart et al. 2015). Each of them comes with its own genealogy, its own history, in which ways to act or react are inscribed. Right after the disaster, maps produced by governmental offices organised a set of perimeters around the Fukushima Daiichi nuclear power plant consisting of round circles of twenty kilometres (a "No-go Zone", a "Difficult Return Zone", a "Preparation for Return Zone"…) that was based on maps designed after the Second World War bombing of Hiroshima and Nagasaki. Only days later, new maps that showed the dissemination of radionuclides as leopard skin motifs were published. Evacuations went on, one village but not the neighbouring one, or just one part of a village and not the other, according to the amount of contamination. Strict distance from the nuclear plant ceased to be relevant.

Minami-sôma, Ôdaka district, less than two kilometres from the forbidden zone, and in the so-called "Preparation for Return Zone": here people are allowed to come for the day to take care of their belongings (their house, their garden, their fields, their animals) but can not stay at night. The zoning therefore designates what mathematicians would call a *discrete* life, organised along discontinuous states, which are not connected with each other. From the point of view of any observer, this form of only day-time visitation or residence doesn't really populate the environment anymore. The village looks like a ghost town: shops closed, roads deserted. Most of the fields and rice paddies are not cultivated anymore. Mister Nemoto, a farmer, and his wife, come almost every day from faraway temporary accommodations to look after their fields and their belongings. But their presence is not enough to get a sense of how life before was, despite all their efforts; the house without heating system is cold, humid, and use is now restricted to the main room.

Minami-sôma, Ôdaka district (photograph by the author, Autumn 2012)

Here and there, at street corners, the government has installed measurement devices that ostensibly show the amount of radioactivity in the air. The obvious bulkiness and stationary nature of the device contrasts with the lightness and portable nature of the measuring device used by most of the inhabitants of the Fukushima area, a simple pocket Geiger counter:

Minami-sôma, Ôdaka district (photograph by the author, Autumn 2012)

Fundamental discrepancies exist within an operation that basically consists of *knowing by measuring*, as exemplified by the two devices mentioned. As in other pollution cases, these discrepancies can be summarised in two general models. The first model, related to the first picture, gives priority to few but reliable devices. This is the basic position of the expert. It can be formulated this way:

Low Frequency / High Fidelity => the Expert

On the contrary, the second model gives priority to more devices – the most that people acting as a collective can get – even though these devices are said to be less reliable. The formula would then be:

High Frequency / Low Fidelity => Citizens

In the first model, the expert speaks with the authority inherent in his/her position, and this authority is reinforced by the *device of precision* (Wise 1994), which he/she can afford and is the only one to know how it works. As Isabelle Stengers abundantly argues, according to the model of the expert, measurement is faithful to reality, it sticks to reality, it *is* the reality itself. It enacts a truth about reality. As such, it is supposed to be disengaged from politics. Pinpointing the *measure for all things* every day, as published in local newspaper, for instance, serves to attest to a specific state of reality: that day, measures obtained through long-term studies of food products by the Prefectural Agricultural Center of Fukushima give the amount of cesium 134 and cesium 137 for fish; the day after, for vegetables or for meats or wild plants. Moreover, a long list of places and their related amount of radioactivity allow everyone to appreciate the specific *texture* of the day.

The measure of all things as a daily routine (photograph by the author, Spring 2013)

In the second model, citizens are constructed with – emerge from – the very act of nurturing a collective review of reality (Morita & Co. 2013). In the model enacted by citizens, there is no such thing as one reality: reality is as diverse as localities, and diverse over time. It requires volunteers to go into the field as often as they can to organise monitoring of water in rivers, of trees in forests, of wild plants, of airs, in order to circumscribe the movement or settling of radionuclides.

Realities along points of measure (photograph by the author, Spring 2013)

Within the schematic distinction between the experts' model and the citizens' one, which are accompanied by differences in the measuring processes, the people I met have to find their way around the sea of numbers. When I met representatives from the Citizens' Radioactivity Measuring Station (CRMS) at Fukushima City, a year after the disaster, they explain that the first months were devoted to producing alternative numbers with the explicit aim of convincing local people to move away from their homes.

It was not long before they realised, however, that the final decision could only be their own, that numbers have no coercive force and are closely intertwined with ways of life, visions of the world, and political positions. In this configuration, measurement therefore involved a political position: it is a question of *information* ("we have the right to know by ourselves as a collective force and to produce alternative numbers"), and it is a question of *choice* ("we give ourselves numbers, then each of us can *decide* for him/herself what to do").

One of the most striking features of all these operations, however, is the difficulty of obtaining knowledge – a sort of stable knowledge – through them. It is as if no knowledge about what was really going on could ever be stabilised: as if, due to this most dramatic state, there was a resistance or *recalcitrance* of numbers to give an unequivocal statement about the situation. This is especially true when considering measurements of the radioactivity, which easily contradict each other, are versatile, fluctuate, and change over time along significant scales. The simple experience that consists of walking with a Geiger counter, looking at numbers going up and down at almost every move becomes a real challenge for logic and understanding. If measurements are meant to help us objectify the reality outside, they seem inadequate to fully grasp such a sentient entity as radioactivity. And while every number is given as obvious and evident, they are basically critical and intimate numbers, intrinsically tied to the people, time and space, but also to the institutions that organise their collection. Perhaps in this field more than any other, numbers and measurements barely speak for and by themselves – they need spokespersons, translators, and morality or trustfulness of those who soon appear to be decisive (Gooday 2004). They request each person to delineate for her/himself the position she/he needs to adopt. The *values* of numbers, here, take on a specific meaning as they relate to the various ways people *charge* measurements with personal histories, political beliefs, and representations of reality and of the world.

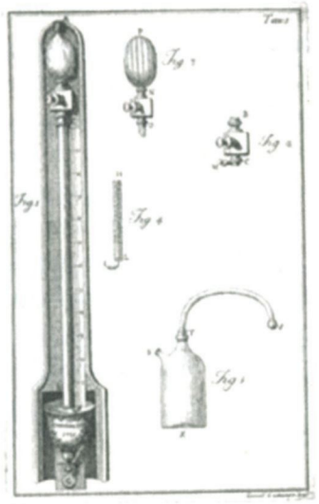
Let us, however, briefly move away from what is at stake in the disaster and take measurements differently by looking at the tools designed throughout history to grasp something that is *in the air*, to grasp something ungraspable. What is in the air? This history shows that knowledge goes from the sky as populated by objects (such as clouds) to the sky as something that gradually takes on the properties of a flux rather than an object.

Back to the 18th Century

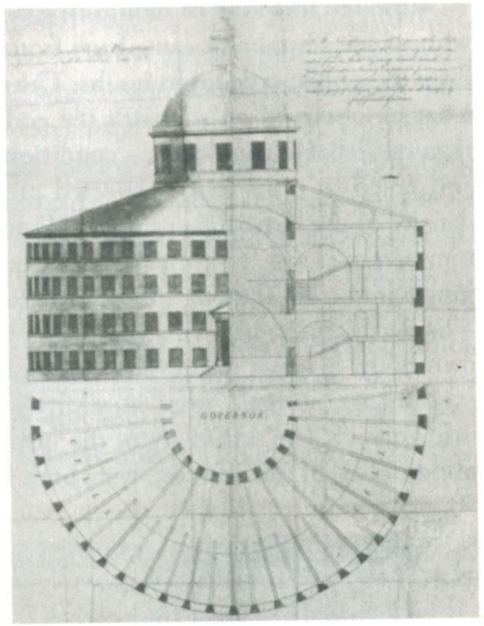
How did people measure the sky? The air? How did they comprehend what surrounded them, the atmosphere they were living in? And is this history of some help in understanding the situation that arose after the Tōhoku disaster?

Derived from the British experimental philosophy that developed starting in the mid-17th century and especially the work of Robert Boyle and his air pump, devices aimed at remedying the "infirmities" of the human senses with instruments and at seeing things that were previously invisible – such as air, sky, atmospheric phenomena – flourished here and there around the mid-18th century. As science historian Simon Schaffer explains: "Resources drawn from the early work included [...] a faith in the accumulation of *quantitative* meteorological data; and a strict attention to what seemed to be obviously mephitic sites, such as marshes, sewers and graveyards" (Schaffer 1990: 293). Until the 1770s, air purity was tested by means of the barometer, by measuring the survival time of animals enclosed in glass vessels. In 1772, the English theologian and natural philosopher, Joseph Priestley designed a test called the "nitrous air test", which could be used to measure the "goodness" and "respirability" of a sample of ordinary air. Later on, the test was transformed by Marsilio Landriani into an instrument named the eudiometer (after *Eudios*, a Greek word meaning "goodness of the air").

The purpose of the instrument was to stabilise a technology for measuring the *virtue of air*, to thus provide a quantitative basis for the management of the medical environment. According to physicists as well as social reformers of all kinds, pneumatic chemistry was able to provide "a new practice of policy recommendations for the better management of the social economy and the human body" (ibid.: 283). As Priestley puts it in the language of his time: "If it be of importance and of use to us to know the principles of the element we breathe, surely it's not of much less importance nor of much less use to comprehend the principles, and endeavour at the improvement of those laws, by which alone we breathe it in security." By means of instruments that could quantify and qualify the air people breathed, the idea naturally emerged that, "there must be processes which *restored* vitiated air and rendered it virtuous and respirable" (ibid.: 288). The best example of such a concept of air as a social controller is the well-known Panopticon, first promoted in the 1780s by the jurist Jeremy Bentham as an architectural model to administrate prisons, but also schools, factories or hospitals.



Marsilio Landriani's eudiometer (©Museo Galileo – Institute and Museum of the History of Science)



Jeremy Bentham's Panopticon

As one of the first attempts to *condition* air, the Panopticon was based on the idea that the air one breathes very much influenced the way one acts and that manipulating the first could benefit the second. Knowledge about air then organised itself along a line that linked air with management, management with security, security with social development, and eventually social development with civilisation.

A few years later, Alexander von Humboldt gave a tremendous extension to the programme set up by Priestley and Landriani, which consisted of mapping and collecting airs. In 1799, Humboldt left for South America for five years, bringing with him a whole set of precise instruments, among them the eudiometer. His aim was to review, through measurements, all that could exist on earth, from botany to geology, from zoology to meteorology: his volume, *Cosmos* (first published in 1845) was conceived as the sum of all that could be knowable – that is, measurable – on the planet. Not limiting himself to prisons and local places, he aimed at establishing and coordinating the monitoring of the variations of the atmosphere all around the globe – a "global atmospheric chemistry" (Dettelbach 1999: 480).

Although this kind of monitoring occupied much of the extant diaries with which Humboldt came back from America, it was silently removed from the public expedition results. The main reason for this withdrawal of what he observed on site with the eudiometer was that the instrument required reliable conditions – conditions that look like laboratory ones – and failed to provide the expected precision he was looking for in the density of the Amazonian jungle. "Producing a large quantity of reliable numbers over vast territories" (ibid.) would have required transforming the jungle into a lab (Latour 1995), but Humboldt had to *do with* the jungle – its peculiarities, its own atmosphere, from which he couldn't detach his own body, his own relationship to the field: he got sick, was attacked by mosquitoes, suffered from humidity and heat, which also affected his instruments. The sensitivity of the instruments and the sensitivity of the philosopher, of the observer, were both linked to the environment.

Radioactive Beings

During the course of 2011, the Fukushima Departmental Golf Clubs associated with the Sunfield Nihonmatsu Golf Club initiated a legal case against TEPCO, the operator of the nuclear plants. They asked for the decontamination of a field located forty-five kilometres from the nuclear plant and tried to get compensation for the stoppage of their activities. TEPCO's answer specified in return that, "radioactive substances dispersed by Fukushima Daiichi don't belong to TEPCO but to private owners". In this case, radioactive substances are regarded as mere objects that can subsequently be owned by people: whatever its nature, what was deposited on the surface of their field is now considered their property. Beyond the obvious limit of such an argument, it is true that private owners as well as farmers in the Fukushima area have to consider radionuclides as a certain kind of presence they have to learn to deal with. To talk about radionuclides as presence – at least *things* – rather than as objects: we get closer to the actual configuration. One would suppose that objects can be removed at will; but one has to cohabitate with a presence, to find for it a place, to learn about its behaviour, the ways it moves, and the ways it remains still. It is about considering radionuclides as "vibrant matter", animated by a "thing-power" of their own; it is about "encountering" radionuclides as complex entities rather than as conglomerates or homogeneous objects that could be numbered (Bennett 2010).

Beyond measuring the amount of radioactivity in the air here and there, several experimental approaches have been set up over time by farmers in collaboration with agronomists, which aim at understanding how radioactivity *behaves*, how it expresses itself ("detekuru" in Japanese) – always in relationship with a specific environment. In these experiments, rice paddies, fields, forests are transformed into observing platforms from which to capture *fluxes*, but also *frictions*, and to reveal the always specific, always complex relationships between small beings such as radioactive particles and an environment.

One of these experiments consists of putting a camera into rice paddies, protected by a box: measuring *while* standing in an environment, the device makes it possible to follow not only the flow of the water coming in and coming out of the rice paddy, but also the flow of radionuclides.

Capturing fluxes of water (photograph by the author, Spring 2013)

At the same time, these data on fluxes wouldn't mean much, from the point of view of the farmers, if they weren't connected with the kind of "calibrated sensitivity" previously mentioned (Dettelbach 1999: 503), the "appropriate sensibility" in confronting radionuclides, acquired on the spot, after years and years of commitment to the natural surroundings.

Transforming a rice paddy into a rational surface – a grid – capturing images of the movement (of water), measuring radioactivity at the borders of the rice paddy using Geiger counters: all of these operations become significant as long as farmers can mobilise their knowledge of the paddies, fields or forests surrounding their own piece of land; and also mobilise their knowledge of seasonal cycles or of the specific texture of rains in the area.

Radioactivity, the farmer, his rice paddies and the environment (photograph by the author, Spring 2013)

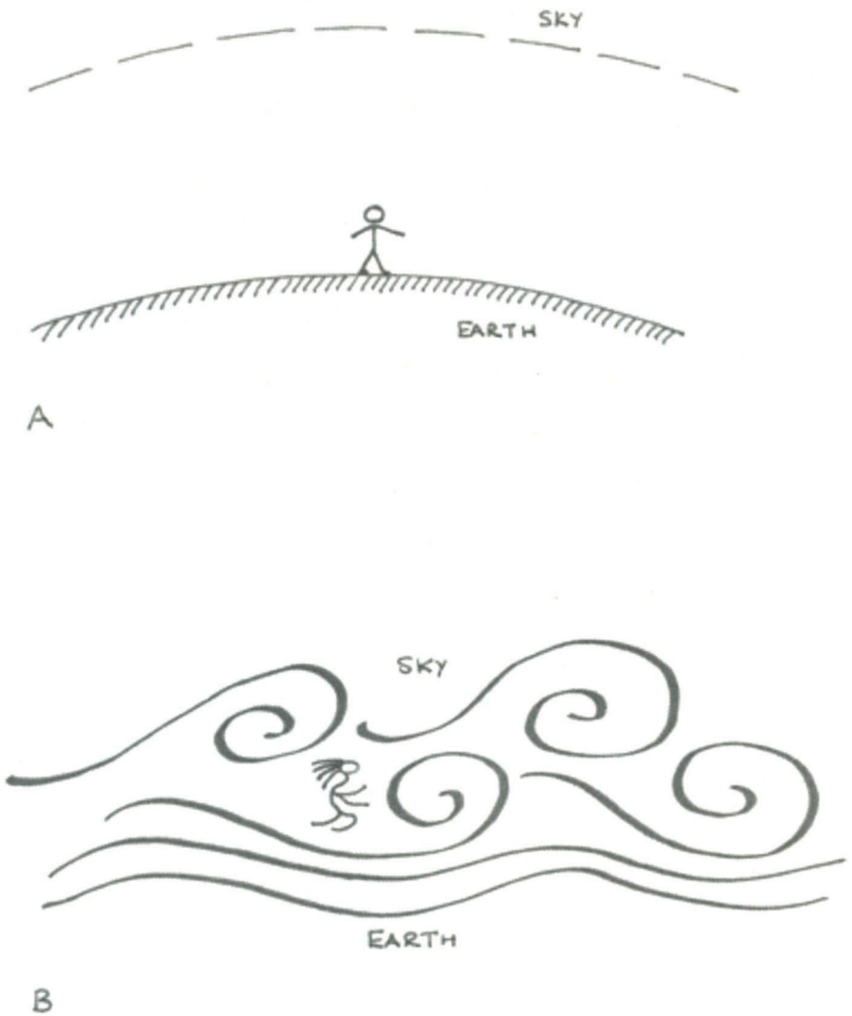
Far from an object, radioactivity, in such constellations, is considered within a set of relations – the relation between humans and their land being one of them.

Concluding Remarks

It is significant that relationships to measurements change over time. In 2014, three years after the disaster, people I used to see walking around with Geiger counters have put them aside in the glove box of their car, and pass by the monitoring stations without a glance. Something that has more to do with understanding the mysterious and unstable entities with which people have to share their land and their daily life is going on. To borrow Jane Bennett's expression, they could have said: "If we think we already know what is out there, we will almost surely miss much of it" (Bennett 2010: xv).

This last decade, in the same vein as Bennett, several authors have come to argue for an ecological approach that would take into account non-humans and their agencies as much as human ones. The *de-objectification* of the world shouldn't be regarded merely as a philosophical gesture aimed at expanding our scope and our imagination or at saving the world from slow but pervasive destruction: although not contradictory with such aims, such an approach instead concerns changes in the world itself that somehow remind us of its existence (Hache 2014). Tim Ingold's theory of *dwelling*, for instance, provides clues for comprehending what one calls the environment as an intertwining space filled with non-human as well as human entities that are mutually permeable and intrinsically bound: "It is not through being furnished with objects that the open sphere of sky and earth is turned into a habitable environment. [...] To understand how people can inhabit this world means attending to the dynamic processes of world-formation in which both perceivers and the phenomena they perceive are necessarily immersed" (Ingold 2007: 28).

Confronted with what has happened since March 2011, people inhabiting the Fukushima area are experiencing the long-lasting intimacy of their lives with radionuclides. In the words of Timothy Morton, they are "glued to [their] phenomenological situation" (Morton 2013: 36), it becomes "ambient" (op.cit.: 30). When one extends the frame of such an analysis, an irreducible relationship to a familiar landscape (in other words, an *intimacy*) that complicates the work of measurement and makes it denser suddenly appears in the network of measurements. This intimacy is worth taking into account as it makes it possible to revisit what it means to measure as well as what it means to do politics.



A: The exhabitant of the earth.
B: The inhabitant of the weather-world
(in Ingold 2007).

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