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ARTICLE

Radioactive Performances: Teaching about Radiation after the Fukushima Nuclear Disaster

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ABSTRACT

Following the 2011 Fukushima nuclear disaster and its release of radioactive contamination, the Japanese state put into motion risk communication strategies to explain the danger of radiation exposure. Through an ethnography of state-sponsored exhibits, hands on activity, and didactic centers aimed at providing radiation information, this article examines how state expertise on radiation hazards is increasingly being disseminated to the public via teaching infrastructure that are jargon-free, interactive, and amusing. In particular, educational infrastructure in post-Fukushima Japan foster a process that I call "radioactive performances," where radiation is presented as non-threatening and even beneficial. What is the impetus for resorting to such forms of explanations in the aftermath of a nuclear disaster? I argue that radioactive performances promote asymmetrical information about radioactive risks, being partisan toward a state-laden politics of revitalization in Fukushima in order to manage the vulnerabilities of an ecologically and economically precarious Japan. While providing comprehensible information, radioactive performances are partial in their nature, as they omit controversial aspects of radiation dangers, as well as different understandings of what counts as recovery. The notion of radioactive

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performances is useful to understand how environmental hazards get materialize to support specific politics of recovery in post-disaster contexts.
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In 2015, when I began fieldwork in Fukushima, signs of a nuclear disaster were clearly present. Cities like Tomioka were ghost towns, with traffic lights shifting from yellow to red on abandoned streets. One of the most striking sights was the rust, as if the brittle skin of the town had crumbled apart after the evacuation of its citizens. With phantom-like eeriness, storefront windows were stuck in time, exhibiting the same household items from four years ago—the tell-tale signs of the Fukushima Daiichi nuclear disaster that struck Japan on March 11, 2011. Beyond this gloomy scenery, affected citizens were also embedded in diverse technoscientific practices, with the hope of making the radioactive threat visible. In the cities of Iwaki and Iitate, I witnessed citizens wearing electronic pocket dosimeters, devices used to monitor the external dose of radiation exposure. Often, these devices were more than tools, acting as a bodily prosthesis to augment one's corporeal senses in irradiated environments.

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Figure 1. The empty streets of Tomioka, 2016.

Yet, in the scope of my fieldwork, radiation never seemed more tangible than at the Fukushima Prefectural Centre for Environmental Creation, a government-sponsored scientific hub created in 2016 to explain the phenomenon of radiation to the population of Japan. At this center, members of the public could apprehend radiation information through interactive games, joyful activities, and cute presentations. For instance, children read *manga* (Japanese comics) that tackled questions about radiation, such as food safety or health effects. Written by a local entertainer, the approach was one of adorable and charming aesthetics.

In the aftermath of Fukushima, the Centre for Environmental Creation is emblematic of a specific form of risk communication strategy which attempts to promote the understanding of radiation through jargon-free explanations (CEC 2019). Through an ethnography of state-sponsored exhibits, hands on activity, and didactic centers aimed at providing radiation information, this article examines how state expertise on radiation hazards was increasingly being disseminated to the public via teaching infrastructure that made radiation information easy to understand, interactive, and enjoyable. I argue that educational infrastructure in post-Fukushima Japan fostered a process of "radioactive performances," where radiation was presented as non-threatening and even beneficial. In particular, radioactive performances promote asymmetrical information about radioactive risks, being partisan toward a state-laden politics of revitalization in Fukushima. While providing comprehensible information, radioactive performances are partial in their nature, omitting controversial aspects of radiation phenomena, as well as different understandings of what counts as recovery.

In order to introduce the notion of radioactive performances, I take a cue from theory of performativity used to develop nonrepresentationalist approaches around issues of gender (Butler 1993) or reality (Barad 2007, Myers 2015). In particular, I draw from Butler's performativity of gender, which argues that the normative power of performance lies in a process of reiteration, that is a repetition of norms, as well as through exclusion (1993:188). In a context of teaching infrastructure, a focus on performativity highlights how specific reiterations materialize and explain radiation hazards for the public.

During my fieldwork, I noticed that three elements of radioactive performances were repeatedly promoted over other ones. First, they emphasized the naturalness of radioactivity over man-made radioactive

pollutants. Second, information about radiation is enacted through cute aesthetics and games. Third, they foster the amazing and useful aspects of radioactivity in domains of scientific and medical technologies.

These iterations are not random processes, as there is always a politics in making certain aspects of radiation hazards visible or not. For instance, after Chernobyl, Petryna (2013) examined how knowledge about radiological injury was mobilized as a form of political power to negotiate public accountability, financial revenue, or medical compensation in a post-Soviet Ukraine transitioning from communist to capitalist ideologies. Following the same disaster, but in the context of Belarusian society, Kuchinskaya (2014) highlighted a different story, where invisibility around radiation risk is rather produced due to particular structural conditions, often in the interest of the nuclear industry and economic needs of the state. Similarly, radioactive performances in post-Fukushima Japan are associated with politics that sustain policies of recovery in order to manage the vulnerabilities of an ecologically and economically precarious Japan (Allison 2013).

Ethnographically speaking, this article focuses on teaching infrastructure aimed at engaging the Japanese public after Fukushima. Between 2015 and 2017, I spent a total of 14 months in Japan, conducting participant observation in state-related centers that explain radiation, while interviewing technical advisors and scientists present during public activities. I also highlight the visitors' interactions with the materials that explain radiation, focusing on predominant narratives that propagate through such experiences. In order to track which aspects of radiation hazards get prioritized or not, it is useful to bring into conversation the concept of "nuclearity" (Hecht 2012:14), which unsettles classificatory schemes by examining both the banality and exceptionalism of nuclear things. I engage with this concept to historicize the practices through which radiation hazards were defined as exceptional, banal, or inexistent—before and after Fukushima. Combined with a focus on performativity, this frame looks at how radiation phenomena get stylized through repetitions, which assumptions about risks end up being normalized, as well as whose voices get marginalized in the process.

While it is easy to critique shortcomings in risk communication, especially from the viewpoint of a non-Fukushima resident, there is a logic associated with radioactive performances. For the Japanese state, an important part of radiation hazard is associated with unwarranted stress, where the fear of radiation might be more damageable than exposure to

certain levels of radiation (Japan Cabinet Office 2018:11). Indeed, it has been argued that the main adverse health effects of Fukushima are linked to mental health, social problems, and the fear and stigma associated with radiation anxiety (Spiegel 2011, UNSCEAR 2013:11–12). In this, radioactive performances attempt to alleviate the fear of radiation for the benefit of the public. Yet, performances also imply an audience, and scholars working on risk communication argued that there is no such thing as a homogeneous public (Irwin 1995). While some citizens that I interviewed were happy that the state embraced a jargon-free approach to radioactive risk communication—making it easier for them to understand a difficult phenomenon—replies to these centers were polarized. For instance, members of an organization wishing to evacuate children from Fukushima argued to me that the endeavor was little more than a "safety campaign" (*anzen kyanpēn*) and a form of "brainwashing" (*sennō*). As such, I also contrast how the state materialization of radioactive risks differs from the lived experience of affected individuals, notably by focusing on the experiences of evacuees, citizen scientists, farmers, and medical doctors.

This comparison demonstrates that radioactive performances clash with alternative understandings of risk and recovery. Lastly, radioactive performances are not all-encompassing state replies, but represent part of a set of diverse strategies for information delivery about radiation hazards (Hirakawa and Shirabe 2015).

Radioactive Risk: Between Exceptionalism and Banality

Many tropes associated with post-Fukushima radioactive performances were molded through specific historical and political contexts, both within and beyond Japan. To better understand radioactive performances after Fukushima, it is crucial to lay out Japan's nuclear history, as well as the global political economy that surrounds nuclear power and radiation risk.

The atomic bombings of World War II represent a foundational core in the Japanese imagination of nuclear hazards. Nowadays, a visit to the Hiroshima Peace Memorial Museum is a harsh exposé of the effects of bombing and radiation exposure, which include frightening keloids (scars), hair loss, cancers, and other sicknesses. For instance, in one corner of the museum, a piece of long black fingernail (*kuroi shime*) is on exhibit, while an information panel explains that survivors grew abnormal fingernails due to thermal radiation. Sights like these are commonplace in the museum,

which stresses forward the difficulty that irradiated victims, known as *hibakusha*, have faced; these include health problems, as well as discrimination associated with the narrative that radiation caused multi-generational genetic damages among survivors—an issue that remains controversial to this day (Goldstein and Stawkowski 2015). These depictions constitute a case of "nuclear exceptionalism" (Hetch 2012), which demonstrate the specific harm brought by nuclear things. They also perform a politics of victimization that secures Japan "within the global narrative of the universal history of humanity," producing, as Lisa Yoneyama (1999:13) argues, a postwar forgetting of the nation's past, when Japan was not a peaceful-loving country, but a former military and colonial aggressor.

While many children regularly visit the museum as part of school trips, radioactive hazards were not always so perceptible to the Japanese citizens. After World War II, American forces occupied Japan until 1952 and the suffering of hibakusha was made invisible, withheld from official public discussions (Pelletier 2013:414). Studies surrounding the effects of radiation exposure on survivors were initially pursued in secret by American authorities, while being influential in shaping the paradigm of radiation protection.[1] The history of nuclear power in Japan could have remained trapped in trauma and secrecy, but the 1953 Atoms for Peace program changed this narrative. Under the care of the International Atomic Energy Agency (hereafter IAEA), the Atoms for Peace program promoted the useful aspects of atomic energy, like limitless energy or helpful medical radioisotopes (Hamblin 2008:52). Part of a Cold War propaganda in the interest of American geopolitical strategies, the program attempted to shift the negative tropes associated with nuclear things. In Japan, this was assured by a nexus of politicians, bureaucrats, enterprises, media, and scientists, informally known as the "Nuclear Village" (*genshiryoku mura*). With the help of American influences, this nexus promoted nuclear energy via means of financial budget for public relations (Honma 2013, Suganuma 2016). Atomic energy centers founded in the 1970s distributed pro-nuclear information (Dusinberre and Aldrich 2011:693), while national education programs solidified a discourse of safety and amazement among the younger population—by downplaying references to nuclear accidents (Pilling 2014:265), or by providing colorful textbooks such as "The Exciting Nuclear Power Land" (MEXT and METI 2010).

This nuclear hype finds its epitome with Mr. Pluto (*pluto kun*), a cartoon character created by the Japanese Power Reactor and Nuclear Fuel

Development Corp in the 1990s (see Gofman 1994). In an educational video, Mr. Pluto claims that he is not a monster (*obake*) and that he is working toward peace (*heiwa*).[2] He aims to bring the "true story of plutonium," which is said to be safe and unrelated to the apparition of cancer. Mr. Pluto begs the viewer to be controlled by the "wonderful wisdom" (*subarashii chie*) of humans, demonstrating that plutonium's purpose is of use for high-tech projects. To demonstrate its safety, a kid drinks a plutonium-laced soda. The subtext is clear: not only is nuclear power safe, but a little radiation is even good for you! Such narratives would strengthen the creation of a nuclear safety myth (*anzen shinwa*), which attempted to reconceptualize the imaginary of risk around nuclear power.

Beyond Japan, the nuclear arms race of the Cold War equally influenced the acceptable boundaries of radiation hazards by promoting the interests of national security (Masco 2014) over the well-being of communities facing the devastating effects of radioactive contamination (Brown 2013). In this context, a permissible dose of radiation exposure (Cram 2016) intertwined itself within the imperatives of war, economic interests, or colonialism (Hecht 2012). Additionally, the 1986 Chernobyl disaster would stir up uncertainties around radiation dangers.[3] Amid controversial debates, part of the international scientific community argued that the disaster's most significant health impacts were its psychological effects (Chernobyl Forum 2003–2005). This emphasis led to the notion of radiophobia, which was "used to describe public reaction considered out of proportion to the real risk of the accident" (Stawkowski 2017:360).

The myth of nuclear safety could have prevailed in Japan, but then March 11, 2011 happened. The subsequent discharge of radioactive materials initially led the state to launch a 20-kilometer evacuation zone around the power plant (METI 2012:3). By March 2012, when data around the extent of contamination became clearer, the evacuation zoning was reorganized. In doing so, the state increased the radiation threshold for evacuating the public from 1 milliSievert per year—the former global standard—to 20 milliSieverts per year. State experts explained this change by contending that massive relocation would prove more harmful than raising the threshold of permissible radiation exposure. However, this policy caused public controversy and was condemned as failing to reflect the risk to all residents, like young mothers and their children (Slater, Morioka, and Danzuka 2014; CSRP 2017). Therefore, in a model case of "knowledge deficit" (Wynne 1992), the state engaged in a traditional risk

communication strategy, bringing experts to dole out information about radiation. This communication delivered data in a dry and unclear manner, often through "number-drenched information" (Dudden 2012:354). Citizens that I interviewed in 2016 echoed the confusion associated with trying to make sense of radiation risks through complex quantitative explanations made in interchangeable units of radioactivity.

As time went on, the skepticism that surrounded institutional experts beholden to the state (*goyō gakusha*), along with hard-to-understand risk communication, led to the creation of citizen science networks where people tracked radioactive contamination in their food and environment (Sternsdorff-Cisterna 2015). These grassroot movements were not well received by the state, and women who partook in these activities were accused of having an "irrational 'radiation brain,' being anti-science, and overreacting" (Kimura 2016:24). And while much was written on how citizens produced novel forms of expertise to learn about radiation, scant attention was paid to how state responses changed over time to present information to the public. Notably, with a sense of emergency fading over, and with reports arguing that it was "hard to believe that radioactivity had affected the population health [*Hōshasen ni yoru kenkō higai ga aru to wa kangae nikui*]" (Japan Cabinet Office 2018:2), the state embraced a politics of revitalization in Fukushima. As of 2012, this politics emphasized a restoration of irradiated areas through state-sponsored decontamination and monitoring, a gradual repatriation of former evacuees to Fukushima, and the promotion of a resilient mindset in the face of adversity (METI 2014, Nemoto 2014).

Yet, during a 2016 interview conducted with an official of the Reconstruction Agency (*fukkō-chō*)—the apparatus tasked with the reconstruction process of Fukushima—I was told that the region was still afflicted by "harmful rumors" (*fūhyō higai*) around radiation, impeding the social and economic revitalization of Fukushima. It is in such context that educational infrastructures were created to provide "basic information" (*kisoteki jōhō*) that could help create an "environment prompt for return" (*kaeru kankyō*).

The remainder of the article focuses on how radioactive performances support this attempt to rebuild life in post-Fukushima Japan. In particular, I examine three case studies. First is the Decontamination Info Plaza, established in January 2012 as a joint program between the prefecture of Fukushima and Japan's Ministry of the Environment. Situated

in Fukushima-city, the center provided information about radiation in general, as well as explanations about monitoring methods and decontamination practices. Another important educational infrastructure was the Fukushima Prefectural Centre for Environmental Creation, situated in Miharu and inaugurated in July 2016. The center was established with the financial support of the Japanese government to conduct research and provide education on radioactive contamination. It possessed numerous facilities and public halls accommodating hundreds of individuals. The last case study concerns the National Institute of Radiological Sciences, a world-leading radiological institute with a mandate to study the effects of radiation on the body. After 2011, it assisted in the restoration of the areas affected by radioactive contamination by managing research projects that address the concerns of Japanese citizens.

The Naturalness of Radiation

During the spread of commercial nuclear power, the banalization of nuclear things through natural comparisons was a tactic used by the industry, which insisted that "radioactivity was part of nature" and that "nuclear power [was] just a form of energy like all others" (Hecht 2012:10). Similarly, in post-Fukushima teaching infrastructure, radiation phenomenon was often explained through the use of comparisons that highlighted the naturalness of radiation (*shizen hōshasen*).

Such emphasis was particularly present at the Decontamination Info Plaza (hereafter DIP), as well as in the Center for Environmental Creation (hereafter CEC). Both venues had facilities that promoted the understanding of radiation with familiar examples to raise awareness of environmental recovery in Fukushima (CEC 2019:2–8).

At CEC, the most popular attraction was the Environmental Creation Theater, where young families immersed themselves in a 360-degree multisensory experience that explained the phenomenon of radiation under 10 minutes. The theater's narrator argued that radiation was part of daily life: "It can be found everywhere! From the sun's ray to the mineral in the earth […] Without radiation, no life would exist on Earth!" After these explanations, an enormous Boeing passed above theatergoers' heads in the cinematic sky. Subsequently, the amount of radiation exposure received during an intercontinental flight, mostly from cosmic rays, was said to be

higher than the level of radiation found in Fukushima. With necks strained upward, children and parents mumbled words of apparent relief.

In addition to the theater, particle detectors used for visualizing the passage of radiation, such as a cloud chamber (*kiribako*), allowed visitors to literally see radiation emanating from natural sources. These particle detectors were popular with children, as they allowed them to see a phenomenon associated with tropes of invisibility. At DIP, visitors had the opportunity to manipulate radiation measuring devices, such as the scintillation radiation counter PA-1000 or the semiconductor radiation counter PDM-122. With these devices, technical advisors encouraged visitors to test the amount of naturally occurring radioactivity in different commonplace materials gathered on a table (e.g., a bag of rice, a piece of granite, or an iron plate).

PHOTO BY MAXIME POLLERI

Figure 2. Monitoring devices available for public use at DIP.

Beyond interactive displays, many pamphlets emphasized the fact that food produced in Fukushima was regularly tested, with results falling under a strict limit of allowable amount of radioactivity. These pamphlets explained that radiation naturally exists in our food, such as the potassium ingested in bananas: "Foods will bring us effects of natural radioactive rays, one of which is the element K [potassium] that is indispensable to us" (Takamura n.d.:3).[4] Against such an optimistic background, a technical advisor at DIP argued to me that "there is absolutely (*mattaku nai*) no need to worry about the food we ingest."

At CEC, visitors could search and display the current atmospheric level of radiation in Fukushima Prefecture through an interactive "radiation measurement map." With the help of a touch panel, visitors witnessed how much the radiation levels had changed since the accident, as well as how much they differ from other areas overseas. For instance, in July 2016, it was possible to compare the radiation levels in Fukushima with other locations in the world like New York. In doing so, visitors learned that many places, such as Brazil or Iran, had naturally occurring radiation levels (called background levels) higher than what has been monitored in Fukushima.[5] These comparisons provided optimistic views of radiation levels in Fukushima, and visitors playing with the radiation measurement map were relieved to see that radiation exposure had seemingly reached normal levels.

When I questioned a radiation scientist about the heavy emphasis on the naturalness of radioactivity in teaching infrastructure, I was told that radiation phenomenon is "a bit hard to understand" and that "you can't explain it from nothing, you can't explain it without at least some kind of basis that everybody can understand." While the emphasis on naturalness makes radiation banal to the point of being easy to understand, these comparisons also perform specific semiotic-materialities of radiation. In this case, the constant itineration of the naturalness of radiation depicts radioactivity as a common-occurrence phenomenon, rather than something mysterious, associated with the by-products of nuclear power. As Hansson argues, the term "natural" has strong values of approval and was long used in the form of pro-nuclear claims stating "that exposures of the same size as naturally occurring (background) radiation cannot be dangerous—presumably because they occur in nature" (2015:31). Similarly, by saying that citizens are routinely exposed to radiation, like that coming

from cosmic rays, the teaching infrastructure of Fukushima performs a narrative where there is no need to worry about the exposure of the region.

Yet, performances surrounding the naturalness of radiation do not convey the sheer complexity of radiation dangers after a nuclear disaster. In particular, there is nothing natural about the radioactive isotopes released during the Fukushima nuclear disaster. The major radionuclides of Fukushima were Iodine-131, Cesium-134, Cesium-137, and Strontium-90, as well as traces of plutonium, amid many other radionuclides and pollutants. Importantly, radiation levels in Fukushima are predominantly based on measurements of atmospheric radiation, taken at different locations and compiled to create an average level for the cities of the prefecture. Yet, weather factors such as wind, rain, or snow have displaced radionuclides like cesium, which accumulate themselves in various locations. Because of this uneven dispersion, measurements based on atmospheric city average overlook the presence of hot spots, or places where the level of radiation is significantly greater.

In 2016, this was made particularly apparent when I followed citizen scientists testing radiation levels in Fukushima prefecture. With the help of a Geiger counter, a device used to measure the level of external radiation, I witnessed citizen scientists becoming "hunters of Sieverts" as they measured the level of residual radioactivity in different cities with the attempt of mapping hot spots. For instance, in the city of Tomioka, a monitoring post displayed a level of 0.374 microsieverts per hour, but a few footsteps away gave us a result of 3.604 microsieverts near the soil—a tenfold increase. In Fukushima, different citizen science centers also tested soils, revealing important levels of contamination by radioactive cesium (Polleri 2019). Mothers that I interviewed were worried that children might be playing near hot spots, subsequently ingesting radionuclides as they often put things in their mouth. One citizen scientist in Fukushima argued that even the family dog was a vector of potential harm; by swooping itself into a hot spot, it risked bringing dangerous radionuclides home, where children would pet him.

Itineration about the naturalness of radiation, such as saying that we ingest radioactivity by eating bananas, have little to do with the hazards of internalizing fission products from a nuclear power plant. Indeed, each radionuclide possesses specific biological signatures and presents particular risks if they are inhaled or ingested, a phenomenon referred as internal contamination (Cram 2016:525). Strontium-90 is such a problem, as

a doctor of medicine who specialized in radiation and cancer explained to me during an interview in Tokyo: "It mimics calcium and enters your bone marrow. It stays there for long periods and weakens your immune system." Talking about internal contamination in Fukushima, another medical doctor employed at the Sagami Cooperative Hospital explained the dangers associated with bioaccumulation, or the gradual accumulation of radionuclides in the body:

> Even if the levels [of contamination] are low, they tend to accumulate themselves into the body, and while some muscles might eventually expel some of the contaminants, other body parts don't. For example, radioactive cesium can enter the ovaries (*ransō*) of women and it stays there without getting expelled; that's a risk that can be transmitted to the child and the future generations.

Scientific practices of monitoring, as well as the narratives of medical doctors, consequently made the materiality of radioactive contamination perceptible in different ways than the naturalness of state radioactive performance. Nonetheless, the naturalness analogy remains a powerful tool for a state that wishes to assure the population of the safety of Fukushima. First, it performs the materiality of radioactivity as a form of risk that has always existed on a daily basis. Second, it reimagines Fukushima as a region whose levels of radiation appear normal, especially in comparison to other places whose background radiation level is higher. After Chernobyl, Kuchinskaya argues that seeing an area as "no longer significantly contaminated is to redefine the radiation risk as in the past, thus canceling out the need for continued radiation protection work" (2014:64). Similarly, evacuation zones in Fukushima are gradually lifted when the level of radiation appears to be satisfactory. A comparison with the naturalness of radiation facilitates this policy of recovery, but also put shadows on the specific risks of man-made radioactive pollutants, which will linger for decades and centuries.

As Hecht argues, "For all the efforts at making nuclear things exceptional, there were opposing attempts to render them banal" (2012:8). While radioactive performances depict radiation as banal to the point of being naturally present in our foods, they neutralize the controversies of raised threshold of exposure to man-made pollutants. The naturalness of radioactivity hereby performs radiation as something that is normal for a

Fukushima on the path of recovery. A last example is found at the train station of Fukushima City, where visitors can buy radium eggs (*rajiumu tamago*) that are parboiled in the waters of the Iizaka hot spring, famous for its natural radium. In a few delicious bites, radiation is made completely palatable through such symbolic association. *Itadakimasu* [Bon appétit]!

The Legacy of Mr. Pluto

At the entrance of CEC, a large-bellied, hippopotamus-like mascot welcomed visitors while accepting hugs from children. The educational annex was mostly visited by young families, and an advisor explained to me that the center purpose was to "deepen the understanding of children about radiation," especially by making their experience enjoyable. Therefore, with the help of the giant mascot, young visitors were having a good time even before entering the center.

A striking fact about the teaching infrastructure encountered during my fieldwork was that information about radiation was culturally performed, presented under cute aesthetics, displays, or games—something the Japanese call *kawaii* (Yomota 2006). In the context of nuclear science, appealing ways have long facilitated the integration of complex information, sometimes blending education within propaganda. The character Mr. Pluto is a perfect example—sharing the aim of promoting nuclear power while banalizing its risk. However, in the aftermath of nuclear disasters, a cute and fun approach is wholly novel and not something witnessed after Chernobyl or Three Miles Island. In the case of the 2011 disaster, cuteness is used to support a normalization of life in Fukushima, especially for citizens that are worried about contamination and wish to learn more about radioactivity via simple explanations.

From a foreign viewpoint, it is easy to criticize the use of cuteness as a triviality, but this constitutes an ethnocentric understanding. Importantly, the Japanese notion of "cuteness" does not have the puerile significance that it possesses in the English language. And while kawaii is often translated as "cute," "adorable," "charming," "lovely," or "pretty," it also points towards behaviors and mindsets evoking joyful, non-threatening, fun, feminine, or childish connotations. In Japanese society, making things cute is a well-accepted practice, encouraged amidst a diverse set of social contexts. In the present context, kawaii echoes the analogy of a "flavor-coated pill" (Cheok 2011:252), in that it facilitates the integration of

frightening information in an attractive way, bringing "the user to a desired frame of mind and attitude and then deliver[ing] content that might not otherwise be received." Indeed, one of the main aims of CEC is to "make invisible things visible" (*me ni mienai mono o mieruka suru*) and to replace "hard-to-understand numbers" (*wakarinikui sūchi*) with interactive playrooms (CEC n.d.:7) which the medium of kawaii facilitates.

One way to use cuteness is through "characterization," or the transformation of things into charming and lovely characters (Nozawa 2013). Indeed, in many centers, visitors learned about the specific threats present in Fukushima, although representations of these perils were anything but threatening. At DIP, a series of cartoonish posters first explained the phenomenon of radiation. In them, a teacher—depicted as an old and wise owl—explained radiation to a bear, a rabbit, a squirrel, and a little girl. The wise owl pointed out that ionizing radiation could pose a biological threat to one's genetic material, but that the body's enzymes quickly repaired any damages. Alongside these scenes, a small blue cape-wearing hero was successfully applying a Band-Aid to the damaged body. Yet, what the cute hero failed to mention is that cells are also prone to making errors in regenerating themselves from DNA breaks. This can bring mutations in living cells, which is a permanent alteration of the cell's reproductive outcome, resulting in an accumulation of mutations that can cause cancers, immune disorders, and genomic instabilities even years after the exposure (Sakiyama 2011).

Likewise, in a document produced by the Ministry of the Environment (2014:17–18), radiation phenomenon was introduced by a set of two characters, a little boy with green hair called *Midori* and his blue dog *Ao*. In the booklet, each radionuclide had its specific characteristics, like pronounced eyebrows, large ears, or notable hairstyles. For instance, Strontium-90 took the form of a friendly looking yellow figure with eyes, a mouth, and an antenna on the top of its head. And while children interacted with these adorable anthropomorphic radionuclides, there were rarely in-depth discussions about how exposure to these radionuclides caused specific bodily harm.

In one of the few instances where readers learned about the problems of internal contamination, the dog Ao explained that food put on the market had passed the reference value for radioactive contamination, thereby alluding to its safety (Ministry of the Environment 2014:33). Furthermore, in talking about internal contamination, Ao argued that radioactive cesium

was easily evacuated (*haishutsu*) through our sweat (*ase*) and our pee (*oshikko*). Yet, reference values for the safe consumption of foods are measured in a unit called the becquerel, symbolizing radiation emissions per second. This unit does not express adverse health effects of consuming contaminated food since it does not take into account the toxicity and longevity of radionuclides. What cute characters failed to explain is that citizen scientists have also found contaminated food beyond market areas, notably by testing products themselves (Sternsdorff-Cisterna 2015, Polleri 2016).

Anthropologist Shunsuke Nozawa (2013) argues that cute characters are "specialized speech-actants" that produce performative effects, since they constitute an interface that relays specific signs. According to the advisors employed in educational centers, anthropomorphizing radiation or giving it cute characteristics was a key step to render information acceptable for those that interacted with the exhibits. Yet, cuteness also performed a scenario that constructed an optimistic narrative of minimal risk, conveying a sense of certainty and safety around the controversial and uncertain topic of radiation dangers.

Carr argues that "expertise requires the mastery of verbal performance, including—perhaps most importantly—the ability to use language to index and therefore instantiate already existing inner states of knowledge" (2010:19). At DIP, specific forms of cute verbal performance were used by the state. For instance, many radiation measuring devices had honorific suffixes added to their names.[6] The diminutive suffix *chan*—a cute pronouncing of the suffix *san*, translated as "Mr." or "Mrs." to connote an amiable, childish, or feminine context—was present on monitoring devices (e.g., *Arufa-chan*, *bēta-chan*). Numerous tactile electronic screens also displayed information about radiation in accessible language, like *hōshasen tte nani* ("What is radiation?"). In "Hōshasen tte nani," the Japanese particle *tte* demonstrates informal reported speech. Similarly, colloquial speech was present in different explanations, such as when the dog *Ao* stated that radioactive cesium is evacuated through our pee (*oshikko*). These cute and colloquial verbal performances evoke a feeling of non-technicality, showing that the discussion is directed toward the general public.

Such performances subsequently shift the topic of radiation from something formerly reserved to a body of experts toward information and practices that everyday people can understand and enact. Indeed, according

to the technical experts at DIP, it was important that measuring devices, described as educational tools (*kyōiku tsūru*), did not induce feelings of anxiety. Technical advisors argued that citizens had to become physically accustomed to testing devices and encouraged residents to touch their buttons and to play with them during mock tests. Through such techno-scientific mobilizations, citizens could empower themselves as part of a minutiae of everyday living in Fukushima. As a technical advisor explained to me: "This learning process is the key to the reconstruction (*fukkō*) of Fukushima!" Such process was facilitated through the aesthetic of kawaii, which promoted an experience of pleasantness and accessibility.

At DIP, cute and interactive models helped younger visitors to understand the process of radioactive decontamination, seen as having contributed to the sharp decrease of radiation levels throughout Fukushima. For instance, a model explained the decontamination process through playtime. It consisted of a miniature house in a transparent plastic box filled with small white and red balls. The white balls represented uncontaminated soil; the red balls stood for radioactive pollutants and were encrusted on the house rooftop, in the miniature trees, and amidst the uncontaminated soil. With a toy shovel, it was possible to pick up the red balls and to dispose of them in scale-sized vinyl bags (*furekonbaggu*) used in the decontamination process. Children could literally pick up the symbolic radioactive contaminants, conjured as a biophysical entity isolated from the human environment. Much like Latour's (1993) modern stance, the game created two distinct ontological zones: that of the human and that of nature. By playing with the toy shovels and trying to get rid of the radionuclides in the plastic box environment, decontamination acquired a tangibility that felt like a game of sorts, notably trivializing the harsh experience of decontamination done by subcontract workers (Hecht 2013a; see also Ghis Malfilatre 2016). Indeed, children did not need to put on protective suits before separating the red and white balls, and there was no recognition of potential health hazards.

Beyond the fact that children had to physically participate in this learning process, these games were performative in that they aimed to "sediment particular ways of seeing and knowing" about the world (Myers 2015:19). Indeed, the game performed decontamination as a successful technical fix (from contaminated to clean) that could revitalize the region of Fukushima for the repatriation of evacuees. Yet, many citizens that came back to former evacuation zones in Fukushima were dissatisfied by the

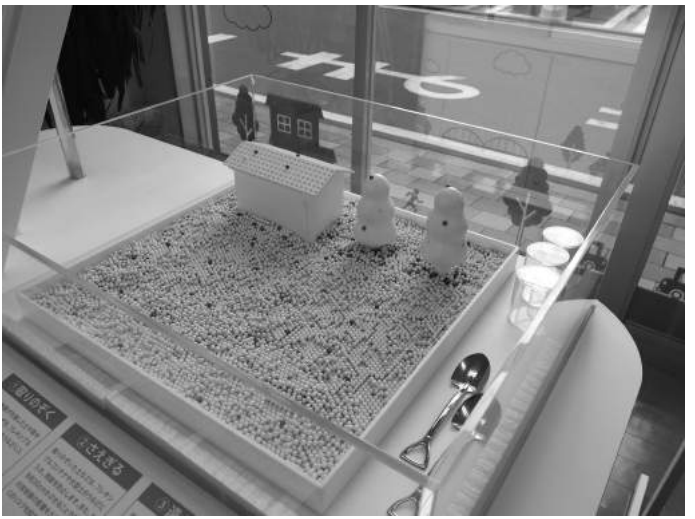

PHOTO BY MAXIME POLLERI

Figure 3. One of the plastic boxes used in the interactive decontamination model.

actual effectiveness of state-sponsored decontamination (Polleri 2019). For instance, residents of Iitate village that I interviewed in the spring of 2016 and 2017 argued that vinyl bags used for decontamination had broken down due to the build-up of gas released by rotten soil. Plants and flowers had grown inside the bags, tearing them apart and re-scattering radionuclides over their land.

Cute interactive games were also very popular at CEC. In front of a giant interactive screen called the "radiation visualization wall," children learned to block radiation rays or particles through the movement of their bodies. By selecting the proper material (e.g., a piece of paper), they had to block either alpha particles, beta particles, or gamma rays, pretending that one body was a thick metal plate that hampered external exposure. By doing so, children collected points, and at the end of the game, the child with the highest score was crowned the winner. Importantly, this aestheticization of scientific knowledge implied a profound sense of investment (as play) that dismantled the separation between the individual and the fearsome agent of radioactivity—as the happy faces of children exemplified.

In the context of Cool Japan ideology (a form of economic soft power adopted by the Japanese state), Laura Miller argues that kawaii aesthetics were used to officially promote a narrow model of cute femininity, thereby "maintaining and promoting structures of gender stratification" (2011:18).

In her study of Japan's military, Frühstück equally examines how the strategic use of cuteness "serves as a tool for achieving a more sympathetic public response" toward the Self-Defense Forces, while normalizing the military through infantilization (2007:136). Similarly, cuteness in Fukushima was strategically used to perform radiation information in a manner that softened former uneasiness associated with the complexity of radioactivity knowledge. Yet, it went beyond mere description, as it asymmetrically performed a non-threatening atmosphere around radiation, glossing over the dangers of radiation hazards and the complexity of contamination in the lived environment. As such, cuteness was part of radioactive performances put into service for a state politics of normalization of a raised threshold of exposure after Fukushima.

The Wonder of Science and Technology

Hecht argues that "the power of nuclear things depends on *both* exceptionalism and banality" (2012:338). The same applies to post-Fukushima radioactive performances, which so far were associated with banalities like the naturalness of radiation, or cute and fun aesthetics. Still, radioactive performances are also imbued with exceptionalism, notably around the wonders of science and technology. In this, useful aspects of radioactivity are emphasized, while radiation is no longer a synonym of harm, but rather linked with the latest technological advances and scientific amazement.

Through my fieldwork, I witnessed state-sponsored open days and activities that allowed people to dabble with normally off-limit radiation-related technologies. For instance, on April 24, 2016 the National Institute of Radiological Sciences (hereafter NIRS) held a public open house entitled "I Want To Know More! What You Can Do with Radiation" (*Motto shiritai! Hōshasen de dekiru koto*).[7] On that day, hundreds of members of the public were invited to see the institute's research facilities. All were jostling each other to admire the latest PET scan technologies, radiation emergency instruments, and enormous cyclotrons used in nuclear medicine for the production of radioisotopes.

In one instance, children could try the equipment of the institute's latest task force, the "Radiation Emergency Medical Assistance Team (REMAT)," while waiting in line to be photographed in front of a high-tech minivan. Usually reserved for emergency situations, the van was the background

of a role-playing scene (*kosupure*), with children wearing mock REMAT costumes as advisors took pictures of them.

At NIRS, a special elevator led down to the Heavy Ion Medical Accelerator, situated in an impressive subterranean facility. Walking through the underground maze of this metallic behemoth, families were overcome by the scale of the apparatus, whose interior looked like a sci-fi anime scene. It was not rare to hear visitors say things like "Oh! This is so cool!" (*suge*) or "It looks like a spaceship, right?" (*Uchūsen mitai ne*). At this open house, the research institute felt almost like a fairground. Children collected as many stamps as possible during the "stamp rally," wherein they ran between stands to present their completed sheets to staff members. The objective was to see all areas of radiological interest: from the new therapeutic research facilities to the electrostatic accelerator building. In one child's words to an advisor, "Look! I've done it! It's all filled!"

PHOTO BY MAXIME POLLERI

Figure 4. The Heavy Ion Medical Accelerator at Japan's NIRS.

Notably, NIRS's expertise focused on radiation protection in the medical domain. In the previous sections, the boundary between the natural and artificial aspects of radioactivity were often strategically mobilized to make radiation trivial. Still, at NIRS, man-made radiation was not synonymous with an artificial property necessarily banal or dangerous. In fact,

manmade technologies were affectively linked to technologies that sustained life. For instance, radiation-related devices exhibited by the institute were used to produce helpful particle therapies to treat cancer. Here, "radiation damage" was not something to be afraid of, but a useful agent that killed harmful tumors, as demonstrated on medical dummies during the open day.

In this instance, radiation education was channeled in terms of sustaining life in awe-inspiring ways. Yet, displays and technologies at NIRS asymmetrically performed information that selectively amplified the positive aspects of radiation over its negative effects. The end result was a trajectory that promoted a pleasant atmosphere in which radiation was not a scary entity, but something useful and wonderful. Of course, these aspects don't necessarily have to be opposed, but after Fukushima one can wonder about the purpose of such performances.

This emphasis makes sense in the precarious context that surrounds nuclear-related technologies in Japan. Before Fukushima, Japan had one of the most well-respected nuclear and radiological scientific communities in the world, while being embedded in a nuclear power industry revival known as the "nuclear renaissance" (Gordon 2011). The disaster was a harsh blow on this expertise, causing the nuclear community to share a pessimistic vision toward the future of nuclear research. This was reinforced by the fact that nuclear power plants were shut down or suspended for safety inspections after 2011, contributing to an uncertain nuclear future. Scientists to whom I spoke shared a common fear that good students might not come to work in nuclear-related research after Fukushima. Subsequently, it is not surprising that teaching infrastructure targeted children (the NIRS open fair had activities recommended for children *okosama ni osusume*). Focusing on children is a way to revitalize nuclear interest in a generation that is too young to remember the disaster. As such, radioactive performances also work for the future of Japan's nuclear policy, suggesting that the country might increase its reliance on nuclear energy and technology. This is a road already pursued by the Ministry of Economy, Trade, and Industry (METI) and the administration of Prime Minister Shinzō Abe (Polleri 2020).

Moreover, to fulfill the need for knowledge in teaching infrastructure, the prefecture of Fukushima has turned to experts working in nuclear-related agencies. This has resulted in cooperation with IAEA and the Japan Atomic Energy Agency (JAEA), an independent agency conducting

research and development (R&D) in the nuclear field. These organizations promote nuclear power industries and their associated technologies. Because of such associations, an important pro-nuclear ideology permeated post-Fukushima teaching infrastructure. At DIP, a technical advisor that I interviewed was critical of anti-nuclear movements that advocated the evacuation of Fukushima, arguing that "You cannot work on the problems that radioactive contamination has brought while being linked with an ideology…The anti-nuclear activists are victimizing the people of Fukushima to suit their needs!" Yet, in criticizing this bias, the advisor was unaware of the pro-nuclear ideology present within his own center. In that regard, performances around science and technology do not lead to a rejection of the nuclear lobby but reinforce cooperation with agencies that have their own interests and for whom recovery lies in the revitalization of an industry affected by Fukushima.

In her study of Japanese Self-Defense Forces, Frühstück argues that information about specific weapons and armed vehicles given to the public represents a "celebration of military technology […] associated with having the latest and most advanced equipment" (2007:144). Likewise, radioactive performances celebrate radiation-related technologies in ways that make the revitalization of Fukushima possible throughout the latest tracking and monitoring technologies. For instance, at NIRS, one of the most popular attractions was the whole-body counter (WBC), a machine that measures the internal level of radioactive contamination in a person's body. Visitors waited in line for their results as a technician stated that each body was "just fine" (*daijōbu desu*). While the WBC appears to be the epitome of radioactive risk monitoring, there was no discussion regarding what this machine could not measure. Notably, a WBC does not measure the potential for future genetic damage, but the overall amount of radiation in a person's body. This can be misleading, as one expert in radiation/chemical carcinogenesis explained to me in 2016:

> While the average result of a test might appear to be low, one particular spot in the body can have a very high amount of internal contamination. Even on a single organ, like the stomach, there can be a lot of heterogeneity. This is enough for a cancer to develop, as a cancer does not "understand" the term "average," but concentrates itself on a spot. A result that is "below average" does not imply a lack of risk, not at all.

A radiation biologist employed by NIRS equally explained to me the reasons for using a WBC: "We are doing those tests because we can do them. In theory, the screening can make people feel better." In talking about the management of radioactive pollutants, Hamblin argues that the term "monitoring" held much power, since it suggests "a certain level of vigilance in scientific testing, thus ensuring safety" (2008:192). In that regard, WBC tests were technological performances that acted as an assurance aimed to provide emotional safety (*anshin*), rather than only biological safety (*anzen*).

At CEC, visitors also experienced guided tours of the JAEA and the National Institute for Environmental Studies' research facilities. There, children were given white lab coats and introduced to brand new instruments that monitored radioactivity in Fukushima. Technical advisors did not present monitoring machines as a sign that the prefecture was contaminated, but as encounters that reflected the wonder of science and technology, arguing that these machines were rare and the most advanced of their kinds. Tropes of technological wonders were much present within the Prefecture of Fukushima, which has aimed to lead the robotic industrial revolution of Japan with machines used for radiation monitoring. Indeed, events such as "Robot Festa Fukushima" were held to increase interest in robots among returnees. During such events, one could learn about snake-like robots that wiggle through complex pipe structures for inspection purposes of the power plant (see also METI 2015:12).

In the analysis (*bunseki*) and monitoring (*kanshi*) section of the Environmental Radiation Monitoring Centre, I had the opportunity to further examine the latest monitoring facilities of Japan. Situated in Minami-Soma, the center was in charge of environmental monitoring in the coastal region of Fukushima and shared its office with JAEA. Amidst the strong smell of gasoline surrounding the R&D hangar, a JAEA employee proudly introduced me to an array of sensor drones and unmanned aerial vehicles that collected data on radioactive contamination. These projects were directed toward the development of technologies necessary for the environmental recovery of Fukushima (CEC 2019:9). Since 2015, the Ministry of Economy, Trade, and Industry has attempted to transform the coastal region of Fukushima into an "innovation coast" (*inobēshon kōsuto*) by developing a strong R&D base around radiation monitoring and reactor decommission technology (METI 2015:12). Such policies aim to provide potential job opportunities that will promote the economic revitalization of

the region. Importantly, Fukushima was always a poor and depopulated region (Kainuma 2011), a situation that the disaster further exacerbated. According to the scientists and bureaucrats I spoke to, Fukushima would soon be full of blooming industries, standing at the cutting edge of technological growth.

Yet, for some evacuees, recovery was not necessarily synonymous with economic revitalization. In July 2016, I interviewed a father that had evacuated from Fukushima to Nagano Prefecture, fearing for the health of his child when the disaster happened. As he argued to me: "Right now Fukushima is like a bubble, but it's going to pop one day. Money is like a drug. A lot of people will come back to Fukushima because the government is promoting employment and kickbacks, but honestly, what is more important?" For this evacuee, state performances associated with the marvel of technological development coalesced toward a politics of revitalization that primarily served the interests of nuclear industries, rather than those of evacuees. As he bitterly argued: "[F]or those who want to leave there's nothing…"

Performing Hazards

Following Fukushima, radioactive performances provide information that are easy to understand, interactive, and non-threatening. This is done through three specific iterations that emphasize naturalness explanations, cute and fun aesthetics, and the wonder of science and technology. However, this form of risk communication strategy do not merely depict the phenomenon of radiation exposure. Rather, what is being governed through radioactive performances is also an attempt at defining what radiation hazard is and is not—and for whom. Radioactivity is a process where unstable elements gradually transform themselves into something stable, immutable. Likewise, radioactive performances are performative processes that transform the story of Fukushima from an unstable situation of emergency and anxiety to a narrative of normalization and status quo.

In sharp contrast to the bodily artifacts of the Hiroshima Peace Memorial Museum, which transforms a former military aggressor into a victim of nuclear war, post-Fukushima radioactive performances eliminate disturbing aspects of radiation exposure and fall within historically established processes of control that aim to diffuse widespread societal unrest, to reclaim

political control and economic stability, and to pacify a fearful public—and in ways that will be reinforced for the 2020 Tokyo Olympics, currently postponed due to COVID-19. A politics of victimization and relocation, as seen in Petryna's account of Chernobyl (2013), has no place in the narrative that radioactive performances support in Japan.

PHOTO BY MAXIME POLLERI

Figure 5. A revitalization sign at the train station of Fukushima.

Not too long ago, in the midst of the Cold War, American children were taught to "duck and cover" to protect their bodies against the effects of a nuclear explosion brought by Soviet attacks (Jacobs 2010). These performances were integral to modern state power and its expertise, often with the effect of managing the national community at the level of emotion, so as to install "structures of emergency into a deep future" (Masco 2014:43). Yet, radioactive performances described in Japan embody a different politics. They do not represent a normalization against potential annihilation from foreign enemies, but a normalization in a Japan that is already post-Fukushima. These performances point toward a form of governance that reframe ongoing exposure as normal, while attempting to socialize the victims of a nuclear disaster into learning to live comfortably with the radiation that infests their environment. Radioactive performances consequently skirt the "nuclear uncanny," that is, moments of disruption and anxiety associated with radioactive materials (Masco 2006:28).

As opposed to the initial crisis that followed Fukushima, fueled by anxiety, panic, and fear, technical advisors argued to me that information about radiation should now be transferred in ways that did not instantiate fear—or, if fear was inevitable, it should be what they called a "proper fear" (*tadashiku osoreru*). Yet, the term appropriate fear implies that the correct fear is invariably "the one established by the authorities," and relegates different opinions as reflecting the wrong understanding (Shirabe, Fassert, and Hasegawa 2015:3).

This was notably the case of one voluntary evacuee that I regularly met throughout my fieldwork, a mother named Natsuo (pseudonym), who had chosen to evacuate from Koriyama, Fukushima. As she explained when I interviewed her in 2016: "The government is constantly repeating the slogan of 'recovery and reconstruction,' and in doing so they encourage voluntary evacuees [*jishu hinansha*] to return to areas of high risk […] Mothers who criticize how the Fukushima disaster is being handled are being called unpatriotic [*hikokumin*]." For Natsuo, this pressure had created a social atmosphere where choosing to avoid being exposed to low-level radiation for long-term safety was considered the wrong or irrational choice. When I last meet her in 2017, she was appalled by state-sponsored public exhibitions, which she saw as undermining her fight for the right to remain evacuated from an environment she considered dangerous. By emphasizing specific aspects of the phenomenon of radioactivity, educational infrastructure contributes to the strengthening of this atmosphere and encourages the return of evacuees to their hometowns, especially as financial subsidies for evacuation get gradually cut off.

Radioactive performances have as such a real influence since they reinforce a structure of exclusion for those who experience risk and recovery differently than the policies of repatriation promoted by the government. Even among the experts at NIRS, tensions were present. I met one high-ranking scientists who voiced a preference for the evacuation of children from irradiated areas rather than the construction of child-focused educational centers. Yet, this individual was told by colleagues that her opinion was "inconvenient" (*futsugō*) and was absent from official channels of risk communication.

Butler has argued that performativity is a "process of iterability, a regularized and constrained repetition of norms" (1993:95). In this understanding, a successful iterability represents the capacity of specific tropes to be repeatable in different contexts; the naturalness of radiation, cute and fun

aesthetic, and a fetishization of nuclear technologies are all tactics that existed before Fukushima and beyond Japan. Yet, each of these tactics are repurposed in the context of an ecologically and economically insecure Japan.

To better understand the performativity of environmental hazards, or how hazards get materialized within specific boundaries, it is essential to examine how former tropes and imaginaries get recycled within new contexts, with the effect of reproducing social inequalities and propagandist forms of knowledge. The notion of radioactive performances reveals how subtle forms of governance give the appearance of openness and public participation, while actually reproducing limited conventions of what counts as harm and recovery. While such forms of risk communication are innovative in their interactivity and freedom from jargon, they are less so in their content.

In the end, for a community where harmful residual radioactivity has become a public everyday concern, coming to grips with serious contamination requires more education than ever. This brings a set of conceptual and ethical questions: What can be considered appropriate relationships toward long-lasting contamination? Who gets to teach about these problems, and what is being left out? How do we define normality when retrieving former baselines of pre-pollution are but naïve nostalgic endeavors? To answer these questions, Fukushima needs more stories that embrace the complex experiences associated with radioactive contamination, rather than a single narrative of recovery.

Yet, it is doubtful that this will happen. Inside the Fukushima Prefectural Centre for Environmental Creation stands an enormous black and white digital clock, showing the time elapsed since 2:46 p.m. on March 11, 2011. As one can read below the clock: “This is also the amount of time Fukushima has been working to recover and create the local environment. Fukushima will continue to advance this process step by step.” This clock represents the ultimate trump card of radioactive performances that stabilize hazards as temporal problems are stuck in the past, while gliding over the potential genetic dangers associated with chronic exposure to radiation. And with each second passing by, the voices and concerns of those who still fight for permanent evacuation appear dimmer and dimmer. ■

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Endnotes:

[1]WWII atomic bombings produced an opportunity to study the effects of radiation exposure on human beings (see Gusterson 1998:105). Survivor data, known as the Life Span Study, was collected in the 1950s by the Atomic Bomb Casualty Commission, leading to the conclusion that doses of radiation above a certain level (100 millisieverts per year) could cause adverse health effects. These include cancers, impairing immunity to infection, and increased risks of cataracts, heart disease, or stroke (Gale and Lax 2013:19, Morris-Suzuki 2014:336). The Life Span study served as a basis for creating safety standards (Goldstein and Stawkowski 2015:72), while being criticized for shortcomings in its methodology (Stewart and Kneale 2000, Takahashi 2012).

[2]Video available at https://www.youtube.com/watch?v=sOFg8oWMHRM. Last accessed August 26, 2017.

[3]The field of radiological protection currently adopts a linear non-threshold (LNT) model, arguing that risk is proportional to the level of exposure received, with no dose being completely safe. Consequently, chronic and low-dose exposure to ionizing radiation (i.e., below 100 mSv per year, which is the situation afflicting Fukushima) can increase the risk of adverse health effects in the future (WHO 2016). Yet, the science and management of risk associated with chronic low-dose exposure constitutes a harsh area of debates (see Green 1999, Goldstein and Stawkowski 2015).

[4]While bananas have naturally occurring potassium, it would take around 20 million bananas to get radiation poisoning (Hecht 2013b).

[5]Background radiation is due to naturally occurring terrestrial or cosmic radiation sources.

[6]In Japanese, names are often followed by various honorific suffixes, such as *san*.

[7]NIRS headquarters are located in Chiba prefecture, not far from Tokyo. Chiba was also affected by the nuclear disaster as some areas were found to have radiation hot spots.

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Foreign Language Translations:

Radioactive Performances: Teaching about Radiation after the Fukushima Nuclear Disaster
[**Keywords**: Japan, Fukushima, nuclear disaster, radioactive contamination, performance, risk communication, normalization]

放射性のパフォーマンス：福島原発災害後の放射線教育
[**キーワード**：日本、福島、原発災害、放射能汚染、パフォーマンス、リスクコミュニケーション、正常化]

Performances radioativas: Ensinando Sobre Radiação após o Desastre Nuclear de Fukushima
[**Palavras-chave**: Japão, Fukushima, desastre nuclear, contaminação radioativa, performance, comunicação de risco, normalização]

放射性表演: 福岛核电灾变之后关于辐射之教学
[**关键词**: 日本, 福岛, 核能灾变, 放射性污染, 表演, 风险沟通, 正常化]

Радиоактивные перформансы — Преподавание, связанное с радиацией после аварии на АЭС Фкукусима-I.
[**Ключевые слова**: Япония, Фукусима, атомная авария, радиоактивная контаминация, перформанс, информация о рисках, нормализация]

العروض المُشِعة: التدريس حول الإشعاع بعد كارثة فوكوشيما النووية
كلمات البحث: اليابان، فوكوشيما، الكارثة النووية، التلوث الإشعاعي، الأداء، الإبلاغ عن المخاطر، التطبيع