# Lost in Communication: Non-fiction representations of genetic stigma

Single Volume

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# Abstract

Recently renewed support for nuclear power is inevitably followed by concern about future radiological accidents. In order to deal with these future challenges, I propose a narrative ethics analysis of Craig Mazin's *Chernobyl* (2019) in an effort to better understand the contributions of pop-culture nuclear narratives to wider nuclear safety "sociotechnical imaginaries" which, according to STS scholars Sheila Jasanoff and Sang-Hyun Kim, potentially inform or challenge radiation protection policy decision making. Focusing on representations of genetic stigma, I borrow from narrative ethics scholars James Phelan, David Richter and Maria Mäkela to explore how a dramatized retelling of true events integrates wider nuclear safety imaginaries. First, I examine the Fukushima Daiichi aftermath as the stage of radiation "in/visibility" politics and resituate concerns about radiation exposure within STS and risk communication scholarship, international guidelines and "lessons learned," in order to identify pop-culture narratives as perceived competitors of official risk communications. Then, I briefly study the evolution of nuclear narratives since the start of the Cold War, while also addressing the reality of genetic stigma in order to identify how it was deployed as a narrative topic or storytelling theme in the past. This allows me to conduct my analysis of *Chernobyl* by first studying how its political framing of scientific truth and narrative lies forces survivors' stories to fit into its own moralized dichotomy, then by studying how it uses artifice to create a problematic illusion of "pastness" that serves to exploit the experiences of people exposed to radiation. I conclude that *Chernobyl* further entrenches genetic stigma in wider nuclear safety imaginaries by perpetuating the idea that individuals exposed to radiation are a danger to others with the help of traditional and social media paratexts through which it solidified its illusory historical and scientific authenticity.

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# Acknowledgments

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# Author’s Declaration

I hereby declare that except where specific reference is made to the work of others, the contents of this dissertation are original and have not been submitted in whole or in part for consideration for any other degree or qualification in this, or any other university. This dissertation is my own work and contains nothing which is the outcome of work done in collaboration with others, except as specified in the text and Acknowledgments. This dissertation contains fewer than 80,000 words including footnotes and has fewer than 150 figures.

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# Chapter 1 – Introduction

## 1.1 Background – Imagining nuclear safety in nuclear policy

Despite the nuclear industry's ups and downs, fifty-eight reactors are currently under construction in the world, according to the International Atomic Energy Association (IAEA).[1] However, most of this activity is occurring in Asian, Middle Eastern and Eastern European countries. As for Western Europe – two reactors are being built in the United Kingdom, two in Slovakia and only one in France. In the meantime, a 2017 referendum in Switzerland resulted in plans to phase out of nuclear by 2050,[2] and on April 15th 2023, Germany finally shuttered the last three of its seventeen reactors[3] – all closed since the 2011 Fukushima Daiichi nuclear disaster.

On March 11th 2011, the Touhoku or Great East Japan Earthquake (magnitude 9) battered Japan's Pacific coast and generated a tsunami that in some locations reached 40 meters high as it breached land. The seaside Fukushima-Daiichi nuclear station, which was protected by only a 5.5 meter tall sea wall, was partially destroyed by a 15 meter high portion of the tsunami, leading to the country's worst nuclear incident to date. While normal safety protocols were triggered to cease all fissile reactions as the earthquake struck, the ensuing wave destroyed both the primary power lines and the back-up power generators needed to maintain the station's decay heat cooling systems in 5 out of the 6 reactors. Following this damage, three chemical explosions and three meltdowns occurred –releasing dangerous amounts of radiation into the environment.[4] This was followed by an immediate drop in favour towards nuclear energy exploitation

1 International Atomic Energy Association, *Nuclear Power Reactors in the World*, Reference Data Series n°2 (Vienna: IAEA, 2023), 11.

2 Swiss Confederation, Federal Chancellery, *Loi sur l'énergie (Lene)*, Votation populaire du 21 mai 2017 - Explications du Conseil fédéral (February, 2017), 6. This summary of the legal implementations of the referendum results explains that the Fukushima Daiichi disaster led both the Council and Parliament to consider backing out of nuclear production: "Suite à l'accident qui a frappé la centrale de Fukushima, le Conseil fédéral et le Parlement ont en outre décidé de sortir progressivement du nucléaire : la construction de nouvelles centrales nucléaires sera interdite."

3 Agence France Presse, "Germany ends nuclear era as last reactors power down," *France 24,* April 15, 2023, https://www.france24.com/en/live-news/20230415-germany-ends-nuclear-era-as-last-reactors-power-down.

4 Director General Yukiya Amano, *The Fukushima Daiichi Accident*, Non-serial Publications (Vienna: IAEA, 2015), 23-43.

and in approval to build new power plants in Japan,[5] as well as a halt to nuclear energy production led by the Japanese government.[6]

Although Japan has already started re-opening some of its plants since 2015,[7] at the end of February 2023, Japanese public opinion shifted in favour of reopening its idle nuclear plants for the first time since the catastrophe. The poll was conducted by the *Asahi Shimbun* newspaper, as it has done every year since 2013. In the immediate aftermath of the disaster, all Japanese plants had paused operation, and according to *Asahi Shimbun*'s first year of polling, the public was 58% in support of keeping them closed and only 28% in favour of recommencing operations. This share of opinions stayed relatively stable until February of 2022, when the Russian invasion of Ukraine started. As of early 2023, 51% of the polled population is in support of restarting nuclear plant operations – in large part due to the energy crisis that the war in Ukraine has caused.[8]

Renewed support for nuclear power, which can be seen in other countries with large nuclear industries like France,[9] as well as in the broader European Union (EU) political landscape,[10] is unavoidably followed by concern that nuclear accidents, and

5 Wouter Poortinga, Midori Aoyagi and Nick F. Pidgeon, "Public perceptions of climate change and energy futures before and after the Fukushima accident: A comparison between Britain and Japan," *Energy Policy* 62 (November, 2013), 1207.

6 US Energy Information Administration, *Japan's fossil-fueled generation remains high because of continuing nuclear plant outage*, 15 March 2013, https://www.eia.gov/todayinenergy/detail.php?id=10391. "Following the accident at Fukushima, all reactors in Japan were required to perform computer-simulated stress tests to confirm their continued ability to operate safely in the event of a natural disaster. As reactors shut down for regularly scheduled maintenance or refueling, stress tests were performed and submitted to the Japanese Nuclear and Industrial Safety Agency (NISA) for review and acceptance. On May 5, 2012, the last of Japan's 54 nuclear generating reactors was shut down for scheduled maintenance and stress tests. Only two reactors, Ohi Units 3 and 4, have restarted since the accident, and they are scheduled for an outage later this year."

7 Nancy Slater-Thompson, *"*Japan restarts first nuclear reactor under new safety rules," *Today in Energy*, 12 August 2015, https://www.eia.gov/todayinenergy/detail.php?id=22472. Nancy Slater-Thompson, *"*Five and a half years after Fukushima, 3 of Japan's 54 nuclear reactors are operating," *Today in Energy*, 13 September 2016, https://www.eia.gov/todayinenergy/detail.php?id=27912.

8 "Majority favor restarting idle nuclear plants, Asahi poll finds," National Report, *Asahi Shimbun,* 21 February 2023, https://www.asahi.com/ajw/articles/14844619. Shoko Oda, "Nuclear power revival reaches Japan, home of the last meltdown," National, *Japan Times*, March 06, 2023, https://www.japantimes.co.jp/news/2023/03/06/ national/nuclear-power-revival/.

9 Ifop survey, *Les Français et le nucléaire : adhésion et traits d'image*, September 2022, 7, https://www.ifop.com/ wp-content/uploads/2022/09/119425-Rapport.pdf. This poll found that public support for constructing new nuclear installations increased in France, from 51% to 65%, between October 2021 and September 2022.

10 P.L. and Agence France Presse, "Emmenés par la France, onze pays de l'UE s'unissent pour défendre l'énergie nucléaire," Energie, *BFM Business*, 28 February 2023, https://www.bfmtv.com/economie/entreprises/energie/ emmenes-par-la-france-onze-pays-de-l-ue-s-unissent-pour-defendre-l-energie-nucleaire_AD-202302280337.html. France and ten other EU countries have recently signed a joint declaration intended to defend pre-existing nuclear installations

thus exposure to radiation, will continue to be a future possibility. This is particularly the case in a world besieged with global pandemics and plagued with increasingly unstable political relations, as Russian troops and airstrikes have shown by disturbing Chernobyl's Red Forest[11] and cutting off power to the Zaporizhzhia nuclear power plant.[12] These surprise challenges in the world of nuclear energy exploitation were reflected in the opening statement of the first conference held by the European Nuclear Safety Regulators Group (ENSREG) after the global outbreak of the Covid-19 pandemic, in June 2022: "this state of affairs illustrates perfectly how nuclear safety is part of a larger picture that requires regulators to constantly adjust to the world around them."[13]

The members of ENSREG are among 94 signatories and ratifiers of the 1994 Convention on Nuclear Safety (CNS) submitted by the aforementioned IAEA. This convention not only stipulates that safety is a regulatory priority for nuclear energy exploitation,[14] but also obligates the relevant parties to keep radiation exposure as low as "reasonably" possible.[15] Such commitments are reflected in the work of partner organisations like ENSREG, which defines "nuclear safety" as protecting the public, workers in the nuclear industry and the environment from the "hazards" and "risks" of nuclear energy exploitation – not only by ensuring "that the established radiation dose limits are not exceeded and that the probability and consequences of nuclear accidents are reduced to an acceptable level,"[16] but also by preparing emergency arrangements to

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and support the development of nuclear exploitation technologies. These other EU countries include Bulgaria, Croatia, the Czech Republic, Hungary, Finland, the Netherlands, Poland, Romania, Slovakia and Slovenia.

11 "Unprotected Russian soldiers disturbed radioactive dust in Chernobyl's 'Red Forest', workers say," Europe, *Reuters*, 29 March 2022, https://www.reuters.com/world/europe/unprotected-russian-soldiers-disturbed-radioactive-dust -chernobyls-red-forest-2022-03-28/.

12 "Ukraine war: Russian air strikes cut power at Zaporizhzhia nuclear plant," Europe, *BBC*, https://www.bbc.com/news/world-europe-64897888.

13 Ann MacLachlan, "6th European Nuclear Safety Conference," Streaming service of the European Commission, 20 June 2022: 9:08:00 to 9:08:20, https://webcast.ec.europa.eu/6th-european-nuclear-safety-conference-2022-06-20.

14 IAEA, "Convention on Nuclear Safety," INFC1RC/449 (July, 1994), 4, https://www.iaea.org/sites/default/files/ infcirc449.pdf. Article 10 obligates signatories and ratifiers to "take the appropriate steps to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety."

15 *Ibid*., 5. Article 15 states that "in all operational states, the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits".

16 European Nuclear Safety Regulators Group, "Regulating for safety," Nuclear Safety, Online, last accessed: 29 November 2023, https://www.ensreg.eu/nuclear-safety/regulating-safety.

mitigate radiation exposure in line with Euratom's 2013 Basic Safety Standards Directive, which itself relies on data produced by the International Commission of Radiation Protection (ICRP). Nuclear energy exploitation therefore rests on notions of radiological safety and nuclear emergency preparedness, as understood, defined and enshrined by a vast network of international regulators and their partners.

Together, the overlapping understandings of these different aspects of "nuclear safety" and the sociopolitical notions that they belie might be called a radiation or nuclear safety "imaginary" or "imaginaries" – to echo the seminal work of science and technology studies (STS) researchers Sheila Jasanoff and Sang-Hyun Kim on "sociotechnical imaginaries". First proposed in their 2009 *Minerva* publication, "Containing the Atom: Sociotechnical Imaginaries and Nuclear Power in the United States and South Korea", and then redeployed in a 2013 *Science as Culture* article, "Sociotechnical Imaginaries and National Energy Policies," Jasanoff and Kim have put forward the concept of "sociotechnical imaginaries" to help theorize the relationship between science, technology and political power.[17] These imaginaries "at once describe attainable futures and prescribe futures that states believe ought to be attained" and "have the power to influence technological design, channel public expenditures, and justify the inclusion or exclusion of citizens with respect to the benefits of technological progress."[18]

According to this framing, evolutions in nuclear energy sciences such as the development of Accident Tolerant Fuels (ATFs)[19] and crystalline compounds able to improve the durability of the waste vitrification process[20] might be attributed to the nuclear safety imaginaries embedded in the aforementioned regulatory agreements. However, nuclear safety regulators and authorities must not only contend with their own understandings or expectations of future potential radiological effects on society in the wake of unintended exposure, but also those of the wider public – with which there may even be overlap. Although sociotechnical imaginaries "reside in the reservoir of norms

17 Sheila Jasanoff and Sang-Hyun Kim, "Containing the Atom: Sociotechnical Imaginaries and Nuclear Power in the United States and South Korea," *Minerva* 47 (June, 2009): 119-146.

18 *Ibid*., 120.

19 Office of Nuclear Energy, "These Accident Tolerant Fuels Could Boost the Performance of Today's Reactors," online, 28 January 2020, https://www.energy.gov/ne/articles/these-accident-tolerant-fuels-could-boost-performance-todays-reactors.

20 Gerald S. Frankel, John D. Vienna, Jie Lian, *et al*., "Recent Advances in Corrosion Science Applicable To Disposal of High-Level Nuclear Waste," *Chem. Rev.* 121, n° 20 (2021): 12327–12383.

and discourses, metaphors and cultural meanings out of which actors build their policy preferences," Jasanoff and Kim are careful to distinguish them from the "discursive frames that guide media representations of science and technology," on the basis that sociotechnical imaginaries "are associated with active exercises of state power, such as the selection of development priorities, the allocation of funds, the investment in material infrastructures, and the acceptance or suppression of political dissent," whereas the "social reality" of media representation "rests on the repeated use of words and images in public communicative space," therefore falling outside the scope of their studies.[21]

Since these earlier publications, Jasanoff and Kim have gone on to redefine sociotechnical imaginaries "as collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology,"[22] in recognition of "the myriad ways in which scientific and technological visions enter into the assemblages of materiality, meaning, and morality that constitute robust forms of social life." No longer tied specifically to national policy, Jasanoff explains that "sociotechnical imaginaries can originate in the visions of single individuals or small collectives, gaining traction through blatant exercises of power or sustained acts of coalition building," and thus, "[m]ultiple imaginaries can coexist within a society in tension or in a productive dialectical relationship."[23] However, in examining the proliferation of Jasanoff and Kim's concept of sociotechnical imaginaries in articles and book abstracts published since the concept's first emergence in 2009, Tadeusz Rudek highlights the fact that most scholars "looked for imaginaries in legal acts and documents" as opposed to in pop-culture narratives, leading to a "blind spot," despite the fact that the latter would serve well to scrutinize "the consistency of dominant and alternative imaginaries" and "help to gain a broader view and comparative perspective in different contexts."[24]

21 Jasanoff and Kim, "Containing the Atom," 123.

22 Sheila Jasanoff, "Future Imperfect: Science, Technology, and the Imaginations of Modernity," *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*, Eds. Sheila Jasanoff and Sang-Hyun Kim (University of Chicago Press, 2015), 4. Sheila Jasanoff, "Imagined worlds: The politics of future-making in the twenty-first century," *The Politics and Science of Prevision Governing and Probing the Future*, Eds. Andreas Wenger, Ursula Jasper and Myriam Dunn Cavelty (Routledge, 2020), 32.

23 Jasanoff, "Future Imperfect," 4.

## 1.2 Research Question and Thesis Aims

As such, I propose a narrative ethics analysis of Craig Mazin's *Chernobyl* (HBO, 2019) – a dramatized re-telling of the 1986 Chernobyl nuclear disaster described as a "Surprise Monday Night Hit".[25] Over the course of five episodes, it retraces the technical manoeuvres leading up to the explosion at reactor four, and follows the ensuing scientific (and criminal) investigation into the incident during its immediate aftermath. Upon release, the show's cumulative audience across official platforms reached 8 million, breaking the company's digital viewership records at the time,[26] and garnering the attention of (as well as promotion by) nuclear scientists[27] and activists[28] alike.

The widespread popularity of this series just a few years after the Fukushima Daiichi nuclear accident, during which the Chernobyl disaster often served as a frame of reference across both domestic[29] and foreign[30] media, already makes *Chernobyl* an interesting case study to start examining pop-culture narratives as "alternative imaginaries" to those expressed through official policy, as well as the relationships that may tie them together. The fact that one of the survivors of the Chernobyl meltdown, Lyudmila Ignatenko, has blamed the series for the public backlash she received after it

24 Tadeuz Josef Rudek, "Capturing the invisible. Sociotechnical imaginaries of energy. The critical overview.," *Science and Public Policy* 49, n° 2 (April, 2022), 231.

25 Josef Adalian, "How *Chernobyl* Became HBO's Surprise Monday Night Hit," *Vulture*, 04 Jun 2019, https:// www.vulture.com/2019/06/chernobyl-hbo-monday-ratings.html.

26 Travis Clark, ""Chernobyl" has become a big hit for HBO, and shows audiences are sticking around after the end of "Game of Thrones"," *Business Insider*, 13 June 2019, https://www.businessinsider.com/chernobyl-is-a-hit-for-hbo-in-critics-ratings-after-game-of-thrones-2019-6?r=US&IR=T#:~:text=%22Chernobyl%22%20has%20a%20cumulative%20audience,HBO%20Now%20subscribers%20could%20cancel.

27 Claire Corkhill (@clairecorkhill), "Are you suffering withdrawal symptoms from finishing watching the #HBO miniseries #Chernobyl?" *Twitter*, 15 August 2019, https://twitter.com/clairecorkhill/status/1162070520818470917.

28 Chernobyl Children International (@Chernobyl), "Tonight on @skyatlantic, the penultimate episode of the record-breaking "Chernobyl" mini-series." *Twitter*, 28 May 2019, https://twitter.com/Chernobyl/status/ 1133308462765621252.

29 Rachel DiNitto, "Chernobyl and Beyond: A New Era of Nuclear Literature," *Fukushima Fiction: The Literary Landscape of Japan's Triple Disaster* (University of Hawaii Press, 2019), 121-159.

30 Tanja Perko, Iztok Preselj, Marie C. Cantone et al., "Fukushima Through the Prism of Chernobyl: How Newspapers in Europe and Russia Used Past Nuclear Accidents," *Environmental Communication* 13, n°4 (January, 2018): 527-545.

aired,[31] makes its scrutiny in the context of renewed debate about "nuclear safety" and the effects of low-dose radiation exposure after an accident all the more relevant.

In fact, among the most "predictable" effects of a nuclear disaster according to Robert Jacobs, a history professor at the Hiroshima Peace Institute and the Graduate School of Peace Studies of Hiroshima City University, is the way it turns survivors into "social pariahs" – often leading to school-yard bullying, marital rejection or job discrimination.[32] What Jacobs attributes to a "natural fear of contamination that is associated with people exposed to a poison" – founded on the belief that DNA damage incurred by radiation exposure might lead to "malformed" future generations (suggesting that "contagion" might better translate the perceived effects of radiation exposure than "poison") – has also been discussed as a notable source of "stigma" by health care workers and researchers working in the Fukushima area since the disaster ocurred.[33]

Therefore, on the basis of this framing, I question what about radiation-exposure health stigmas *Chernobyl* contributes to broader understandings of nuclear safety in the wake of the Fukushima Daiichi disaster, and the ethical ramifications of these contributions – the purpose being to draw critical attention to pop-culture nuclear narratives as competitors of "official" communications in aftermath of disaster, in ways that both policymakers and story writers should be aware of.

## 1.3 Methodologies

In continuation with Jasanoff and Kim's characterization of "sociotechnical imaginaries" as the cultural glue that binds science and technology to political power, I refer to "imaginaries" as the "norms and discourses, metaphors and cultural meanings" woven through nuclear disaster narratives such as *Chernobyl*. Here, I also refer to the concept of "narrative" as defined by narrative ethics scholar James Phelan in

31 "The 'Real' Lyudmila from Chernobyl Speaks for First Time," News, *BBC,* 23 March 2023, https://www.bbc.co.uk/news/av/world-europe-50731500/the-real-lyudmila-from-chernobyl-speaks-for-first-time.

32 Robert Jacobs, "The Radiation That Makes People Invisible: A Global Hibakusha Perspective," *The Asia-Pacific Journal* 12, issue 31, n°1 (July, 2014), 6.

33 Masaharu Tsubokura, "Influence of different media, producing stigma," *Health Effects of the Fukushima Nuclear Disaster*, Eds. Kenji Kamiya, Hitoshi Ohto and Masaharu Maeda (Elsevier, 2022), 265-279. Joo-Young Jung, "Stigma perceptions, social media neighborhood storytelling, and future outlook in post-disaster Fukushima," *Asian Journal of Communication* 31 (December, 2021), 64-82.

*Experiencing Fiction* (2007) – the rhetorical act of "somebody telling somebody else on some occasion and for some purpose(s) that something happened". Like Phelan, I also refer to "narratives" interchangeably as "stories," and the act of sharing that story as "storytelling." These stories can be broken into sub-layers of narrative ethics study: First, "the report of a sequence of related events during which the characters and/or their situations undergo some change"; and second, the "dynamics of audience response."[34] Both of these dimensions are relevant to the study of pop-culture narratives as competitors of (or contributions to) the sociotechnical imaginaries that go on to inform nuclear safety policy decisions, particularly where concerns for social stigmatization arise.

However, Phelan's narrative ethics framework more specifically helps to understand the literary-cultural impetus behind government policies alongside the concept of sociotechnical imaginaries because it purports "to uncover the ethical values underlying the specific rhetorical exchanges of a particular narrative"[35] – ethical values which "inevitably come into play" in the context of any "acquisition or deployment of power".[36] Following this, as well as both Phelan's observations that "individual narratives […] establish their own ethical standards in order to guide their audiences to particular ethical judgments"[37] and "ethical judgments in narrative include not only ones we make about the characters and their actions but also those we make about the ethics of storytelling itself,"[38] this thesis focuses on the first sub-layer of narrative ethics study by exploring the theoretical concepts and definitions that the series writer Craig Mazin uses to frame radiation exposure, communicated to a global digitized audience with the help of paratexts and social media, as well as the ethical judgments that can be made regarding the production and delivery of such narratives in a modern disaster recovery context.

My approach to this narrative ethics analysis of *Chernobyl* is therefore not only informed primarily by the work of David Richter, who analyses "the ethical issues that arise out of the differences between the genres of history and historical film, biography

34 James Phelan, *Experiencing Fiction: Judgments, Progressions, and the Rhetorical Theory of Narrative*, (Ohio State University Press, 2007), 7.
35 James Phelan, "Narrative Ethics," *the living handbook of narratology*, November 21, 2013, accessed October 30, 2023, https://www-archiv.fdm.uni-hamburg.de/lhn/node/108.html.
36 *Ibid*.
37 Phelan. *Experiencing Fiction,* 10.
38 *Ibid*., 12.

and biopic," arguing that "the material cause of narrative may in fact carry major ethical consequences,"[39] and for whom "[a] good history film will enrich our lives, strengthen our character and challenge our system of beliefs" whereas "[a] bad one may involve ethical cheating […] a nearly universal form of hypocrisy, […] a show of lofty motives (moral, political or religious) while inviting us to court our own degradation and that of others as we become involved in the lengthy and graphic representation of brutal rape or revenge killing or torture,"[40] but also by that of Jonathan Gray on the role of paratexts in shaping diverse media narratives (through concepts of "bonus materials" and *in media res* paratexts[41]) which he argues need to be examined "not as some odd exercise in completionism, […] but rather because paratexts are regularly constitutive, central and absolutely important."[42]

In a similar vein, I borrow from the work of Maria Mäkelä et al. who argue that social-media "radically alters the narratological settings of the ethics and rhetoric of storytelling, sometimes turning good intentions into unsolicited narrative effects,"[43] by transforming the story into a "*viral exemplum*." Defined as "the chain reaction, typically fuelled by social media shares, from narrative experientiality to representativeness and normativity," the *viral exemplum* can help further develop our understanding of a radiation or nuclear safety imaginary through narrative ethics analysis, since "even when challenged by subsequent evidence, the initial interpretation and affective reactions may persist and lead to normative conclusions and political action".[44]

The exemplum, here, is conceived as a story first shared via social media, but as I will show in my analysis, *Chernobyl* similarly undergoes the online transformations described above, and in a paper co-written with Paul Dawson, in which they discuss the concept of sharing stories, which they define as both telling the story, and distributing it across "broader networks", such as X (formerly known as Twitter),[45] arguing that a

39 David H. Richter, "Keeping Company in Hollywood: Ethical Issues in Nonfiction Film," *Narrative* 15, n° 2 (May, 2007), 141.
40 *Ibid*., 143.
41 Jonathan Gray, *Show sold separately: promos, spoilers, and other media paratexts* (New York University Press, 2010), 23.
42 Jonathan Gray, "Afterword: Studying Media with and without Paratexts," *Popular media cultures: fans, audiences and paratexts*, Ed. Lincoln Geraghty (University of Portsmouth, 2015), 230.
43 Maria Mäkelä, Samuli Björninen, Laura Karttunen, *et al*., "Dangers of Narrative: A critical Approach to Narratives of Personal Experience in Contemporary Story Economy," *Narrative* 29, N° 2 (May, 2021), 154.
44 *Ibid*.
45 Paul Dawson and Maria Mäkelä, "The Story Logic of Social Media: Co-Construction and Emergent Narrative Authority," *Style* 54, n°1 (2020), 24.

cultural narrative can emerge from this process, "whereby the nonlinear recursivity of viral circulation is subjected to the causal logic of narrative".[46] The global popularity and online media resonance of Craig Mazin's *Chernobyl* is of particular interest in this context.

This branch of narrative ethics scholarship also overlaps somewhat with the notion of Cultural Materialism developed by Raymond Williams (1980; reis., Verso, 2005),[47] who discusses his cultural materialist notion of communication being a means of (cultural) production, and for whom the highly globalized social media and streaming platforms that are popular components of story telling today would qualify as amplificatory, durative *and* alternative story telling devices – echoing Mäkelä's construction of the *viral exemplum*. One of the key concepts of cultural materialism is its recognition that "practices are imbued with cultural significations and as such embedded in particular social relations" and "through processes of alienation, social products (both physical and social) become reified as natural objects."[48] Echoing the warnings found in narrative and communications scholarship that came afterwards, the general concept of Cultural Materialism allows literary scholars to engage with texts by situating them in the social, political, cultural and historical environments in which they are produced.

Furthermore, Williams is critical of analytical approaches to communications that see them only as "devices for passing of 'information' and 'messages' between persons who either generally, or in terms of some specific act of production, are abstracted from the communication process as unproblematic 'senders' or 'receivers'."[49] In this context, works of nuclear fiction can also be understood as cultural artefacts, and in this day and age of easily accessible online media (the material medium through which most audio-visual works are currently transmitted), they become uprooted from local contexts to become transnational social, cultural and political vectors whose role in nuclear safety and radiation risk communication in particular is as of yet little understood.

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46 *Ibid*.

47 Raymond Williams, "Means of Communication as Means of Production," Radical Thinkers, *Culture and Materialism* (1980; reis., Verso, 2005), 278.

48 Andrew Milner, "Cultural Materialism, Culturalism and Post Culturalism: The Legacy of Raymond Williams," Historical Materialism Book Series. *Again, Dangerous Visions: Essays in Cultural Materialism* (Brill, 2018), 269.

49 *Ibid*, 51.

Finally, although I draw some insights about how radiation exposure is represented in pop-culture media from the previous work of nuclear narrative and culture scholars, my thesis constitutes a serious departure from these previous studies insofar as I focus on the ethical dimensions of narrative production in nuclear plant disaster contexts. In doing so, this thesis aims to add to Mäkelä and her colleagues' attempts to "bridge the gap between narrative theory and contemporary narrative practices by demonstrating what it could mean for a narratologist to provide the general audience as well as various professional groups with critical tools for navigating today's textual and social environments, dominated as they are by storytelling."[50]

## 1.4 Structured Literature Review

My argument that *Chernobyl* constitutes a pop-culture nuclear narrative that feeds into wider "nuclear safety" imaginaries, and that its representation of radiation in particular deserves ethical scrutiny given the recurring stigmatization of nuclear disaster survivors, is divided into the four following chapters:

### Chapter 2 – Radiation "visibility" after the Fukushima Daiichi disaster.

As a precursor to my literary analysis of Mazin's *Chernobyl*, I study the emergence of competing radiation imaginaries in the wake of the 2011 Fukushima Daiichi disaster, in the form of both official and unofficial communication practices and guidelines. I start by examining both the limitations of radiation risk communication strategies as implemented following the disaster and the emergence of large-scale volunteer data collection projects such as Safecast, as different approaches to filling information gaps during a radiological accident by making radiation more "visible" to the general public. Then, I examine the socio-political notions that underpin these different information production and sharing strategies through a study of "citizen science" and "risk society" concepts, which allow me to study how different kinds of concerns with radiation exposure have been discussed or classified in the past, and how they fit into the above preoccupations with radiation risk communication and recently updated guidelines from organisations such as the IAEA and ICRP.

Borrowing from the works of Olga Kuchinskaya, Aya H. Kimura, Adriana Petryna and Abalkina E. Melikhova, I start by highlighting the recurring notion of

50 Mäkelä et al., "Dangers of Narrative," 139-157.

radiation visibility at the centre of exposure imaginaries. Olga Kuchinskaya (2013 and 2014)[51] explored ways in which both the visibility and invisibility of radiation are manufactured through the processes of detection and framing of data, in Belarus and Ukraine after the Chernobyl accident, drawing parallels with the Japanese government's handling of the Fukushima Daiichi nuclear disaster, while Aya Hirata Kimura (2016)[52] studied the radiation monitoring practices of women in Japan in the wake of the disaster and how this contributed to bullying and discrimination because of women's preoccupation with the contamination of food as compared to the economic concerns of Japanese men – showing that competing imaginaries (along with their eventual policy implications) not only exist between the individual members of a society and a potentially incompetent or oppressive bureaucratic collective but also between different social groupings within the general public.

Adriana Petryna (2013) studied how radiation became imbricated in healthcare, labour protection and welfare access, and how this forced the wider public in affected areas of Ukraine to track the levels of their own radiation exposure and engage in constant negotiations around the interpretation of this data.[53] Likewise, Abalkina E. Melikhova and M. Savkin (2021)[54] studied the issue of radiation data collection and data sense-making in affected areas of Russia after the Chernobyl disaster and found similar tensions around interpretations of radiation exposure data, exacerbated by wider community issues such as poverty. These studies demonstrate how data-centred approaches to filling information gaps foment a public life subsumed by data collection.

This initial outline of perceived information gaps or radiation visibility issues, allows me to focus on the emergence of the concepts of "risk," starting with an acknowledgment of the contributions of Ulrich Beck in this field through his seminal publications: *Risk Society* (1992) and *World at Risk* (Polity Press, 2009). I situate them within the larger field of risk and risk communication scholarship, including works by

51 Olga Kuchinskaya, "Twice invisible: Formal representations of radiation danger," *Social Studies of Science* 43, n°1 (2013), 78-96. Olga Kuchinskaya, "Citizen Science and the Politics of Environmental Data," *Science, Technology and Human Values* 44, n°5 (2019), 873.

52 Aya Hirata Kimura, *Radiation Brain Moms and Citizen Scientists* (Duke University Press, 2016), 224.

53 Adriana Petryna, *Life Exposed: Biological Citizens after Chernobyl* (Princeton Press, 2013), 304.

54 I Abalkina, E Melikhova, and M Savkin., "Communicating radiation risks to the residents of the Chernobyl-affected areas in Russia: key lessons learned," *Proceedings of the International Conference on Recovery after Nuclear Accidents: Radiological Protection Lessons from Fukushima and Beyond*, Annals of the ICRP 50, n°S1 (Sage Publications, 2021), 209-216.

Alonzo Plough and Sheldon Krimsky (1987),[55] Jeffrey Grabill and Michelle Simmons (1998),[56] and Ortwin Renn (2008),[57] in which Beck's notion of technical rationalities and cultural rationalities long continue to echo. I turn to the work of Brian Wynne and Ian Welsh on science communications surrounding radiation exposure, and the notion of "trust" (as opposed to polarized rationalities) before addressing the notion of "citizen science" through a study of the works of Rick Bonney (1996, 2009),[58] according to whom "citizen science" is a largely data-collection centred activity that institutional and scientific experts could use to promote scientific enquiry and learning among members of the public, and Alan Irwin (1995),[59] for whom the expression should designate lay participation in the elaboration of research strategy and in the interpretation of data, breaking with "enlightenment" traditions of scientific knowledge production. Studying the difficulty of consolidating these opposing ideas of "citizen science" allows me to underline the political expediency of different exposure imaginaries (for both authority figures and the wider public).

To complete this study, I examine the "lessons learned" by international nuclear safety and radiation protection organisations such as the IAEA, Euratom, the ICRP and the NEA to ascertain how they frame radiation risk evaluation and communication – including the ICRP's *Radiological Protection of People and the Environment in the Event of a Large Nuclear Accident* (2020)[60] and *Proceedings of the International Conference on Recovery after Nuclear Accidents: Radiological Protection Lessons from Fukushima and Beyond* (2021),[61] the IAEA's *Considerations in the Development of a*

55 Alonzo Plough and Sheldon Krimsky, "The Emergence of Risk Communication Studies: Social and Political Context," *Science, Technology, & Human Values* 12, n°3 / 4 (1987), 4-10.

56 Jeffrey Grabill and Michelle Simmons, "Toward a Critical Rhetoric of Risk Communication: Producing Citizens and the Role of Technical Communication," *Technical Communication Quarterly* 7, n°4 (1998), 415-441.

57 Ortwin Renn, *Risk Governance: Coping with Uncertainty in a Complex World*, Earthscan Risk in Society Series (London: Earthscan, 2008), 476.

58 Rick Bonney, "Citizen science: A lab tradition," *Living Bird* 15, n°4 (1996), 7-15. Rick Bonney et al., "Citizen Science: A Developing Tool for Expanding Science Knowledge and Scientific Literacy," *BioScience* 59, n°11 (2009), 977-984.

59 Alan Irwin, *Citizen Science: A study of people, expertise and sustainable development* (Routledge, 1995), 212. Alan Irwin, "Citizen Science and Scientific Citizenship: Same Words Different Meanings?" *Science Communication Today: Current Strategies and Means of Action*, eds. Berhand Schiele, Joëlle Le Marec and Patrick Baranger (Presses Universitaires de Nancy, 2015), 29-38.

60 ICRP, *Radiological Protection of People and the Environment in the Event of a Large Nuclear Accident*, Annals of the ICRP 49, n°4 (2020), 142.

61 ICRP, *Proceedings of the International Conference on Recovery after Nuclear Accidents: Radiological Protection Lessons from Fukushima and Beyond,* Annals of the ICRP 50, n°S1 (2021), 220.

*Protection Strategy for a Nuclear or Radiological Emergency* (2021) and 2020 EPR strategy document,[62] the NEA 's *Fukushima Daiichi Nuclear Power Plant Accident, Ten Years On* (2021)[63] and *Building a Framework for Post-Nuclear Accident Recovery Preparedness* (2022),[64] which point to opening more dialogues with the wider public on notions of radiation risks – as well the retrospective overviews of the radiation risk communication strategies undertaken during the Fukushima Daiichi disaster, such as the work of Erik R. Svendsen et al. in "Risk Communication Strategies" (*Curr Envir Health* Rpt, 2016), Noboru Takamura et al. in "Experiences of crisis communication during radiation emergency" (*Journal of Radiation Research*, 2021) and Pablo M. Figueroa in "Risk communication surrounding the Fukushima nuclear disaster" (*Asia Eur J*, 2013), so as to highlight recurring observations about the influence of alternative platforms on delivering information about the spread and risks of radiation.

## Chapter 3 – Genetic stigma in nuclear narratives

I begin the ensuing chapter with a brief overview of previous works discussing nuclear literature and fiction as outlet or support for alternative nuclear imaginaries potentially deserving of more ethical analysis, including Paul Boyer's *By the Bomb's Early Light* (1985); Spencer Weart's *Nuclear Fear* (1988), Jonathan Hogg's *British Nuclear Culture: Official and Unofficial Narratives in the Long Twentieth Century,* Daniel Cordle's *Late Cold War Literature and Culture* (2017, and Grace Halden's *Three Mile Island: The meltdown crisis and nuclear power in American popular culture* (2017) before finishing with Rachel DiNitto's *Fukushima Fiction: The Literary Landscape of Japan's Triple Disaster* (2019) and Jerome Shapiro's *Atomic Bomb Cinema* (2001), drawing insights about the evolving interest in pop-culture nuclear narratives as alternative voices regarding nuclear politics and nuclear safety imaginaries.

Following this, I explore the specific theme of genetic stigma in real life and nuclear narratives, based on the works of Robert Jacobs, Susan Lindee, Michelle A. Heath and several public health and risk communication researchers including

62 IAEA, *Considerations in the Development of a Protection Strategy for a Nuclear or Radiological Emergency,* Emergency Preparedness and Response (EPR), Safety Standards Series (Vienna: IAEA, 2021), 218.

63 NEA, *Fukushima Daiichi Nuclear Power Plant Accident, Ten Years On: Progress, Lessons and Challenges* (Paris: OECD Publishing, 2021), 84.

64 NEA, *Building a Framework for Post-Nuclear Accident Recovery Preparedness* (Paris: OECD Publishing, 2021), 92.

Masaharu Tsubokura and Noboru Takamura. I contrast the notion of genetic stigma with that of radiophobia, as described by Aliaksandr Novikau in "What is "Chernobyl Syndrome?" The Use of Radiophobia in Nuclear Communications" (*Environmental Communication*, 2017), and the findings of Jessica Douthwaite ("'Is Radioactive Iodine Present Equally in the Cream on Milk as in the Milk Itself?': Lonely Sources and Gendered History of Cold War Britain", *Gender and History*, 2022), Claire Langhamer ("Mass observing the atom bomb: the emotional politics of August 1945," *Contemporary British History*, 2018) and Jonathan Hogg ("'The family that feared tomorrow': British nuclear culture and individual experience in the late 1950s", *BJHS*, 2012) on the emergence of a 'nuclear culture' in Cold War Britain, as well as Aya Goto et al.'s "Leveraging public health nurses for disaster risk communication in Fukushima City" (*BMC Health Services Research*, 2014). This way, I acknowledge the possibility of fears regarding radiation exposure, or distrust in nuclear safety authorities, being weaponized to discredit opposition to nuclear safety policies as resulting from ignorance, while also addressing the existence of a real social phenomenon that repeatedly emerges after nuclear disasters and throughout the history of nuclear literature to convey wider sociopolitical critiques.

In this context, I look again to the works of Masaharu Tsubokura (2022),[65] Maria Mäkelä and Hanna Meretoja (2022),[66] and Maria Mäkelä et al. (2021)[67]to help understand the various ways in which different media, such as social media, traditional news media and scientific publications, interfered with radiation risk communications in the wake of the Fukushima Daiichi disaster, leading to the potential stigmatization of individuals exposed to radiation, and the need for more critical approaches to assessing storytelling as alternative political voices in radiological safety contexts, before conducting a brief analysis of the use of genetic stigma in Netflix's *Dark* (2017) to elaborate its underlying premise – that human beings are tragically stuck in cycles of violence. In the following chapters, I explore the way references to past events and portrayals of radiation infiltrate wider nuclear safety imaginaries, using *Chernobyl* as a case study and the works of various narrative ethics and literary scholars as a frame of reference.

65 Tsubokura, "Influence of different media, producing stigma," 265-179.
66 Maria Mäkelä and Hanna Meretoja. "Critical Approaches to the Storytelling Boom." *Poetics Today*. Vol. 43, N°2 (2022): 213
67 Mäkelä *et al*., "Dangers of Narrative," 139-159.

## Chapter 4 – Knowledge in *Chernobyl* (HBO, 2019): The key to avoiding nuclear disaster?

I start my literary analysis with a chapter on the heavily moralized pursuit of knowledge in HBO's *Chernobyl* and its supporting paratexts, echoing problematic patterns outlined in the previous chapter. After highlighting the use of paratext as the author's attempt at narrative control with support from the works of Gérard Genette (*Paratexts: Thresholds of interpretation*, 1997; "Introduction to the Paratext, New Literary History," 1991), Jonathan Gray, (*Show sold separately: promos, spoilers, and other media paratexts*, 2010) and Cornelia Klecker ("The other kind of film frames: a research report on paratexts in film," *Word & Image*, 2015), I outline how the series and its writer define knowledge in terms of a dichotomous relationship between truth and lies in pursuit of an answer to the story's central question: "What is the cost of lies?"

Then, I examine the combative tone that is used to illustrate this relationship, with the help of Soviet scholars Ilya Kaganovsky (*How the Soviet Man was Unmade: Cultural Fantasy and Male Subjectivity Under Stalin*, 2008), Declan Cronin. ("Meet the New Villain, Same as the Old Villain: The New Cold War in American TV, Film, and Video Games," *Of Life and History*, 2019) and David Caute (*The Dancer Defects: The Struggle for Cultural Supremacy during the Cold War*, 2003), who explore the visual and social themes present in Western representations of Soviet society. Drawing from the work of scholars such as Kristin Shrader-Frechette ("Rights to Know and the Fukushima, Chernobyl and Three Mile Island Accidents," 2015), Bindu Panikkar and Ronald Sandler ("Nuclear energy, justice, and power: the case of the Pilgrim Nuclear Power Station license renewal," 2015), as well as Richard T. de George ("The Myth of the Right of Collective Self-Determination," 1991), allow me to also outline the political framing that under-girds this moralized dichotomy.

Finally, I show how this conflict between truth and lies is moralized through the behaviour of the characters, which are clearly delineated as good or bad on the basis of their approach to information in the wake of the disaster.

## Chapter 5 – Authenticating radiation: The realist drive for authenticity in nuclear fiction.

In this chapter, I concentrate on the paradoxical use of artifice to create the illusion of historical and scientific authenticity – and on the ethical issues this entails when addressing the traumatic experiences of nuclear disaster victims and survivors.

Relying on David Richter's definition of an "ethics of representation" in non-fiction film, I first examine notions of 'authenticity' and ontological realism in *Chernobyl* with the support of works by literary scholars Jerome De Groot (*Remaking History: The past in contemporary historical fictions*, 2016), Rene Wellek ("The Concept of Realism in Literary Scholarship", *Neophilologus*, 1961), Philip Rosen (*Change Mummified: Cinema, Historicity, Theory*, 2001) and Charles Taylor (*The Ethics of Authenticity*, 1992), as well as those of Soviet scholars Petre Petrov ("The Industry of Truing: Socialist Realism, Reality, Realization." *Slavic Review*, 2011) and Krisztina Fehervary ("Goods and States: The Political Logic of State-Socialist Material Culture." *Comparative Studies in Society and History,* 2012). Referring back to Maria Mäkelä's *viral exemplum*, as well as the aforementioned works of Gérard Genette, Jonathan Gray, Cornelia Klecker and Simon Hobbs ("*Cannibal Holocaust*: The Paratextual (Re)construction of History," 2015), I am able to outline the rising importance of social media paratexts in amplifying and reifying these illusions of pastness and causality.

On this basis, I go on to explore how the veneer of authenticity allows *Chernobyl* to subsume its subjects' personal experiences and traumas stemming from large-scale nuclear disaster within an eminently more coherent story that, in combination with the heavily moralized roles outlined in the previous chapter, accidentally turns some of the victims of radiation exposure into mere plot devices meant to amplify ambient fears. Basing myself on the representations of radiation explored in previous chapters, and on the works of Jeffrey A. Weinstock ("'Invisible Monsters: Vision, Horror, and Contemporary Culture'." *The Ashgate Research Companion to Monsters and the Monstrous*, 2012), Mike Bogue (*Apocalypse Then: American and Japanese Atomic Cinema, 1951-1967*, 2017), and Patrick Gonder ("Like a Monstrous Jigsaw Puzzle: Genetics and Race in Horror Films of the 1950s." *The Velvet Light Trap,* 2003), in particular, I am able to outline how *Chernobyl*'s

representations of radiation exposure turn individuals like Vasily and Lyudmila Ignatenko into dangers for other people involved in both the series – and real-life.

Finally, basing myself on the above analysis and on conclusions drawn from my previous chapters, I explore this real-life impact with the help of Thomas G. Couser (*Vulnerable Subjects: Ethics and Life Writing,* 2004), Irina Marchesini. ("A new literary genre. Trauma and the individual perspective in Svetlana Aleksievich's Chernobyl'skaiamolitva." *Canadian Slavonic Papers,* 2017) and Amit Thakkar ("Introduction: Trauma Studies, Film and the Scar Motif." *Scars and Wounds*, 2017) – demonstrating how traumatic experiences of nuclear disaster, including radiophobia and reproductive or genetic stigma, are subsumed in commercial narrative (non-) fictions.

## Chapter 6 – General Conclusions

To finish the thesis, I conclude that *Chernobyl* contributes to wider nuclear safety imaginaries by further entrenching genetic stigmas and the social marginalization associated with radiation exposure in the aftermath of nuclear disaster, by perpetuating the idea that individuals exposed to radiation are a danger to others and making creating an online network of traditional and social media which served to validate its representation Soviet society and nuclear sciences as authentic. I discuss the fact that the narrative ethics scholarship approach to this thesis makes it an original contribution that could serve to invite future history and literary scholars, as well as radiological protection policy makers or advisors interested in pop-culture nuclear narratives, for further study, before exploring limitations and future research topics such as the usefulness of "imaginaries" as an analytical concept, and how to develop more practical uses for this reasearch.

# Chapter 2 – Radiation, lost in communication.

As laid out in the introduction, radiation or nuclear safety "imaginaries" refer to the "norms," "discourses," "metaphors" and "cultural meanings" woven through nuclear safety policies, which I propose to explore in pop-culture "nuclear narratives" through a narrative ethics analytical framework – thus allowing me to answer the question of what *Chernobyl* has contributed to broader nuclear safety imaginaries since the Fukushima Daiichi disaster, and the ethical ramifications of such contributions. Laying the groundwork for my analysis of *Chernobyl*'s contribution to these imaginaries with respect to radiation exposure stigmas in particular, I first explore how the notion of radiation "visibility politics" in the wake of the Fukushima Daiichi disaster undergirds a push for individual radiation monitoring capabilities in recently renewed radiation risk communication guidelines, while risk communication scholars discuss pop-culture fiction or social media stories as competing with the radiation safety information they are trying to disseminate as the disaster unfolds.

In the first section, I examine the information gap that formed with respect to the spread and effects of radiation in the wake of the Fukushima Daiichi disaster, and the political dimensions of this lack of radiation "visibility" that stretch from the invisibility of risk. In the following section, I further explore radiation "visibility" as a constituent of a wider nuclear safety imaginary implicating citizen science and the notion of trust, which is to say the belief in the reliability of one's source of information, to help theorize the relationship between science, technology and political power, by examining the "lessons learned" from risk communication practices in the aftermath of the Fukushima disaster in international nuclear safety organisations. Finally, I explore how alternative media communications addressing the spread and effects of radiation are perceived as interfering with traditional forms of risk communication in the aftermath of the Fukushima Daiichi disaster, before I move on to studying the theme of genetic stigma in nuclear narratives in the next chapter.

## 2.1 Visibility Politics: From Radiation to Risk

In the wake of the Fukushima Daiichi disaster, there were both technical and human errors that led to the formation of information gaps about the spread of radiation in the environment, possibly affecting the public's health, just waiting to be filled. For instance, as underlined by the IAEA, Japanese officials did not understand their own chain of command in the case of a nuclear incident, and therefore could not deliver consistent or timely responses to public enquiry. Initial responses to the catastrophe were also complicated by the fact that many of the radiation sensors meant to model the dispersal of radiation in the event of a nuclear accident – set up by the Japanese government in 1984, as part of its System for Predictions of Environmental Emergency Dose Information (SPEEDI) – were also either destroyed or lost communication because of the tsunami.[68] In this context, I will begin by borrowing from Olga Kuchinskaya's work on the importance of radiation visibility, to identify practices that contributed to, or perpetuated, the formation of these gaps.

Although the Fukushima Prefectural Government's own SPEEDI machine was unable to receive data, they had put in a request with Japan's Nuclear Safety Technology Center to send them the data via email – only to reportedly delete or lose track of the data they received between March 12th and March 16th following the disaster.[69] Furthermore, US military aircrafts had monitored the spread of radiation from the Fukushima plant between March 17th and 19th of 2011, and sent their data to the Japanese government's Ministry of Economy, Trade and Industry as well as its Ministry of Education, Culture, Sports, Science and Technology on March 20th, before releasing the information publicly on March the 23rd.[70]

During this period, the Japanese government neither released the data nor made evacuation decisions based on the data. The Special Advisor to then Japanese Prime

68 Carolynne Hultquist and Guido Cervone, "Citizen monitoring during hazards: validation of Fukushima radiation measurements," *GeoJournal* 83, n°2 (2018), 4.

69 "Fukushima Pref. deleted 5 days of radiation data just after meltdowns," *The Mainichi*, March 22, 2012, Wayback Machine, October 25, 2015, https://web.archive.org/web/20120325172734/http://mdn.mainichi.jp/mdnnews/news/20120322p2a00m0na012000c.html.

70 Kyodo, "Japan sat on U.S. radiation maps showing immediate fallout from nuke crisis," News, *The Japan Times,* June 19, 2012, Wayback Machine, November 01, 2012, https://web.archive.org/web/20121101132531/http://www.japantimes.co.jp/text/nn20120619a1.html. Kyodo, "Japan failed to use U.S. radiation data gathered after nuke crisis," Full Story, *The Mainichi*, June 19, 2012, archive.today, July 16, 2012, https://archive.ph/20120716140052/http://mainichi.jp/english/english/newsselect/news/20120619p2g00m0dm004000c.html.

Minister Naoto Kan, Goshi Hosono explained that the government did not reveal SPEEDI data in order to "avoid panic among the population."[71] Confusion about who should be releasing which information also played a part in delaying the establishment and communication of radiation risks.

However, there was also another issue: "In its guidelines for nuclear emergency preparedness, the Nuclear Regulation Authority (NRA) has a policy of not using SPEEDI."[72] Instead, the NRA "decided to base evacuation decisions on such factors as state of the nuclear reactor and actual measurements in surrounding areas, without using SPEEDI." This problem made the news in 2016, when the Japanese government started plans to allow local governments to use SPEEDI data for their own evacuation procedures. However, unless the NRA also adopts SPEEDI data in its evacuation decisions, this creates another confusing discrepancy between the information given by local governments and the information given by national institutions like the NRA.

Pablo M. Figueroa argues that "the government's biggest failure in terms of risk communication was its standpoint of willingly not warning people about probable events and the avoidance to openly speculate about the worst-case scenarios […] One example is the forecast of the path the radioactive plume would take," using SPEEDI.[73] Figueroa goes on to discuss the possible reasoning behind such decisions – from the political maxim that "people don't need to know" and the disaster myth that "people might panic," to the belief that speculation is inherently wrong. On the latter, he observes that "talking about risk and communicating it is necessarily speculative," and that by avoiding the disclosure of SPEEDI modelling data, the Japanese government "did speculatively reassure its people that the situation was or would soon be under control."[74]

Thus, although the SPEEDI data in particular consisted of projections (as opposed to real-time measurements), the decisions that led to withholding the above information fall under the scope of what Olga Kuchinskaya refers to as the "politics of invisibility," according to which the ways in which radiation is represented matters

71 Reiko Hasegawa, *Disaster Evacuation from Japan's 2011 Tsunami Disaster and the Fukushima Nuclear Accident*, (IDDRI, 2013), 27.

72 "Gov't OKs use of SPEEDI data for local bodies' nuclear evacuations," *The Mainichi*, March 12, 2016, https://mainichi.jp/english/articles/20160312/p2a/00m/0na/020000c.

73 Pablo Figueroa, "Risk communication surrounding the Fukushima nuclear disaster: an anthropological approach," *Asia Eur J* 11, n°1 (2013), 59.

74 *Ibid*., 60.

because "the production of in/visibility is relative: some discourses, practices and conditions render hazards less visible and potentially even nonexistent as a social issue."[75] If making radiation visible means identifying and framing the spread of radioactive materials as well as establishing and representing the potential consequences of this spread, then choosing not to divulge data that tracked or simulated the spread of radiation in the case of the Fukushima Daiichi disaster effectively made the radiation invisible.

In response to the invisibility imposed at the national level during and after the Fukushima Daiichi nuclear disaster, many citizen groups and local municipalities set up radiation monitoring systems and programs. For instance, the Kawamata Town Board of Education and Kindai University worked with the children and parents of Kawamata kindergarten schools to collect a considerable amount of radiation exposure data. This tactic, which included ongoing risk communication between school nurses and parents, was concluded to be a "great comfort" to participants.[76] On a larger scale, "[t]here was an undeniable demand from citizens to have better data on the extent of contamination, and CRMOs [Citizen Radiation-Monitoring Organizations] met this demand by working to fill the post-Fukushima knowledge gap."[77]

Among the many non-governmental data collection groups that emerged across Japan in the nuclear disaster context were Safecast and Project 47, whose activities served to make radiation more "visible" to the wider public. Aya Kimura, who studied many of these organizations in Japan, supports Kuchinskaya's framing of radiation visibility by observing that "[t]esting describes a certain reality […] that was not known before the measurement" and thus, this "makes the invisible visible, enabling a different kind of conversation to take place, which might have consequences for policies."[78]

To illustrate, Safecast is an ongoing project founded by Japanese and international volunteers (Sean Bonner, Peter Franken and Joi Ito) to provide inhabitants of Japan with their own Geiger-Muller counters and to help other volunteers learn to build the counters themselves. The data they collect is pooled online, and represented

75 Kuchinskaya, "Citizen Science and the Politics of Environmental Data," 873.
76 H. Yamanishi, T. Ito and M. Hosono, "Activities to support individual dosimetry of children in Kawamata Town," (proceedings of the International Conference on Recovery after Nuclear Accidents: Radiological Protection Lessons from Fukushima and Beyond) *Annals of the ICRP* 50, n°S1 (Sage Publications, 2021), 101.
77 Aya Kimura, *Radiation Brain Moms and Citizen Scientists* (Duke University Press, 2016), 111.
78 *Ibid*., 124.

through regularly updated maps and tables accessible anytime, to anyone across the globe.[79] The maps in particular, and their global reach, effectively help anyone who consults their work to artificially visualize the spread and levels of radiation across Japan.

In fact, Olga Kuchinskaya specifically compares Japan's Safecast project to Belarus' Belrad institute, both of which are dedicated to monitoring radiation levels in their respective environments, in order to support her larger point about the importance of radiation representation: "imperceptible hazards, such as radiation, need to be made observable and publicly visible (i.e. publicly recognized as a hazard)" because "[p]ublic invisibility of environmental hazards does not necessarily mean that there is no danger but that those who are most affected are ignored and disempowered in the process of knowledge production."[80]

As for Project 47 – it was a small group of concerned civilians co-founded by CEO Wataru Iwata in the immediate aftermath of the Fukushima Daiichi disaster, later converted into the CRMS laboratory (Laboratoire citoyen de mesure de la radioactivité) with help from international radiation monitoring organisations like France's Commission de recherche et d'information indépendantes sur la radioactivité (CRIIRAD) and the German Society for Radiation Protection, as well as with the financial support from a fund for the children of Fukushima and the Japanese magazine *Days Japan*.[81]

Wataru Iwata explained during a press conference held with CRIIRAD that "we all met in Nihonmatsu for a working meal; we saw people over there who were doing their own everyday things without protective measures: no home confinement instruction and no recommendation were issued. […] as radioactivity is invisible, has no odor or color, these people tended to their everyday life as usual: this is how (we realized the importance to detain these instruments and) we decided to create this action

79 "Safecast," *Safecast*, January 20, 2024, https://safecast.org/.

80 Kuchinskaya, "Citizen Science and the Politics of Environmental Data," 873.

81 Iwata Wataru, interviewed by Nadine Ribault and Thierry Ribault, "Fukushima: "Everything has to be done again for us to stay in the contaminated areas" 汚染地域に残るには、すべてやり直さない," Japan Focus. *The Asia-Pacific Journal* 10, n°4 (2012), 1. This special feature journal article, along with information given by CRIIRAD confirms that there was an attempt to make a "Japanese version of CRIIRAD" but there are no longer any traces of them online, so they have presumably ceased functioning.

group."[82] Here, we can see how the concept highlighted by both Kimura and Kuchinskaya, of making the invisible visible, directly motivated some of the radiation monitoring by civilians in the aftermath of the Fukushima Daiichi incident.

CRIIRAD was itself established as a response to the French government's poorly received handling of the Chernobyl nuclear catastrophe and radioactive cloud. It has since been dedicated to monitoring radiation levels in a wide variety of locations and materials, and to defending the right to be informed and to participate in decision making processes, the right to live in an environment and consume foods and objects that are uncontaminated by radiation as well as the right to be protected against the dangers and risks induced by radioactive substances.[83] As CRIIRAD's director Bruno Chareyron explained during the press conference: "It is important that the Japanese citizens request assistance from independent experts in order to obtain a correct assessment of the doses they have been exposed to, so that if they were to contract any pathologies linked to this radiation, they can obtain decent repair and compensation."[84]

Therefore, establishing radiation "visibility" through the collection, representation and sharing of radiation data constitutes a political act both upstream and downstream of the policy decisions studied by Jasanoff and Kim, as carriers of sociotechnical imaginaries, insofar as this process serves to access politically determined compensation schemes – or eventually to petition for or contest certain political decisions regarding nuclear safety and radiological protection measures. This relationship between unofficial representations of radiation and official nuclear policy making is particularly evident in the legal creation of a biomedical status for atomic bomb survivors after the Second World War, and more recent attempts to extend this status to their descendants.

In Japan, the term *hibakusha* originally emerged after the Hiroshima and Nagasaki bombings to designate "those who were directly exposed to the explosion

82 Wataru Iwata, "Press conference transcription held by M. Wataru IWATA (Project 47) and M. Bruno CHAREYRON (CRIIRAD) in Japan National Press Club in Tokyo on 1st June, 2011," (press conference, Tokyo, Japan, June 01, 2011) CRIIRAD (2017), https://www.criirad.org/wp-content/uploads/2017/08/en_conf_japon_01062011.pdf.

83 Its website explains that it was formed in 1986 in response to lies by the public authorities ("Mensonge des services officiels."), and in order to properly inform the public of soil, plant and food contamination ("La CRIIRAD informe la population sur la réalité de la contamination des sols, plantes et aliments."). In this case, it can be said that the CRIIRAD was formed to combat the deliberate invisibilisation of radiation by the French government –one of the practices against which Kuchinskaya warns.

84 Wataru, "Press conference transcription," 03.

created by the bombs, and exclud[ed] those who entered the city afterwards",[85] for the purpose of evaluating wartime damage specifically. Since the Japanese government was against redress measures for civilians affected by its involvement in World War II, the concept and delimitations of *hibakusha* would be established by social welfare measures enacted through the 1957 Medical Law. This allowed the meaning of *hibakusha* to be expanded, "includ[ing] those who had possibly been exposed to the injurious effects of radioactivity from the atomic bombs" which is to say, for instance, "people who tended the injured on the outskirts of cities, and those who carried and cremated corpses."[86]

The scope of this definition can in part be attributed to "efforts by locals of the bombed cities to respond to anxieties over delayed effects of radiation and provide treatment for those sufferers who were not diagnosable by then-current medical knowledge."[87] The author of this overview of the emergence of the category of *hibakusha*, Akiko Naono, shows how "[s]urvivors developed 'an awareness of themselves as autonomous, integrated political subjects' by being interpellated as *hibakusha*," since "more than a few of the leaders of the nationwide Hidankyō [Federation of Atomic and Hydrogen Bomb Sufferers Organizations] movement did not consider themselves *hibakusha* initially" but rather developed an identity as *hibakusha* after achieving this legal status – which, in turn, "offered them grounds to join collective action."[88]

However, radiation and medical data are needed for this collective action – information which is not always made easy to access (showing how invisibility impedes grass-roots political action). Individuals like Yoko Nakano, for instance, only learn they are *hibakusha* after a freedom of information request. In Nakano's case, she learned that "her cells had been examined by the ABCC [the U.S. Atomic Bomb Casualty Commission]" because her mother had been pregnant near Nagasaki when it had been bombed.[89] The ABCC was taken over by the Radiation Effects Research Foundation, which has "played an important role in setting radiation protection standards at nuclear facilities including atomic power stations," but it has a history of obfuscating

85 Akiko Naono, "The Origins of 'Hibakusha' as a Scientific and Political Classification of the Survivor," *Japanese Studies* 39, n°3 (2019), 334.
86 *Ibid*., 346.
87 *Ibid*.
88 Naono, "The Origins of 'Hibakusha'," 348.
89 "Hibakusha: Woman exposed to radiation while in womb fears another nuke plant tragedy," *The Mainichi*, November 18, 2016, https://mainichi.jp/english/articles/20161118/p2a/00m/0na/017000c.

information about radiation exposure in the aftermath of the Hiroshima and Nagasaki bombings, among many others – providing another example of policy-imposed radiation "invisibility."

More recently, the Japanese government estimates that there are between 300 000 and 500 000 second generation *hibakusha* – that is to say, children of the survivors of the Hiroshima and Nagasaki bombings.[90] A survey conducted by the Japan Confederation of A- and H- Bomb Sufferers Organizations, pooling data from 3 417 respondents, reportedly found that 60.3% had "anxieties and worries" as second generation *hibakusha*, of which 78.6% specified that these worries were about "the effects of radiation on their health" – despite "only some" respondents associating existing health problems with their status as second generation *hibakusha*.[91] Either way, these second-generation *hibakusha* "are not subject to the Atomic Bomb Survivors' Assistance Act,"[92] and as a result, the head of a second generation *hibakusha* group in Nagasaki, Ikuro Maruo, believes that more people should receive medical checks in order to "show the national government how many second generation *hibakusha* are looking to receive assistance"[93] – thereby increasing radiation "visibility" through data collection, in an effort to influence policy.

Another way of making radiation more or less visible to the general public would be by changing the radiation exposure thresholds that are considered dangerous – as was the case during the Fukushima Daiichi catastrophe, when the Japanese government raised the quantity of millisieverts (mSv) per year considered healthy for a human body from 1 to 20. Kuchinskaya refers to this as "[p]laying with standards for radiation protection" as "part of trying to make contamination less publicly visible,"[94] and points out the parallels drawn by the Belrad radiation protection experts with the aftermath of the Chernobyl disaster, who had "remarked on the feelings of *déjà vu* after the disaster at the Fukushima Daiichi nuclear plant" and suggested that "Japanese officials employed the old tactics of playing down the scale of the accidents and

90 Atsuki Nakayama, "Japan's 2nd-generation A-bomb survivor groups stagnate amid prejudice, low gov't support," *The Mainichi*, 20 August 20, 2021, https://mainichi.jp/english/articles/20210828/p2a/00m/0na/024000c.

91 Kayo Mukuda, "Japanese children of A-bomb survivors worry for health, want exposure certification: survey," *The Mainichi*, Octobre 24, 2021. https://mainichi.jp/english/articles/20211022/p2g/00m/0na/047000c.

92 Nakayama, "Japan's 2nd-generation A-bomb survivor groups stagnate amid prejudice."

93 *Ibid*.

94 Kuchinskaya, "Twice invisible" (2013), 91.

withholding data, perhaps in attempts to avoid enlarging the evacuation zone and conducting more clean-up measures."[95]

Likewise, Abalkina et al. describe how the Soviet government struggled to establish radiation norms in parts of Russia, due to a three-way disagreement between the government's policymakers, international radiation protection experts (including the IAEA and the World Health Organisation, or WHO), and the wider public in affect areas (including Russia's own specialists and scientific elite). Attempting to lower protection costs and remove restrictions on the lives of inhabitants in zones of strict control, it tried replacing the lifetime cumulative dose of 1 Sv over 70 years, to a 350 mSv dose for children only. This was met with criticism from both the foreign experts and "Soviet society," but for different reasons. On the one hand, in the context of the International Chernobyl Project, "foreign scientists noted excessive conservatism in assessing life-long doses, including account for the doses already received by the population".[96] On the other hand, "[t]he authors of the '350 mSv' concept were accused of inhumanity" by locals, for making the threshold too high.[97]

Adriana Petryna documents how different levels of healthcare support for those exposed to radiation during the Chernobyl disaster were narrowly tied to quantitative measurements in *Life Exposed: Biological Citizens After Chernobyl* – and in doing so, highlights the fact that recognition of their status as victims of Chernobyl (and access to special disability, health and employment regimes) was subjected to frequently changing thresholds. Just as with Kuchinskaya's work, *Life Exposed* examines the different policies laid out by the USSR and later the Ukrainian government, and the different deterministic and stochastic radiation data thresholds they used to determine which help could be accessed through their remedial nuclear disaster policies,[98] which remain dependent on the interpretation of radiation measurements in the food and environment of Ukrainians. Dedicated to analysing "the kinds of human agency that were available to the sufferers,"[99] Petryna found that obtaining a disability status

95 *Ibid*.
96 *Ibid*, 211.
97 Abalkina *et al*., "Communicating radiation risks to the residents of the Chernobyl-affected areas in Russia," 209-16.
98 etryna, *Life Exposed,*, 100.
99 *Ibid*., xvii.

constitutes a sort of "public agency through sickness,"[100] much like Naono observed regarding those who obtained the status of *hibakusha* in Japan.

However, Petryna also relates an exchange between two men affected by the 1986 nuclear disaster, from which she concludes that "[t]he man's aggressive gesture bespoke his frustration over the fact that disability had forced him into capricious exchanges with the state and its new disciplinary grids" and thus, "[h]aving to rely on his illness as the only sure means of economic survival made him anxious and aggressive."[101] Frustrations with the framing of radiation exposure risks, as opposed to obfuscation practices, were recounted in a series of interviews organized by the Liaison Committee for Organizations of Victims of the Nuclear Disaster called "Voices of the Evacuees of Fukushima," covered by *The Japan Times.* One member of the public cited in the article as "Mr. Suzuki," who recalled the 1986 Chernobyl accident and thus "knew how terrible radiation is," explained that his family's living arrangement in his "wife's father's old wooden house, with thin walls and space where outside air comes through" in Fukushima, meant that they should continue to receive government support, since "safety – our safety – is not what the government or Tepco should decide, right?"[102]

These shifts in safety standards, set by the Japanese government and the Ukrainian, Belorussian and Russian governments before it, highlight the complexities involved in making radiation "visible" – which includes the interpretation of radiation "risks," and radiation representation choices based on these perceived "risks." The experimental project GammaSense, which was launched in the Netherlands in 2017, is a good example of the ways in which notions of radiation "risk" depend on "visibility." The conceptual foundation of this project and its funding by the EU's MakingSense campaign, was "challenging existing decision-making in a way that can be described as direct democratic engagement with risk management in the context of here-and-now-exposure to high levels of gamma radiation – bypassing the existing mechanisms in

100 *Ibid*., 90.
101 *Ibid*., 156.
102 Sarai Flores, "Five years on, Fukushima evacuees voice lingering anger, fear and distrust," *The Japan Times,* trans. Yuri Ota, Ippei Watanabe and Hirotsugu Yamamoto, March 09, 2016, https://www.japantimes.co.jp/community/2016/03/09/voices/five-years-fukushima-evacuees-voice-lingering-anger-fear-distrust/.

place for risk governance in terms of pre-estimation, risk estimation and risk evaluation."[103]

However, among many issues encountered over the course of the project, including difficulties finding members of the public to participate (among those who did, some were: "actually rather uncomfortable with the project and its purpose as a whole: they did not really think about existing nuclear facilities as something to be worried about, and thought that partaking in permanent monitoring of gamma radiation levels would insert a new source of fear into their day-to-day lives"[104]), de Hoop notes that "there was no debate about the meaning of 'risk' and what levels and forms of risk are (un)acceptable to whom and how this should be represented in order to maximize people's ability to take their own decisions – questions that are central to risk evaluation, which indeed remained at the background throughout the project."[105]

In this sense, the representation choices involved in making radiation "visible" (even based on data collected from medical records and dosimeters) is fraught with competing "rationalities" – to borrow the concept from the seminal work of German sociologist Ulrich Beck on "risk societies," in which he proposes "that the origin of the critique of science and technology lies not in the 'irrationality' of the critics, but in the *failure* of techno-scientific rationality in the face of growing risks and threats from civilization" – a failure "systematically grounded in the institutional and methodological approach of the sciences to risks."[106]

The contributions of radiation "visibility" to nuclear safety imaginaries appear to hinge in part on these disputed concepts of "risk," which means on competing "risk imaginaries" like the ones outlined by Jasanoff and Kim in their comparative studies of South Korean, American and German nuclear policy-making. Noting that Ulrich Beck's influential *Risk Society* (1992 [1986]) emerged in Germany's specific postwar history to produce "pervasive risk-consciousness and risk aversion,"[107] they conclude that "US and South Korean risk-benefit settlements, if we may call them that, entailed little or no public debate about the state's role in making and sustaining sociotechnical imaginaries that systematically downplay some form of collective risk-taking, whether economic or

103 Evelien de Hoop, "More Democratic Sustainability Governance through Participatory Knowledge Production? A Framework and Systematic Analysis," *Sustainability* 12, n°15 (2020), 12.
104 *Ibid*., 14.
105 *Ibid*., 21.
106 Ulrich Beck, *Risk Society* (Sage, 1992), 59.
107 *Ibid*., 192.

physical," whereas in Germany, "[t]he shaky, shifting consensus on the nuclear phase-out points to persistent insecurity about Germany's ability to deal with technical or political uncertainty."[108]

At the same time, "risks concern possible events that could but need not necessarily occur," and are "marked by a high degree of unreality." As such: "*Risks are social constructions and definitions based upon corresponding relations of definition*. Their existence takes the form of (scientific and alternative scientific) knowledge. As a result, their reality can be dramatized or minimized, transformed or simply denied according to the norms which decide what is known and what is not."[109] In this sense, risk is imbricated in visibility politics – and in the case of radiological crises, representations of radiation become instrumental in larger discussions of radiation protection and nuclear safety.

As for the "unreality" of probabilistic radiation data, and thus the question of its use in making radiation visible or not, the controversial decision not to disclose SPEEDI data after the Fukushima Daiichi catastrophe is evidence of the complexities involved in making radiation representation choices.

## 2.2 Understanding "risk": Beyond "rationalities"

Beck theorizes that in the usual risk society, "the industrial system is rendered capable of dealing with its own unforeseeable future through risk assessments," thereby "creat[ing] present security in the face of an open and uncertain future," but that nuclear power in particular breaks this "social contract" because the nature of a nuclear accident would make it impossible to adequately prepare and compensate for "organized irresponsibility."[110] In response, STS scholar Ian Welsh convincingly argues that, rather than "ionising radiation as the paradigm case for risk society on the basis that this invisible risk renders society dependent upon science," it is "the associated social expressions of subordination which are experienced as a social distance inimical to trust relations,"[111] which are explored in this section on ongoing risk communication and STS discourse about competing "rationalities."

108 *Ibid*., 195.
109 Ulrich Beck, *World at Risk* (Polity Press, 2009), 45.
110 *Ibid*., 27.
111 Ian Welsh, *Mobilising Modernity: The Nuclear Moment* (Taylor & Francis Group, 2000), 213.

According to Tomio Kinoshita's "Short History of Risk Communication in Japan", the concept of risk made its way into Japanese academia only in the 1970s, and industrial and governmental institutions continued promoting new technologies in purely positive terms, resulting in a lack of public discussion about risks, all the way into the late 1990s.[112] Even after the Chernobyl nuclear disaster, nuclear plants were lauded in the Japanese media and by government officials as infallible, largely due to something Kinoshota calls "the Infallibility Myth."[113] Therefore, the 1 msv threshold originally established by the Japanese government could be interpreted as a relic from the age of supposed infallibility – perhaps as an implicit political promise that an accident would never happen.

In this context, risk communication serves as a means to produce radiation visibility. According to David Spiegelhalter, the expression "risk communication" was first used in 1984, emerging in the context of the Three Mile Island nuclear accident – and since then, "there has been intense, and often contested, work on this topic."[114] This is confirmed in an earlier publication by Alonzo Plough and Sheldon Krimsky, "The Emergence of Risk Communication Studies: Social and Political Context" (1987), in which the authors assert: "Prior to 1986 there were only a few essays in the scholarly and policy literature with "risk communication" in their titles."[115] They go on to describe what can now be considered the early years of risk communication scholarship as the result of being "strongly marketed by specific interest groups and used instrumentally to achieve particular ends."[116] This view is shared by other scholars such as Speigelhalter, who points out the irony of Baruch Fischhoff's Developmental Stages in Risk Communication, published in "Risk Perception and Communication Unplugged: Twenty Years of Process" (1995), which includes steps such as: "All we have to do is show them it's a good deal for them."[117]

112 Tomio Kinoshita, "Short History of Risk Communication in Japan," *Journal of Disaster Research* 9, n°sp (2014), 592.

113 *Ibid*., 594.

114 David Spiegelhalter, "Risk and Uncertainty Communication," *Annual Review of Statistics and Its Application* 4, n°1 (2017), 32. The author bases this date on the work of William Leiss (1996) who himself bases this date on the work of Bernd Rohrmann, Helmut U. Stegelmann and Pieter M. Wiedmann in Risk Communication: An Interdisciplinary Bibliography (Julilch Germany, 1990). A cursory look at Google Ngram will confirm the expression "risk communication" taking off in the mid-1980s.

115 Plough and Krimsky, "The Emergence of Risk Communication Studies," 4.

116 *Ibid*.

117 Baruch Fischhoff, "Risk Perception and Communication Unplugged: Twenty Years of Process," *Risk Analysis* 15, n°2 (1995), 141.

However, conceding that risk communication scholarship itself is relatively new, Plough and Krimsky suggest that "the practice of it may be as old as human culture itself."[118] They trace the development of modern risk communication studies to political and intellectual shifts since the 18th century, notably: "the rise of the modern state with an implied responsibility for general social welfare," "the development of public health institutions" and finally, in the context of WWII, "the government's need for scientifically based decision methodologies [which] gave rise to a new era of federal research support that spawned fields like operations research and systems analysis."[119] Plough and Krimsky describe this overall evolution as a "transition from folk discourse about risk to an expert-centred communication."[120]

Plough and Krimsky identify modern risk communication scholarship as arising from a relatively new context where "[i]n schools of public policy the effective management of environmental and health risks is synonymous with quantitative assessment of problems."[121] In doing so, they define two different sorts of rationality – "technical rationality" and "cultural rationality"[122] – paralleling Ulrich Beck's "frequently competing" "scientific" and "social" rationalities.[123] Technical rationality is defined as "rest[ing] on explicitly defined sets of principles and scientific norms," involving efforts in fields like psychology to codify individual or group behaviours in the wake of disaster and operating under the belief "that risk can be studied independently of context."[124] Cultural rationality, on the other hand, is described as difficult to apprehend outside of real disaster scenarios, as it is influenced by factors such as trust in the local political culture, folk wisdom, personal concern for family or community and many risks unaccounted for by authorities.[125] The authors refer to "clear instances of reasonable decision-making at the community level that are inconsistent with expert opinion", though they are careful to underline that this form of reasoning "does not deny the role of technical reason; it simply extends it."[126]

118 Plough and Krimsky, "The Emergence of Risk Communication Studies," 5.
119 *Ibid*.
120 *Ibid*.
121 *Ibid*.
122 *Ibid*, 8.
123 Beck, *Risk Society*, 30.
124 *Ibid*.
125 *Ibid*., 9.
126 *Ibid*.

This oppositional perception of technically and socially informed forms of risk conception and communication are echoed by Jeffrey Grabill and Michelle Simmons, in "Toward a Critical Rhetoric of Risk Communication: Producing Citizens and the Role of Technical Communication," published in *Technical Communication Quarterly,* 1998. Grabill and Simmons distinguish between a "technocratic" approach, in which the "[t]echnical aspects of risk, not the values, concerns, fears, and opinions of each local community are considered during decision making processes,"[127] and a "negotiated" approach, wherein "[a]nyone who is affected by a given risk is considered a stakeholder, and community collaboration only works when a high degree of participation is included in public decision making about risk."[128]

This dichotomy between specialist and non-specialist knowledge-based values is prominent in the frequently alluded to concept of "citizen science", which this chapter has outlined as a major alternative source of information in the wake of the Fukushima Daiichi nuclear accident. This concept is often traced back to Alan Irwin's book *Citizen Science: A study of people, expertise and sustainable development* (1995), and to Rick Bonney's article "Citizen science: A lab tradition" published in *Living Bird* (1996).[129]

On the one hand, Irwin's definition of citizen science refers to "a form of science developed and enacted by citizens themselves," including "the 'contextual knowledges' which are generated outside of formal scientific institutions."[130] He erects this science, "which assists the needs and concerns of citizens" in opposition to what he calls "enlightenment" science. Irwin's primary critique of traditional or enlightenment science is that it is grounded on certain "assumptions about the relationship between citizens, science and technology" or "that wider exposure to contemporary 'public ignorance' in matters of scientific thinking will lead to greater acceptance and support for science and technology."[131] These assumptions stem from the *deficit model* that he warns about in the preface of his work: "I hope scientists themselves will engage with

127 JGrabill and Simmons, "Toward a critical rhetoric of risk communication," 421.
128 *Ibid*., 422.
129 Caren B. Cooper and Bruce V. Lewenstein, "Two Meanings of Citizen Science," *The Rightful Place of Science: Citizen Science*, ed. D. Cavalier and E. B. Kennedy (Tempe: Arizona State University Press, 2016), 53. M. V. Eitzel, Jessica L. Cappadonna, Chris Santos-Lang et al., "Citizen Science Terminology Matters: Exploring Key Terms," *Citizen Science: Theory and Practice* 2, n°1 (2017), 1. Christi J. Guerrini, "Biomedical Citizen Science or Something Else? Reflections on Terms and Definitions," *The American Journal of Bioethics* 19, n°8 (2019), 17.
130 Irwin, *Citizen Science*, xi.
131 *Ibid*., 14.

this book if only to be provoked out of 'deficit' (or 'enlightenment') models of an irrational and passively ignorant public for science."[132]

Bonney's use of the expression "citizen science," on the other hand, designates the "lab tradition" of using data collected by "amateurs" to carry out standard research. At the time of his publication, Bonney was the lab education director at the Cornell Laboratory of Ornithology and his support for institutionally led citizen science rests on the educational value that he sees in the practice of collecting data: "From backyard birders to school children, amateur ornithologists become proficient in bird identification, acquire the skills of patient observation, imbibe the process of scientific investigation and gain the satisfaction of furthering scientific knowledge."[133] Projects such as FeederWatch are expected to help "participating students to learn about bird identification, bird biology, and even math, writing and geography as they count birds at their schoolyard feeders and submit data to the lab via the Internet."[134] Likewise, students participating in project PigeonWatch emphasized what the experience taught them.[135] As such, Bonney's conception relies on the *deficit model* criticized by Irwin.

Over the course of the new century, both Irwin and Bonney have continued to discuss their respective notions of citizen science, while recognizing the overlap between each other's distinct schools of thought. In a 2012 article co-written by Rick Bonney, he and his colleagues note that "citizen-science projects are a natural fit for scientific endeavors with important environmental or public policy implications because they engage the affected populations from the start,"[136] and that web-based data collection tools "are democratizing project development, allowing for the creation of data-entry systems for community based projects that arise out of local, practical issues or needs."[137] In 2015, Alan Irwin remarks that "citizen science is open to many definitions and it contains more than one strand. It can be presented as a public extension to existing scientific projects. It can also be considered as one step towards

132 *Ibid*., xii.
133 Bonney, "Citizen Science:," 7.
134 *Ibid*., 9.
135 *Ibid*., 14.
136 Janis L. Dickinson, Jennifer Shirk, David Bonter *et al*., "The current state of citizen science as a tool for ecological research and public engagement," *Frontiers in Ecology and the Environment* 10, n°6 (2012), 291 – 297.
137 *Ibid*., 291.

greater public participation with – and greater democratic accountability over – the direction and creation of scientific research."[138]

Nevertheless, Bonney and Irwin's definitions of citizen science are diametrically opposed to one another – to the point of describing mutually exclusive activities. Fundamentally, the former defends a version of "citizen science" that is an extension of the current science regime and views the public as lacking scientific understanding, while the latter asserts that the current scientific regime should be significantly altered precisely because its relationship with the public is founded on the *deficit model*. And indeed, despite noting the various strands of "citizen science" that evolved since their initial publications, Bonney's work continues to discuss citizen science projects as a vehicle for public education,[139] with the aim of "elevating public understanding of and support for science, the environment and Earth stewardship,"[140] and Irwin continues to call on scientific institutions to "view citizen science as not simply an extension to their activities but also at least partially as a reframing of those activities and a positive invitation to enter other 'questioning communities'."[141]

Since their appearance in the mid-1990s, both of these strands of "citizen science" have increasingly circulated in scientific and political discourse.[142] As a result, researchers have had to grapple with two conflicting visions of "citizen science" in order to provide a clearer working framework for the scientific and political institutions which have become increasingly interested in citizen science research projects. Their conflicting views of what citizen science *ought to be* populate the same institutional spaces, and thus compete for the same institutional resources and socio-political recognition – embodying two competing sociotechnical imaginaries, particularly in the realms of environmental and public health.

According to Susanne Hecker et al. in "How Does Policy Conceptualize Citizen Science? A Qualitative Content Analysis of International Policy Documents," published in *Citizen Science: Theory and Practice* (2019), a study of 43 citizen science policy documents collected from the United States, Australia, New Zealand, the European

138 Irwin, "Citizen Science and Scientific Citizenship," 30.
139 Rick Bonney *et al*., "Citizen Science: A Developing Tool for Expanding Science Knowledge and Scientific Literacy," *BioScience* 59, n°11 (2009), 978.
140 Dickinson *et al*., "The current state of citizen science," 292.
141 Irwin, "Citizen Science and Scientific Citizenship," 36.
142 Susanne Hecker, Nina Wicke, Muki Haklay et al., "How Does Policy Conceptualize Citizen Science?" *Citizen Science Theory and Practice* 4, n°1 (2019), 1

Commission, Germany, Austria, the United Kingdom and the OECD showed that "[h]alf of the documents mention CS [citizen science] as a tool for data collection and analysis mainly in the field of environmental research, some of which refer back to Bonney's initial definition from 1996," and that "only ten documents refer to Irwin's definition of CS (1995), acknowledging the added value of societal development through CS."[143] There is a clear privileging of Bonney's "traditional" form of citizen science. However, the policy aims and regulations in this study mostly reveal that there is no general consensus concerning the purpose of citizen science and how it should be implemented.

Noting that the "explicit policy move to include publics in dialogues with science since about 2000 has been accompanied *de facto* by intensified policy and scientific anxiety about the perceived untrustworthiness of those publics,"[144] Ian Welsh and Brian Wynne argue that this follows "the procedural normalisation of science as arbiter of public authority and ultimate source of legitimation for commercial and policy commitments" since the mid twentieth-century, becoming "virtually unquestionable outside of its own terms, which have been extended in scope, with little-or-no democratic consideration."[145] In this case, the relative popularity of Bonney's vision of "citizen science" and its emergence since the turn of this century continues to reflect this trend – and by extension, depending on the area of discussion, "[t]he denial of experience-based public knowledge by scientific and policymaking authorities and the refusal to acknowledge that science cannot provide secure (including predictive intellectual) control over future possible consequences of human decisions, is a form of denial of differences."[146]

Examining radiation risk communication guidelines and reports that were published by international nuclear safety organisations and as part of government commissioned research projects since the Fukushima Daiichi disaster shows how the dichotomy between specialist and non-specialist knowledge about radiation risks have recently been addressed in nuclear safety and radiation protection contexts. One example is the SHAMISEN project, funded by the EURATOM Programme of the European Commission, through the OPERRA (Open Project for the European Radiation

143 *Ibid*., 4.
144 Ian Welsh and Brian Wynne, "Science, Scientism and Imaginaries of Publics in the UK: Passive Objects, Incipient Threats," *Science as Culture* 22, n°4 (2013), 541.
145 *Ibid*., 543.
146 *Ibid*., 545.

Research Area) project. The SHAMISEN project, completed in February 2021, described itself as "challenging historical recommendations for preparedness, response and surveillance of health and well-being in case of nuclear accidents" by drawing lessons from both the Chernobyl and Fukushima disasters. "The final recommendations of SHAMISEN differ from those of previews [sic] reviews in that they are based on a holistic evaluation of the impact of accidents and not purely on technological considerations,"[147] echoing the dichotomous framing found in risk communication and STS scholarship.

Some of the "lessons" studied by SHAMISEN are previous EU funded nuclear risk management projects, STRATEGY and EURANOS, which found that "[v]oluntary actions that are carried out by the public or affected individuals themselves, or that increase personal understanding or control over the situation, are usually deemed positive as they respect the fundamental ethical values of autonomy, liberty and dignity" such as "the provision of counting equipment, dietary or drinking water advice, and certain gardening or agricultural procedures that could be carried out by the vegetable grower or farmer."[148]

A number of the 2017 European Atomic Energy Community (EAEC) recommendations published through the SHAMISEN project invited "the general public" and "communities" to be included in dialogues or research conducted by nuclear safety authorities.[149] Among the recommendations published in the SHAMISEN consortium's "Recommendations and procedures for preparedness and health surveillance of populations affected by a radiation accident" (2017), for instance, were to: "facilitate two-way communication through the creation of dialogue spaces where affected people can voice their needs and worries and receive practical advice on everyday life"[150] (Recommendation 21); "[c]onsider the preferences of people living in affected areas when deciding whether mitigation actions should be revised, lifted or

147 Takashi Ohba, Liudmila Liutsko, Thierry Schneider *et al*., "The Shamisen Project: Challenging historical recommendations for preparedness, response and surveillance of health and well-being in case of nuclear accidents: Lessons learnt from Chernobyl and Fukushima," *Environment International* 146 (2021), 146.

148 Deborah Oughton, "Social and ethical issues in environmental remediation projects," *Journal of Environmental Radioactivity* 21, n°5 (2013), 23.

149 Deborah Oughton, Viviana Albani, Francesc Barquinero *et al*., "Recommendations and procedures for preparedness and health surveillance of populations affected by a radiation accident," ICRP (2017), 15, 17, 32, 33 and 40.

150 *Ibid*., 33.

extended according to the evolution of the situation (e.g. individual dose monitoring, decontamination of living places, psychosocial assistance, foodstuff surveillance)"[151] (Recommendation 23).

Its sequel project, SHAMISEN SINGS, is meant to explore more concrete recommendations for nuclear risk communication in the event of a disaster. Some of its deliverables were published on the website of CONCERT, a European Joint Programme for the Integration of Radiation Protection Research, co-funded project under the Horizon 2020 initiative. However, out of the eight deliverables with viable access (three deliverables could not be found due to broken links), five were dedicated to reviewing and improving the availability of radiation monitoring tools such as apps intended for public participation in citizen science, two explored stakeholder feedback and ethical issues regarding the use of such tools (and one was also about the creation of the SHAMISEN SINGS website).[152]

The 2020 IAEA Emergency Preparedness and Response (EPR) strategy document also emphasises the involvement of "interested parties" other than "the relevant government departments, response organizations, operating organizations and other authorities with a direct involvement in emergency preparedness and response" – such as the representatives of other response organizations and of other States, as well as "[t]hose who are or may be directly affected by an emergency at a particular location, such as specific communities or groups of the population, representatives from industry (e.g. food production sectors) and the population at large".[153] The 2020 IAEA EPR strategy document specifically underscores exchanges with the public as a means "to ensure that the protection strategy addresses their concerns".[154]

Likewise, the ICRP's most recent guidelines primarily discuss "stakeholder" involvement and communication strategies in the "Preparedness Planning for a Large Nuclear Accident" section, but mention elsewhere that "[p]ast experience has demonstrated the importance and benefit of involving stakeholders in these decisions, particularly representatives of local authorities, professionals, and inhabitants of affected communities, to improve the decision-making process."[155]

151 *Ibid*., 35.
152 CONCERT. "Research Projects." Deliverables. Online. Last accessed: 24 March 2023. https://www.concert-h2020.eu/deliverables/research-projects#anchor-shamisen-sings.
153 IAEA, *Considerations* (2021), 65.
154 *Ibid*., 64.
155 ICRP, *Radiological Protection of People and the Environment* (2020), 31.

The NEA's 2021 report, "Fukushima Daiichi Nuclear Power Plant Accident, Ten Years On," explains that "[m]ethods and tools are needed to appropriately balance approaches to managing diverse risks, keeping in view stakeholders' needs and concerns, looking at the wider range of benefits beyond those to health, generating and assessing options on this basis", and reveals that "[t]he NEA is examining multidisciplinary practices for optimising health and safety within wider environmental and socioeconomic contexts and under dynamic and uncertain conditions."[156] It further asserts that "[i]t is now well accepted that involvement of stakeholders – including local authorities, industry, nongovernmental organisations, government officials, and, of course, the general public – in policy decision making is appropriate and advisable to enhance the credibility, legitimacy, sustainability, and final quality of decisions related to the recovery effort."[157] Even more recently, the NEA's "Building a Framework for Post-Nuclear Accident Recovery Preparedness" (2022), underlines "stakeholder" engagement (including the general public and various members identified as more vulnerable – such as the elderly or pregnant women and children), communication strategies and community resilience among several key components to developing a more robust accident recovery framework.

In fact, while this NEA document defines disaster recovery as "a set of policies, procedures, principles, objectives, strategies, and/or tools identified and documented for the purpose of managing the process of recovery from an emergency […] begin[ning] when the radiation source at the origin of the accident is considered to be sufficiently secured and/or the exposure situation is adequately characterised to support long-term decision-making,"[158] the ICRP document's editorial preface discusses the notion of recovery much more vaguely, as "handl[ing] the long-term consequences of a major nuclear accident," which it asserts has received little consideration since the Chernobyl accident, thus the call for better "understanding of the current state of recovery in Japan, consider[ing] strategies that may accelerate recovery, and improv[ing] preparedness for recovery from possible future major nuclear accidents."[159]

On the one hand, this new institutional interest in long-term recovery efforts may explain a shift in the recent reports and guidelines by these supranational nuclear safety

156 NEA, *Fukushima Daiichi Nuclear Power Plant Accident* (2021), 59.
157 *Ibid*., 63.
158 NEA, *Building a Framework for Post-Nuclear Accident Recovery Preparedness,* 21.
159 ICRP *Proceedings of the International Conference on Recovery after Nuclear Accidents,* 5.

and radioprotection organisations, which appear to be drawing closer to the dichotomous understandings of technical and social or cultural "rationalities" portrayed in the previously mentioned works of various risk and science studies scholars. On the other hand, it could be part of a wider attempt to bring "different" public interest groups into the hegemonic fold of sociotechnical policy endeavours through "[t]he institutional science–policy culture's denial of legitimate political normative differences [as] manifested in the monolithic insistence on scientific risk assessment as the final arbiter in technoscientific controversies."[160] Hence, disaster recovery is characterized by the 2022 NEA guideline as needing a "transparent, clear, consistent, and credible communication strategy that includes participation and dialogue throughout recovery" but at the same time "[t]he public needs to understand the risks associated with low-level contamination/ radiation exposure."[161] Likewise, the 2020 IAEA report specifies that "[t]he outcome of any consultation with interested parties on the implementation of protective actions and their perspectives on the relative acceptability of different options" should not interfere with technically-informed decisions of authorities, as "this may lead to taking unjustified actions, which may lead to cause long term damage."[162]

Another example of how such policy aims may not sufficiently address the discrepancy between different "rationalities" regarding nuclear safety, is a paper on ETHOS Fukushima, which participated in the dialogue seminars conducted by the ICRP, during which Aya Kimura found that despite its apparent open-ness to public participation: "ETHOS Fukushima calls upon citizens to be hopeful of life in the affected area and to take charge of their own well-being in the contaminated environments" and as such "[w]hile ETHOS is technically open and nondirective, these affective tropes marginalize other possible feelings such as being scared and outraged, and highlight the virtue of continuing to live in the affected areas (vs. evacuation) and of self-management of radiation exposure (vs. decontamination/ compensation by the government and the industry)."[163] According to the ICRP's own *Proceedings of the International Workshop on the Fukushima Dialogue Initiative* (2016), the dialogue initiative "brought several important clarifications and complements concerning the

160 Welsh and Wynne, "Science, Scientism and Imaginaries," 545.
161 NEA, *Building a Framework for Post-Nuclear Accident Recovery Preparedness*, 44.
162 IAEA. *Considerations in the Development of a Protection Strategy*, 59.
163 Aya Hirata Kimura, "Fukushima ETHOS: Post-Disaster Risk Communication, Affect, and Shifting Risks," *Science as Culture* 27, n°1 (2017), 114.

human and organisational dimensions of the rehabilitation process," but overall "did not raise new issues concerning the protection of people living in long-term contaminated areas."[164]

This form of limited engagement with the public regarding radiation exposure risks, which mainly consists of non-confrontational group conversations, echoes Welsh and Wynne's argument that "public differences are typically provoked by the normative commitments embodied in policies promoted in the name of scientific revelation, rather than political choice," and thereby creates environments in which "public meanings" are reduced to "scientific meanings."[165] "This insertion of normative political force into claims about scientific knowledge, contravening the classic injunction that 'is' can never dictate 'ought', is scientism. […] This refusal of science, through its designated public authorities, to accommodate other meanings, and other concerns, except those over which it feels it can exercise control, is difficult to reconcile with the anxious search for public trust."[166]

Much earlier, Brian Wynne published "Misunderstood Misunderstanding" (1992) to discuss how "it is increasingly accepted that the issues of public understanding of science, and of public risk perceptions, are not so much about public capabilities in understanding technical information, but about the trust and credibility they are prepared to invest in scientific spokespersons or institutions."[167] On this basis, he proposed "in-depth interviews with hill sheep farmers in the Lake District of Northern England who received intensive expert information and advice about environmental hazards from radioactive caesium isotopes deposited as fall-out from the Chernobyl accident,"[168] and found that, as a result of the confusion between reassurances and potentially drastic measures proposed in the summer of 1986, "the scientists had made unqualified reassuring assertions then been proven mistaken, and had not even admitted making a serious mistake. Their exaggerated sense of certainty and arrogance was a major factor in undermining the scientists' credibility with the farmers on other issues such as the source of the contamination."[169]

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164 ICRP, *Proceedings of the International Workshop on the Fukushima Dialogue Initiative*, 117.
165 Welsh and Wynne, "Science, Scientism and Imaginaries," 553.
166 *Ibid*.
167 Brian Wynne, "Misunderstood misunderstanding: social identities and public uptake of science," *Public Understanding of Science* 1, n°3 (1992), 282.
168 *Ibid*.
169 *Ibid*., 287.

Such reactions were also observed in Japan, after the Fukushima Daiichi catastrophe. For instance, in his study of different forms of citizen science in the wake of the Fukushima Daiichi disaster, Nicolas Sternsdorff-Cisterna writes about a theatre play delivered after a food critic's lecture on radiation in the food supply, both underlining the fear of radiation "invisibility" and parodying the way that the nuclear meltdowns were handled. Audience members were invited by Little Red Riding Hood to remember the frightening experience of trying to come home on March 11th 2011, and the fear of radiation exposure that started emerging days later – the focus being (once more) on its invisibility: "It has no visual cues, it has no smell, and it has no taste. It is pervasive and all around you, but you do not know it is there. The audience […] shouted in approval of his description."[170] Little Red Riding Hood, who rallied the spectators against nuclear energy, was contrasted with a fictional professor of the University of Tokyo, whose parodic defence of the nuclear industry was booed off stage. Sternsdorff-Cisterna explains that the researchers in certain departments of the University of Tokyo specifically were associated with the nuclear industry, therefore leading to distrust in their communications about the risks of radiation exposure – to the point where professors from other universities would distance themselves from the University of Tokyo to increase their credibility.[171]

These were not the only instances where distrust was fostered. The questionable change of the safe radiation exposure threshold was the subject of further political controversy when Japan's former environment minister, Tamayo Marukawa, reportedly said that "[i]t might sound strange to talk about an 'anti-radiation faction,' but there are some people who will say they are worried no matter how far you lower (the radiation level)," and that "[t]he former environment minister [Goshi Hosono] made the decision (to lower the radiation level) amidst the hype from these kinds of people, without any sort of scientific basis whatsoever" during a 2016 meeting of the House of Councillors members of the Liberal Democratic Party (which were in power, at the time).[172]

Distrust was further aroused in 2013 when former Japanese Prime Minister Shinzo Abe's government passed and promulgated the Act on the Protection of Specially

170 Nicolas Sternsdorff-Cisterna, *Food Safety after Fukushima: Scientific Citizenship and the Politics of Risk* (University of Hawaii Press, 2018), 49.

171 *Ibid*., 50.

172 "Environment minister apologizes for comments on Fukushima radiation limits," *The Mainichi*, February 10, 2016, https://mainichi.jp/english/articles/20160210/p2a/00m/0na/013000c#:~:text=Marukawa%20offered%20an%20apology%20for,of%20clarity%20in%20my%20words.%22.

Designated Secrets (SDS) – a state secrecy law intended to allow the Japanese government to secretly designate certain information as a state secret and punish any official and civilian handling of that information even if they did not know it was designated as a state secret. Leading up to the law's adoption, there were fears that it could be used to further obfuscate nuclear plant operations in Japan: "People's concern that their right to know could be undermined is evident in the unanimous opposition to the bill expressed by participants in the Nov. 25 public hearing held in the city of Fukushima. Seven officials and experts invited by both the ruling coalition and the opposition camp were speaking on the basis of their experience in the Fukushima nuclear crisis." Namie's mayor at the time, Tamotsu Baba, underlined his distrust in the government after its handling of Fukushima Daiichi's radiation leak.[173]

Importantly, Wynne's study of the Cumbrian sheep framer's interactions with scientists after the Chernobyl meltdown revealed that they "experienced the scientists as denying, and thus threatening, their social identity by ignoring the farmers' specialist knowledge and farming practices,"[174] silencing their own locally dissident views because they "identified socially with family, friends and neighbours who were part of the Sellafield industrial workforce."

Understanding "that 'credibility' and 'trust' are themselves analytical artefacts which represent underlying tacit processes of social identity negotiation, involving senses of involuntary dependency on some groups, and provisional or conditional identification with others,"[175] can change the way citizen science endeavours are interpreted. For instance, the observation that members of the public in the wake of the Fukushima Daiichi disaster were more likely to believe or rely on their own radiation measurements even if official data was similar, could be framed as evidence that "help[ing] citizens become knowledgeable active participants in the safety dialogue" is increasingly vital to crisis management because "communication alone is not sufficient anymore" and instead requires "nurturing the ability to measure radioactivity themselves and become experts".[176] (a framing which relies on the *deficit model* of

173 "The politics of secrets," Editorial, *The Japan Times*, December 02, 2013, https://www.japantimes.co.jp/opinion/2013/12/02/editorials/the-politics-of-secrets/.
174 Wynne, "Misunderstood misunderstanding," 298.
175 *Ibid*., 299.
176 Genevieve Baumont, "Nuclear Crisis Preparedness Lessons Learned from Fukushima Daiichi," SpringerBriefs in Applied Sciences and Technology, Safety Management, *Risk Communication for the Future: Towards Smart Risk Governance and Safety Management* (Springer, 2018), 52.

knowledge critiqued by Irwin, Welsh and Wynne). However, it could also be interpreted as a sign of degradation in the relationship between the public and authority figures – suggesting a breakdown or dysfunction in the science-policy system, that may not be remedied through data collection alone.

This reflects Ian Welsh's remarks that "foregrounding the importance of knowledge in general and scientific knowledge in particular contemporary theory decouples the process of knowledge formation from the social expression of crucial sets of material interests."[177] And thus, by focusing on the deficit model to explain lack of support for nuclear industry policies, or even critical approaches to nuclear energy exploitation, the risks that fall outside the bounds of government and industry study effectively become invisible themselves, as Welsh concludes from his work: "In adopting knowledge as a key currency for the expression of risk and trust relations in late century the underlying social and economic relations are in effect obscured."[178]

Thus, it can be said that data-collection and the politics of radiation "in/visibility" are part of a wider discussion about peoples' personal and professional relationships with knowledge production, science communication and representations of radiation risks – in which context, the lack of trust in official communications makes it all the more relevant to identify and study other forms and sources of nuclear narrative, as windows onto the otherwise obscured social relations surrounding nuclear energy exploitation and nuclear safety.

## 2.3 Competing with radiation risk communications.

Among the "lessons to be learned" outlined by nuclear STS scholar Tanja Perko in a commentary on the impacts of the Fukushima Daiichi accident published in 2016 was that "mass communication during Fukushima resulted in a challenge for the emergency authorities because communication has evolved into a multidirectional process where information was disseminated at an often uncoordinated and rapid pace and was able to easily reach all kinds of audiences."[179] For instance, the lay public in a less affected area such as Europe might have a heightened sense of radiation risks – whereas the citizens

177 Ian Welsh, *Mobilising Modernity: The Nuclear Moment* (Taylor & Francis Group, 2000), 207.
178 *Ibid*.
179 Tanja Perko, "Risk Communication in the Case of the Fukushima Accident: Impact of Communication and Lessons to be Learned," *Integrated Environmental Assessment and Management* 12, n°4 (2016), 684.

of Japan actually affected by the disaster showed "[l]ow or no engagement" with official communications.[180] The Fukushima Daiichi nuclear catastrophe should therefore become a reference for nuclear safety authorities, including national governments and traditional media, to be better prepared for clear communications in the event of a future emergency[181] – a preparation which would benefit from a greater study and ethical scrutiny of these alternative communications, including pop-culture nuclear narratives, on the basis that they are built on ethical values that "inevitably come into play" in the context of any "acquisition or deployment of power."[182]

These observations are corroborated by a 2016 review of communication practices in the aftermath of the Fukushima Daiichi nuclear catastrophe, which found that "it is difficult to provide a unanimous message on exposure and health risks to the public, especially at an early stage after an emergency event," adding that "[p]eople's preparedness to handle conflicting information could be different in various populations and influenced by several factors."[183] In this context, the authors assert that "[t]he world of science fiction has done the public a vast disservice by woefully misrepresenting ionizing radiation in pop culture" and thus "even greater transparency in risk communication will not necessarily be efficient".[184]

Masaharu Tsubokura, a medical doctor and professor in the Department of Radiation Health Management at the Fukushima Medical University School of Medicine, who participated in caring for residents in the aftermath of the disaster, has also conducted research on the ways in which different media interfered with the delivery of risk communications in the wake of the Fukushima Daiichi meltdowns. Across television, newspapers, and magazine discussions of the disaster, Tsubokura noted that the more "nationally oriented" they were, "the more they discussed the pros and cons of nuclear power plants themselves and the future direction of nuclear power in Japan, rather than the actual health effects of the accident on the affected people," and that "people who used national newspapers and national media had higher radiation

180 *Ibid*.
181 *Ibid*., 685.
182 *Ibid*.
183 Erik R. Svendsen, Ichiro Yamaguchi, Toshihide Tsuda *et al*., "Risk Communication Strategies: Lessons Learned from Previous Disasters with a Focus on the Fukushim Radiation Accident," *Curr Envir Health Rpt* 3 (2016), 349.
184 *Ibid*.

anxiety than those who mainly used local media,"[185] reflecting the trends identified by Perko, but also suggesting that conflicting political views that arise from moments of crisis are

In addition, analysing over 25 million radiation-related tweets and retweets in the six months following the Fukushima nuclear accident, Tsubokura and his colleagues found that "tweets by a small number of highly influential accounts (influencers) were responsible for most of the information circulated. […] The influencers had various backgrounds, such as celebrities who had nothing to do with radiation, and accounts that became famous for repeatedly criticizing the government." By comparison, "the impacts of accounts by scientists such as physicists and biologists as well as government accounts were relatively small."[186] Tsubokura further remarks that "[m]any attempts have been made to provide accurate information as a fact check, or to counter inaccuracies, but the effect is limited".[187]

These findings echo the research of Mäkelä and colleagues on the emergence of social media as a powerful story sharing platform that presents novel social and ethics problems which are as of yet little understood – particularly in the realm of narrative study, and the formation of social imaginaries. In a publication co-written with Hanna Meretoja, they observe that "[l]osers in this game of narrative attention economy are tellers who cannot instrumentalize personal stories (such as health care or social service professionals), tellers whose story does not provide easy affective resonance ("undeserving" individuals), or tellers whose concern exceeds the parameters of human experientiality (such as climate scientists trying to warn us of dangers that do not yet manifest themselves in our daily lives)."[188] In the context of radiation risk communication, these dynamics of social media storytelling reflect Brian Wynne's observations about the way trust and credibility is fostered via "underlying tacit processes of social identity negotiation," and "provisional or conditional identification with others,"[189] as the relatability of online personas takes centre-stage in capturing public attention.

185 Masaharu Tsubokura, "Influence of different media, producing stigma," *Health Effects of the Fukushima Nuclear Disaster,* eds. Kenji Kamiya, Hitoshi Ohto and Masaharu Maeda (Elsevier, 2022), 268.
186 *Ibid*., 266.
187 *Ibid*., 267.
188 Mäkelä and Meretoja, "Critical Approaches to the Storytelling Boom," 204.
189 Wynne, "Misunderstood misunderstanding," 299.

Among the most prevalent complications with this form of storytelling identified by Tsubokura and his colleagues was the formation of echo chambers (which they define as a "fragmentation phenomenon, in which influencers with similar ideas connect and retweet, result[ing] in the same type of information being spread repeatedly in one community"[190]) and the waning interest in stories about radiation over time: "[i]n the immediate aftermath of the nuclear power plant accident, interest in radiation was very high" but "as time passes, this wanes, creating a situation where false perceptions become fixed and incorrect news can easily spread."[191] They conclude that "the timing and target of the information are more important than what kind of information is conveyed."[192] More specifically, another overview of the risk communication issues that emerged in the aftermath of the Fukushima Daiichi nuclear disaster by Noboru Takamura et al. asserts that "crisis communication" specifically (which is to say the communications "directed to people facing severe disruption as a result of a nuclear disaster") must be prepared during "ordinary (non-emergency) times,"[193] whereas "risk communication regarding radiation health effects […] targeting relatively small groups became more important in Fukushima" during the ensuing recovery period.[194]

As a result, Tsubokura suggests that "[r]ather than basic and scientific knowledge of radiation, it is important to find a way to connect the information with the current interests of the people and to create a place to convey it,"[195] and Takamura et al.'s recommend that "[d]uring the initial phase of a nuclear disaster, the message must be simple, short and general, with a focus on public safety via mass-gathering communication" whereas "after the initial phase, the topic of communication must become more detailed and complex, with a focus on the personal content via small group/personal communication."[196]

However, in a paper studying ETHOS Fukushima, which participated in dialogue seminars conducted by the ICRP, Aya Kimura found that despite its apparent open-ness to public participation: "ETHOS Fukushima calls upon citizens to be hopeful

190 Tsubokura, "Influence of different media, producing stigma," 267.
191 *Ibid*., 273.
192 *Ibid*., 270.
193 Noboru Takamura, Makiko Orita, Yasuyuki Tairia et al., "Experiences of crisis communication during radiation emergency and risk communication for recovery of the community in Fukushima," *Journal of Radiation Research* 62, n°S1 (2021), i95.
194 *Ibid*., i96.
195 Tsubokura, "Influence of different media, producing stigma," 270.
196 Noboru *et al*., "Experiences of crisis communication," i99.

of life in the affected area and to take charge of their own well-being in the contaminated environments" and as such "[w]hile ETHOS is technically open and nondirective, these affective tropes marginalize other possible feelings such as being scared and outraged, and highlight the virtue of continuing to live in the affected areas (vs. evacuation) and of self-management of radiation exposure (vs. decontamination/ compensation by the government and the industry)."[197] Also, according to the ICRP's own *Proceedings of the International Workshop on the Fukushima Dialogue Initiative* (2016), the dialogue initiative "brought several important clarifications and complements concerning the human and organisational dimensions of the rehabilitation process," but overall "did not raise new issues concerning the protection of people living in long-term contaminated areas,"[198] which gives the impression that at least some of the calls for public participation in risk debate and in the development of novel risk communication methods are not meant to yield concrete impacts on data-led protection policies.

Kimura warns that the tropes of self-reliance and individual capacity in the wake of nuclear disaster that are evident in the exchanges with ETHOS (and facilitated by the ICRP) "resonate with the affective regime under neoliberalism that privileges self-responsibility, anticipation, maximization of emotional potential, and cosmopolitan empathy."[199] Neo-liberal ideology has embedded itself in risk communication and nuclear disaster preparedness discourse may be justified by the appearance of certain passages in the aforementioned nuclear safety and risk communication guidelines – such as in the NEA's 2021 report ("Fukushima Daiichi Nuclear Power Plant Accident, Ten Years On"), which recommends multilateral dialogue including affected communities because "[s]takeholder involvement and public engagement are extremely important in transitioning to an environment of "informed consent" characterised by public participation and community ownership in such policy decision making."[200] This recommendation frames the outcome of public consultations as the result of fully informed (and therefore freely made) decisions, thereby implying that the measures will be morally justified, on the grounds of neo-liberal or liberal pretences.

197 Kimura. "Fukushima ETHOS," 114.
198 ICRP, *Proceedings of the International Workshop on the Fukushima Dialogue Initiative*, 117.
199 Kimura, "Fukushima ETHOS," 100.
200 NEA, *Fukushima Daiichi Nuclear Power Plant Accident, Ten Years On*, 67.

The 2020 IAEA EPR strategy document, likewise suggests that dialogue with the public would help "promote acceptance and the perception of empowerment among the affected population" and improve community resilience in the face of future disasters.[201] At first reading, this unintentionally cynical description suggests a neo-liberal bent in the trend towards lay inclusion in discussions of disaster risk, as it relies on the appeal of self-responsibility to encourage acceptance of pre-determined protection measures. However, as explored in the previous chapter, one of the primary public-facing missions of these institutions is to understand social values within nuclear disaster contexts in order to better convey technical risks. As such, the approaches and phrasings examined here could very well indicate that nuclear safety organizations aiming to inform and protect the public are forced to contend with a modern political zeitgeist that impacts their audience's reception (or not) of radiation risk communications and recommendations. (Also of note here is that the primary audience of international safety regulators is composed of the Member States that consult with them.)

Paradoxically, "[i]nauthentic agency is perpetuated and continually reproduced because the culture of neoliberalism elevates the pedestrian choices the individual makes in her everyday life, especially choices of consumption, as expression and proof of the individual's uniqueness, individuality and power […] The individual feels socially connected to other individuals and a larger community through the shared fetishism of the objectified and commodified ideas of power, freedom, independence or even countercultural non-conformity, all of which enable the individual to construct her identity and superficially define the social context within which she perceives herself to be situated".[202] In that sense, and in light of the writings around the ICRP Dialogues, the promotion of both data-centred radiation monitoring programs and narrative-centred dialogues or storytelling events, can be construed as deceptive invitations to enact inauthentic political agency, under circumstances that are beyond the individual's power to change or resist.

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201 IAEA, *Considerations in the Development of a Protection Strategy,* 64.

202 Mary V. Wrenn, "Agency and Neoliberalism," *Cambridge Journal of economics*. Vol. 39, No. 5 (2015): 7 Here, the author defined 'agency' in similar terms to individual autonomy or self-governance, as "the impetus of action" during "decision-making processes", which she observes as associated with the concept of freedom in the neo-liberal context: "to object to neoliberalism is to oppose 'freedom'."

In this vein, Maria Mäkelä and Hanna Meretoja describe the development of a "curious yet strategically beneficial relationship between the naturalness of storytelling and its conspicuously manipulative uses" when "storytelling is marketed with the cognitive vocabulary of essentiality, universality, embodiment, naturalness, and empathy" and warn that: "Such neoliberal, streamlined interpretation of the cognitive rhetoric is effective in effacing socioeconomic and cultural backgrounds of storytellers and audiences."[203]

By contrast, wider-reaching popular narratives may be worth investigating for their role in creating or perpetuating common understandings of crisis situations like the "disaster myth," which is to say the tenacious belief in public psychological and social responses to emergency situations despite proof to the contrary – such as when Japanese authorities chose not to disclose SPEEDI data because they did not want to cause "panic." In the aftermath of the Fukushima Daiichi disaster, Tatsuya Nogami studied how well implanted disasters myths were in Japanese society compared to Western societies (where most such studies had been conducted), and found that "Japanese people also believe the disaster myths that have generally been found to be untrue".[204] In a separate publication on this same topic, Nogami also examined how pervasive disaster myths were among disaster response professionals compared to lay people, specifically. The myths that Nogami tested for included beliefs that "[p]eople get panicky trying to get out of the affected area in the immediate aftermath of a disaster", "[l]ooting frequently occurs in affected areas in the aftermath of a disaster", "[c]rime rates increase in the affected area after a disaster", "[p]eople go into shock and are unable to cope with the situation by themselves immediately after a disaster", and "[i]t is more helpful to send food, water, and clothing to the affected area than monetary donations".[205]

Since previous explorations of disaster myth beliefs in Japan looked at a mixed population of emergency responders – many of whom were firemen, policemen and other workers typically on the ground, Nogami's new study "is designed to exclusively focus on disaster myths among municipal officers" since they are in charge of organizing relief efforts.[206] The results of this study showed that although "disaster

203 Mäkelä and Meretoja, "Critical Approaches to the Storytelling Boom," 198.
204 Tatsuya Nogami and Fujio Yoshida, "Disaster myths after the Great East Japan Disaster," *Disasters* 38, n°2 (2014), S201.
205 Tatsuya Nogami, "Disaster myths among disaster response professionals and the source of such misconceptions," *Contingencies and Crisis Management* 26, n°4 (2018), 4.
206 *Ibid*., 3.

response professionals gave less credit to the panic, looting, and donating myths than lay people," they still "did not differ from each other in the crime myth and the shock myth."[207] Unable to identify the likely source of these myths, Nogami asserts that "[b]ecause disaster myths among these professionals could trigger inadequate disaster response during a disaster, more research clearly needs to be performed to explore what disaster myths stem from among disaster response professionals, as well as among lay people."[208]

Corroborating Nogami's concerns is the research of Daniel F. Lorenz, Katja Schulze and Martin Voss, who studied the impact of disaster myths on collaboration between professional and volunteer emergency responders, in Germany. The study consisted of a simulated emergency response scenario involving professional rescue teams composed of 120 members of the Berlin Fire Brigade and the German Red Cross alongside twenty-four "unaffiliated responders" in a seven-hour training exercise with 14 tasks, a survey of the professional responders' opinions about "unaffiliated responders" and a population survey. The results found that although the general population was eager to help in a hypothetical emergency situation, and the twenty-four "unaffiliated" participants in the joint exercises were perceived by the professionals as a great help, belief in disaster myths most likely hindered communication and coordination between groups – hence the lack of cooperation during instances of real emergency scenarios: "[i]f the population is viewed as being incapable, panic-prone, shockprone, or even dangerous, then it is only reasonable that professional rescue teams at the scene do not perceive both the help that is being administered, as well as any existing aid potential as found among the populace."[209]

Curiously, the origins of such myths and other persistent beliefs about disasters are not very well understood. Though "mass media" has not been conclusively identified as a source for these myths,[210] Nogami concludes that among the possible factors influencing the persistence and spread of these myths is "that participants might have been influenced by pre-existing images and stories of disasters that they had previously seen/heard".[211] This last possibility "is partly confirmed by the present

207 *Ibid*., 5.
208 *Ibid*., 7.
209 Daniel Lorenz, Katja Schulze and Martin Voss, "Emerging citizen responses to disasters in Germany," *Journal of Contingencies and Crisis Management* 26, n°4 (2017), 6.
210 Nogami, "Disaster myths among disaster response professionals," 6.
211 Nogami and Yoshida, "Disaster myths after the Great East Japan Disaster," S201.

finding that participants believed the looting myth, although there had been only a few, if any, reports of looting from the Japanese media and public organisations after the Great East Japan Earthquake."[212]

In summary, the observations across these different reviews point towards not only an emerging recognition that more complex nuclear narratives circulating outside of the nuclear crisis time frame interfere with interest in official radiation risk communications, but that this is accentuated by recourse to personal narrative themes and by physical distance from real disaster events. In the radiation (in)visibility context, pop-culture nuclear narratives emerge as interesting vehicles of alternative nuclear safety imaginaries, potentially perpetuating disaster myths or reiterating widespread concerns about radiation exposure risks – thereby making them an important subject of study from a narrative ethics perspective.

# Conclusion

As observed by the others of the aforementioned 2016 review of risk communication lessons drawn from the Fukushima Daiichi accident, "consideration of ethical issues regarding complex situations is a key factor to strengthening public trust"[213] and that this is highly context dependent, since "[t]rue risk communication is an interactive exchange of information, not a one-way process".[214] Underlining that "[i]nappropriate or ineffective risk communication could cause more harm to the public's health",[215] the authors suggest that some ethics principles from environmental epidemiology could be applied to radiation risk communication strategies, such as "beneficence", "accessible language", "respect for autonomy", "community engagement", "full disclosure of risks and benefits" and "prompt communication of results".[216] However, since one of the main concerns that emerged from the literature was competition from alternative sources of radiation risk "communication," which may convey different value judgments and focal points regarding radiation exposure as part of wider alternative nuclear safety imaginaries – what ethical questions can be asked of pop-culture nuclear narratives?

212 *Ibid*.
213 Svendsen *et al*., "Risk Communication Strategies," 349.
214 *Ibid*., 353.
215 *Ibid*.
216 *Ibid*., 355.

From Kuchinskaya and Kimura's more recent work on radiation invisibility, back towards Ulrich Beck's work on "risk society," choices in how radiation is represented are suggested as highly valuable, even in alternative media communications. For instance, Beck explains that "[s]ince risks and the social definition of risk are one and the same, collective knowledge and lack of knowledge concerning the concrete injuries, possible injuries, standards, illnesses, diagnostic possibilities, and so forth, are an essential part not only of risk assessment but also of coping with risks"[217] – and thus, "[m]aking the threats publicly visible and awakening attention within one's own living space" the mass media "are cultural eyes through which 'blind citoyens' can perhaps regain their autonomous judgment."[218] However, if alternative media choices in representation are important in contributing to radiation (and radiation "risk") visibility, and as a way to consider alternative imaginaries in increasingly multi-layered nuclear safety policy making processes, then perhaps there should be some ethical scrutiny regarding the nature of these nuclear narratives and the judgments that can be made about them. This could help address the "uncontrolled consequences" which "emerge from a different epistemic world from that which was understood to prevail, and in which public authority claims for science were invested,"[219] pointed out by Wynne and Welsh. Hence the utility of considering narrative ethics as a nuclear narratives analysis framework.

Therefore, in order to proceed with an analysis of *Chernobyl*'s representation of radiation and the ethical questions that surround those choices, I follow this chapter with a brief overview of nuclear narrative studies since the Cold War era, and the place of genetic stigma within that history, in order to demonstrate how even when radiation exposure is not necessarily the primary subject of discussion in a given narrative, its use to elaborate wider social and political commentary rests on assumptions about radiation that are then perpetuated in wider nuclear safety imaginaries.

217 Beck, *World at Risk*, 31.
218 *Ibid*., 45.
219 Welsh and Wynne, "Science, Scientism and Imaginaries," 545.

# Chapter 3 – Genetic stigma in nuclear narratives

In the previous chapter, I outlined how information gaps concerning the spread of radiation and radioactive materials formed in the aftermath of the Fukushima Daiichi nuclear disaster and explored some of the ways that the wider public established alternative sources of data to make radiation visible. In the same instance, I examined the wider STS and risk communications context of radiation (in)visibility politics to explore the lack of discussion about the meanings and social relevance of risk, and then analysed how different international organisations dedicated to nuclear safety regulation and radiation research address such discrepancies in more recent radiation safety and communication guidelines. Finally, I show how "lessons learned" from the Fukushima Daiichi disaster in radiation risk communication scholarship point at pop-culture nuclear narratives and new storytelling media as competitors in the wake of a radiological crisis – thereby opening pop-culture nuclear narratives to literary ethics analyses that would help understand the competing values that "inevitably" partake in struggles over nuclear safety decision-making power, according to James Phelan's framing of narrative ethical judgments.[220]

I therefore propose to take a closer look at the specific place of radiation-exposure health stigmas in the study of nuclear narratives, before moving onto answering the question of what *Chernobyl* specifically contributes to broader nuclear safety imaginaries (as conceived by Jasanoff and Kim), and the ethical ramifications of such contributions. Thus, in this chapter, I start by briefly examining the history of nuclear narrative study and situating the reality of genetic stigmas within that context. Finally, I end with a short analysis of the role played by genetic stigma in a more recent and globally popular work of nuclear pop-culture fiction, Netflix's *Dark* (2017), in order to demonstrate how the basis of this stigma can be used to convey wider societal or political commentaries, and that by exploiting the very real issue of genetic stigmatization for narrative purposes, it is made invisible.

220 Phelan, "Narrative Ethics."

# 1. Radiation stigma(s) in pop-culture nuclear narratives

Early scholars working on nuclear narratives in literature and art, such as Paul Boyer (*By the Bomb's Early Light*, 1985) and Spencer Weart (*Nuclear Fear: A History of Images*, 1988) mostly focused on perceptions of the atom bomb – still living, as they were, in an era marked by fear of immanent nuclear conflict. However, as Jeff Hughes has observes in his critical approach to the notion of "nuclear culture", these authors were among the first to "engag[e] with wider responses to nuclearization".[221]

Boyer, for instance, proposed his work as "assessments of the bomb's effects on American culture and consciousness" as opposed to the "studies of the evolution of nuclear strategy" and "explorations of the political and diplomatic ramifications of the nuclear arms race" that existed at the time,[222] focusing on "the vast literature in which Americans directly and explicitly discussed the atomic bomb and its meaning, the wealth of cultural material—from the most rarified to the most ubiquitous—clearly influenced by the bomb" between 1945 and 1950.[223]

Though Weart made mention of Chernobyl and how the Three Mile Island accident turned the plant's towers into an iconic visual reference for nuclear power,[224] he was also primarily focused on the militaristic origins of and associations with nuclear power. Weart's methodology was founded on the idea that "the images we cherish have a greater role in history than has commonly been thought", because they produce a "lasting impact on the beliefs and emotions of their audience"[225] – drawing his arguments from the conclusions of contemporaneous psychological and anthropological research, in addition to the recent emergence of image studies in the field of history.

Likewise, Daniel Cordle argues that "many nuclear fictions contextualised and contributed to debates about nuclear policy," in his work on late Cold War nuclear literature, focusing on the 1980s. When "the only available images and experience of actual atomic war [were] the film footage, photographs and testimony left from Hiroshima and Nagasaki (a terrible but in so many ways more limited experience than that threatened by global thermonuclear war)," the "imaginative constructions of

221 Jeff Hughes, "What is British nuclear culture? Understanding *Uranium 235,*" *The British Journal for the History of Science* 45, n°4 (December, 2012), 498.
222 Paul Boyer, *By the Bomb's Early Light* (University of North Carolina Press, 1985), xvii.
223 *Ibid*., xx.
224 Spencer Weart. *Nuclear Fear: A History of Images* (Harvard University Press, 1988), 369.
225 *Ibid*., xiii.

nuclear near futures were particularly important in furnishing the public with their sense of what was at stake in the Cold War."[226] Cordle's work thus explores the "alternative logics" conveyed through "[n]uclear literature—and film, music and other facets of nuclear culture— both reflect[ing] and constitut[ing] the broader discourse within which these various positions coalesced," making them "deeply political" in nature,[227] – tackling, for instance, themes "of gendered and sexual identity […], particularly in relation to the family,"[228] as well as "the long-term health consequences of atomic tests from decades before, the safety of nuclear power stations, the transport and storage of nuclear waste and the ecological consequences of thermonuclear war."[229]

Following the wane in official narratives about nuclear science and technology since the end of the Cold War, Jonathan Hogg argues that "unofficial narratives within popular culture, and more specifically computer gaming culture, came to represent the increasingly depoliticized and stable assumptions around the dangers of the nuclear state."[230] Paralleling the reduced sense of danger regarding nuclear conflict, "iconic motifs such as the nuclear mushroom cloud served mainly as static, depoliticized representations of the nuclear past,"[231] while nuclear conflicts and materials became story-telling devices for an increasingly wide array of narratives – from comedic use as a "comment on the inevitability of an imperfect nuclear power industry" and incidental communications of "instant, large-scale danger" in action oriented cinema, to "[t]houghtful reflections on the meaning of the atomic bombings of Japan" and dramas focused on political intrigue.[232]

In the context of this emergence of disparate nuclear narratives and new interests in more complex representations of the nuclear attacks on Japan, Jerome Shapiro's 2000 publication on the thematic appeal of Japanese atom bomb cinema in the United States suggests that "for more than fifty years, the production and popularity of bomb films have remained consistently high", and that some have even "achieved strong following." Shapiro therefore contends that "[r]egardless of any opinion poll or critical

226 Daniel Cordle, *Late Cold War Literature and Culture: The Nuclear 1980s* (Palgrave Macmillan, 2017), 48.
227 *Ibid*.
228 *Ibid*., 77.
229 *Ibid*., 113.
230 Jonathan Hogg, *British nuclear culture: Official and unofficial narratives in the long 20th century* (Bloomsbury Publishing, 2016), 161.
231 *Ibid*., 164.
232 *Ibid*., 164-166.

measure of American apathy and activism, it is clear […] that most Americans, whether filmgoers or film-makers, are deeply concerned with the threat of nuclear war and technologies."[233] Pitting scholarly study of nuclear power and public opinions toward nuclear against cultural representations of nuclear warfare and radiological disaster, the author describes a conflict between competing nuclear narratives, rooted in the "competing ideological elements" of the (ever evolving) institutions that produce them – borrowing from the work of Raymond Williams on Cultural Materialism.[234]

Emerging in mid-twentieth century Great Britain,[235] Cultural Materialism has since developed as a larger body of literary work, in which "[t]he importance of struggles over culture and cultural practices" are newly conceived "as 'political' struggles rather than simply matters of taste, distinction, or esthetics marks a key contribution".[236] In particular, Williams argues that any means of communication "are not only forms but means of production, since communication and its material means are intrinsic to all distinctively human forms of labour and social organization" and as a result of their materiality, are "directly subject to historical development,"[237] hence the interest in nuclear narrative studies, which explore the political relationships built and/or reflected by social imaginaries in the realm of emerging nuclear technologies in particular.

Most recently, Rachel DiNitto studies the "florescence"[238] of disaster literature that emerged since 2011, challenging traditional disaster literature by "grappling with the ethical and global consequences of the nuclear disaster, which could not so easily be blamed on Mother Nature."[239] For many authors, "the disaster was a turning point, a moment of self-reflection, a crisis of representation, and for some, a mandate to critique"[240] – something Shapiro found to be missing from Japanese popular culture

233 Jerome Shapiro, *Atomic Bomb Cinema: Apocalyptic Imagination on Film* (Routledge, 2001), 308.
234 *Ibid*., 316.
235 Andrew Milner, "Cultural Materialism, Culturalism and Post Culturalism: The Legacy of Raymond Williams," Historical Materialism Book Series. *Again, Dangerous Visions: Essays in Cultural Materialism* (Brill, 2018), 269.
236 G. Helms, "Cultural Materialism," *International Encyclopedia of Human Geography* (Elsevier, 2009), 426.
237 Raymond Williams, "Means of Communication as Means of Production" Radical Thinkers. *Culture and Materialism* (1980; reis., Verso, 2005), 50.
238 Rachel DiNitto. *Fukushima Fiction: The Literary Landscape of Japan's Triple Disaster* (University of Hawaii Press, 2019), 1.
239 *Ibid*., 3.
240 *Ibid*., 1.

when he completed his analysis of nuclear disaster in Japanese cinema. And unlike traditional nuclear disaster literature in Japan, the response to the Fukushima Daiichi meltdowns was not only marked by increasingly "Orwellian-type dystopic novels that warn of censorship and doublespeak," and particularly "the nuclear "myth of safety" (*anzen shinwa*) – that was the basis for convincing a nation scarred by atomic bombs to adopt nuclear power,"[241] but "represents a moment of wide literary participation not limited by region or first-hand experience of the disaster."[242] Thus, DiNitto's work "highlights the ways in which writers mediate the experience of disaster as they strive to give it shape in language and the important social role fiction writers play in turning a disaster into narratives of trauma that speak to the concerns of global, national, and local audiences."[243]

In this way, her work supports the problem highlighted by Hughes with the concept of nuclear cultures: "[w]hile the national may be an appropriate level of analysis for political, diplomatic, strategic and even technical histories of nuclearism, I suggest that it does not do justice to the complexity of social and cultural responses to the nuclear condition."[244] Although it could also be argued that political, economic and cultural forces shape the nuclear narratives landscape that emerges and evolves within a given population, DiNitto's work on fiction in the aftermath of the Fukushima Daiichi disaster shows how a nuclear accident can spur storytellers to look elsewhere to better understand their present situation – for instance, to Chernobyl.

An example briefly mentioned by DiNitto, is the author of the long-running culinary comic *Oishinbo*, Tetsu Karyia, decided to visit the Fukushima disaster zone himself and interview some of its residents – incorporating some of their testimonies in a 2014 special chapter on the Japanese nuclear disaster and its effects on food safety, titled "The Truth About Fukushima." Of particular concern to Japanese authorities and the wider Japanese public, was the author's decision to include passages where characters bled from their noses – supposedly as a side effect of radiation exposure.[245] In doing so, the storyteller relays the experiences of individuals living in the disaster zone: "Katstaka [sic] Idogawa, the former mayor of Futaba, uploaded photos to his personal

241 *Ibid*., 13.
242 *Ibid*., 6.
243 *Ibid*., 10.
244 Hughes, "What is British nuclear culture?" 496.
245 Derek Moscato, "Fukushima Fallout in Japanese Manga: The Oishinbo Controversy Through the Lens of Habermas' Discourse Ethics," *Journal of Communication Inquiry* 41, n°4 (2017), 6.

(and public) Facebook page showing himself with visual evidence of the nosebleeds he was enduring post-Fukushima incident, specifically bloodied tissues set atop dated post-it notes," therefore representing "a very real situation of nosebleeds (among other health issues real or perceived) in the area."[246]

In his own study of the *Oishinbo* controversy, Derek Moscato notes that "Comic books like manga act as a literary form to help communicate universal ideas and problems – including the ethical behavior of individuals, organizations such as businesses, as well as government institutions."[247] As he points out, the author of one of manga's early hits *Astro Boy* was influenced by his own experiences of WWII: "Manga author Osama Tezuka, who experienced the fire-bombings of Osaka while working at an army arsenal, had a deep mistrust of politicians and military leaders, but also of scientific knowledge and technology."[248] Similar statements about the utility of nuclear fiction to process the disaster came from news outlets such as *Reuters* which reported that although only one film had recently been released on the subject of the Fukushima Daiichi nuclear disaster ("Homeland") and "[i]ts director was careful to emphasise the human story over any political statements during publicity tours", more than 30 manga discussing the topic had been published in that same time. Experts and industry insiders interviewed for the article asserted that "[m]anga are a lot more independent and can go where even news programs might hesitate,"[249] and that "[t]he special aspects of manga, like looking towards the future and fiction, allow tackling the object [the nuclear problem] on a different level."[250]

Storytelling can therefore be said to allow authors like Tezuka and other survivors of the WWII bombings to add their experiences and express their own perceptions of radiation risk outside of the physical health oriented data collection initiatives supported by the Japanese government, hospitals and international research institutions. However, publication in traditional media is decided by an appeal to the sensibilities or worries of listeners and readers – for instance, in the case of journalist Misa Koyama and hibakusha Kazuo Nakamura. Koyama explains how she decided to

246 *Ibid*., 13.
247 *Ibid*., 7.
248 *Ibid*., 5.
249 Kenichiro Shinohara, cited by Elaine Lies, "No laughing matter: Japan's manga comics boldly tackle Fukushima," *Reuters*, June 25, 2014. Kenichiro Shinohara is editor of *Morning* manga weekly.
250 Kazuma Yoshimura, cited by Lies, "No laughing matter." Kazuma Yoshimura is head of the Manga Research Centre at Kyoto's Seika University.

pursue Nakamura's story after her paper received "a letter in beautiful handwriting" about his experience of black rain, before delving into his testimony.[251] Like many other *hibakusha*, "he has never been seriously ill, but he does have fears. 'The atomic bomb lives inside my body,' he said. 'You never know when its effects will come out. Radiation never dies'." Nakamura is one of many survivors of the bombing exposed to black rain who are still applying for recognition of their status from the Japanese government,[252] and thus his storytelling can be construed as a continued social or political engagement with the radiation risk and protection policy debates potentially circumvented by the focus on data.

Another *hibakusha* who used storytelling in such a way is Masamoto Nasu, author of a picture book *Hiroshima: A Tragedy Never to Be Repeated*: "The book, published in 1995, continues to sell and remains in print. It is a multifaceted, scientific picture book depicting Hiroshima before and after the bombing from a bird's eye view, the structure of the bomb, its history from development to release over the city, and the effects of radiation, among other elements."[253] He and his collaborators travelled to Hiroshima in order to start their work by "listening to the experiences of hibakusha who had been directly affected by the bomb" (Nasu was only three years old when the bomb was dropped). In an interview on his work inside and outside of writing, he is cited as saying that this one in particular "might just become my will and testament."[254]

Outside of writing, "he [Masamoto Nasu] legally challenged national security legislation as unconstitutional, and litigated against the Chugoku Electric Power Co.'s planned construction of the Kaminoseki Nuclear Power Plant in the Yamaguchi Prefecture town of Kaminoseki. He also toured the country giving lectures on his experience of the bomb and the horror of atomic weapons."[255] But he does not separate this activity from the world of writing: "If you cannot be skeptical then you'll believe something based on one thing. The world of stories teaches people about other worlds, and develops their sense of imagination."[256] Nasu's storytelling can therefore be

251 Misa Koyama, "'It's my last opportunity to tell people about black rain': Japanese A-bomb survivor," *The Mainichi,* October 01, 2021, https://mainichi.jp/english/articles/20210930/p2a/00m/0na/013000c.
252 *Ibid*.
253 Rika Uemura, "Hibakusha children's author reflects on a life of writing, why society needs imagination," *The Mainichi,* July 16, 2021, https://mainichi.jp/english/articles/20210715/p2a/00m/0na/022000c.
254 *Ibid*.
255 *Ibid*.
256 *Ibid*.

described as a form of political engagement on the topic of nuclear energy and radiation risks, helping the reader of his stories use their imagination to make radiation visible, as well as the technical apparatuses and vocabulary associated with radiation – thus, contributing to the ever-changing landscape of competing nuclear safety imaginaries.

The use of the term *hibakusha* itself, after the 2011 nuclear meltdowns in Japan, hints to the political undertone of "Fukushima fiction." Whereas some members of the public "purposely and politically use the term *hibakusha* to refer not only to the Fukushima accident victims but to anyone who lives under the threat of radiation," the term *hisaisha* is instead preferred by others due to the lack of associated stigma.[257] In this context, Rachel DiNitto notes that Fukushima fiction "does not necessarily trace itself back to the legacy of Hiroshima or Nagasaki atomic-bomb literature,"[258] but at the same time, it "takes up the plight of this new generation of *hibakusha* in light of that earlier history and its political stakes" by focusing on themes such as "the privatization of risk that is happening in the post-3/11 context where individual citizens are having to take on risks that should have been shouldered by government or corporate entities," or "dramatizing the social ostracization of nuclear victims and their double victimization at the hands of a society that does not accept them."[259] For instance, Tawada Yokō's novella, *The Lantern Bearer* (2014), makes references to the aforementioned State Secrecy Law, as well as "the toxic environment, and the unreliable information on children's health" clearly linking it to the Fukushima disaster, and exploring the idea that "the government's obfuscation has normalized this situation and its accompanying problems," including residents who must "hide their origins rather than risk discrimination because they are considered to be radioactive," eventually leading newer generations to having "no qualms about their life of confinement or their poor health."[260]

In this way, DiNitto's study of Fukushima fiction – but also the works of nuclear narrative scholars before her and the traditional media portrayals of personal story sharing in the wake of the Fukushima Daiichi disaster – reflects the somewhat recent "narrative turn" observed by narrative ethics scholars Maria Mäkelä and Hannah Meretoja, for whom narrative has become instrumentalised "in various spheres of life," supported by "notions of narrative as a cognitive sense-making tool, a culturally

257 DiNitto. *Fukushima Fiction,* 91.
258 *Ibid*.
259 *Ibid*.
260 *Ibid*., 146.

mediated hermeneutic practice of shaping experience, and a rhetorical strategy to capture the attention of audiences amid the information overload".[261]

## 2. The (un)reality of genetic stigma

As explored thus far – STS, historical and literary research on nuclear narratives and cultures has theorized the political dimension of nuclear fiction as a response to the developments in nuclear technology and mostly military policies since the end of the Second World War, paralleling observations by STS and risk communication scholars explored in the previous chapter on how alternative media and pop-culture nuclear narratives may serve to make radiation or radiation risks more "in/visible," potentially interfering with official risk communications during times of crisis. However, not many have focused on retracing specific or individual narrative themes present in these fictions, and that is particularly the case for the concept of radiation exposure as an invisible stigmata on (or in) the survivors of radiological disaster, or on the ethical ramifications of its use as a storytelling device for wider social and political commentary.

And yet, the social marginalization and discrimination that result from such beliefs are common responses to the victims of radiological disaster after a real-world accident – as pointed out by Robert Jacobs, who has observed in the immediate months after the Fukushima Daiichi meltdowns, "reports of cars with Fukushima prefecture license plates being denied service at gas stations in other prefectures" and evacuated children "being bullied by other children in their new schools,"[262] echoing the marginalization of the *hibakusha* before them, "who found it very difficult to find marriage partners, since prospective spouses feared they would have malformed children" and "to find jobs, since employers assumed that they would be chronically sick".[263]

This stigmatization is compounded by the prevalent notion of "radiophobia," "blaming the victim" for their justifiable anxieties.[264] Novikau's overview of the history of radiophobia (and related expressions) shows how a wide variety of labels including

261 Mäkelä and Meretoja, "Critical Approaches to the Storytelling Boom," 194.
262 Robert Jacobs, "Social Fallout: Marginalization After the Fukushima Nuclear Meltdown," *The Asia-Pacific Journal* 9, Issue 28, n°4 (July, 2014), 3.
263 Jacobs, "The Radiation That Makes People Invisible," 6.
264 *Ibid*., 8.

"radiophobia" but also "radiation phobia syndrome", "survivor syndrome" and "Chernobyl syndrome" emerged in past nuclear communications literature to describe the psychological effects of surviving a nuclear disaster, such as "an increase in the level of anxiety caused by worries about the health risks to children and by disruption of normal daily routines" or even "a more or less permanent form of psychic numbing which includes diminished vitality, chronic depression, and constricted life space" – but not to argue that such reactions are "imaginary and unconnected to reality."[265]

However, these expressions have also been used to describe the reactions of populations that "do not have traumatic experience" of the disaster and whose knowledge is instead "usually obtained through the media",[266] and eventually "as a tool to deny citizens' questions about the health effects of Chernobyl" across the Soviet Union.[267] The health effects of surviving a nuclear disaster were then directly attributed to unreasonable levels of fear, and thus "the risks associated with the possible use of nuclear power in the future, and therefore with a possible future accident could be labelled as "irrational" much more easily."[268] In this case, the concept of radiophobia (or the idea that radiation itself is being "stigmatized") becomes a useful tool in the politically polarized dichotomy between technical and social or cultural "rationalities" to silence dissent against the prevailing nuclear safety science-policy trends outlined in the previous chapter.

This can be seen, for instance, in the case of the victims of another radiological catastrophe – the negligent pollution of the Techa river by the USSR's first plutonium producer, Mayak, in the period of 1949-1951. The people who could not be evacuated, such as the inhabitants of Muslumovo, would be (and continue to be) exposed to very high levels of radiation since the initial crime took place, leading to noticeable degradations in health across generations – such as exceedingly high levels of genetic disorders.[269] Kate Brown's interview of sisters from Muslumovo reveals that one of them faced a break up in college because her partner at the time "heard a classified lecture at his Cheliabinsk institute about genetic problems among the Muslumovo

265 Aliaksandr Novikau, "What is "Chernobyl Syndrome"? The Use of Radiophobia in Nuclear Communications," *Environmental Communication* (2017), 801.
266 *Ibid*., 802.
267 *Ibid*., 804.
268 *Ibid*.
269 Kate Brown, *Plutopia: Nuclear Families, Atomic Cities, and the Great Soviet and American Plutonium Disasters* (Oxford University Press, 2013), 300.

cohort" and thus, not only did he "not want to have children with her," he "advised her never to have children" at all. Unfortunately, like her sister, she went on to unknowingly have children with serious health issues, involving inexplicable malformations and sudden death. Even in this situation, officials such as Angelina Gus'kova, who in 1991 was "the chief official voice in evaluating Chernobyl-related health problems" claimed that most of the sufferers in Muslumovo were merely affected by "more prosaic diseases such as brucellosis, tuberculosis, hepatitis, and rheumatism, caused by poor diet and sanitation," while others suggested that they "had no chronic radiation disease but were chronic welfare cases looking for handouts."[270] As a result, the sisters, like many inhabitants of Muslumovo led lives defined by "the stresses of family illnesses exacerbated by low wages, uncertain access to transportation and health care, and social stigmatization."[271]

In a similar vein, after the Hiroshima and Nagasaki bombings: "Many believed that survivors would be unable to have healthy children due to radiation-induced heritable mutations, and in a social world where marriages were commonly arranged, some families concealed exposure in an effort to secure desirable matches for their children."[272] Surveys led by the Fukushima Medical University, and later the Mitsubishi Research Institute in Tokyo, show that a significant minority of respondents believe that radiation exposure after the Fukushima Daiichi catastrophe would cause a genetic effect on the next generation – stagnating at about 30% (down from 60% initially), and this was reflected more recently in Tokyo, where 40% of residents surveyed by the Mitsubishi Research Institute believed radiation exposure would lead to genetic effects (thereby corroborating the observations previously explored in risk communication scholarship, of heightened discrimination by "outsiders").[273] Although epidemiological research conducted since the Nagasaki and Hiroshima bombings (not only the Life Span Study) demonstrate that increased rates of cancer and cardiovascular disease is possible among people exposed to radiation (and less likely among those exposed to lower

270 *Ibid*., 301.
271 *Ibid*., 304.
272 Susan Lindee, *Suffering Made Real: American Science and the Survivors at Hiroshima* (The University of Chicago Press, 1994), 7.
273 Tsubokura, "Influence of different media, producing stigma," 271.

doses), there is still no clear evidence that low rates of exposure can cause genetic defects in the next generation.[274]

Thus, the "fear of having and transmitting genetic effects or illness is a burden that must be carried throughout their lives; it is a fear that can create significant social isolation and stress. When such fears are shared by those in the community, the Hibakusha and Hibakusha Nisei feel socially stigmatized as well, and may be blocked from marital and social opportunities that are open to non-Hibakusha."[275] The *hibakusha nisei*, or second generation *hibakusha* (as previously discussed), indeed also face such prejudices, according to Ikuro Maruo – for whom "[s]econd-generation people have been facing discrimination in a number of areas including finding work or a marriage partner as they are said to 'get sick easily,' among other things. It's not easy to identify as one and join a group for them."[276]

However, since getting diagnosed with pancreatic cancer in 2018, Maruo himself believes that "the effects of radiation reached the second generation,"[277] joining the worries of first-generation *hibakusha* such as Ayako Nakano, who "[empathizes] with the Fukushima people who are worried that their internal exposure to radiation could adversely affect their descendants" as her own mother "had been worried throughout her life about the future of her daughter, who was exposed to radiation before even being born."[278] Considering that the government currently refuses to extend the coverage of the Atomic Bomb Survivors' Assistance Act to descendants of the *hibakusha* because it "does not recognize second-generation survivors as having genetically experienced effects of the atomic bombs,"[279] this situation harkens back to Adriana Petryna's research on the Ukrainians after the Chernobyl meltdown, whose lives were subsumed

274 Toshiteru Okubo, "Long-Term Epidemiological Studies of Atomic Bomb Survivors in Hiroshima and Nagasaki: Study Populations, Dosimetry and Summary of Health Effects," *Radiation Protection Dosimetry* 151, n°4 (2012), 673. Mark P Little, Tamara V Azizova, David B Richardson et al., "Ionising radiation and cardiovascular disease: systematic review and meta-analysis," *BMJ* 380:e072924 (2023), 12-13. A Amrenova, C Baudin, E Ostroumova et al., "Intergenerational effects of ionizing radiation: review of recent studies from human data (2018 -2021)," *International Journal of Radiation Biology* (2024), 7.

275 Lindee, *Suffering Made Real*, 145.

276 Ikuro Maruo, cited by Atsuki Nakayama, "Japan's 2nd-generation A-bomb survivor groups stagnate amid prejudice, low gov't support." *The Mainichi,* August 30, 2021, https://mainichi.jp/english/articles/20210828/p2a/00m/0na/024000c.

277 Nakayama, "Japan's 2nd-generation A-bomb survivor groups."

278 "Hibakusha: Woman exposed to radiation while in womb fears another nuke plant tragedy," *The Mainichi,* November 18, 2016, https://mainichi.jp/english/articles/20161118/p2a/00m/0na/017000c.

279 Kayo Mukuda, "Japanese children of A-bomb survivors worry for health, want exposure certification: survey," *The Mainichi,* October 24, 2021, https://mainichi.jp/english/articles/20211022/p2g/00m/0na/047000c.

by radiation measurements due to recurring healthcare policy changes (a "quibbling over numbers," which Jacobs describes as the "tradition of nuclear forgetting"[280]). In this context emerges a conflict wherein the risks underlined by such campaigns for policy change also feed the discrimination that survivors face in matters of work and marriage.

Thus, it is important to recognise that the issue with genetic stigma after a nuclear disaster does not lie only with the quality of political or institutional engagement with alternative radiation "rationalities" or nuclear safety imaginaries, but also with the stigmatisation itself – which manifests outside of purely public and political spheres. As such, the issue of stigmatisation responds to Hughes' call "to think more explicitly about the different social, political and ideological groups involved in the production, dissemination, mediation and reception of nuclear science and technology and their many and diverse representations and sites," thereby "historiciz[ing] the flux of interpretations in the cultural production and consumption of the nuclear."[281] In this case, the relationship concerns those exposed to radiological disaster who are then subjected to genetic stigma, and the people (often further away from the disaster) who stigmatise them – and in particular, how the stigma itself is recycled or questioned in the pop-culture nuclear narratives that challenge or comfort wider nuclear safety imaginaries. In this context, the reality of genetic or radiation exposure stigma should also raise some ethical questions about its thematic use in nuclear fictions (or pop-culture nuclear narratives in general) to deliver a wider and more complex message about politics or society. If nuclear narratives can not only be interpreted as vehicles of alternative nuclear safety imaginaries, but expected to challenge the dominant imaginaries that directly inform nuclear safety policy – then the means by which they deliver their conclusions should be held up to deeper ethical scrutiny.

Indeed, interviews with survivors frequently reveal that "[r]adiation stigma seems to be an issue at least in the months immediately following the accident," during which "Fukushima participants actually experienced discrimination firsthand [sic] or knew someone personally who experienced discrimination," mostly "when the

280 Robert Jacobs, "On Forgetting Fukushima," *The Asia-Pacific Journal* 14, Issue 5, n°1 (March, 2016), 2.

281 Hughes, "What is British nuclear culture?" 504.

participant or someone they knew traveled [sic] outside Fukushima Prefecture."[282] Of particular interest here is the fact that, not only did these discriminatory acts involve the vandalism of cars with Fukushima license plates, but marriage discrimination "was determined to be the most significant issue facing the people of Fukushima Prefecture," and this was both "more common among the older generations" and "targeted towards women in particular."[283]

This concern with the way radiation affects women's bodies and reproductive capacities is also evident in research conducted after the Chernobyl meltdown in various European nations, where spontaneous abortions are believed to have occurred more frequently as a result of radiation fears.[284] In other words, women may be faced with the brunt of radiation stigma, because of their perceived value as child-bearers, as the conduits of future generations, or as home-makers – echoing the prominent political themes of gender, sexuality and the household in nuclear literature, as outlined by Daniel Cordle. Works like Louise Lawrence's *Children of the Dust* (1986), for instance, serve to connect the "domestic space" with "individual human bodies" – "an ecosystem involved in processes of exchange (through the mouth and nose; through the skin) with the larger ecosystems of its external environment" – potentially transforming them into "the genetically mutated future generations who survive in the post-holocaust world."[285] This type of portrayal overlaps somewhat with the real concerns of people during the Cold War, particularly among women themselves.

In studying journalistic representations of nuclear technology around the time of the 1957 murder-suicide of Elsie and Andrew Marshall along with their three children, Jonathan Hogg explores the concept of "nuclearity" as "the way in which knowledge of nuclear technology impacted on individual experience" in mid-century Britain.[286]

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282 Michelle A. Heath, "Radiation stigma, mental health and marriage discrimination: the social side-effects of the Fukushima Daiichi nuclear disaster," Thesis dissertation (University of Oregon, 2013), 98.

283 *Ibid*, 99.

284 Roberto Bertollini, Dario di Lallo, P. Mastroiacovo et al., "Reduction of births in Italy after the Chernobyl accident," *Scandinavian Journal of Work*, *Environment & Health* 16, n°2 (1990): 96-101. Knusden, LB., "Legally-induced abortions in Denmark after Chernobyl," *Biomedicine and Pharmacotherapy* 45, n°6 (1991): 229-231. D. Trichopoulos, X Zavitsanos, C Koutis et al., "The victims of chernobyl in Greece: induced abortions after the accident," *British medical journal (Clinical research ed.)* 295 (1987): 1. A. Ericson and B. Kallen, "Pregnancy Outcome in Sweden After the Chernobyl Accident," *Environmental Research* 67, n°2 (1994): 149-159.

285 Daniel Cordle, *Late Cold War Literature and Culture*, 122.

286 Jonathan Hogg, "'The family that feared tomorrow': British nuclear culture and individual experience in the late 1950s," *British Society for the History of Science* (2012), 537.

Among the media representations feeding the nuclearity of Cold War Britain are the interviews led and published by Donald Edgar in March 1958's *Express*, on the subject of a proposed referendum on nuclear disarmament at Oxford University: "In both articles, we are told of the emotional, even 'hysterical', pleas from the antinuclear activists. In response to such emotion, we are told that calmness and rationality pervades the undergraduate community at Oxford, and that 'instinctive common sense' defines the workers in their approach to nuclear politics." Female interviewees in particular were concerned with "[f]amily, children and the future."[287]

Building on Hogg's work and the concept of "nuclearity," Claire Langhamer conducts a qualitative study of the United Kingdom's Mass Observation program of 1945, for which volunteer contributors would provide the government with work on their own feelings regarding nuclear power, in the form of diaries, questionnaires and surveys. Langhamer noted a similar polarisation between self-construed rational and emotional responses to the development of nuclear technology: "[t]here was certainly a perception amongst some male Mass Observers that reaction to the atom bomb was gendered and that women were more likely to exhibit an 'emotional' response to the subject. Analysis of the panel responses as a whole suggests that this was not actually the case. Mass Observation had explicitly requested that its panellists narrate their feelings on the topic and men, as well as women, responded in emotional terms."[288]

Similarly, Jessica Douthwaite's work on this era of British nuclear culture outlines how "women's participation in [both anti-nuclear and Cold War civil defence communities] was seen to derive from maternalistic, caring and protective impulses, and their roles in each community were often predicated on activities deemed feminine and motherly,"[289] and how this drove a lot of the concern with the radioactive contamination of milk in particular, since women at the time had campaigned "to make milk freely and widely available to pregnant and nursing mothers, babies and school-aged children".[290] Analysing a letter from an unknown woman to the BBC asking for clarification about radiation levels in milk, Douthwaite suggests that "[t]he technical, elite answers beamed

287 *Ibid*., 545.

288 Claire Langhamer, "Mass observing the atom bomb: the emotional politics of August 1945," *Contemporary British History* 33, n°2 (2018), 18.

289 Jessica Douthwaite, "'Is Radioactive Iodine Present Equally in the Cream on Milk as in the Milk Itself?': Lonely Sources and the Gendered history of Cold War Britain," *Gender & History* 34, n°3 (October 2022), 828.

290 *Ibid*., 830.

onto her television set – the male perspective – were inconclusive" because they did not address her needs as a home-maker: "food choices, cooking, cleaning and hygiene."[291]

In fact, many of Emily Gibbs' interviewees for a study on nuclear anxieties in Cold War Britain "stated that it was their children who motivated them to act against nuclear weapons," and even "cited them as the reason they experienced feelings of nuclear anxiety,"[292] highlighting the care-related burden of nuclear disaster. Interestingly, "the majority who expressed concern about the future of their children were primarily in the anti-nuclear movement," and as such "[t]he Cold War and the threat of nuclear weapons appeared to deeply affect family relationships and experiences in Britain."[293] In this context, family members might join nuclear disarmament movements, in an effort to re-establish a sense of future security for their children.

These emotions link back to Langhamer's study, which shows a conflictual social dynamic emerging from different nuclear imaginaries in this context. On the one hand: "Mass-Observers actively constructed distinct, although sometimes overlapping, emotional communities that span around their own particular position. These self-made communities demonstrate the 'sociality of feeling' and the ways in which feeling tied the individual to the world."[294] On the other hand, some "saw themselves as sitting outside of any community of feeling" and "those that supported use of the bomb […] were more likely to paint themselves as outsiders". Whether for or against the use of nuclear weapons, Mass Observers used language such as "they are barmy or I am daft" or "at least 75% of those with whom I've spoken, are muddle headed or cowards or both" to describe such differences, harkening back to the family tensions outlined in research since the Fukushima Daiichi accident. Crucially: "Beyond this positioning of the self in relation to the collective, the sociality of feeling – and its boundaries – was apparent in writing about specific categories of other people".[295] In summary, the heightened concerns about the health impacts of radiation exposure on day-to-day activities among some members of the public (particularly women in traditional home

291 *Ibid*., 832.
292 Emily Gibbs, "Remembering the Nuclear Past: Uncovering Emotional Histories of Britain's Nuclear Bomb, 1945-1989," Thesis dissertation (University of Liverpool, 2021), 210.
293 *Ibid*.
294 Langhamer, "Mass observing the atom bomb," 14.
295 *Ibid*., 15.

making roles), and the lack of such concerns among others, has a long record of leading to conflict – on both political and domestic levels.

Sex-based trends in reactions to radiation exposure were likewise noted in Japan after the Fukushima Daiichi meltdowns. Takamura et al.'s overview of the radiation risk communications literature highlights that "concern about exposing the next generation to radiation" (the idea of "genetic effects" in particular) was highly correlated with worries about consuming food and water as well as living with children in the affected area – and this was much more prominent among groups who felt unsure or reluctant to return to places like Tomioka, Japan. They also found that the fear of consuming contaminated foods and water was especially prevalent among female respondents.[296]

Aya Goto and co-authors studying Japanese nurses' records of parent counselling in the aftermath of the Fukushima Daiichi disaster, found that "[m]others of young children are among the most affected in the Fukushima nuclear incident, as inconsistent information about radiation levels in breast milk […] had further created high levels of confusion in terms of maintaining safety for their children" – leading, in part, to a 15% drop in Fukushima City's population of children younger than 5, in the two years following the accident.[297] Not only were mothers reporting "somatic symptoms of their children despite no abnormalities in medical assessments",[298] but also "conflicts of risk perceptions with their spouses".[299]

Although Goto et al. recommend dosimeters, like those used for Safecast and Project 47, as an "empowerment tool" for mothers to "regain" a "sense of control of one's surroundings" based on findings by the EU commission after the Chernobyl disaster, the public health nurses themselves "suggested an organizational upgrading of the provision of city health services to improve their communication with the community" – which they were able to partially implement through their increased decision making power after the Fukushima Daiichi disaster, by setting up special check up programs, public lectures and epidemiological assessments for the local residents.[300] In any case, the study found that the primary challenges in discussions of radiation

296 Takamura et al., "Experiences of crisis communication," i98.
297 Aya Goto, Rima E Rudd, Alden Y Lai, *et al*., "Leveraging public health nurses for disaster risk communication in Fukushima City: A qualitative analysis of nurses' written records of parenting counseling and peer discussions," *BMC Health Services Research* 14 (2014), 2.
298 *Ibid*., 6.
299 *Ibid*., 7.
300 *Ibid*., 8.

exposure risks were "the need for mothers to be considerably informed on radiation risks as they can have an impact on their relocation decisions, child safety concerns, and interpersonal conflicts within the family due to differing risk perceptions."[301]

Going back to Elsie and Andrew Marshall's suicide note, which imagined an eventual mass extermination of people and children in particular,[302] Hogg suggests that, "[f]or the Marshalls, the assumption that a nuclear war would represent the end of existence itself was informed by conventional assumptions at the core of nuclearity. That the nuclear threat appears both imminent and inevitable is a familiar Cold War motif."[303] In a sense, the theme of hereditary genetic defects after exposure to low-dose radiation present in these nuclear narratives can also be considered a "conventional assumption" at the core of "nuclearity," informing the increasingly fractured and competing nuclear safety imaginaries – as conveyed through media representations, such as in response to the 1957 Windscale fire, which led "to another layer of anxiety for British households", whereby "[t]he discursive power of the vocabulary employed by journalists, with discussion of atom dust, radioactive milk and near-catastrophe […] may have had more impact in its implicit reinforcement of central aspects of nuclearity rather than did anxiety over the incident itself."[304]

Interestingly, DiNitto notes that Kawakami Hiromi's short story "God Bless You, 2011" (Kamisama, 2011) was not only "the first fictional work to comment on the nuclear disaster," but stood out for "her characterization of nuclear victims, human and animal, as marginalized figures in Japanese society," in which "Fukushima nuclear victims suffer from the phenomenon of double victimization – harmed by the accident, they were subsequently shunned by society."[305] Another early work studied by DiNitto is Furukawa Hideo's novel *Horses, Horses, in the End the Light Remains Pure* (*Umatachi yo, sore de mo hikari wa muku de*, 2011), in which the author uses racial discrimination as an allegory to "represent a new generation of nuclear victims […] that has suffered marginalization and discrimination in Japanese society because of their exposure to radiation." Thus, the "misshapen, mongrel form of Furukawa's writing aligns with the shifting form of the region itself" also serves as "a metaphor for and horrible omen of

301 *Ibid*.
302 Hogg, "'The family that feared tomorrow'," 536.
303 *Ibid*., 547.
304 *Ibid*., 545.
305 *Ibid*., 110.

the deformities that may emerge in the future as radiation-induced birth and genetic defects."[306]

Shapiro's earlier work attempts to isolate the main components that tied Japanese atom bomb cinema together at the turn of century, before the Fukushima Daiichi disaster occurred, and thus, before this global narrative turn in Japanese nuclear fiction. Shapiro suggests the existence of "hibakusha exploitation films",[307] partly borrowing from Maya Morioka Todeschini's own work on representations of female *hibakusha* in Japanese film to observe that despite real victims' genetic stigmatization, "[s]uffering and enduring suffering selflessly only enhances women's beauty" in film.[308]

Such films include Tokihisa Morikawa's *Natsushōjo* ("Summer Girl", 1995), which was centred on a fictional *hibakusha* couple, their son, and the appearance of a girl's ghost. The mother comes to believe that this is the ghost of the daughter she had lost to radiation exposure during pregnancy, and by the end of the film she takes her son and the ghost girl "to swim in the ocean", where "[t]he girl leaves a trail of blood in the water" as a sign that "[s]he has begun to menstruate".[309] Based on traditional Japanese folk tales, funerary customs and *Obon* festivities, which enforce a strict separation between the realms of the living and the dead, Shapiro interprets the abrupt ending of *Natsushōjo* as the result of "a narrative trajectory too horrifying to realize" – an impression affirmed to him by the fact that a "tearful hibakusha" approached him and his wife to tell them "her own wretched story" after they saw a screening in Hiroshima.[310]

One of the most prominent unifying themes explored by Shapiro is the idea of a "harmony with nature", often embodied by female characters: "The feminine or women's connection to nature is a powerful theme in Japanese culture. […] Women are empowered by their bond with nature, and those women who break that bond pay a heavy penalty; for example, the princess-general of the invading army paid that price when an insect severed her limbs" in Hayao Miyazaki's *Nausica of the Valley* (1980),[311] or also in the special relationship between women and the mutant moth creatures in *Mosura* (1961, or, *Mothra*, Lee Kresel, 1962) and its sequel *Mosura tai Gojira*

306 *Ibid*., 83.
307 Shapiro, *Atomic Bomb Cinema*, 261.
308 *Ibid*., 262.
309 *Ibid*., 260.
310 *Ibid*., 261
311 *Ibid*., 271

(*Godzilla vs. the Thing*, or *Godzilla vs. Mothra*, 1964) in which "it is the women and female moths who struggle and sacrifice themselves to resolve the films' crises in favor of a more earthly balance and harmony in the here and now".[312]

According to Shapiro, "there is a great deal of self-censorship out of fear of *netako wo okosu* ("stirring up trouble") with the powerful hibakusha lobbies that vociferously attack anyone or anything that does not "reflect the hibakusha mind." (Japan's brand of political correctness, "word hunting," can be quite vile.)" – for instance "attacking" Tsuburaya Productions for a certain *Ultraman* episode, which it subsequently suppressed.[313] Here, the *hibakusha* are depicted as a hindrance to the free use of genetic stigma as a storytelling theme by those who are not the targets of stigmatization themselves.

As outlined in the previous chapter, "[t]he widespread, uncritical use of narratives of personal experience in journalism and social media may have large-scale consequences that are neither intended nor anticipated" and it "may come at the cost of informativeness or of understanding complex phenomena, while the narrative form as such tends to complicate the distinction between factual and fictional rhetoric."[314] However, comparatively little work in this vein exists to investigate the influence and uses of fiction itself as a medium to explore complex topics or difficult social and environmental situations, and their possible roles in vehiculating problematic behaviours or messages in relation to nuclear disaster scenarios, and genetic stigma in particular.

## 3. Radiation as intergenerational violence

Finally, a recent example of genetic stigma used prominently to convey wider critiques, not only of the nuclear power industry, but of harmful social dynamics not only from the family but defining humanity as a whole, is *Dark* – the first German television series produced by Netflix, which started airing on December 21st, 2017. Co-creators of the series are Baran bo Odar (director) and Jantje Friese (writer), who were previously known for working together on another sci-fi thriller, *Who Am I* (2014). Over the course of three seasons, the story of *Dark* follows the tense family dynamics of several

312 *Ibid*., 278
313 *Ibid*., 304
314 *Ibid*, 193.

households in a small nuclear town called Winden, where they are faced with the mysterious disappearances and murders of local children.

The paranormal plot devices of *Dark*, such as time travel and parallel universes, as well as its many interpretations and portrayals of "beasts," "ghosts" and radiation-induced deformities, are reminiscent of themes explored in early 20th century German expressionism. I will show, however, that despite the highly intimate framing of these themes (another characteristic of German expressionism) *Dark's* narrative nevertheless delivers a social commentary – a social commentary which merits critique in the context of our exploration of radiation visibility in the aftermath of nuclear disasters.

The nuclear plant itself is a permanent fixture in *Dark*, making an appearance in nearly every episode of the first season as well as in its first opening sequence –and many episodes thereafter. In many of the first season episodes, like episodes one ("Secrets"), two ("Lies"), four ("Double Lives"), five ("Truth"), seven ("Crossroads") and ten ("Alpha and Omega"), the series seems to put Winden's nuclear plant on prominent display in the background of certain scenes. These lingering shots, evoking Bodar's Stanley Kubrick inspiration, present the nuclear plant as a silent but central component of Winden and its social web.

Multiple scenes illustrating characters' usual day-to-day routines underline the quiet but prominent social role that the plant plays in *Dark*. In the first season, in episodes three ("Past and Present") and nine ("Everything is Now"), some of the intrigue takes place inside the plant because that is where several characters work: Claudia Tiedemann, and later Aleksander Tiedemann (her son in law), become directors of the plant; Helge Doppler is a janitor at the plant; and Hannah Kahnwald is a massage therapist who occasionally provides her services for Aleksander, in the plant. At other times, it is Jonas (Hannah's son) who passes the plant on his bike, or other characters waiting for a bus at the stop just ahead of the plant, often allowing the viewer to take in and remember its presence. More explicitly, in episode three, the founder of Winden's nuclear plant (and father of Helge), Bernd Doppler, asks Claudia whether she knows how many livelihoods in Winden depend on the nuclear plant's operation —she answers that they have 612 employees, but he interjects with "Everyone!" His assertion that by taking responsibility of the plant, she will be "taking responsibility for the entire town," is illustrated several times throughout the series, as the lights across Winden sometimes

start wildly flickering – stopping everyone in their tracks and underlining the fact that everyone depends on the power supplied by the nuclear plant.

During Aleksander Tiedemann's closing speech at the plant, he begins by saying: "Energy creates community. […] In six days our plant will be decommissioned for good. This is a dramatic event for all of us. I would like to thank you for your loyalty. Without you the Winden nuclear power plant as we know it could never have existed." This passage again highlights the nuclear plant's imbrication in Winden's social web, though this time it emphasizes everyone's participation in maintaining and operating the plant. The nuclear plant is therefore not only highly relevant to the lives of the characters and other inhabitants of Winden, but it is passed down, from one loyal generation to the next. The connection between the plant and Winden's cycles of violence becomes even clearer in the context of the child abductions and murders that constitute the initial hook of *Dark*'s story. When children first start going missing, police officer Ulrich Nielsen suspects they may be being kept somewhere in the plant, which he tries breaking into in episode four of the first season – and in the 1953 setting, the missing children's bodies start appearing on the plant's construction sight, as seen in episode eight.

In fact, with Bernd Doppler succeeded by Claudia Tiedemann (the little girl who grew up close to the Doppler family) and Claudia succeeded by Aleksander Tiedemann (the boy who mysteriously entered Regina Tiedemann's life and later became her husband, and thus Claudia's son-in-law), the somewhat nepotistic succession of directors at Winden's plant is also evocative of a sort of nuclear industry "family," whose own harmful secret results in a major disaster. Winden's nuclear plant explodes in the second season due to a substance called the "god particle," which is what allows the characters to travel through time, but it appears in the first place because nuclear waste is secretly hidden under the cooling pools of one of the reactors when the plant is being shut down. This places the nuclear plant at the heart of the series' mystery and its paranormal plot devices, and thus imbricates it in the existential questioning that underpins the story.

*Dark* reflects a long line of apocalyptic scenarios of mass death and suffering in the German popular imagination. In *Radiation and Borders: Chernobyl as a National and Transnational Site of Memory*, Karena Kalmbach notes that this is a recurring

difference between French and German expectations of nuclear disasters, in the immediate aftermath of Chernobyl. Literary fiction from Germany was dominated by "the fear of the immediate health effects from radioactive exposure." In Die Wolke (1987), a popular storybook aimed at children, for instance, author Gudrun Pausewang portrays the flight from a nuclear plant meltdown "as [a] mass panic in which everyone fights for themselves" and during which "children are dying one after the other." Similarly, Christa Wolf's Störfall (1987) follows the impact of the Chernobyl meltdown on the narrator while she simultaneously deals with a cancer-related family loss. This work in particular highlights the link between anxieties about self-determination and nuclear energy, as one of its central themes is the false sense of empowerment associated with technologies like nuclear plants and modern day medical treatments.[315]

*Dark*'s own representation of nuclear energy is partly founded on references to real-life consequences of nuclear disasters such as the Chernobyl meltdown, to both illustrate the suffering caused by radiation exposure and give the spectator a sense of foreboding. The episode "Lies" opens with a scene of birds flying near Winden's nuclear power plant, and after another scene of flickering lights, ends with the birds found scattered on the ground, dead, by Charlotte Doppler, the Winden Chief of Police. In "Past and Present," a younger version of Charlotte is shown finding and studying dead birds with white flecks, and Egon Tiedemann (the 1980s Chief of Police) is both caught in a rain of bird carcasses, and starts investigating a field full of dead sheep. Then, in "Double Lives," the adult Charlotte has sent the birds to a forensic specialist, who explains that white flecks started appearing on birds after the Chernobyl incident. The use of these birds as ominous foreshadowing is likely inspired by the reality that swallows found around the contaminated area of Chernobyl were indeed shown bearing mutations (such as white flecks) as an effect of high levels of radiation – though they did not rain out of the sky.[316]

Similarly, in episode three, *Dark* makes use of flocks of sheep, a food source sometimes perceived to be highly contaminated by the radioactive cloud hanging over Europe (particularly in the UK, where restrictions placed on sheep farming in North

315 Carol Anne Costabile-Heming, "Rereading Christa Wolf's Störfall following the 2011 Fukushima Catastrophe," *Catastrophe and Catharsis: Perspectives on Disaster and Redemption in German Culture and Beyond,* eds. Katharina Gerstenberger and Tanja Nusser (Boydell & Brewer, 2015), 90.

316 Andre Pape Møller and Timothy A. Mousseau, "Biological consequences of Chernobyl: 20 years on," *Trends in Ecology and Evolution* 21, n°4 (2006), 203.

Wales and Cumbria were lifted only in 2012), to evoke past radiation scares and suggest that something is perhaps not right with the nuclear power plant in Winden. This particular reference is also reminiscent of Schopenhauer's work on human suffering, according to which he describes humans as "lambs in a field, disporting themselves under the eye of the butcher, who chooses out first one and then another for his prey. So it is that in our good days we are all unconscious of the evil Fate may have presently in store for us—sickness, poverty, mutilation, loss of sight or reason."[317]

In that vein, the radiation induced injury in *Dark* is ultimately allegorical. In the first episode of the second season, there appear to be “growths” in the trees and houses of Winden after the apocalypse. These growths are seen again in the final episode of the series, “Paradise”, when Claudia Tiedemann delivers a monologue about the mystery of Winden’s cycle of violence using “lumpy growths” and “cancer” in a “family tree” as a metaphor: “I've tried to put together the pieces of the puzzle. To understand how everything can be reborn from the same family tree over and over again. Until I realized that we're not all part of the knot. Both worlds are a cancer that must have grown from something else. If you remove it, you destroy all that was born of it, but you keep everything alive that already existed in the origin world.”

In middle of Claudia’s speech, the visuals cut to a scenic view of the forest in Winden after the first world's apocalypse, where she is paying respects to Regina – many of the trees have large lumpy growths at about human eye level. This serves to suggest that the cold mother-daughter relationship she had with Regina was not the only thing she passed down from her elders – by following in Bernd Doppler’s footsteps at the nuclear plant, knowing that it was leaking radioactive materials, the series implies that she gave her daughter the cancer that killed her. Claudia’s mother-daughter relationships point towards a wider theme about women’s role in perpetuating cycles of violence – delivered through the allegory of radiation.

The cycle of violence in *Dark* is alluded to within the series in the form of “ghosts” of the past, come to haunt the inhabitants of Winden. This is made explicit in the second episode of the second season, “Dark Material,” in which a young Regina Tiedemann, in the 1980s setting, asks her secret boyfriend: “Do you believe in ghosts? […] The book we’re reading at school. It’s about the ghosts and demons that we inherit

317 Arthur Schopenhauer (1851), “On the Suffering of the World,” *Studies in Pessimism,* ed. Thomas Bailey Saunders, trans. Thomas Bailey Saunders (London: Swan Sonnenschein, 1893), 12.

from our parents. And… that you pass them on. Dark stuff. From generation to generation." In the following episode, named "Ghosts," in a discussion between the young Claudia Tiedemann and her friend Tronte, she discusses her relationship with her mother, revealing their cold relationship and asserting that she will be "different" when she has her own children. However, the viewers know from the previous episode that Claudia has never explicitly expressed love for her teenaged daughter Regina, who feels unloved and self-harms, thereby revealing that the relationship she had with her mother eventually informed the way her relationship with her daughter developed. By "transmitting" the same mother-daughter difficulties she had with her own mother to her daughter, echoed in Regina's discussion about ghosts, Claudia and Regina's relationship is used to suggest a straightforward cause and effect relationship between their experiences of neglect.

However, the transmission is not always perpetuated by parents. In the very same episode, a younger Egon Tiedemann (when he was working for the Winden police force in the 1950s) uses the term "ghost" to refer to Ulrich Nielsen, who had time-travelled to the past and assaulted a child version of Helge Doppler with a rock in an attempt to kill him – an act which will haunt Helge through the rest of his life, culminating in the case of missing and murdered children in 2019's Winden.

Interest in the social meanings of ghosts has generated a field of scholarship at the crossroads between psychology, sociology, art and literature, now known as "hauntology." The word itself, a play on the word "ontology," was coined (as "*hantologie*") by Jacques Derrida in *Spectres de Marx* (1993) – in reference to the persistence of past concepts in academic scholarship despite the rise of post structuralist and postmodernist theories. However, a different conception of "hauntings" precedes, and may have influenced Derrida's neologism – Abraham and Torok's psychoanalytical studies of the intergenerational ghosts, collectively published in *L'écorce et le noyau* (1978), in which they "had become interested in transgenerational communication, particularly the way in which the undisclosed traumas of previous generations might disturb the lives of their descendants *even and especially if they know nothing about their distant causes.* [Emphasis not mine.]"[318] Their work "offers a new explanation for

318 Colin Davis, "Hauntology, Spectres And Phantoms," *French Studies* LIX, n°3 (2005), 374.

ghost stories, which are described as the mediation in fiction of the encrypted, unspeakable secrets of past generations."[319]

Serge Tisseron, in particular, borrows the notion of ghosts to describe intergenerational transmissions of trauma or violence in his psychoanalytical work – though he distinguishes between the "*revenant*," which is to say the traumatic memory that may come to possess the victim later in life (potentially manifesting in the mimicry of his or her tormentor), and the "*fantôme*," which would be the traumatic effect of this possession on other family members (such as the children of the victim), who can only make sense of the secret trauma through their imagination.[320]

The example Tisseron uses to illustrate the notion of *revenant* is a scene from the film *Mystic River* (2003), which is partly centred on the childhood trauma of one of the main characters (Dave), and the relationship this creates between him and his own child (among others). Tisseron focuses on the scene where this man is revisiting his trauma while watching a vampire film – as described by the author, he relives the fear, the anxiety, the despair and the impotent rage of the adolescent he had been before, but at times, he appears to mimic the exaltation and pleasure that he must have observed or imagined that his abusers felt.[321] For that matter, a parallel can be made between Tisseron's *revenant* and the vampires in the film that Dave was watching – suggesting that his past trauma is like an undead creature continuously leeching off of him in the present.

Ultimately, this narrative use of the ghost across different social science fields overlaps with some intergenerational transmission of violence hypotheses, using the ghost as an allegory for a direct or indirect transmission of trauma or suffering from one generation to the next. *Dark*'s use of time travel, parallel worlds and fate as plot devices

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319 *Ibid*.

320 Serge Tisseron, "La transmission troublée par les revenants et les fantômes," *Cahiers critiques de thérapie familiale et de pratiques de réseaux* 1, No. 38 (2007), 36. His explanation of the difference between psychiatric revenants and ghosts is summarized on p. 36: "C'est cela, être hanté par un revenant : parler subitement avec les phrases d'un disparu, *ou bien* adopter quelques instants ses intonations, ses mimiques ou même ses colères, *ou bien* encore s'habiller, sans même s'en rendre compte, exactement comme lui à l'occasion d'un événement familial. De telles attitudes n'ont rien d'exceptionnel. Le problème est que si des revenants prennent trop souvent possession d'un parent, les enfants de celui-ci risquent bien de se retrouver hantés à leur insu par un fantôme…"

321 *Ibid*. Paraphrased from: "Sur ce chemin, il revit bien sûr la peur, l'angoisse, le désespoir et la rage impuissante de l'adolescent qu'il a été. Mais à d'autres moments, il manifeste des mimiques d'exaltation et de jouissance. Celles-ci, à la différence des précédentes, ne correspondent pas à des émotions qu'il a vécues lui-même, mais à celles qu'il a observées chez ses abuseurs… ou qu'il leur a imaginées."

allow the series to construct a narrative illustrating a similar understanding of 'cyclical violence', positing that new generations repeat the exact same mistakes as previous generations – as can be seen with characters like Katharina and Claudia.

The final season of *Dark* serves to illustrate Eve's duality with Adam, their symbolic use through Jonas and Martha as a stand-in for humanity as a whole, and of course, the central role of human reproduction in perpetuating their sins. This human reproduction (of new generations and the violence inflicted on them) is embodied by Eve and the other female characters. The fourth episode in particular, "The Origin," focuses heavily on female characters – on child versions of Claudia and Ines looking through a pornographic magazine, on Egon telling his wife "Who knows what goes on inside the heads of you women?" – and Helena Albers shown getting an abortion at 12. The title of this episode also evokes a painting by Gustave Courbet, "L'Origine du monde." The reproductive role of women, and the part it plays in cycles of violence, is also hinted at by one of the mirrored images in the new introductory sequence – the upper lip of a woman being painted with lipstick, which resembles external female genitalia in the way that it is mirrored.

Moreover, Martha's monologue as Ariadne in the first season already hints at this premise: "I stand before you, no king's daughter. No man's wife. No brother's sister. A loose end in time." The line about "a loose end in time" is delivered as the viewer watches Martha's mother sitting in the audience. In the context elucidated by this analysis, Jantje Friese's insistence on *Dark* being an intimate family drama, "à travers les âges"[322] seems to imply that Ariadne is a "loose end in time" because she will no longer be part of a family structure in which dishonesty and violent trauma can be passed down to her and onto further generations, now that she is dying (some versions of this myth have her die, whereas in others she lives).

Nevertheless, *Dark*'s plot contains many examples of such "transmission." One of the most physically obvious is Katharina Nielsen, Martha's mother. By the end of the series, the time travelling plot device allows the viewers to have seen the violences experienced by three generations in her family. Chronologically first is Helene Albers, Katharina's mother, who is present at an abortion clinic at the very young age of 12 and

322 Pierre Langlais, ""Dark", une tragédie fantastique émouvante et intense sur Netflix," *Télérama* (November 30, 2017). Paraphrased from: "nous préférons en faire un drame intimiste, une histoire familiale à travers les âges."

with visible signs of assault. Later on, the audience is shown an older version of Helene slapping a teenaged version of Katharina, and on another occasion Katharina comes to school with a black eye. Even later, although this is the first physical altercation that the audience is shown in the series, Katharina slaps her own teenaged daughter Martha (shocking both her daughter and older son, Magnus). Finally, when Katharina discovers that she can travel through time to search for her missing husband and youngest son (Mikkel), she comes across her mother again. This time, the altercation ends in Katharina being stoned to death.

In "The Origin" the world of "Eva" is contrasted with that of "Adam," through an exchange between Hannah Khanwald and Egon in the 1950s, after they have started an affair. As Hannah discovers she is pregnant, her male doctor tells her in a somewhat menacing tone that pregnancy is always a gift. When she informs Egon, the following exchange ensues:

> EGON – I thought you were being careful. [Hannah scoffs and smiles wryly.] Is it mine?
>
> HANNAH – [She gets back up.] Is it yours? What do you think I do all day long? Fuck around? Do you think I chose this? Living in this shithole? I thought you were harmless, but you're all the same. You all think you own the world. That you can take what you want. You eat and fuck and think you're God. Everywhere you go, always the same fucking smug assholes.

As such, attempts to harness the "God particle" and time travel to create a utopian world, on top of the investment in nuclear energy that already promised (and failed to deliver) a utopian world, are identified through this exchange as the realm of Adam – contrasting with the reproductive role of Eva that is illustrated in the rest of the episode, and reminiscent of the core themes of Christa Wolf's *Störfall* (1987).

At the start of the fifth episode of the second season ("Lost and Found"), Jonas dreams of having sex with Martha, but it soon turns into a nightmare as they look to her abdomen and see her veins blackening with a mysterious dark matter (the God particle)

that then jumps out of her body and towards his face. This scene can be interpreted as Adam being bitten in the face by his egotistic pursuit of dangerous technologies via the harm it does to Eva's womb. Nevertheless, the harm identified in this scene is the damaged womb, and the fear of a damaged legacy – like in the real-world discourse that fuels such fears, such as could be found in Japan after both the WWII bombings and the 2011 Fukushima disaster.

Echoing not only Claudia's realizations about her role in Regina's suffering, but the imagined role of the *hibakusha*, *nisei hibakusha* and *hisaisha* of the real world and their counterparts in Japanese nuclear fiction, Peter Doppler and Elizabeth are turned away from the nuclear power plant in the second episode of the third and final season, "The Survivors," by military personnel – one of whom looks at Elizabeth and asks Peter: "Why are you doing this to her?" In this case, the writers of *Dark* chose to make Peter the scapegoat of his daughter's radiation exposure, but in reality, the brunt of childcare falls on the shoulders of women and mothers – hence the stigmatization of both their bodies and their fears of contaminated food in the wake of nuclear disaster. In the case of *Dark*, this accusation is treated without nuance. In fact, according to the narrative framework developed by the writers of *Dark*, the audience is primed to perceive this exchange as the result of yet another condemnable act of violence of the adult generation inflicted on its youth.

The most literal allusion to cyclical violence being transmitted through reproduction, with a focus on women's reproductive capabilities specifically, turns up in the eighth episode of the second season ("Endings and Beginnings"), when Elizabeth Doppler, Charlotte and Peter Doppler's youngest daughter, is revealed to also be Charlotte's mother –and thus, they are stuck in an endless loop of creating identical copies of previous generations over and over. The womb is therefore the stage upon which *Dark* connects both radiation induced injuries and cycles of intergenerational violence.

The analysis of the role of genetic stigma plays in *Dark* cannot be concluded without mentioning that in episode six of the first season ("Sic Mundus Creatus Est"), there is an explicit reference to the Chernobyl disaster by the 1986 version of Hannah Kahnwald, who explains the rain is acid because of the meltdown – a direct reference to Friese's childhood experiences, as she explains to Langlais that after the meltdowns,

their mothers would forbid them from playing outside, fearing acid rains. Thus, they were kept inside for weeks.[323] In a sense, the authors' depiction of radiation exposure and nuclear disaster in *Dark* loosely evokes Tisseron's description of the ghost – as the fiction that onlookers must generate in order to make sense of other people's unspoken (or unheard) traumas. One of the more obvious complications with storytelling as a means of making sense of disaster and debating acceptable notions or thresholds of risk is that popular narratives may not stem from the needs or views of locals, and may convey inexactitudes – acid rain is not the result of nuclear clouds, after all, but of burning fossil fuels such as coal.

The role of the creators', and actors', fears of nuclear energy on the realization of *Dark* is also made evident when bo Odar and Friese explain that the Chernobyl meltdown was the first terrifying event of their lives,[324] and Louis Hofmann, the actor who played young Jonas, emphatically agrees with his interviewer that the message "nuclear is bad"[325] is the most important message of the series. *Dark*'s understanding of radiation as a manifestation of intergenerationally transmitted violence and trauma is shared in recent scholarship on the concept of nuclear trauma as intergenerational, as suggested in the final chapter of *The Routledge Companion to Literature and Trauma* (2020), Gabriele Schwab's "Transgenerational Nuclear Trauma." Drawing again from Abraham and Torok's psychoanalytical conceptualizations of ghosts and hauntings, Schwab projects nuclear disaster related traumas into the future, to distinguish them from other forms of trauma in literature: "It is this haunting from the future that distinguishes nuclear trauma from other forms of trauma. […] While such visions have also been developed in the aftermath of Hiroshima and Nagasaki, nuclear trauma reaches differently into the future. It is not only fears of slow nuclear violence that generate a haunting from the future; it is also the knowledge that the radioactive contamination of the earth is irreversible and the stockpiling of nuclear weapons as well as the production of nuclear waste from nuclear power plants is a ticking time bomb."[326]

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323 Langlais, ""Dark", une tragédie fantastique." Paraphrasing of: "nos mères nous interdisaient de jouer dehors, par peur des pluies acides. Nous sommes restés enfermés pendant plusieurs semaines."

324 *Ibid*. Translating from: "le premier évènement terrifiant de nos vies."

325 HeyUGuys, "Louis Hofmann & Lisa Vicari | Netflix Dark Season 1 Exclusive Interview," Youtube video, 8:21, November 17, 2017, https://www.youtube.com/watch?v=2ARRvHKHRVE.

326 Gabriele Schwab, "Transgenerational Nuclear Trauma," *The Routledge Companion to Literature and Trauma* (Routledge, 2020), 447.

Again, the parallels between reproduction of social trauma and radiation exposure reflect the 1980s nuclear literature "preoccupation with gender and sexuality" outlined by Daniel Cordle – "by turns nostalgically recuperating and transgressively challenging ideas of family from the earlier period," in part "because the family was central to the broader ethical and political debate, presented in extremis as itself under attack and the final bastion against anarchy, or, in a counter discourse, as the bedrock of intransigence and patriarchy."[327] As such, *Dark* can be described as haunted itself – by the ghosts of the Chernobyl and Fukushima disasters.

However, given the widespread interest in nuclear imaginaries and pop-culture narratives as responses to the exercise of undemocratic decision making in the realm of nuclear energy and safety policies, according to Phelan's framing of narrative ethics and his observations that individual narratives should be critically approached on the basis that they establish their own ethical standards to guide wider audiences towards particular value judgments, and that the audience can thus make ethical judgements about the storytelling itself,[328] the uncritical recourse to genetic stigma in order to convey wider (and often heavily moralized) social or political commentaries should be of greater interest to narrative, history or STS scholars and policy makers.

## Conclusion

After examining a short history of nuclear narrative studies to show that genetic stigma is mentioned in passing and only rarely the focus in itself of scholarly attention, followed by an exploration of the concept of radiation stigma in both a real and a literary context, I finally demonstrate how various examples of nuclear fiction, Netflix's *Dark* in particular, often embed genetic stigma into their storytelling as a means of using it for wider social or political commentary as opposed to discussing the stigma itself – thus weaving it uncritically into larger nuclear safety imaginaries, and rendering it "invisible."

Considering that "[t]he issue of radiation is not something that interests people all the time" but instead "something that arouses interest whenever there are various events that attract their attention,"[329] such as news related to the Fukushima plants or

327 Cordle, *Late Cold War Literature and Culture*, 77.
328 *Ibid*., 12.
329 *Ibid*, 276.

disaster aftermath, it would not be unreasonable to interpret the popularity of series like *Dark* and *Chernobyl*, which aired starting in 2017 and 2019 respectively, as evidence that popular fiction generates interest in the topic of radiation outside of the aforementioned timing constraints. Furthermore, in resituating Fukushima fiction in a more global "nuclear culture" informed by the works of Kate Brown and Adriana Petryna, to "consider how Japanese writers set their stories in nuclear landscapes that feature depleted uranium munitions, nuclear power and processing plants, nuclear waste sites, communities built on irradiated ground, and the culture of secrecy and knowledge that surrounds the nuclear," and as such "emphasize the ways in which Fukushima fiction engages with larger geopolitical and national discourses on the nuclear,"[330] Rachel DiNitto's work helps underline the growing overlap between perceived nuclear "cultures" through increasingly globalized nuclear fiction.

Therefore, the focus of this thesis on highly popular and easily accessible TV series constitutes a starting point in understanding alternative ways of representing radiological disaster that "attract the interest of the residents and create a place where they can learn about radiation,"[331] and constitute somewhat influential nuclear imaginaries. Following my choice of *Chernobyl* specifically as the primary subject of nuclear ethics analysis, I therefore rely on the works of David Richter, who propose that ethical issues emerge from different modes of representing history,[332] and argues that a "bad" historical film would involve the "nearly universal form of hypocrisy" that involves "a show of lofty motives (moral, political or religious)" while violating these principles in the act of storytelling itself. Doing so would help outline the values imbricated in alternative nuclear imaginaries, thus addressing the "uncontrolled consequences" which "emerge from a different epistemic world from that which was understood to prevail, and in which public authority claims for science were invested,"[333] as pointed out by Wynne and Welsh.

Finally, it would address one of Mäkelä's points about modern storytelling practices, according to which "the possible downsides of these engaging narratives that everyone should allegedly be crafting in today's story economy" have not received

330 DiNitto, *Fukushima Fiction,* 123-124
331 Tsubokura, "Influence of different media, producing stigma," 276.
332 Richter, "Keeping Company in Hollywood," 141.
333 Welsh and Wynne, "Science, Scientism and Imaginaries of Publics in the UK," 545.

enough scholarly attention, and instead "have been, for the most part, uncritically celebrated."[334]

334 Mäkelä and Meretoja, "Critical Approaches to the Storytelling Boom," 192.

# Chapter 4 – Knowledge in *Chernobyl* (HBO, 2019): The key to avoiding nuclear disaster?

As laid out in the introductory chapter, pop-culture narratives constitute under-explored contributors to wider sociotechnical imaginaries, for which I propose a narrative ethics study of Craig Mazin's *Chernobyl*. This is particularly relevant after the Fukushima Daiichi reactor meltdowns, as a rise in calls to work with an increasingly large and diverse public cohort as local nuclear plant stakeholders brings into question the different ways that radiation comes to be understood or represented in such discussions – particularly in light of the predictable emergence, after radiological disasters, of radiation exposure health stigmas and related discriminatory or marginalizing behaviours.

In this sensitive context, I propose narrative ethics scholarship as a useful frame of reference to examine the contributions of pop-culture nuclear narratives to these overarching nuclear safety imaginaries, joining Mäkelä and her colleagues' stated attempts to show how narrative theory can help navigate the crossroads between popular narrative and political action, by more specifically focusing on the ethical questions that arise from works like Craig Mazin's *Chernobyl*.

Selected not only because of its wide audience reach and the interest it generated in both traditional and social media, but also for its association with real-world behaviours alerted after its airing, the HBO mini-series makes for an interesting case study for the above considerations regarding radiation exposure stigmatization. Indeed, beyond the harassment of Lyudmila Ignatenko, which will come up more prominently in the next chapter, STS scholar Sonja D. Schmid remarks in a 2020 publication of *Technology and Culture* that "[t]he series has definitely had an impact" on its global audience, as "more and more people have been streaming into the "Exclusion Zone" surrounding the now shut-down nuclear power plant, in some cases legally, but often illegally, prompting increased concerns not only for security but also fire safety."[335]

Revisiting James Phelan's definition of narrative as the rhetorical act of "somebody telling somebody else on some occasion and for some purpose(s) that

335 Sonja D. Schmid, "*Chernobyl* the TV Series: On Suspending the Truth or What's the Benefit of Lies?" *Technology and Culture* 61, n°4 (2020): 1159.

something happened,"[336] which he divides into two sub-layers of interpretation – the first being "the report of a sequence of related events during which the characters and/or their situations undergo some change", and the second being the "dynamics of audience response,"[337] I focus on the former sub-layer in order to explore how "individual narratives […] establish their own ethical standards in order to guide their audiences to particular ethical judgments."[338]

However, the narrative ethics of non-fiction film in particular are not easy to ascertain, given the difficulty of distinguishing between "true stories" and fiction: "Both are forms of narrative, and both contain truths about value – social and moral truths particularly. Indeed, fictions can convey with certainty what true stories can only approximate, when they fall silent before the gaps in what can be known."[339] In the case of *Chernobyl*, I show that the creative liberties of non-fiction film to construct logical consistency and a coherent moral paradigm within its chosen frame of reference, reshapes the more complex experiences of those whom the story is about in order to fit this narrative.

I explore these themes in my analysis of *Chernobyl* and its external paratexts – interviews of the writer in notable trade papers and his discourse in the free access Youtube podcasts he created to accompany the viewing of his series, among the many other outlets through which he has continued to shape the narrative of *Chernobyl*, and guide its audience reception and interpretation (which will be more deeply explored in the final chapter of the thesis), following In this chapter, on the basis of this framing and these narrative materials, I answer my thesis question about what radiation-exposure health stigmas *Chernobyl* contributes to broader understandings of nuclear safety in the wake of the Fukushima Daiichi disaster, and the ethical ramifications of such contributions,

In the first section, I start by outlining Mazin's definition of a dichotomous relationship between scientific or empirical truths and narrative lies, drawing a parallel with the radiation visibility politics explored in the previous chapters. In the second section, I explore the political commentary and history imbricated in this dichotomy and the combative or violent tone that underpins its messages. In the third and final section,

336 Phelan, *Experiencing Fiction*, 3.
337 *Ibid*.
338 *Ibid*., 10.
339 Richter, "Keeping Company in Hollywood," 161.

I show how this aggressive conflict between truth and lies is transposed onto the series' characters, underlining not only the ethical problem with forcing their more nuanced experiences into *Chernoby*l's narrative mould, but also how the dichotomous mould misrepresents the complicated nature of science and science-based decision making.

## 4.1 Radiation in *Chernobyl* – caught in a war between empirical truth and narrative lies.

Mazin's retrospective exploration of the Chernobyl catastrophe is briefly framed by another story – that of the demise of the series protagonist, Valery Legasov. The series opens and closes with a monologue recorded by Legasov two years after the main storyline. He had been the first deputy director of the Kurchatov Institute of Atomic Energy when he was recruited into the government commission investigating the explosion, and the very first scene shows him finishing the final tape-recording of his impressions of the ordeal before committing suicide. The very last scene, while taking place in the immediate aftermath of the event, ends with an excerpt from these future recordings – reminding the viewer of the opening scene and of Legasov's impending death.

The frame story of Legasov's suicide not only serves to set the tone for the rest of the series. It also helps situate the catastrophic event within a conceptual frame of reference – particularly regarding notions of "truth" and "lie," and by extension science, reality and narrative's role in masking the two. The script from just about 20 minutes into the first episode (featuring Legasov and his recorded voice) makes the distinction clear:

Episode 1 – '1 : 23 : 45'

RECORDED VOICE What is the cost of lies?

RECORDED VOICE It's not that we'll mistake them for the truth. The real danger is that if we hear enough lies, then we no longer recognize the truth at all. What can we do then? What else is left but to abandon even the hope of truth, and content ourselves instead... with stories.

RECORDED VOICE In these stories, it doesn’t matter who the heroes are. All we want to know is: who is to blame? Well. In this story, it was Anatoly Dyatlov. And he was the best choice. An arrogant, unpleasant man, he ran the room that night, he gave the orders… and no friends. Or at least not important ones.

LEGASOV But instead, ten years for "criminal mismanagement". What does that mean? No one knows and it doesn't matter. What does matter is that to them, justice was done. Because you see? A just world is a sane world. (beat) There is nothing sane about Chernobyl. What happened there, what happened after... even the good we did... all of it... all of it... (beat) Madness.

LEGASOV I've given you everything I know. They'll try to deny it, the way they always do. Will you prevail? I do not know. I only know you'll do your best to try. [340]

In Episode 5, “Vichnaya Pamyat,” following his court appearance, Legasov is interrogated by the head of the KGB (Charkov), stripped of his scientific position and prestige, as well as coerced into keeping silent about his experiences with the Chernobyl investigation. The series then finishes with an overhead shot of Legasov being driven away while his recordings are played in voice-over:

LEGASOV (VO ON TAPE) To be a scientist is to be naive. We are so focused on our search for truth, we fail to consider how few actually want us to find it. But it is always there, whether we can see it or not, whether we choose to or not. The truth doesn't care about our needs or wants. It doesn't care about our governments, our ideologies, our religions. It will lie in wait, for all time.

LEGASOV (VO ON TAPE) And this, at last, is the gift of Chernobyl. Where I once would fear the cost of truth, now I only ask:

340 *Chernobyl*, episode 1, “1 : 23 : 45,” directed by Johan Renck, written by Craig Mazin, featuring Jared Harris, Jessie Buckley and Paul Ritter, aired May 06, 2019, on HBO.

LEGASOV (VO ON TAPE) What is the cost of lies?[341]

The language used in the frame story casts knowledge as a recognition of truth, in a larger dichotomous struggle between scientific truth and narrative lies. Whereas lies are associated with "stories," "heroes," "blame," "justice" and a "sane world" – corresponding to "our needs," "wants," "governments," "ideologies," and "religions" – truth is associated with a "madness" that is "always there." On the one hand, lies are a human construct, while on the other hand, truth exists independently of human experience. More precisely, Legasov asserts that lies are "hear[d]" or serve to "content ourselves," while truth is "recognize[d]," sought out, "see[n]" and associated specifically with scientific inquiry (through reference to "scientists" and to Legasov's own involvement in the investigation), hinting at the ways one might come by these different kinds of information.

This particular opposition between narrative lies and scientific truth is reiterated by Mazin in several interviews, through which the author attempts to more thoroughly and clearly frame the series narrative. In the *Hollywood Reporter*, for instance, he clearly uses "narrative" as an antonym for "truth": "I know the next thing I'm going to do is something that is about now, and is about here, in the United States, and for better or for worse, I'll approach it with the same insistence on truth over narrative."[342] He insists on this opposition, and consequently on the idea that narrative can be completely removed from the process of producing "truth," in an interview with *Vox*: "The thing about truth is, in its best version, it's not narrativized."[343]

Mazin's emphasis on "narrative" or "narrativization" as antonymic for "truth," without contrasting these terms with the notion of lie, indeed suggests that narrative is a stand in for the latter. This opposition between truth and narrative-as-lie is further compounded by Mazin's statement in *Vox*, that: "I think the reason narrative works is that our brains are designed to work with it. There's a reason opioids work so well on us, because our bodies have natural endorphins and receptors for them, right? So we

341 *Chernobyl*, episode 5, "Vichnaya Pamyat," directed by Johan Renck, written by Craig Mazin, featuring Jared Harris, Stellan Skarsgård and Emily Watson, aired June 03, 2019, on HBO.

342 Craig Mazin, interviewed by Emma Dibdin, ""Chernobyl" Creator Breaks Down the HBO Drama's Haunting Finally and Cautionary Message," *The Hollywood Reporter*, June 05, 2019, https://www.hollywoodreporter.com/live-feed/chernobyl-finale-explained-creator-craig-mazin-interview-1215670.

343 Craig Mazin, interviewed by Emily Van Der Werff, "HBO's Chernobyl is a terrific miniseries. Its writer hopes you don't think it's the whole truth," *Vox*, June 04, 2019, https://www.vox.com/culture/2019/6/4/18647339/chernobyl-finale-hbo-truth-how-accurate.

figured out a way to hijack that system, and that's what narrative does too"[344] – which divorces narrative from the cognitive processing of information, and instead associates it with a purely mechanical process attributed to clinical addiction.

The suggestion that the practice of science should lead straight to a coherent, narrative-less "truth," as conveyed by both the framing passage of *Chernobyl* and the external paratexts intended to inform audiences of the author's intentions, is clearly illustrated in the loosely mirroring starts of episodes one and two. The beginning of the second episode ("Please remain calm") introduces Ulana Khomyuk and her colleague Dmitri in their laboratory at the Belorussian Institute for Technology – echoing a passage near the start of the first episode, which introduced engineers and scientists in Chernobyl's control room, headed by Dyatlov. In both cases, they are met with unexpected situations, but the reactions of the two groups – and of Khomyuk and Dyatlov in particular – are completely different.

Immediately after the explosion at reactor four, Dyatlov dismisses subordinates like Perevozchenko and the information they report, because what they have seen ("The lid is off. The stack is burning. I saw it."[345]) does not fit his theoretical expectations, as their managing superior ("You're confused. RBMK reactor cores don't explode."[346]). Khomyuk and Dmitri, on the other hand, work together to run through a number of hypotheses that could explain why they have detected a worrisome dosimeter reading ("A leak? […] The Americans?"[347]) before Khomyuk decides to investigate – collecting a sample of the dust deposited on her windowsill to bring to a spectrometer, and realizing that it is reactor fuel. This launches further hypotheses ("Could it be a waste dump? […] Nuclear test? New kind of bomb? […] Something with the space program?"[348]), leading to further investigation and inductive reasoning.

Another instance of *Chernobyl*'s examination of the scientific truth produced in different socio-political *milieux* comes later in the same episode, when Valery Legasov and his investigation partner Boris Shcherbina take a call while they wait in a Pripyat Hotel. They are informed that: "A nuclear plant in Sweden detected radiation. And identified it as a by-product of our fuel. The Americans took satellite photos – the

344 *Ibid.*
345 *Chernobyl*, "1 : 23 : 45".
346 *Ibid.*
347 *Chernobyl*, episode 2, "Please Remain Calm," directed by Johan Renck, written by Craig Mazin, featuring Jared Harris, Stellan Skarsgård and Emily Watson, aired May 13, 2019, on HBO.
348 *Ibid.*

reactor building. The smoke. The fire. The whole world knows. […] The wind's been blowing toward Germany. They're not letting children play outside in Frankfurt."[349] Following this report, the camera pans towards the window of the hotel, through which Pripyat's children can be seen playing outside. Here, institutions and governments abroad have "seen" the truth, in the form of satellite photographs and chemical readings – unlike the local inhabitants of Pripyat, who remain ignorant of the truth because of the plant managers' "narrative" (established during an emergency meeting of the city's governing council in the night).

The primary importance of empirical data itself is frequently alluded to in the miniseries, through the use of dosimeters. These instruments are the primary scientific tools that accompany various characters over the course of their investigations of the Chernobyl explosion. In the first episode, plant workers Perevozchenko, Gorbachenko, Dyatlov, Akimov and Sitnikov attempt on several separate occasions to track the radioactive scope of the explosion using a variety of lower and higher capacity dosimeters. In the next episode, General Vladimir Pikalov approaches the reactor core with the highest capacity dosimeter that the military could obtain, at Legasov's request. In the third episode, a team of workers use a dosimeter to guide their journey through the flooded underbelly of the reactor core, its sound reverberating loudly in otherwise silent underground corridors. Workers sent to the reactor's roof top in episode four are strapped with dosimeters to help them keep watch of their radiation exposure, and again the sound is loud – loud enough to cover the ambient noise. In the fifth and final episode, the only dosimeter shown is a real one, from archival footage showing the radioactivity of a first responder's boots. The static clicking of dosimeters is omnipresent, as it even integrates *Chernobyl*'s soundtrack,[350] echoing Legasov and Scherbina's investigation of the explosion.

Therefore, the reference frame of the series, the external paratextual framing provided by the author and the cinematographic choices used to represent the sciences undertaken in different socio-political and cultural *milieux*, paints a very specific understanding of "truth" as an empirical reality wherein "sense experience is the

349 *Ibid*.

350 Asbjoern Andersen, "Why Chernobyl Sounds So Sublime, Authentic – And Haunting," *A Sound Effect*, June 06, 2019, https://www.asoundeffect.com/chernobyl-hbo-sound/.

ultimate source of all our concepts and knowledge,"[351] and in this case also fits under the umbrella of "correspondence theory" – one of many "theories of truth," and among its most prominent as it is "usually applied much more broadly to any view explicitly embracing the idea that truth consists in a relation to reality, i.e., that truth is a relational property involving a characteristic relation (to be specified) to some portion of reality (to be specified)."[352] In the case of Mazin's *Chernobyl*, scientific truth is synonymous with an empirical reality that can interpreted and conveyed "ideally" without narrative.

This interpretation of truth as independent of narrative is not only the theoretical basis of literary and cinematographic realism, which purports that such work "accurately reproduces that part of the real world to which it refers,"[353] it is also an influential – but not definitive – position in scientific and political thought. It has been noted by historian Kenneth J. Hammond that the adoption of either correspondence or coherence theories of truth dictates judgment and decision-making in the realm of science, where the same data might be used to reach different conclusions based on this underlying assumption about the nature of reality.[354] Psychologist Philip T. Dunwoody explores Hammond's theory in the psychological field of judgment and decision-making (JDM), corroborating Hammond's study[355] while also highlighting the existence of other conceptual frameworks that might influence decisions, such as the pragmatist theory of truth.[356] The central premise of *Chernobyl* therefore allows the author to set up a clear theoretical frame of reference, loosely rooted in a specific understanding of reality and (by extension) narrow assumptions about scientific methods and processes that cast "narrative" as uninvolved in the creation and use of empirical knowledge to make radiation visible during a disaster.

In this sense, Mazin's characterization of "truth" and concern about narrative interference in accessing this truth echoes the discussion about (in)visibility politics in

351 Peter Markie, "Rationalism vs. Empiricism," *The Stanford Encyclopedia of Philosophy,* ed. Edward N. Zalta (Fall, 2017), last accessed March 13, 2024, https://plato.stanford.edu/archives/fall2017/entries/rationalism-empiricism/.

352 Marian David, "The Correspondence Theory of Truth," *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, last modified May 28, 2016, https://plato.stanford.edu/archives/fall2016/entries/truth-correspondence.

353 Steve Blandford, Barry K. Grant and Jim Hillier, *The Film Studies Dictionary* (Oxford University Press, 2001), 195.

354 Kenneth R. Hammond, "Coherence and correspondence theories in judgment and decision making," *Judgment and decision making: An interdisciplinary reader* (Cambridge University Press, 2000), 54.

355 Philip T. Dunwoody, "Theories of truth as assessment criteria in judgment and decision making," *Judgment and Decision Making* 4, n°2 (2009), 121.

356 *Ibid*., 122.

previous chapters, and the roles of radiation data and pop-culture narratives in making radiation visible. As outlined by Kuchinskaya, different government regimes (both before and after the fall of the USSR) employed numerous radiation visibility and invisibility techniques to justify different government responses to the disaster and its aftermath. The political imposition of radiation invisibility in the USSR specifically, is explored more deeply by historians Serhhii Plokhy and Kate Brown in their own works on the Chernobyl meltdown, in which they each sort through the memories of those involved (whether drawn from the contemporaneous memoirs and correspondences left by prominent actors, or from the present-day recollections of local civilians) to discuss the USSR's culture of silence.

Leaders of the USSR had in fact already quietly moved past another nuclear disaster at Ozersk, and were attempting to follow this political model in response to the Chernobyl meltdown – invisibility politics founded at least in part on, according to Plokhy's *Chernobyl: History of a Tragedy* (2019): "[t]he tradition of complete secrecy about the nuclear program, the regime's unwillingness to admit disaster after having prided itself on being the first to build a nuclear power plant and successfully managing the peaceful atom (incompetence in that regard had hitherto been attributed only to the United States and the capitalist world), and, finally, concern about unleashing panic and a resulting inability to mobilize the resources needed to fight the disaster."[357] This specifically suppressive form of invisibility politics was also present when managing liquidators, such as the women interviewed by Kate Brown for *Manual for Survival* (2019), who had been sorting and cleaning radioactive wool at their factory in Chernihiv.

Conflicting memories about the pressures put on the ill to hide where they worked[358] or factory practices that led to polluting the Desna river[359] are attributed by Brown to the management style of USSR industries, which "served state enterprises to speed up employees and goad them to work more for less pay, or to volunteer their days off for no wage at all" – in part by burying worker complaints. Brown demonstrates that this was done in the wool treatment factory after the Chernobyl meltdown, where a report to Kiev and Moscow affirms that "the factory staff had no illnesses in connection

357 Serhii Plokhy, *Chernobyl: History of a Tragedy* (London: Penguin Books, 2019), 175.
358 Kate Brown, *Manual for Survival* (Pengin Books Limited, 2019), 89.
359 *Ibid*., 94.

with radioactivity" and that neither "had any workers suffered from any occupational health problems in the previous four years," despite incident records describing "a 200-pound bale of wool falling on a worker's limbs and another bale clocking a woman on the head,"[360] as well as the former workers' memories of physical symptoms such as anaemia, sore throat and dizziness – and later on, the premature deaths of many workplace acquaintances.

The women interviewed by Brown also recalled that one of the safety measures undertaken at the factory was to store heavily contaminated wool in a separate area for future relocation, but they wondered why they had been asked to sort that wool in the first place (since they could have been left in the delivery trucks and brought elsewhere), and why it was left to pile up for 18 months before finally being buried.[361] Although commissions from the Ministries of Light Industry, Health, and Justice came from Moscow and Kyiv to confirm radiation measurements and elaborate safety measures, the workers themselves recalled that if they asked what doses they were exposed to, the answer would be: "You don't need to know."[362] Mazin's writing therefore delves into the subject of invisibility politics, as part of a wider commentary on the late Soviet style political regime, which will be further explored in the next section.

The USSR's brand of suppressive invisibility politics is best illustrated through the numerous visual juxtapositions sprinkled throughout *Chernobyl*, including in the aforementioned scene of Legasov and Shcherbina realizing that the entire world has discovered the radiological disaster in Pripyat while inhabitants are shown naïvely going about their usual activities in the disaster zone. The very first use of such juxtapositions, however, is towards the end of the first episode. As a result of Dyatlov, Fomin and Brukhyanov assuring each other and the local authorities that nothing serious has transpired at Chernobyl's reactor four during the night (or more precisely at "1: 23: 45" am, which is the title of the episode), life resumes as normal for inhabitants of Pripyat later in the morning. The appearance of normality, in the form of adults heading for work and children laughing on their way to school on a calm sunny day, is pierced with ominous images of death: a large plume from reactor four billows into the sky,

360 *Ibid*., 90.
361 *Ibid*., 94.
362 *Ibid*., 88-89.

killing the pine trees in the forest below; a dying starling drops from above onto the same ground the inhabitants are treading.

Again, in the next episode ("Open Wide, O Earth"), asynchronous sound is used to bridge two visually contrasting scenes. Lyudmila Ignatenko, a civilian from Pripyat, goes to Moscow's Hospital No. 6 in order to visit her husband Vasily, a first responder at reactor four's fire. By this point, Lyudmila is never told that her husband was irradiated, nor given precise instructions or information about what his condition entails, and therefore she hugs Vasily tightly upon reuniting with him. After lingering on the image of their vulnerable bodies pressed together, the camera switches abruptly to a scene of military men clad in protective gear as they approach the reactor (while the score remains). This juxtaposition serves to non-verbally underline how dangerously exposed the uninformed Vasily and Lyudmila were to the radiation emanating from the open reactor.

While the explicit subject of *Chernobyl*'s narrative is to explore the *cost* of lies, which is to say the repercussions of dishonesty during a radiological disaster as part of a wider effort to suppress the visible extent of the catastrophe, it more specifically proposes to do this exploration through the lens of both correspondence theory and an empirical approach to science that purges it completely of narrative. As such, Mazin's representations of "truth" and "lies" allow an exploration of the different approaches to increasing or decreasing radiation visibility in the wake of a large scale nuclear disaster, thereby also inscribing itself into the previously outlined debates about citizen science and risk concepts, as part of the larger nuclear safety imaginary that goes on to feed radiation protection policy decisions.

However, it can also be said that with this oversimplified dichotomy between truth and lies, *Chernobyl* "misses the extent to which Soviet scientists participated in international projects," which is "not surprising, because the history of Soviet technoscience has been long written as a form of liberal critique of the authoritarian regime and not as an integral part of the "universal" narrative and analytical framework of power, society and knowledge."[363] More specifically, the dichotomy between scientific truth and narrative lies that frames *Chernobyl,* illustrated by scenes that allude to the importance of the sociopolitical and cultural *milieux* that produce or suppress

363 Eglė Rindzevičiūtė, "*Chernobyl* as Technoscience," 1182-1183.

knowledge (and here specifically, radiation visibility), is not only an exploration of "the intersections of science and technology with social and cultural sectors,"[364] but pulls science, scientists, empirical data collection and narrative representation into a stark political commentary that itself creates enemies out of those who do not fit its own narrative mould.

## 4.2 Narrative as a political weapon, in *Chernobyl*.

During the first episode of the companion podcast, Mazin reiterates his understanding of lies and truth: "When people choose to lie, and when people choose to believe the lie, and when everyone engages in a very, kind of passive conspiracy to promote the lie – over the truth – we can get away with it for a very long time. But the truth just doesn't care. And it will get you in the end." This perception of the lie is reflected in the miniseries' portrayal of an elderly member of Pripyat's governing council, "Zharkov."

In the first episode of the series, the local government is summoned by Brukhyanov to discuss the incident at reactor four, assuring them that nothing serious had happened. An elderly member of the council ultimately decides on the course of action to follow: restricting the movement of inhabitants in Pripyat and cutting the phone lines, to reduce the flow of "misinformation." He justifies this by explaining: "It is in my experience that when the people ask questions that are not in their best interest, they should simply be told to keep their minds on their labour and leave matters of the state to the state. […] Our faith in soviet socialism will always be rewarded."

However, when the inhabitants of Pripyat are finally being evacuated in the next episode, the audience is shown Zharkov climbing into one of the buses, just like everybody else. Considering that Zharkov was the one who suggested cutting communications in order to stop the spread of "misinformation," the situational irony here is evocative of Mazin's statements that "the truth doesn't care" and "it will get you."

This irony not only illustrates the nature of lying, it gives it a political context. In the companion podcast of this second episode, Mazin describes the sort of person this man, Zharkov, was meant to represent: older members of committees and institutions who had lived through the Bolshevik revolution and had seen Lenin alive. People for

364 *Ibid*., 1179.

whom the "cult" of Lenin or Leninist communism was still "fresh" – as Mazin puts it: "They were believers," hence the religious language Zharkov uses to describe state obeisance (having "faith"). This political connection is all the more important as it is what makes the story of Chernobyl relevant to a modern day audience: the parallel between expressions such as "alarmism" (or "misinformation," to quote Zharkov) and the modern-day concept of "fake news."

Indeed, the lying in *Chernobyl* is often framed as politically motivated: In episode two, Legasov is given data about the explosion and what he sees unsettles him – however, he has difficulty convincing the investigation council members of the severity of the incident and Boris Shcherbina even condemns what Legasov says as "alarmist."

Welcoming Shcherbina and Legasov to the reactor site, Brukhyanov and Fomin attempt to give the former as little information as possible, expecting that Shcherbina would not be able to question their knowledge (they privately describe him as a "pigheaded" "bureaucrat"). In order to silence Legasov, Brukhyanov attempts to accuse him of alarmism: "It's disgraceful, really. To spread disinformation at a time like this."

Meanwhile, Ulana Khomyuk tries relaying her findings (her institute in Minsk detected unusually high levels of radioactive material in the air) to her local deputy, only to be snubbed: "This is why no one likes scientists. […] They're everywhere, spreading fear." This deputy follows with the assertion that "I prefer my opinion to yours." to which her response is: "I'm a nuclear physicist." Again, we have this idea of alarmism (with scientists "spreading fear"), and emphasis on the precarious position of expertise in this regime.

These, and other incidences of political obfuscation reminiscent of the invisibilisation practices discussed in previous chapters, occur very often over backdrops of political officiation, underlining the institutional (rather than individual) dimension of lying in *Chernobyl*: in the local government building in Pripyat, in a Minsk government office, in the Commission's meeting room in Moscow etc. The one setting where these lies are confronted with the "truth" is in a non-governmental building re-purposed for the secret court trial at the end of Episode 5. After the trial ends and the camera pans out, away from the building so as to get a better look, an imitation Mickey Mouse statue comes into view – accentuating the escape from spaces of the

Soviet State, but also standing as a visual reminder of the scientific and cultural competitions between the Soviet and "Western" blocks, during the Cold War.

In fact, when the government's invisibility politics were no longer effective, "[m]ore than half of Gorbachev's first address to the country on the Chernobyl disaster was dedicated to polemics with and attacks on the West. […] Gorbachev was reacting to the wave of indignation and criticism that had rocked Central and Western European countries and eventually reached the United States as a result of the initial Soviet refusal and subsequent reluctance to share information on the occurrence and consequences of the disaster."[365] Thus, the truth vs. lie dichotomy of *Chernobyl* becomes part of a wider political dichotomy between the two blocks of the Cold War, implicating the previously described ideal of un-"narrativized" science into this conflict.

As a result, there is a tension between expert characters such as Legasov or Khomyuk and both career politicians and agents of the KGB, which is often illustrated in combative terms. The violence in *Chernobyl* is particularly associated with a soviet power-structure that severely limits individual and scientific pursuits. In Episode 3, for instance, Legasov must retrieve Khomyuk from a KGB jail cell, after she was stopped from questioning patients in Moscow's Hospital No. 6. The moral of her adventure is that a scientist must find answers, even at risk of being targeted by political repression:

LEGASOV I don't want to do this anymore. I want to stop. (beat) But I can't. So tomorrow, I will wake up and make more decisions that will kill more people, because there is no alternative. And no, I don't think you have a choice any more than I do. I think, despite the lies, the stupidity-- (the jail) --even this... you are compelled. The problem has been assigned, and you will stop at nothing to find the answer. That is who you are.

KHOMYUK A lunatic, then.

LEGASOV A scientist.

365 Plokhy, *Chernobyl,* 234.

Perhaps unintentionally, this dedication of characters like Legasov and Khomyuk to searching for answers mimics military zeal, such as in the above exchange – where they accept the possibility of killing more people in order to attain a perceived greater good.

In the final episode, Legasov is interrogated by a KGB agent (Charkov) who tells him: "Scientists... and your idiot obsession with reasons. When the bullet hits your skull, what will it matter, why?" Here, the relationship between a "soviet style" government and the dichotomy between what Mazin defines as truth and lies in both the narrative and paratextual framing of the series, is obvious. This antagonism between the scientist figure and the figure of state oppression is compounded by their final exchange:

LEGASOV And if I refuse?

CHARKOV Why worry about something that isn't going to happen?

LEGASOV 'Why worry about something that isn't going to happen.' That's perfect. (beat) They should put that on our money.

These exchanges reflect the work of real KGB agents in the aftermath of the Chernobyl disaster, as studied by Serhii Plokhy. A Ukrainian KGB report from April 28th 1986, for instance, states that "[t]he mobilization of buses, nuclear specialists, and police to deal with the consequences of the disaster caused rumours to spread among the worried inhabitants of Ukraine's capital."[366] For this agent, it was not the lack of official information that created rumours, but the assessment and protection measures undertaken by the government in order to address the catastrophe. According to several more statements delivered by KGB agents and politicians, the aim was maintain the populations' "calm"[367] and prevent "panic".[368] In a sense, their concerns reflect those disaster myths, still prevalent today and deployed in the immediate aftermath of the

366 *Ibid*., 183.
367 *Ibid*., 177.
368 *Ibid*., 178.

Fukushima Daiichi disaster, according to which civilians become panicked and therefore harder to help during an emergency situation.

Mazin explicitly notes the political dimension of *Chernobyl* by saying that "if you are part of a power structure that you understand is suppressive, in a way, and that you are limiting people's freedoms, in a way, you must be aware that there could be a spark that could lead to the truth spreading, and people realizing and finally shaking off their shackles and saying "we're not going to be a part of this anymore." That is essentially how the Berlin wall came down." This modern re-contextualisation of the Chernobyl disaster echoes past perceptions of its more than symbolic role in the demise of the USSR. For instance, in a *Japan Times* article published 20 years after the catastrophe, Gorbachev himself writes that: "The Chernobyl disaster, more than anything else, opened the possibility of much greater freedom of expression, to the point that the system as we knew it could no longer continue."[369]

Discussing the circumstances that led to the public being unknowingly exposed to radiation at the May 1st parade in Pripyat soon after the initial explosion, Plokhy argues that "[t]he Soviet leaders in the Kremlin may have prevented panic, but the unintended consequence of the "radioactive" parade was the loss of legitimacy of the regime it was supposed to enhance."[370] In a *KennanX* podcast episode about the Chernobyl meltdown, he provides further detail about the perception that Chernobyl led to the downfall of the USSR by explaining how it acted as a "catalyser" for the "first ever" public political mobilisations in the Soviet Union – including the first competitor to the the communist party, the "Green World" political party.[371]

However, as part of its exploration of these scientific and political dichotomies, violence is frequently alluded to in *Chernobyl*. Reference to combat is made explicit at the beginning of the second episode, in the form of a tape recording of Konstantin Simonov reciting his 1941 war poem *To Alexei Surkov*. Though the name of the poem is revealed by an anglophone radio host in the same passage of the series, the official release of *Chernobyl* does not provide subtitles (perhaps to encourage a sense of exotic-

369 Mikhail Gorbachev, "Turning Point at Chernobyl," *The Japan Times,* April 21, 2006, https://www.japantimes.co.jp/opinion/2006/04/21/commentary/world-commentary/turning-point-at-chernobyl#.XPoajKR7mUk.

370 Plokhy, *Chernobyl*, 189.

371 Craig Mazin and Serhii Plokhy, interviewed by Jill Dougherty, "Meltdown," Wilson Center Kennan Institute: *KennanX*, podcast audio, January 9, 2020, 10:35 to 10:50, last accessed March 01, 2024, https://www.wilsoncenter.org/audio/kennanx-podcast-episode-1meltdown.

ness or other-ness for the show's non-Slavic audiences, thereby hinting at its primary audience). Nevertheless, its verses remain insightful. In reference to the attempted invasion of Soviet Russia by German Nazi forces, its lines include "we've been spared by the bullets." This parallels a scene later in the same episode, where Legasov describes neutrons in a fissile reaction as "bullets." In his companion podcast, Mazin himself describes the poem as "encapsulat[ing] the spirit of the people who went to battle with Chernobyl." Of the line "The great bitter land I was born to defend," he says that the poet shows "acknowledgement that this place, "the Russia that we fight for", it's full of country tracks, graves everywhere, women mourning and crying, and it seems quite miserable, and you are constantly being shot at, and yet –still feel proud […] This notion that the whole purpose of life inside this place is to defend [chuckles] the country in which you are."

Moreover, "Legasov was a romanticist. He wrote poetry; in fact, in early youth he had aspired to become a professional writer, but had been dissuaded by Konstantin Simonov, a leading Soviet literary figure. At the time, students argued about who was more important to the country, physicists or lyric poets. In 1959, the prominent poet Boris Slutsky had written, in one of his poems, "Somehow physicists are in vogue; somehow lyric poets are kept down," and proceeded to conclude that physicists were more important to society than those engaged in the humanities."[372] So, like the televised version of himself, the real Legasov "would compare the situation created by the nuclear accident with that of World War II, as did many others at the Chernobyl power station. But his comparisons […] went beyond the self-sacrifice shown by Red Army soldiers and Chernobyl liquidators. He would also talk about the unpreparedness of the Soviet system to deal with both disasters – the nuclear accident and the military catastrophe of the Nazi invasion of the Soviet Union in the summer of 1941."[373]

Given the overarching premise of *Chernobyl*, and the repeated distinction between narrative and "truth" throughout the mini-series as well as its many paratexts, it would be difficult to imagine that this is an acknowledgment of literary or narrative contributions to the search or expression of "truth." Rather, the use of Simonov's poem in *Chernobyl* could more easily be interpreted as a nod to Legasov's past fondness for a specific kind of narrative – the Soviet narrative. The lie.

372 Plokhy, *Chernobyl*, 267.
373 *Ibid*.

In any case, the historical catastrophe that was the Chernobyl meltdown serves as a backdrop for a political thesis linking truth to "freedom": Mazin's own re-contextualizing of the details in his series connects "truth spreading" with removing the "shackles" of a "power structure" that "limit[s] people's freedoms." Furthermore, his description of the struggling characters portrayed in his series as "people who went to battle with Chernobyl," and his reinterpretation of Simonov's poem to attribute the bullets it mentions to the Russian State as opposed to the Nazis, effectively highlights the silent accusation imbricated in *Chernobyl*'s narrative, when Legasov describes radiation as bullets – and further underlined as Legasov progressively adopts Soviet military paraphernalia in his attire, over the course of the show.

Johan Galtung offers a way of conceptualizing the violence that is being evoked through allusions to war and bullets, in his typology of violence in "Violence, Peace and Peace Research." Originally published in 1969, Galtung's study broadens the concept of violence by defining it as "the cause of the difference between the potential and the actual,"[374] rather than as a "somatic incapacitation, or deprivation of health, alone (with killing as the extreme form), at the hands of an actor who intends this to be the consequence."[375] The fifth episode's court trial serves to lay out the knowledge gathered on the Chernobyl meltdown, and as such, the audience (both of the miniseries and in the fictional courtroom) are presented Legasov's findings: "These rods are made of boron, which reduces reactivity. But not their tips. The tips are made of graphite, which accelerates reactivity. […] Why? For the same reason our reactors do not have containment buildings around them like those in the West. The same reason we don't use properly enriched fuel in our cores. The same reason we are the only nation that builds water-cooled graphite moderated reactors with a positive void coefficient. […] It's cheaper." Legasov's assertions about the Soviet State allowing nuclear reactors to be built with cheaper and less safe materials would constitute a prime example of the aforementioned difference between potential and actual somatic violence, and since no identifiable individual is revealed as responsible for these particular engineering choices, it can be considered as "built into the structure" of the Soviet system.[376]

374 Johan Galtung, "Violence, Peace, And Peace Research," *Journal of Peace Research* 6, n°3 (1969), 168.
375 *Ibid*.
376 *Ibid*, 171.

This gives new meaning to Mazin's interpretation of Simonov's poem – now, going "to battle with Chernobyl" sounds a lot like going to battle with the Soviet State. Indeed, another distinction regarding the types of violence defined by Galtung, is that violence can be latent: "a situation of unstable equilibrium, where the level of actual realization [of the act of violence] is not sufficiently protected against deterioration by upholding mechanisms."[377] The responsibility of the State for the Chernobyl meltdown is explicitly tied to State-enforced obfuscation in the trial episode of *Chernobyl*, at the same time as Legasov reveals that there are several more reactors in the USSR built with the same cheap materials: "I am not the only one who kept this secret. There are many. We were following orders. From the KGB, from the Central Committee. And right now, there are 16 reactors in the Soviet Union with this same fatal flaw. Three of them are still running less than 20 kilometres away... at Chernobyl."

In this case, knowledge of the truth is clearly identified as the upholding mechanism that would normally protect against the risk of violence. Rindzevičiūtė remarks that in the realm of history of science, a "significant scholarship theme is the tension between political ideology and "proper" science"[378] and suggests that Chernobyl's plot "resonates with this paradigm of an emerging "liberal," science-driven, and open society," by showing how "an inappropriate reactor shut-down test was carried out to cover up management flaws". And thus, the narrative focus on this particular dimension of the Chernobyl accident qualifies as "the political use of technoscience as a symbol of progress and power."[379]

In this way, despite Mazin's clarifications that *Chernobyl* is not intended to criticize nuclear power or the nuclear industry, his work echoes that of Plokhy, who wanted his book on the Chernobyl disaster to be "readable", with "messages for today's world" about the nuclear industry as a whole. He suggests that the locations where most reactors are being built today, the Middle East, China and elsewhere outside North America and Western Europe, are regions dominated by authoritarian regimes "with control over information, including scientific information – and that was one of the reasons why Chernobyl exploded,"[380] integrating a long line of criticisms of nuclear energy not being a suitable energy source for democracies – as historically, "for those

377 *Ibid*, 172.
378 Rindzevičiūtė, "*Chernobyl* as Technoscience," 1182.
379 *Ibid*., 1183.
380 Craig Mazin and Serhii Plokhy, "Meltdown."

who oppose this major technology, nuclear power implies a kind of society with intolerable [inegalitarian] economic and political relationships."[381]

## 4.3 Moralizing the dichotomy between "truth" and "narrative"

The opening monologue of Episode 1 has Legasov asserting that Dyatlov "deserves death" for the role he played in the Chernobyl catastrophe – or rather, for the role he plays in Mazin's narrative of a war between "truth" and "lies." This passage foreshadows the portrayal of all characters in the rest of the series as embodiments of the violent, black and white dilemma set up by the narrative – the choice between to pursuing truth, or lies. It also foreshadows the ethical issues with this series' selective use of real people's experiences to build up this dichotomy, as it forces them and the real choices they made during a nuclear meltdown, into these polarized roles.

Notably, at the end of the opening scene in Episode 1, Legasov says: "I've given you everything I know. They'll try to deny it, the way they always do. Will you prevail? I do not know. I only know you'll do your best to try." The "you" in this passage does not refer to any in-series character in particular, but rather acts as a suture – directly addressing the audience watching *Chernobyl*. By involving the audience members in such a way, the writer invites them to adopt the definitions of truth and lie developed by the scenario, and partake in the sociopolitical conflict embodied by the series' characters.

The two characters that best embody a search for truth are Valery Legasov and Ulana Khomyuk – career scientist protagonists. In fact, Ulana Khomyuk is a composite character meant to represent the many experts and scientists involved in investigating the Chernobyl incident.[382] The fictional dimension of *Chernobyl* becomes salient as the diverging attitudes and beliefs of this considerably large group of people is represented by a single personality and understanding of "truth," as imagined and written by Craig Mazin in order to suit the narrative exploration of "the cost of lies." As such, and like

381 Karl Dake, "Myths of Nature: Culture and the Social Construction of Risk," *Journal of Social Issues* 48, n°4 (1992), 23.

382 Aria Bendix, "HBO's "Chernobyl" series invented a main character to depict the world's worst nuclear power plant," *Business Insider* 20 September 20, 2019, https://www.businessinsider.com/hbo-chernobyl-series-invented-nuclear-physicist-character-2019-6?r=US&IR=T.

her fellow scientist Legasov, she is an unflinching seeker of truth – or a "truth ninja," according to Emily Watson, the actress who plays her.[383]

The focus on Khomyuk and Legasov as truth seekers contributes to the impression given in *Chernobyl* that Soviet science and technology existed in isolation. Rindzevičiūtė points out how "Soviet scientists benefited from scientific diplomacy as it helped them obtain their own Soviet data via international and transnational institutions" including the IAEA and UN programs, so the fact that this was not represented in *Chernobyl* "sends a very strong message that knowledge between the Cold War East and West blocs only flowed one way, with the West scrutinizing the underperforming East."[384]

Other characters are used as foils to this search for truth, seeking instead to deny it. Two of the most prominent figures to do this are Anatoly Dyatlov, Chernobyl's deputy chief engineer during the night of the catastrophe, and Viktor Bryuknanov, the plant's manager. Both of these historical figures are shown exclusively in scenes which allow them to express their denial, or planned denial, of the "truth" – through the use of narrative spin.

While these two "liars" are portrayed as unsympathetic, one character in particular serves to underline the morality behind truth seeking: Boris Shcherbina. The Council of Ministers' deputy chairman is portrayed unsympathetically in the first moments of the mini-series, before he converts into a truth-seeker. This is primarily achieved as he continuously puts down Legasov's intelligence and role in the investigation, and threatens to kill Legasov (and a helicopter pilot) if he is insubordinate. As soon as Shcherbina partakes in Legasov's quest for the truth, he ceases to be portrayed as socially abusive towards anyone (unlike Dyatlov, who was similarly abusive at the start of the series and is never shown to change).

The change in his behaviour is most obvious in his speech glorifying self-sacrifice in the third episode, when he and Legasov need three workers to go under the reactor on a mission to potentially avert a far worse nuclear catastrophe. Whereas in the first episode Scherbina swiftly resorts to threatening both Legasov and their helicopter pilot with death in order to scare them into submission, he now makes verbal appeals to

383 Elena Nicolaou, ""She Was A Truth Ninja:" Emily Watson on Her Intrepid Chernobyl Character," *Refinery29*, May 08, 2019, https://www.refinery29.com/en-gb/2019/05/232129/ulana-khomyuk-chernobyl-real-person-scientist-emily-watson-interview

384 Rindzevičiūtė, "*Chernobyl* as Technoscience," 1184.

the plant workers in the hopes of moving them to make a decision of their own free will. This apparent behavioural inconsistency serves the narrative purpose of making truth seeking, even at the cost of one's life, a moral choice – rather than dying later in life as a mere unforeseen consequence of radiation poisoning.

In sum, the antisocial behaviour of characters shown systematically lying integrates those lies in an intolerable cycle of abuse and choices leading to poor outcomes. Nowhere in the series is the immorality of lying and the morality of truth seeking in HBO's *Chernobyl* better underlined, however, by reference to self-sacrifice – as opposed to the sacrifice of others.

In episode two, when Legasov and Fomin disagree about what happened at the nuclear plant, Scherbina offers the first moral test of truth in the series: to send someone near the open core with a dosimeter, in order to measure ambient radiation. When Legasov explains to the general in charge of the disaster site that the undertaking will likely injure or kill one of his soldiers, the general decides to sacrifice himself instead. He is therefore the first knowing self-sacrifice made to obtain the truth. Previous sacrifices were not made in interest of uncovering the truth, but rather in interest of obeying orders despite the truth; they were also made on behalf of others (on behalf of Dyatlov, mainly) rather than as the result of a moral choice to seek the truth.

Allusions to, and glorification of, self-sacrifice has historically been an integral appeal of the masculinity displayed in Soviet Russian culture, particularly in the form of the "heroic invalid" trope of mid-century Soviet cinema, which reflected "the perverse logic of Stalinism: the desire to produce maimed, wounded and disabled male bodies whose damaged forms would point to notions of self-sacrifice and submission."[385]

Legasov's costume evolution doesn't only imply an increasingly oppositional or combative stance towards the Soviet State, it also anchors him more firmly in the plight of the other male workers sacrificed by the political elite who uphold and glorify the idea of self-sacrifice for the nation – without ever sacrificing themselves. These unsacrificed elites are presented in suits throughout the series, rather than in lab-coats, hazmat suits, military gear, or soot. Indeed, this difference in dress is humorously highlighted when the Minister of Coal is sent to a group of miners to recruit them for help with the Chernobyl clean-up – and as they pass him by on their way to the

385 Ilya Kaganovsky, *How the Soviet Man was Unmade: Cultural Fantasy and Male Subjectivity Under Stalin* (Pittsburgh: University of Pittsburgh Press, 2008), 146.

transport vehicles, they clap his immaculate baby-blue suit with their soot covered hands.

The imagery of the male worker – or ironically, the proletariat – sacrificed by the communist government is further reinforced by the series' use of Soviet works of art such as Simonov's poem – but also the mosaic displayed while the poem is being recited ("Blacksmiths of Modernity"), and the folk song performed by a solo male singer in episode four, when soldiers are burying the dogs that they were forced to put down (*Chorniy Voron*, or "Black Raven"). The latter in particular, makes a clear parallel between the dogs killed and the men killing them, as the song recounts the dying of a soldier (from his own perspective).

The humanist dimension of Mazin's narrative is also evident in the series' camera work, which seems to mimic the perspective of the characters on-screen: it glides slowly over the inhabitants of Pripyat who have settled peacefully on the bridge of death to bask in the night-time spectacle of reactor four burning, but is most jerky and erratic as it follows the clean-up workers anxiously scurrying on the reactor's roof.

Mazin both uses traditional Soviet allusions to male sacrificial heroism as a means of distinguishing between moral and immoral characters, while also criticizing the glorification of self-sacrifice by the Soviet State. The writer makes this explicitly clear in the interviews which allow him to further frame the subject matter of *Chernobyl*: "For a million reasons, this was not an anti-nuclear polemic. It's anti–Soviet government, and it is anti-lie, and it is pro–human being."[386] The added nuance that "we're all capable of sliding back into that kind of thinking, all of us"[387] is reminiscent, then, of the invitation extended by Legasov to the real-world audience at the start of the first episode – to continue pursuing truth.

As such, the series partakes in a long line of American cultural productions using Russian or Soviet characters to establish moral boundaries: "Russians as antagonists are as prevalent in Hollywood movies as they were during the height of the Cold War. The continued ideological construction of Russians as villains has since found its way into

386 Craig Mazin, interviewed by Sam Adams, "The Creators of Chernobyl on Viewers taking Away the Wrong Lessons," *Slate*, June 03, 2019, https://slate.com/culture/2019/06/chernobyl-finale-hbo-mini series-craig-mazin-interview.html

387 Craig Mazin, interviewed by Joe Utichi, ""Chernobyl": Craig Mazin Digs Deep on his Landmark Series and Its Modern Resonance – "It's Not Us and Them. We Have an Us Problem"," *Deadline,* August 14, 2019, https://deadline.com/2019/08/chernobyl-creator-craig-mazin-emmys-hbo-interview-news-1202666703/.

new media platforms like video games. Russians appear as the second and third-most common adversaries (before or after Latin American and Middle Eastern terrorists) in fifty-seven bestselling games from 2001-2013."[388] However, *Chernobyl* breaks with the traditional use of Russian characters as foils to an imagined American moral superiority,[389] and instead the series writer focuses on pitting the Soviet people against the Soviet regime.

Nevertheless, his work participates in the same competition between opposing interpretations of realism, and perhaps of reality, within literary or artistic fields which defined much of the cultural wars between the Western and Eastern blocks during the Cold War.[390] In our modern day geo-political context: "New Cold War battlefields exist today on household televisions, in movie theaters, and on mobile phones—they inescapably surround us, oftentimes without our conscious awareness of their presence. [...] Culture is vital, and its place cannot be overlooked. Our portrayal of adversaries is of the utmost significance because it is a method through which to channel a deeper set of beliefs, of not only why our adversaries are the bad guys, but, perhaps more importantly, of why we should be the good guys."[391] In this case, *Chernobyl* dictates the "good guys" as being whoever seeks and shares knowledge, of the kind outlined in the first section of this chapter (a scientific or empirical "truth," as opposed to lies or "narrativized" truth).

The use of real people's experiences, including their personal accounts of those experiences, as a means to construct a black and white moral dichotomy predicated on scientific processes is especially problematic, then, in a context fraught with political violence. Going back to Legasov's assertion that Dyatlov "deserves death" for the role he supposedly played in the catastrophe, it should be noted that as a real person, Dyatlov was not the social tyrant and truth denialist that the miniseries suggests.

In the final episode of *Chernobyl*, Mazin interweaves trial scenes with those of what supposedly happened in the control room of reactor four. The latter are not so much the personal flashbacks of the people directly involved, but reconstructions of the event – sometimes guided by Legasov's disembodied voice, narrating over the actions

388 Declan Cronin, "Meet the New Villain, Same as the Old Villain: The New Cold War in American TV, Film, and Video Games," *Of Life and History* 2, n°1 (2019), 1.
389 *Ibid*, 12
390 David Caute, *The Dancer Defects: The Struggle for Cultural Supremacy during the Cold War* (Oxford University Press, 2003), 74, 219, 468, 572.
391 *Ibid*, 19

of Dyatlov and his co-workers. This reconstitution of both the trial and the events in the control room concentrates on characterizing Dyatlov as abusive and incompetent.

However, Plokhy's description of the secret trial held against Fomin, Brukhyanov and Dyatlov, based on the various memoirs and testimonies of people present at the time, shows that "Anatolii Diatlov […] refused to take a page from Fomin's book and blame his subordinates, who by that time were deceased and might well have been made the ultimate scapegoats" and instead "chose a different and much nobler course, but one that was also dangerous for the authorities. He admitted guilt for a number of violations of the operating instructions" but "was adamant that none of those violations would have caused the explosion if the reactor had been in sound operating condition" and so, "Diatlov was going public with an accusation against the designers of the reactor that many in the industry and the political elite knew to be justified."[392] Thus, as Sonja Schmid puts it, "[i]t was Diatlov who fought tirelessly to exonerate the reactor operators and tried to convince the international engineering community that the reactor design was to blame"[393]

Legasov's contributions to controlling the impact of the disaster and shedding light on its origins were also more complicated than the mini-series could convey through its dichotomy between (scientific) truth and (narrative) lies – largely due to the fact that the scientific pursuit of answers does not inherently lead to consensus on a given "truth." For instance, the real Legasov's scientific opinions about what should be done to contain the runaway meltdown in Pripyat were contradicted by Yevgenii Velikhov, another advisor to Gorbachev and world renown nuclear physicist who would go on to become head of the Kurchatov Institute in 1988. One might say that they presented conflicting narratives of what could or should happen given the empirical evidence they had to contain the disaster, but this disagreement is not the result of any kind of lying – instead, their earnest scientific understandings led to stalemate: "Since Legasov and Velikhov were at odds, the new head of the government commission, [Ivan Silaev, Scherbina's successor], was at a loss, not knowing which project of the two academics to implement."[394] As such, *Chernobyl*'s portrayal of narrative elides both the fact that narrative is often used to convey truth (or the closest one can come to

392 Plokhy, *Chernobyl,* 280.
393 Schmid, "*Chernobyl* the TV Series," 1157-1158.
394 Plokhy, *Chernobyl,* 209.

approximating truth), and that untruths are not necessarily the product of lies or suppression – and in doing so, forces the complex experiences of real people to fit the mould of the black and white intellectual dichotomy that is used to illustrate a violent political conflict, which the viewer is invited to join from the very first episode.

## Conclusion

While first writing this chapter, the Covid-19 pandemic had spread across the globe, and public commentary on Western government responses to the situation made use of Chernobyl as a political allegory to criticize perceived obfuscation of the facts and mismanagement of a disaster: The *Financial Times* published a critique titled "Xi Jinping faces China's Chernobyl moment,"[395] *Reuters* published another titled "Coronavirus 'cover-up' is China's Chernobyl – White House adviser" [396] and *The Telegraph* published "Trump faces his "Chernobyl moment" after slashing pandemic defences to the bone,"[397] among others. On twitter, the allegory was spread by notable voices such as that of George Takei, who explains that: "This is our **"Chernobyl" moment** [emphasis not mine]:a preventable catastrophe that was denied, downplayed and mismanaged until tens of thousands were dead."[398] The expression "Chernobyl moment" has also been used to describe Trump's decision to bomb Iranian bases[399] and the general need to speak more candidly about climate change.[400]

These headlines clearly draw parallels between Mazin's portrayal of the USSR's handling of the Chernobyl catastrophe and the more recent failings of various governments to prevent the spread of a global pandemic and other potential large scale

395 Jamil Anderlini, "Xi Jinping faces China's Chernobyl moment," *Financial Times*, February 10, 2020, https://www.ft.com/content/6f7fdbae-4b3b-11ea-95a0-43d18ec715f5.

396 "Coronavirus 'cover-up' is China's Chernobyl – White House adviser," *Reuters,* May 24, 2020, https://uk.reuters.com/article/uk-health-coronavirus-usa-china-idUKKBN2300P3.

397 Ambrose Evans-Pritchard, "Trump faces his "Chernobyl moment" after slashing pandemic defences to the bone," *The Telegraph,* February 27, 2020, https://www.telegraph.co.uk/business/2020/02/26/trump-faces-chernobyl-moment-slashing-pandemic-defences-bone/

398 George Takei (@GeorgeTakei), "Sorry. This isn't our "Pearl Harbor" moment. That was a surprise, dastardly attack by an enemy nation. This is our "Chernobyl" moment: a preventable catastrophe that was denied, downplayed and mismanaged until tens of thousands were dead," *X*, April 05, 2020, https://twitter.com/GeorgeTakei/status/1246904615985188867.

399 Linette Lopez, "The assassination of Iranian Gen. Qassem Soleimani could be Trump's Chernobyl moment," *Business Insider,* January 07, 2020, https://www.businessinsider.com/trump-decision-kill-iran-general-qassem-soleimani-chernobyl-moment-2020-1?r=US&IR=T.

400 Brian Kahn, "Climate Change Is Our Generation's Chernobyl Moment to Tell the Truth," *GIZMODO.* June 06, 2019, https://earther.gizmodo.com/climate-change-is-our-generations-chernobyl-moment-to-t-1835278291.

catastrophes, by adopting the writer's constructed dichotomy between scientific truths and narrative lies ("cover up", "denied") – showing how even long-form cinematographic representations of personal stories, or "traditional forms of storytelling," fit somewhere in Mäkelä's definition of viral storytelling, wherein "[t]he narrative appropriation of the personal and the particular in social media is most simply exemplified by the memetic reuse and spread of stories of personal experience in forms that condense the moral of the story in a sloganish one-liner."[401] The original storytellers, here, are not Mazin and the rest of the crew that worked on *Chernobyl*, but Legasov, Dyatlov, Ignatenko, and many others whose memories were lifted from different sources and bent just enough out of shape to perfectly illustrate a political war between truth and lies – a process that we can see has turned their stories into a "common property,"[402] in a way that "amplifie[d] the logic of the exemplum,"[403] which was the concept of a pure scientific truth being politically eroded or masked by narrative lies.

As such, it can also reasonably be said that *Chernobyl* makes its own (though not necessarily original) contributions to wider nuclear safety imaginaries – from the dichotomy between a narrowly defined scientific "truth" and narrative "lies" to the reduction of real people's complex experiences of the disaster into narrative props to convey its primary political message about the great social costs of political lies. In this way, *Chernobyl* serves to illustrate some of the concerns previously outlined by radiation invisibility politics scholarship as well as risk society and risk communication studies, and even theoretical debates about the role of the non-expert citizen in scientific knowledge production and the mobilization of this concept in the wake of the Fukushima Daiichi disaster to collect radiation data. More specifically, it echoes the findings of Kyoko Sato, who studied the social imaginaries that emerged in Japan after the nuclear meltdowns of 2011, according to which "the key issues are not simply whether we want nuclear energy or not and how to proceed with the decision we make; it is also about whether we want a society that exploits and neglects the vulnerable, as

401 Maria Mäkelä, "Viral Storytelling as Contemporary Narrative Didacticism Deriving Universal Truths from Arbitrary Narratives of Personal Experience," *The Ethos of Digital Environments: Technology, Literary Theory and Philosophy*, Eds. Susanna Lindberg & HannaRiikka Roine (Abingdon: Routledge, 2021), 52.
402 *Ibid*., 53.
403 *Ibid*., 55.

well as about how we make decisions as a democratic society,"[404] – thereby also reflecting nuclear ethics scholarship for which knowledge is seen as a "protection against any person or group who might attempt to withhold, misrepresent, or manipulate information that is necessary for people to protect themselves,"[405] and withholding information "puts [individuals and communities] in a position where they can be exploited or exposed to unwarranted risks or burdens for the benefit of others,"[406]

As a component of the wider nuclear safety imaginaries that will go on to inform radiation protection policies, particularly as dialogue is increasingly opened to stakeholders outside of government and nuclear industry bodies to better understand alternative understandings of radiation risk, it is therefore important to formulate and answer narrative ethics questions in consideration of how to better approach this reality for future disaster preparation and response. For instance, the ethical grid imposed by *Chernobyl* on both scientific inquiry and the real world survivors of disaster, based on the dichotomy between scientific truth and narrative lies, creates an ethical contradiction that David Richter might call narrative hypocrisy, as outlined in his description of a "bad" non-fiction film: "[a] bad one may involve ethical cheating […] a nearly universal form of hypocrisy, […] a show of lofty motives (moral, political or religious) while inviting us to court our own degradation and that of others as we become involved in the lengthy and graphic representation of brutal rape or revenge killing or torture".[407] Although the audience is not invited to perform any of the latter acts, *Chernobyl* does explicitly invite it to partake in an imaginary quest for a liberating "truth" that caricatures the people involved in the political conflict it describes, because of its narrow definitions of "truth" and "lie".

As previously outlined, Mazin has repeatedly and clearly stated that he himself relies on narrative to convey an approximate truth about narrative lies. Pointing out that

404 Kyoko Sato, "Japan's nuclear imaginaries before and after Fukushima: visions of science, technology, and society," *Resilience: A New Paradigm of Nuclear Safety: From Accident Mitigation to Resilient Society Facing Extreme Situations,* eds. Joonhong Ahn, Franck Guarnieri and Kazuo Furuta, (Springer, 2017), 204.

405 Kristin Shrader-Frechette, "Rights to Know and the Fukushima, Chernobyl and Three Mile Island Accidents," *The Ethics of Nuclear Energy: Risk, Justice, and Democracy in the post-Fukushima Era,* eds. Benham Taebi and Sabine Roeser (Cambridge University Press, 2015), 53.

406 Bindu Panikkar and Ronald Sandler, "Nuclear energy, justice, and power: the case of the Pilgrim Nuclear Power Station license renewal,' *The Ethics of Nuclear Energy: Risk, Justice, and Democracy in the post-Fukushima Era,* eds. Benham Taebi and Sabine Roeser (Cambridge University Press, 2015) 153.

407 *Ibid*., 143.

viewers can feel strongly moved by such scenes while at the same time consciously uncertain of the veracity of the event being portrayed in a non-fiction retelling of the past, Serhii Plokhy asks what role the "bridge of death" scene could possibly play in a story about the war between truth and lies. Craig Mazin's response was that it was "historically justified" despite striving to avoid "committing the same crimes" of selling untruths to the general public, because people knew very little about nuclear power and radiation – and thus, many were in fact watching the fire burning that evening from a variety of locations, resuming life as usual the following day, unassumingly getting exposed and ill. Therefore, the writer's reasoning is that this scene accurately reflects this general "phenomenon," which his interviewer confirms, before adding that "the most important thing is to present that people are exposed."[408]

In her analysis of *Chernobyl*'s central thesis, and despite finding that "series is misleading and reinforces a simple, whiggish explanation for what historians of technology have long since shown to be complex, nuanced processes," Schmid suggests that "*Chernobyl* and its incredible cinematography can serve as a key to unlock people's curiosity, so that historians can offer them more details when they're ready to engage with a more mature understanding of the disaster, and the history of nuclear energy writ large."[409] However, like the nuanced processes elided by *Chernobyl*'s dichotomy between scientific truth and narrative lies, this expectation must be mitigated by the narrative ethics considerations explored in the next chapter, which studies how the moralized framework used to "generate genuine passion" through its convincing cinematography can also vehiculate the less desirable aspects of common nuclear safety imaginaries.

408 Craig Mazin, interviewed by Serhii Plokhy, "What Is the Cost of Lies: HBO's Chernobyl," Youtube video, 1:34:52, posted by "Ukrainian Research Institute Harvard University," April 24, 2020, accessed February 01, 2024, https://www.youtube.com/watch?v=EbRGWRNZUuI&feature=emb_title, 9:05 to 15:02.

409 Schmid, "*Chernobyl* the TV Series," 1160.

# Chapter 5 – Authenticating radiation: The realist drive for authenticity in nuclear fiction.

In this chapter, I continue my narrative ethics analysis of HBO's *Chernobyl* (2019) as a pop-culture narrative feeding into wider nuclear safety imaginaries, by concentrating on the paradoxical use of artifice to create the illusion of historical and scientific authenticity, and the ethical questions that arise when addressing the traumatic experiences of nuclear disaster victims and survivors.

In light of the previous chapter's analysis of the moralized representations of a scientific truth and of narrative lies in *Chernobyl*, it should be clearly stated that Mazin's work makes no effort to engage in philosophical or artistic debates surrounding the nature of reality, history or representation – thereby reflecting some of the primary limitations of non-fiction films outlined by David Richter. Indeed, the non-fiction film cannot easily or clearly present conflicting evidence or multiple motives the way that written texts can, nor can it resemble the "shapeless chronicles" full of loose-ends that written histories can be – and most importantly, "the conventions of non-fiction film almost require that any skepticism about the efficacy or morality of what the protagonists do be dramatized by characters within the film,"[410] as demonstrated in the previous chapter. Mazin himself has noted in interviews that his historical dramatization of the Chernobyl catastrophe is a narrative lie like any other,[411] but this is not self-consciously reflected anywhere within the series itself. Instead, the realist style of *Chernobyl* is used to convey a truth in and of itself by making appeals to authenticity, in the barest sense of the term.

Going by the ontological[412] assumptions set by the mini-series itself, this means that appeals to authenticity in *Chernobyl* are part of a larger attempt at "proving" what was real during the catastrophe (scientific or empirical truth), and distinguishing this from what was unreal (narrative lies). Mazin's prolific research into primary historical and scientific sources as well as soviet scholarship regarding the series' setting – which

410 Richter, "Keeping Company in Hollywood," 143-144.

411 Craig Mazin, interviewed by Emily Van Der Werff, "HBO's *Chernobyl* is a terrific miniseries. Its writer hopes you don't think it's the whole truth," *Vox,* June 04, 2019.

412 By which I mean assumptions about the nature of reality and the associated beliefs about how one might go about ascertaining it.

we will look at more closely in this chapter – reflects this approach to story-telling and perhaps, on a personal level, reflects the writer's training as a psychologist at Princeton University. The interest his work has generated among political think-tanks and academics in Russian or Ukrainian Studies in the USA,[413] including among his *alma mater*,[414] suggests that these appeals were convincing.

This approach breaks with the writing style that Jean Baudrillard's describes as "hyperreality", appealing to many writers since the 1990s who felt that the turn of the century was "a time of ontological distortion and realignment"[415]: "The hyperreal cinema of the 1990s conceives of the movie screen as neither a window on a preexisting social reality (realism) nor a wormhole into a fantastic dream-dimension (escapism), but as an arena in which images and reality exchange masks, blend into one another, and challenge the philosophical premises that differentiate them from each other."[416]

Though clearly distinct from previous explorations of the divide between the real and the not real, *Chernobyl* certainly echoes the sentiment that prevailed at the end of the Cold War, in the world of American cinema: "At the same time that American society experienced the sense that established polar narratives of good versus evil fell along with the Berlin Wall, technological innovations such as cloning, virtual reality, 24-hour cable news channels, the Internet, and CGI cinematography all seemed to operate simultaneously to collapse other polar narratives such as real versus illusory, original versus derivative, and authentic versus artificial."[417] As I will show in this

413 Craig Mazin, hosted by William Pomeranz, "Chernobyl: Screening and Conversation with Creator Craig Mazin," *The History of Chernobyl: 35 Years Later*, Wilson Center Kennan Institute, online, accessed March 20, 2023, https://www.wilsoncenter.org/event/chernobyl-screening-and-conversation-creator-craig-mazin. Ukrainian Research Institute at Harvard University, "What Is the Cost of Lies: HBO's Chernobyl," Youtube video, 1:34:52, posted by "Ukrainian Research Institute Harvard University," April 24, 2020, accessed November 30, 2022, https://www.youtube.com/watch?v=EbRGWRNZUuI&feature=emb_title. The event at the Wilson Center took place on 26 June 2019 and was sponsored by the Kennan Institute of the Woodrow Wilson International Center for Scholars (a political think tank based in Washington D.C.) Likewise, the Ukrainian Research Institute at Harvard University's Davis Center for Russian and Eurasian Studies hosted Mazin for a talk with Serhii Plokhy (Director of the Ukrainian Research Institute, Professor of Ukrainian History at Harvard University and Faculty Associate at the Davis Center) on April 24, 2020.

414 Kris Hristov, "Chernobyl miniseries creator Craig Mazin '92 discusses Soviet history, art of screenwriting," *The Princetonian,* April 12, 2020, https://www.dailyprincetonian.com/article/2020/04/mazin-talk-soviet-history-screen writing. Princeton's newspaper describes a talk with Craig Mazin hosted by Michael Reynolds, director of the university's program in Russian, East European and Eurasian Studies and associate professor in the Department of Near Eastern Studies as well as Creative Writing Lecturer Susanna Styron.

415 Randy Laist, *Cinema of Simulation: Hyperreal Hollywood in the Long 1990s* (Bloomsbury Publishing USA, 2015), 3.

416 *Ibid*., 4.

417 *Ibid*., 2.

chapter, Mazin's style of realism and the ethical issues it incurs are part of "the story we are currently swept up in, and the definitive mass-narratives that expressed the zeitgeist of that period are the founding texts of our own contemporary self-understanding."[418]

Extending Booth's ethics of fiction to the area of non-fiction film, meaning those "biographical and historical films that dramatize actual events in the lives of real people but use professional actors to represent the agents,"[419] Richter argues that the medium itself imposes enough limitations that it necessarily leads to important ethical issues – hence his interest in exploring "the ethical issues that arise out of the differences between the genres of history and historical film, biography and biopic".[420] Thus, he proposes an "ethics of representation", which he considers to be "a special aspect of the ethics of the told that stems from the historian's obligation to factual truth rather than mere consistency and coherence in the story line, or one of the many mythical versions of truth".[421]

Going forward, I will treat Mazin's realist style as an attempt at producing a "truth". The external paratextual framing of this story – in the form of interviews with popular media outlets, talks given in academic or political settings and self-produced podcasts on Youtube – can be interpreted as an extension of this storytelling style. A topic of debate in the study of such public epitexts, to borrow loosely from Gérard Genette's classification of literary paratexts,[422] has been the notion of authorial intent. In the case of film paratexts, this has been complicated by "the sense that the usually large division of labor during the production of a film makes it rather difficult to attribute the work to one single author."[423] *Chernobyl* therefore presents an interesting case of modern storytelling, whereby the main writer explicitly takes on authorial responsibility by delving into his (and the film crew's) creative processes in official podcasts and traditional media interviews. Rather than reflecting on omissions or half truths within the narrative of *Chernobyl* itself, Mazin addresses them in external discursive contexts, thereby preserving the illusion of an objective reality within the primary narrative.

418 *Ibid*., 5.
419 Richter, "Keeping Company in Hollywood," 140.
420 *Ibid*., 141.
421 *Ibid*.
422 Gérard Genette, *Paratexts: Thresholds of Interpretation*, Trans. Jane E. Lewin (Cambridge University Press, 2009), 344-370.
423 Cornelia Klecker, "The other kind of film frames: a research report on paratexts in film," *Word & Image* 31, n°4 (October, 2015): 403-404.

This specific form of paratext, which "flow[s] between the gaps of textual exhibition, or that come[s] to us "during" or "after" viewing, working to police certain reading strategies," is referred to as *in media res* paratexts by Jonathan Gray,[424] who suggests that they may "surround even nonfictional programming with greater aura and authenticity, thus attempting to increase such programs moral and civic value," through not only DVD bonus materials such as director interviews, but also "the fetishistic invocation by any number of news programs of their websites or blogs, an act which draws attention to the supposed excess of facts, information, and opinion that they can marshal, and suggests a mastery of news and an overflowing concern for their citizen-viewer."[425] Paratexts even allow films such as *Cannibal Holocaust* "to alter the cultural perceptions of a narrative and reappraise it within a previously unavailable and impenetrable cinematic environs."[426] Thus, these additional sources are being studied alongside *Chernobyl* in order to give a wider context for the ideas explored in the series, and to illuminate ways in which nuclear narratives and wider discourse become entwined to bridge the divide between fiction and policy in overarching imaginaries – particularly in the age of social media story sharing.

In this area, narrative ethics scholars such as Maria Mäkelä et al. are concerned that "distinction between fact, fiction, and lying is not sufficiently cared for"[427] as their work demonstrates how "even when challenged by subsequent evidence, the initial interpretation and affective reactions may persist and lead to normative conclusions and political action".[428] This is particularly relevant to considering the impact of non-fiction representations of past nuclear disasters on nuclear safety or radiation safety imaginaries.

## 5.1 Illusory 'authenticity' and ontological realism – Striving for "pastness" in historical fiction

Briefly touched upon in the last chapter, Craig Mazin's retelling of the Chernobyl nuclear disaster fits squarely in the register of realism, as it attempts to reproduce what

424 Jonathan Gray, *Show sold separately: promos, spoilers, and other media paratexts* (New York University Press, 2010), 23.
425 *Ibid*., 83.
426 Simon Hobbs, "*Cannibal Holocaust*: The Paratextual (Re)construction of History," *Popular media cultures: fans, audiences and paratexts*, Ed. Lincoln Geraghty (University of Portsmouth, 2015), 143.
427 Mäkelä et al., "Dangers of Narrative," 155.
428 *Ibid*., 154.

it purports to be a true history (or at least part of it). It is on the basis of the "ethics of representation" that Richter observes: "[h]istorians and biographers make a statement or argue a position about the past that will be relevant to the readers of their own time and the same goes for nonfiction film". Therefore, "[h]istory film is historiography with the special powers and limitations of film."

As Jerome de Groot also explains in his study of historical fictions, *Remaking History*: "the historical mode in most cultural representation, and particularly in the novel form, is realist: that is, it is written in an egalitarian style that addresses a kind of imagined authenticity. The style and tone are generally buttressed by a series of statements and paratextual apparatuses that support the "realism" and therefore address a kind of truth that the texts make."[429] In the case of this present analysis, I will be focusing on such paratexts – interviews, specialized academic talks and podcasts given by the writer and people who have worked closely with him, in particular. Craig Mazin identifying himself as the author of *Chernobyl*'s text and intentionally guiding the public reception of his series and the themes therein makes taking into consideration the paratextual framing of the series all the more relevant.

The realism of *Chernobyl* contrasts sharply with Socialist Realism – a movement originating in, and upheld by, the Soviet regime under Stalin's leadership. One of the principle tenets of Socialist Realism was that literature and other art forms should strive to be "truthful",[430] and yet remained highly idealistic. For a while, socialist realism might have been disparaged as "an oddity of the cultural situation of the Soviet bloc."[431] Some of its artefacts are shown in *Chernobyl*, and are used to turn their messages on their heads – such as the Blacksmiths of Modernity mosaic, which glorifies workers' contributions to Soviet society, almost deifying them by depicting them forging a brilliant star (representing nuclear energy), while the rest of the series follows how the Soviet State must resort to sacrificing them for its own mistakes. As such, this makes Mazin's realist style more in line with Social Realism, as it attempts to highlight the struggles of the working class under Soviet rule.

429 Jerome De Groot, *Remaking History: The past in contemporary historical fictions* (London: Routledge, 2016), 30.

430 Petre Petrov, "The Industry of Truing: Socialist Realism, Reality, Realization," *Slavic Review* 7, n° 4 (2011): 873.

431 Rene Wellek, "The Concept of Realism in Literary Scholarship," *Neophilologus* 45, n°1 (1961): 1.

The realism in *Chernobyl* is used by the series writer to distinguish his work (as best as possible) from fiction – that is to say, borrowing from Mazin's dichotomy between truth and narrative, to cement it as a 'truth'. In the third podcast, for instance, he explains that a scene about Dyatlov's past was cut from the final product because flashbacks made the series feel too close to fiction: "To flash back in time, or to have any kind of hallucinatory vision, seemed a little bit more out of the world of a normal fictional television series and less our world. We were so engrossed in the real, that it just kinda threw us out of our rhythm, so we ended up removing it."

The "para-textual apparatuses" of *Chernobyl* are the writer's numerous interviews and lengthy companion podcasts, which ultimately serve to provide the wider public with his sources and the reasons for his occasional departures from those sources, further cementing the realism (and thus authenticity) of his work. As Jerome de Groot remarks in his study of historical fiction – which argues that many of its tropes are a result of the belief in a true and knowable past: "The "historical note" and its paratextual kin illustrate the writers' need to situate their ethical standpoint and to outline how they relate to history, their sense of responsibility to the past, and how they articulate something fictive out of source material that cleaves to a kind of truth. […] [Sarah Walters] like most of her peers, seeks not to misrepresent. This implies that history itself –the set of ideas, sources, evidence, and narratives that "tell" the past –is not already a misrepresentation."[432]

Interestingly, *Chernobyl*'s narrative both results from this particular understanding of the past and knowledge, and promotes it through moralized discourse. This moralization also finds its way into the aforementioned para-textual apparatuses, since Mazin explains his narrative ethics in multiple interviews: "At times I thought, *Well, there's a difference between the perfect way of doing something in terms of historical accuracy, and the perfect way of doing something so that people will watch it and appreciate what matters*. You can't have both, at least in that format. [...] And I was only able to kind of assuage myself by knowing that I was going to talk freely about it to people, so that they knew."[433]

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432 De Groot, *Remaking History*, 31-32.

433 Drew Schwartz, "Craig Mazin's Years-Long Obsession with Making "Chernobyl" Terrifyingly Accurate," *Vice Media*, Jun 04, 2019, https://www.vice.com/en/article/j5wbq4/craig-mazin-interview-about-chernobyl-hbo-miniseries-on-how-accurate-and-what-really-happened.

Such statements further reinforce the argument that a fictional retelling of the past, or even use of the past as a setting for ahistorical drama, slips into the realm of historiography, as "historiography always purports to be referential" and "there are many degrees and notions of reference."[434] Consequently, Mazin lists the numerous different sources he used to back up his writings, on several occasions. Among the most detailed accounts are from a 2019 interview with *Vice*'s Drew Schwartz, in which he echoes Legasov's words on seeking "truth" in the opening of the miniseries: "I used as many sources as I could find. I was looking at research articles in scientific journals; I was looking at governmental reports; I was looking at books written by former Soviet scientists who were at Chernobyl; I was reading books by Western historians who had looked at Chernobyl. I watched documentaries; I read first-person documents. And then there was *Voices From Chernobyl,* which is unique."[435]

Similarly, he emphasises the guidance he received from his Eastern European crew members, whose experiences growing up in the Soviet block are consequently implied to be a source of authentic, or realistic, knowledge of the series' setting: "We did have the advantage of producing this show largely in Lithuania, which is a former Soviet Socialist Republic. We also shot a little bit in Kiev, [Ukraine], and in Moscow. Our crew was 90 percent Eastern European. Many of them were old enough to have been Soviet citizens themselves."[436]

On a separate occasion he explains how this particular type of knowledge "kept us honest,"[437] a notion that comes up a number of times to describe his writing and cinematographic choices. For instance, in the first companion podcast of the series, Mazin admits that he wanted an understated music score in order to allow the viewer to "feel" things about the story "honestly." Mazin's stated investment in realism, or in "the real," is associated with the concept of "honesty" more than once, underlining again that the narrative of Chernobyl is an attempt at truthfulness – and thus part of the idealized quest the series' characters embark on. The concern for honesty, which is a behaviour motivated by moral and ontological convictions rather than a mechanical reaction to

434 Philip Rosen, *Change Mummified: Cinema, Historicity, Theory* (Minneapolis: University of Minnesota Press, 2001), 7.

435 Schwartz, "Craig Mazin's Years-Long Obsession," 2019.

436 Van Der Werff, "HBO's Chernobyl is a terrific miniseries," 2019.

437 Joe Utichi, ""Chernobyl": Craig Mazin Digs Deep On His Landmark Series And Its Modern Resonance – "It's Not Us And Them. We Have An Us Problem"," *Deadline*, Aug 14, 2019, https://deadline.com/2019/08/chernobyl-creator-craig-mazin-emmys-hbo-interview-news-1202666703/.

"truth," appears to be a fundamental dimension of authenticity and its use in representing the past, bringing back to mind the suture identified in the previous chapter, which invited viewers to partake in Legasov's, and perhaps Mazin's, quest for truth, further underlining the moral dimension of our paradigms of reality.

As we have seen, realism is not just a narrative style, it is the expression of a belief in certain forms of knowledge: reality is objective, the past is knowable, etc. Jerome de Groot's study, *Remaking History*, demonstrates how this perception underpins many works of historical fiction, and how this can influence our perceptions of the past – acting as a type of historiography, as suggested by Richter.

As a re-telling of past events, *Chernobyl* features a number of creative decisions, blurring the line between reality and fiction. Like many other historical fictions, which "engage with tropes of pastness and, in doing so, articulate a historiographical sensibility,"[438] it partakes in the construction of collective memories and imaginaries of nuclear disaster. Paradoxically, however, this is achieved through the use of artifice to create the aforementioned "imagined authenticity" of historical fictions.

Authenticity itself is a concept with several layers of meaning. According to Charles Taylor: "[Authenticity] is a child of the Romantic period, which was critical of disengaged rationality and of an atomism that didn't recognize the ties of community"[439] and "I am realizing a potentiality that is properly my own. This is the background understanding of the modern ideal of authenticity, and to the goals of self-fulfilment or self-realization in which it is usually couched. This is the background that gives moral force to the culture of authenticity, including its most degraded, absurd, or trivialized forms."[440] In studies of consumerism, it can refer to the means by which the consumer validates his or her sense of identity – through the illusion of control or of acting as a social or moral agent.[441] In studies of film tourism, tourists are observed as "seeking some form or aspect of authenticity that makes sense to them, that they can relate back to the actual film and experience that first motivated them."[442]

438 De Groot, *Remaking History*, 3.
439 Charles Taylor, *The Ethics of Authenticity* (Harvard University Press, 1992), 25.
440 *Ibid*., 29.
441 Michael B. Beverland and Francis J. Farrelly, "The Quest for Authenticity in Consumption: Consumers' Purposive Choice of Authentic Cues to Shape Experienced Outcome," *Journal of Consumer Research* 36, n°5 (2010): 846.
442 Peter Bolan, Stephen Boy and Jim Bell, '"We've seen it in the movies, let's see if it's true: Authenticity and displacement in film-induced tourism," *Worldwide Hospitality and Tourism Themes* 3, n°2 (2011): 111.

In film studies, appeals to authenticity (such as recreating the visual ambience of a period painting) have been argued as "add[ing] to the credibility and genuine historicity of the film only insofar as they are connected to the values and habits of a period and are used with some discernment about their truth status."[443] According to this particular view: "Authenticity can be obtained only when it is derived from such an understanding. This means using painting to suggest rather than prescribe a period's way of seeing, and it means playing off one painter's visual construction against another's and against other quite different sources for the way people have perceived their world – even using them to subvert each other."[444] This type of assertion regarding the artistic merit of a work of art or fiction is itself based on ontological assumptions, and does nothing to help analyse the use of similar appeals to authenticity in works such as *Chernobyl*, which appear to be based on a different set of assumptions.

Here, authenticity and authentication are used in their barest sense, as a means of distinguishing a supposedly objective reality from the unreal. However, in the realm of history "there might be different approaches to historiography, and in any given context, only a certain mode or range of modes of historiography is likely to be conceived as legitimate. Thus, different modes of writing history often imply different ways of conceiving of or understanding history. There may also be a variety of conceptions of relations between historiography and history, which means a variety of historicities"[445] where historicity is the combination of historiography "the writing of history" and history "the actual past."[446]

An example of the collision between the past and "pastness" in *Chernobyl* is the public conversation surrounding the helicopter crash scene in episode two. This event did not really occur, and instead was inspired by a helicopter crash that took place weeks later – as many news outlets were quick to point out.[447] Attempts to distinguish

443 Natalie Z. Davis, ""Any Resemblance to Persons Living or Dead': film and the challenge of authenticity," *Historical Journal of Film, Radio and Television* 8, n° 3 (1988): 273.

444 *Ibid*., 272.

445 Rosen, *Change Mummified* (2001), 7.

446 *Ibid*, p. 6.

447 Jim Smith, "10 Times HBO's "Chernobyl" Got the Science Wrong," *Live Science,* June 21, 2019, https://www.livescience.com/65766-chernobyl-series-science-wrong.html. Aria Bendix, "HBO's "Chernobyl" just won 10 Emmys — here's what it gets right (and wrong) about the world's worst nuclear power plant accident," *Business Insider*, Sep 23, 2019, https://www.businessinsider.com/chernobyl-hbo-whats-true-myths-2019-5?r=US&IR=T#myth-a-helicopter-crashed-shortly-after-the-explosion-7. Emily Sakzewski, "How does HBO's series *Chernobyl* differ from real events?" *ABC News,* June 17, 2019, https://www.abc.net.au/news/2019-06-18/how-hbos-chernobyl-differs-from-the-real-nuclear-disaster/11184328. Michael Schellenberger,

between facts as presented in *Chernobyl* and facts as documented during or after the catastrophe itself have thus inadvertently underlined this relationship between the unknowable past and more accessible visions of "pastness."

What is it, then, that makes *Chernobyl* a "re-telling of the past"? The "pastness" of the series is achieved through a wide range of production and editing choices, such as reconstructing scenes that had been recorded at the time of the incident. In other words, frames from the miniseries can be directly compared to historical shots of the Chernobyl disaster, lending itself to a form of authentication through visual similitude. This technique has a long history of application in film with historical settings: "The use of paintings from the past is another element in the common discourse about film authenticity. […] colors, light, and composition drawn from paintings now represent the 'realities' of their time. Certainly, this enhances the beauty of the film and allows the audience the pleasure of recognition."[448]

The use of historical photographs to create a visual facsimile of the past has indeed generated significant attention from popular media, which have turned appraisal of the miniseries into a virtual exhibition of artefacts from the actual event.[449] Maxim Trudolyubov, a Senior Advisor at the Kennan Institute and the Editor-In-Chief of *The Russia File*, has said himself in an interview on a *KennanX* podcast to discuss the Chernobyl meltdown, and to which Craig Mazin and Serhii Plokhy had also been invited: "Watching those pictures – it's like watching old photos from childhood. In my case, it's just this. Those are photos from my childhood. Even the colour of the photos is well done, and the photography is excellent. […] I wouldn't think that foreigners of any kind, and Westerners, would be able to reproduce this reality so faithfully."[450] But, can only "pleasure" be inferred from this interest?

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"Why HBO's "Chernobyl" Gets Nuclear So Wrong," *Forbes*, June 06, 2019, https://www.forbes.com/sites/michaelshellenberger/2019/06/06/why-hbos-chernobyl-gets-nuclear-so-wrong/.

448 Davis, ""Any Resemblance to Persons Living or Dead"," 271-272.

449 Valentina Resetarits and Ruqqayah Moynihan, "These photos show just how true to the real-life disaster HBO's "Chernobyl" series is," *Business Insider*, June 13, 2019, https://www.insider.com/photos-show-how-true-to-real-life-chernobyl-series-was-2019-6. "Scenes from HBO's Chernobyl compared to real-life footage shot in Pripyat, 1986," *Far Out Magazine*. June 14, 2019, https://faroutmagazine.co.uk/chernobyl-real-life-footage-pripyat-now-1986/.

450 Maxim Trudolyubov, interviewed by Jill Dougherty, "Meltdown," Wilson Center Kennan Institute: *KennanX*, podcast audio, January 9, 2020, 11:35 to 12:10, last accessed March 01, 2024, https://www.wilsoncenter.org/audio/kennanx-podcast-episode-1meltdown.

Craig Mazin singled out and elevated the social media comments of Slava Malamud in the series' sixth and final companion podcast, for having commented on everything he perceived as accurately or inaccurately portrayed in the series. The fact that Slava Malamud grew up in the USSR serves as further authentication of the "pastness" represented in *Chernobyl*.[451] Mäkelä et al.'s concept of the *viral exemplum* is particularly relevant here as this instance of social media engagement consists of creating that sense of experientiality in the chain of representativeness to normativity – which is to say, passing off fiction as real experience in a nearly irreversible process of (often-times politically) curating the online public's sense of reality.[452]

These perceptions of authenticity were not only based on convincingly imitating photographs taken at the time of the disaster, however – the film crew carefully selected costumes, props and locations in order to maintain this illusion of "pastness". This was further reinforced by *Chernobyl's* use of ambient colours and harsh shadows, as the entire mini-series is filmed under off-kilter lights and treated to reduce warmth. Jakob Ihre, the cinematographer working with Craig Mazin on *Chernobyl*, for instance explains that: "Many times there is a hard light hitting the actors' faces, and that is partly based on the practical […] The glass and the bulbs were all clear glass bulbs. […] Many of the lampshades were not made of cloth but made of hard metal. This created a certain light and in the same room there could be a fluorescent tube, in a soviet apartment, which caused a kind of green tint, mixed with the tungsten light from a clear glass bulb."[453] The chiaroscuro effect this type of lighting produces is, fittingly, a hallmark of the film noir, echoing the investigative nature of the plot and accentuating its dark tone, the shadows bringing into sharp relief the flaws, rubble and grime that might otherwise pass unnoticed.

As for the colours, an interview with Jean-Clément Soret, the series' colourist, reveals that "[t]he brief was to be respectful of the aesthetic of the era and also the Soviet Union eighties. We had the archives to work from, but wanted to improve on that colour palette. At the same time, it had to be high-end, so we were treading a fine line

451 Slava Malamud (@SlavaMalamud), "I have just finished watching Episode 1 of Chernobyl on @HBO My perspective is that of someone born in raised in the Soviet Union who has vivid memories of 1986, the catastrophe itself and how it was handled by the Soviet politicians and the state media..." *Twitter*, May 24, 2019, 10:05pm, https://twitter.com/SlavaMalamud/status/1132029943297265664.

452 Mäkelä et al., "Dangers of Narrative," 154.

453 Cooke Optics, "The Cinematography of Chernobyl || Case Study," Youtube Video, 7:14, November 28, 2019, https://www.youtube.com/watch?v=pgZSGZg0qK4.

between the temptation of desaturation, for instance, but then it wouldn't look as nice, so you'd have to make it not too beautiful. This was particularly true of sunny exterior scenes, where we were careful not to make them too warm. We kept them quite cold to enhance the effect."[454] He further explains that the visuals of *Chernobyl* "had to be a bit scary so you avoided warm tones."[455] Though evocative of the cold and restricted palettes of many horror films, this visual decision also partakes in a long cinematic tradition of portraying soviet societies as devoid of colour, and thus integrates the series in an established line of "historiographical sensibility."

Indeed, in Krisztina Fehervary's brief assessment of Soviet material culture as portrayed through literature and cinema, she notes that "popular accounts continue to depict the Soviet bloc as gray and colorless," wherein "color becomes a powerful tool for legitimating not only capitalism, but democratic governance as well."[456] Furthermore, she delineates two major versions of imagined Soviet greyness. The first, and perhaps "western," version serves to contrast the Eastern Block with "the pleasures and possibilities of capitalist consumption, of human value as indexed by access to abundant and luxurious consumer goods and environments."[457] The second, and perhaps Eastern European version, "is iconic, not of deprivation, but of political repression."[458] As such, when Sagal comments in the first companion podcast that the lighting in *Chernobyl* serves to underline its "gritty realism" Mazin agrees and replies that it is "Soviet. By design."

The realist discourse evoked by Craig Mazin when describing film-direction decisions is also prevalent in descriptions of the cinematography and post-production treatment itself. Ihre explains that: "we didn't try to have any – kind of a – cinematic approach to telling the story. We tried to be as real in many ways. […] You feel at least, the decisions you make are – are true, in many ways. We could have gone different ways in the look of the film, but it was very much based on facts." Regarding the lighting in particular, he asserts: "The research made us make these decisions on how

454 Matt Pluck, "Nuclear Fusion," *Definition Magazine*, accessed: Mar 23, 2023, https://definitionmagazine.com/features/ nuclear-fusion/.
455 *Ibid*.
456 Krisztina Fehervary, "Goods and States: The Political Logic of State-Socialist Material Culture," *Comparative Studies in Society and History* 51, n°2 (2012): 426-427.
457 *Ibid*.
458 *Ibid*.

the film should look like."[459] Likewise, Soret mentions: "It would have been very easy to put a wash of green or yellow on all the scenes, but we resisted that to keep it inside a certain realism."[460]

The sense of pastness serves in effect to ramify the author's claim to realistic portrayals of not only the past, but also of everything in it – from Soviet politics to nuclear engineering. This sought-after sense of authenticity can therefore be extended to portrayals of nuclear materials and themes of nuclear safety addressed in the previous chapters, including the stigmas faced by nuclear disaster survivors.

## 5.2 Nuclear disaster survivors as collateral damage in the quest for authenticity.

Mazin's concern for honesty is not necessarily restricted to the series' approach to history: Indeed, the author also refers to his scientific sources in interviews and explains his interest in getting at least some of the science right (by which he mostly means nuclear physics). As a result, he employs artifice again, to craft the illusion of authentic representations of nuclear radiation and its effects. This is primarily achieved through the visual and verbal illustrations of cause and effect relationships.

Similarly, it can be argued that *Chernobyl*'s narrative relies on the construction of causal relationships in order for viewers to make sense of the events presented to them, particularly where radiation is concerned. There are multiple incidences, throughout *Chernobyl*, that illustrate the perceived relationships between cause and effect and how this influences the direction and possible interpretations of a narrative on nuclear disasters. The most significant of these is the relationship implicitly drawn between the Chernobyl meltdown and the collapse of the USSR. As remarked in the previous chapter, Gorbachev himself links the catastrophe to the dissolution of the Soviet block just a few years later. The series implicitly frames this downfall as yet another poor outcome of a socio-political system rooted in lies, essentially identifying the Soviet State as the cause of the meltdown.

A smaller-scale illustration of this type of relationship is the helicopter crash scene in the second episode, when Valery Legasov and Boris Shcherbina go to

459 Cooke Optics, "The Cinematography of Chernobyl."
460 Pluck, "Nuclear Fusion."

Chernobyl to investigate the explosion. After a primary assessment of the damage, Legasov recommends that the smouldering reactor be extinguished with a mixture of sand and boron, warning that vehicles and people approaching too closely would be severely affected by the radiation and possibly dysfunction or die. Despite these warnings, the first helicopter to make a drop flies into the core's radioactive plume. Upon re-emerging, and to the horror of the scene's onlookers, it falls apart mid-air.

This chosen sequence of events suggests that the primary culprit of the crash was the radioactive smoke. However, watching this scene closely reveals that the helicopter crashes after one of its blades collides with a nearby construction crane, as it had in the case of the real crash – but the scenario and visuals are set up to direct the audience's attention to the smoke, as the visual carrier of nuclear radiation.

The helicopter's passage through the pillar of smoke is drawn out, remaining obscured for a long enough period to heighten the dramatic tension of the scene, as all the characters present are shown waiting with concern for its re-emergence. The tower of smoke dominates most of the shots during this scene – by its size and by its darkness, which contrasts sharply with the pale greys of the sky and the buildings surrounding it. The yellow crane, however, stands in the periphery – when shown at all. When the accident occurs, the shot is so wide that the crane line the helicopter crashes into is hardly visible. But who was the real culprit, in the end? Was it the crane, which we see the helicopter blades catch? Or, was it the radiation which the protagonist (who has been established as a trustworthy paragon of truth) told the miniseries' audience might destroy the machinery?

Legasov's explanation that radiation might interfere with the helicopter's functions constitutes a general causal claim, which is to say that Legasov was suggesting that high levels of radiation destroys machinery as a general rule. Once the crash has occurred, however, it is in the process of becoming singular or particular causal claim, meaning that radiation was *a* or *the* cause of this particular helicopter crash. Mazin's own explanation for the helicopter crash scene was that he "wanted people to know that this was one of the hazards that these pilots were dealing with—an open reactor—radiation was flying over it,"[461] demonstrating that it is the radioactive smoke that was the guilty party in this scene, rather than flying directly into a physical

461 Evan Romano, "How "Chernobyl" Pulled Off That Shocking Helicopter Crash," *Men's Health*, May 14, 2019, https://www.menshealth.com/entertainment/a27458324/chernobyl-helicopter-crash-hbo/.

object due to low visibility. Such changes in the portrayal of real events are meant to heighten the stakes of the scientific protagonists' decisions, and also highlight the horror of nuclear radiation by showing a sequence of events that appears unnatural (the helicopter appears stopped and bent by an unknowable, invisible force – a modern horror-story monster, as will be explored in another section of this chapter).

Another example of the construction of causal relationships in portrayals of a nuclear past, is from the third companion podcast, when Mazin and Sagal discuss scenes of Dyatlov's past – about his son, who died of leukaemia at age 10, in particular. "The details are a little skimpy, but we know at least that much. We also know that Dyatlov, at the time, was working at a naval station near Siberia, helping construct nuclear submarines. […] And there was an accident! Which – he was cleared of wrong-doing, but he was involved, and he received, by the way, in the accident, allegedly, a near-fatal dose of radiation, and yet survived. His son, however, shortly thereafter got leukaemia and died. The question is: Are these two things related? So one possibility is that the clothing that Dyatlov was wearing, that he took home – any contamination therein – may have actually led to his own son's death." Here, Mazin makes a tentative causal claim.

Though this part of the story was eventually cut out of the miniseries before airing, the question remained – and was answered through the portrayal of Lyudmila Ignatenko's experience of loss during the disaster instead. Indeed, according to the series, she loses her baby shortly after birth due to her exposure to a radioactive Vasily in the hospital. In this case the narrative and the causal relationships it builds are *authenticated* by being based on the real Lyudmila's memoirs, as recorded in Svetlana Alexievich's *Voices From Chernobyl*. Recounting the traumatic experiences of real people, particularly when they are still living, is where narrative ethics issues leap from figurative pages of fiction into the real world, as will be further explored in the next section of this chapter.

Before then, it should be noted that this retrospective investigation of the Chernobyl disaster, and the role that Dyatlov in particular played, parallels another. An assessment of the investigation into Masao Yoshida's management of the nuclear crisis in Japan theorizes that he made decisions based on a mixture of classical conditional probabilities and causal probabilities, and therefore: "Given the information at his

disposal, he assessed the plausibility of a causal link to unwanted consequences, based on an appreciation of the laws of physics. At the same time, he organized actions to be taken based on information that he did not yet have in a measurable form, but which he had nevertheless convinced himself was true. Although it had not yet happened, the future catastrophe seemed real enough to him to guide his actions."

What is important here is that this is not necessarily how Yoshida's course of action is perceived after the fact, when the dysfunction has taken its course and has been studied more deeply, giving investigators a different idea of what went wrong. "The *a posteriori* allocation of probabilities in causal reasoning [during the investigation] leads to short-circuiting the infinity of potential future bifurcations, and the retention of only a few of them"[462] and as such "[their] approach does not take full account of the decisions made at Fukushima Daiichi."[463] This passage is not meant to question the validity of Yoshida's judgment after the Fukushima Daiichi incident, but rather highlight both the fact that causal relationships are built differently depending on the knowledge at one's disposal, and the fact that moral interpretations of the decisions made by those involved in a large scale incident can reflect these differences.

Similar questions have been asked in previous disaster films covering true events, such as *Sully: Miracle on the Hudson* (2016), which recounts the near crash of US Airways flight 1549 – averted thanks to Pilot Chesley Sullenberg, who managed to safely land the plane on the Hudson River after a flock of birds impaired the plane's engines. Nevertheless, a court trial was held in order to question his decision to land on the water after his plane's engines were taken out, instead of making other decisions, like landing in nearby airports. The fictionalized court scene revolves entirely around the subject of "the human factor", to quote Sullenberg's character, which is to say decision making with the limited knowledge at one's disposal during a crisis, and while under duress.

Not only does this vision of the relationship between knowledge and causation rely on the realism and truth theories explored in the previous chapter, but it reflects a modern trend of interpreting catastrophes as influenced by human choice, and thus

462 Sebastien Travadel, "Decision-Making in Extreme Situations Following the Fukushima Daiichi Accident," *Resilience: A New Paradigm of Nuclear Safety : From Accident Mitigation to Resilient Society Facing Extreme Situations*, Eds. Joonhong Ahn, Franck Guarnieri and Kazuo Furuta (Cham, Switzerland: Springer, 2017), 177.

463 *Ibid*., 178.

subject to societal or industrial mechanisms of ensuring that adequate responsibilities are taken. Graham Dodds, for instance, explores the evolution of public perceptions of disaster origins and argues that "disasters once attributed to God or nature are increasingly seen as influenced by, if not entirely caused by, human action."[464] At the same time "as we gain understanding of the influence of human action on calamities that we previously ascribed to forces beyond human control […] generat[ing] a stronger demand that we take responsibility for those actions,"[465] however, Ulrich Beck argues that recent political and technological changes such as the emergence nuclear energy exploitation has undermined the "social contract" that would force industries in particular to take on this responsibility – constituting instead a form of "organized irresponsibility" because the nature of a nuclear accident would make it impossible to adequately prepare and compensate for.[466] Rather, by supporting individual recourse to radiation monitoring and personal nuclear safety judgments as explored in the first two chapters of this thesis, the health consequences of radiological disaster are increasingly framed as not only human, but personal – a (for now) *de facto* "individualized" responsibility, dependent on this organized irresponsibility.

Indeed, this individual responsibility can be felt, and portrayed, as "empowering": "While the above considerations point to anxiety as a consequence of the greater role for human action, there is of course the alternative reaction that it can be liberating and empowering. […] Put simply, the diminished dominion of the divine has led to a greater domain for the academic discipline of political science; the greater scope of human agency yields a greater scope for politics."[467] But these comparisons between fictional and non-fictional showcases of causal relationships bring to light a final point about the authentification of knowledge through realist narrative styles (and beliefs): the introduction and ethical problematization of presenting personal choice as a deciding factor influencing the events and effects of a large-scale nuclear disaster in the nuclear safety imaginary – and how this contributes to the stigmatization of individuals affected by radiation exposure.

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464 Graham G. Dodds, ""This Was No Act of God": Disaster, Causality, and Politics," *Risks, Hazards & Crisis in Public Policy* 6, n°1 (2015): 59-60.
465 *Ibid*.
466 Beck, *World at Risk*, 27.
467 Dodds, ""This Was No Act of God"," 61.

There is a scene from the first episode of *Chernobyl*, during which inhabitants of Pripyat gather on a railway bridge in order to watch reactor four smoulder through the night. The first part of the scene focuses on the characters – on their faces, as they watch the fire and engage in small talk. But the second part draws attention away from them through a shift in differential focus from their faces to the ash floating around them. Bits of ash drift from the fire over the onlookers' heads, depositing on their hair and on their clothes – suggesting that some of it will follow them home. The slow motion in this second part emphasizes the significance of the ash, which the miniseries viewers know is radioactive. In this scene, the ash serves the purpose of making visible what is invisible, and thus allows the audience of the miniseries to appreciate the physical danger posed by the burning reactor, and visualise its reach. It is at this moment, as Peter Sagal notes in the first episode's companion podcast, that the radiation becomes like a "horror-movie" "monster", hunting the inhabitants of Pripyat.

Radiation lurks, invisible to the inhabitants of Pripyat but visible to the audience, behind several other scenes of *Chernobyl*. Using the 20th century allegory of the sun to describe nuclear energy, since this was built into some of the Soviet-era iconography referenced by the film (in the "Blacksmiths of Modernity" mosaic, for example), Mazin's team decided to use sunlight as a visual stand-in for radiation throughout the series: "That gave us some kind of template on how to portray this invisible threat. This radioactive atom. So the sun, and the presence of the sun, and the intensity of the sun, somehow became a foreboding element in order to portray the threat."[468]

One scene illustrating this use of sunlight occurs in episode three, when Lyudmila Ignatenko is finally reunited with her firefighter husband Vasily, at Hospital No. 6 in Moscow. Upon finding each-other, they hug in relief. This moment is again drawn out using slow motion, in order to bring attention to the radiation –only this time, there is no ash to help the audience visualise its movement. The presence of radiation is instead illustrated through an immediate juxtaposition of the visuals of this scene with those of another: An ominous, high pitched ring (similar to tinnitus) emerges as the camera drags in slow-motion over the Ignatenkos' embracing bodies and exposed skin, before cutting to a view of men sitting in a helicopter, dressed in protective gear. The

468 Cooke Optics, "The Cinematography of Chernobyl."

lingering score ties the scenes together in order to contrast Lyudmila with the soldiers, underlining her vulnerability in the face of her radioactive husband.

Though the effects of radiation on the body are eventually revealed, and become the focus of the third episode, radiation itself stays for the most part an invisible (and therefore misunderstood) threat to the characters. As such, it fits in with the other antagonists identified by Jeffrey Weinstock in his study on invisible monsters, in which he has noticed that contemporary monster films often feature a "decoupling of monstrosity from appearance."[469] Manifestations of incorporeal monstrosity in Weinstock's study include corporate or political institutions and viruses: "If the monster can be everywhere by virtue of its invisibility, if the snaky tendrils of corporate greed or government manipulation can bypass one's defenses and penetrate the intimate spaces of one's life, the logical final extension of this infiltration is the possibility that the invisible monster (invisible, at least, to the naked eye) is already within us."[470] Radiation makes a compelling addition to Weinstock's list, given its similar ability to "bypass one's defenses and penetrate the intimate spaces of one's life" as well as its transformative effects.

Horror movie techniques such as the slow motion meandering of the camera over vulnerable bodies and hidden monsters, as well as the extravagantly gory makeup of its victims, serve to heighten the dramatic tension and sense of urgency fuelling Legasov and Shcherbina's investigation. Part of the appeal of radiation itself as a horror plot device is rooted in post WWII pop culture: Mike Brogue chronicles a plethora of radiation-induced disasters and monsters from the 1950s and early '60s in his comparison of American and Japanese nuclear-threat cinema, *Apocalypse Then: American and Japanese Atomic Cinema* (2017). "Did Americans in the '50s fear radiation? Yes, and the public's atomic age anxiety found expression in humanoid mutant movies. After all, among other monsters, radiation produced amazing colossal humans, sun demons and multi-eyed savages. […] Unlike the majority of their American counterparts, Japan's humanoid mutants of the '50s and '60s were anything but temporary."[471]

469 Jeffrey A. Weinstock, "Invisible Monsters: Vision, Horror, and Contemporary Culture," *The Ashgate Research Companion to Monsters and the Monstrous*, Eds. Asa Simon Mittman and Peter J. Dendle (Farnham: Ashgate Publishing Ltd., 2012), 276.

470 *Ibid*., 284.

471 Mike Bogue. *Apocalypse Then: American and Japanese Atomic Cinema, 1951-1967* (Jefferson: McFarland, 2017), 109.

In his study on genetics-based fear in mid-twentieth century American films, Patrick Gonder notes that "[b]eyond the effect of radiation, the impact of genetic science itself involves a fundamental loss of control over our own bodies."[472] In 1950s America, "genetic paranoia" –that is to say, suspicion of "communists, feminists, homosexuals and other potentially subversive "cells""[473] and their transmission to future generations – generated a "body rebellion" horror film that "returns the body to a "purified" state through xenophobic excision of the offensive, dangerous element through a kind of violent therapy."[474] Examples of such storylines include: *The Fly* (Dir. Kurt Neumann, 1958), wherein the character Andre Delambre accidentally turns himself into a semi-human-semi-fly monster; *The Bad Seed* (Dir. Mervyn LeRoy, 1956), wherein the 8 year old daughter of a married couple turns out to have genetically-induced psychopathy; *The Brain That Wouldn't Die* (Dir. Joseph Green, 1962), wherein a mad scientist creates hybrids out of different people's body parts, and; *Spider Baby* (Dir. Jack Hill, 1968), which is a comedy horror, wherein the main characters are sisters with a fictional genetic deficiency that makes them progressively "devolve" (in the sense of a reversal of human evolution).

In *Chernobyl*, the social aberration that manifests through Vasily's high-level radiation exposure, is that he is now a danger to his wife and future baby. In this way, Mazin perverts the "hero invalid" trope briefly addressed in the previous chapter, further underlining the rift between the "narrativized" glory of sacrifice upheld by Soviet elites and the horrific reality suffered by the Soviet working class. This is compounded by statements made by Ulana Khomyuk in the fourth episode, about mothers becoming a danger to their children: "The baby lived four hours. She had 28 roentgen. They said the radiation would have killed the mother, but the baby absorbed it instead. Her baby. We live in a country where children have to die to save their mothers. The hell with our names and the hell with your deals. Someone has to start telling the truth."[475]

Sagal and Mazin explicitly discuss the possible effects of radiation on the body in the second companion podcast – confirming that they both perceive sufferers of

472 Patrick Gonder, "Like a Monstrous Jigsaw Puzzle: Genetics and Race in Horror Films of the 1950s," *The Velvet Light Trap* 52, n°1 (2003), 34.
473 *Ibid*., 36.
474 *Ibid*., 41.
475 *Chernobyl*, Episode 4, "The Happiness of All Mankind," Directed by Craig Mazin, Written by Craig Mazin (HBO, 27 May 2019).

radiation poisoning to be a danger to others. Sagal starts by explaining that: "One of the bizarre – it seems almost unbelievable – natures of radioactivity is if I – if you, become irradiated by being exposed to something like Chernobyl, then you are just as dangerous, or at least dangerous, in exactly the same way, whatever you were exposed to. It seems to have an endless, sort of, contagion – going back to our horror movie thing." Mazin's response is that: "Yes, depending on the circumstances. These particles we are talking about are atomic, they're sub-atomic – these neutrons – and when you have these particles on you, and in you – just from breathing! I breathe these things in from smoke, they're in my body, they're now radiating inside of my body outwards."

However, the horror of Vasily's transformation also resides in the loss of his humanity. Eventually, in episode three, a nurse tells Lyudmila that Vasily is no longer her husband: "He's something else now, do you understand? He's dangerous to you." The social violence of this exchange is evident, and it is drawn directly from Lyudmila's memories, recorded in Svetlana Alexievich's book, in which nurses try explaining to her that Vasily is now a radioactive "object." In fact, this is a recurring theme in *Voices of Chernobyl* – the way a nuclear disaster completely changed how people treated each other and perceived objects, the two sometimes swapping places. The grotesque deterioration of Vasily's body in *Chernobyl* is reminiscent of the heroic invalid trope, and thus its horror-inspired portrayal serves to further criticize the notion of self-sacrifice promoted by the Soviet State.

As compelling as these monsters may be, and however much they may help to convey contemporary concerns with certain political regimes or industrial practices, *Chernobyl* is not a work of speculative fiction. It is a narrative-driven retelling of true events – events that occurred recently enough for the real life counterparts of the characters portrayed in the miniseries to still be alive and battling with the physical and emotional trauma of the disaster. As argued by Mäkelä et al., that by bringing a subject "to the scale of human perception, action, and goals" the experiential nature of personal story telling reduces the complexity of large scale and complex issues.[476] In this way, Lyudmila's experiences are reshaped to fit the mould of the moralized dichotomy between characters studied in the previous chapter – at a time when individualized

476 Mäkelä et al., "Dangers of Narrative," 155.

responsibility for the health effects of radiation exposure is increasingly idealized in nuclear safety imaginaries.

## 5.3 Subsuming traumas in pop-culture nuclear narratives.

The comparison between *Chernobyl*'s use of radioactivity and invisible monsters brings to a head ethical questions about the use of life writings in narrative-driven drama. As it turns out, the real Lyudmila was upset by the way she was portrayed in the Chernobyl mini-series, even going so far as to say she did not give her permission for such a portrayal, though representatives of HBO and Mazin have contested this. Not only does she feel unhappy with the way she was portrayed – she has been harassed since the show aired, with individuals placing blame on her for the death of her baby.[477] In this sense, the fallout resembles that recorded in previous studies of narrative ethics: "The McGinniss-MacDonald situation is revealing because it represents a worst-case scenario in which a seemingly sympathetic writer produces not merely an indictment but a post-conviction "sentencing" of its subject. It offers and example of extreme disenchantment leading to an intense clash between authorial and subjective points of view – and thus to a clear conflict of interest."[478]

And yet, this was not the first time that Lyudmila's story was told. How is it possible that Alexievich's record of Lyudmila's experience did not lead to such fallout? The answer may reside in the genre of Alexievich's chef d'oeuvre, *Voices from Chernobyl.* It has been argued that "[f]ollowing from her work as a journalist, Aleksievich has created a new literary genre where non-fiction and fiction meet," and thus "[i]n the attempt to represent traumatic realities, the author interrogates the dramatic destinies of ordinary people" while "fragments of everyday life, memories and oral accounts stress the importance of the (Soviet or post-Soviet) individual in the process of History-making. Such a central position gains even more value in a context dominated by doubts and unanswered questions, as in Chornobyl''s case."[479] However, going back to Richter's framing of the limitations of non-fiction film, it may also be that the textual medium of *Voices from Chernobyl* allows such questions to exist

477 "The 'Real' Lyudmila from Chernobyl Speaks for First Time," *BBC.*

478 Thomas G. Couser, *Vulnerable Subjects: Ethics and Life Writing* (Ithaca, New York: Cornell University Press, 2004), 7.

479 Irina Marchesini, "A new literary genre. Trauma and the individual perspective in Svetlana Aleksievich's Chernobyl'skaiamolitva," *Canadian Slavonic Papers* 59, n°3/4 (2017): 323.

simultaneously across different accounts of the disaster without pushing for a moralized logical thread to unify them.

At one point, during the third companion podcast, Mazin raises the issue of playing "armchair psychologist" with Dyatlov, explaining that he did not like the idea of imagining a motive for Dyatlov's actions. This is a valid concern that also seems to influence the use of Lyudmila's testimony, with Mazin explaining: "I tried to tell it as accurately as I could." However, by imbricating Lyudmila's subjective and traumatic experience in a dramatic narrative that is heavily reliant on thematic coherence, Mazin may not have needed to alter her story directly in order to unintentionally misrepresent it. We might call this a scarification of Lyudmila's emotional wounds, to use Amit Thakkar and Nick Hodgin's scar allegory for representations of traumatic events in film – according to which "personal and collective healing […] is not to be understood as 'closure' of a wound: its erasure, and the formation of perfect, new skin. Instead, we are referring to films acting, much like scars in their formation, as a present and ongoing process of organised engagement with the original wound in which it is implicitly accepted that what is reproduced is not the wound itself but a simulacrum of it."[480]

Furthermore, Alexievich's own work might also be problematic – particularly considering its wide-reaching influence on subsequent nuclear narratives, and thus, on the collective imagination. Is it ethically sound to preserve, intact, a vulnerable person's account of catastrophic events when this account appears to justify or accept some form of stigmatization? Where do narrative guidelines stand on this difficult and potentially controversial issue? Richter warns, though, that complications with elaborating an ethics of non-fiction film boil down to the difficulty of distinguishing between "true stories" and fiction: "Both are forms of narrative, and both contain truths about value – social and moral truths particularly. Indeed, fictions can convey with certainty what true stories can only approximate, when they fall silent before the gaps in what can be known".[481] This is particularly resonant in the context of radiation visibility in non-fiction film and TV series such as HBO's *Chernobyl*.

For the most part, the ethics of life writings concern primarily the relationship between the writer and his or her subject. Thomas Couser pushes the non-fiction

480 Nick Hodgin and Amit Thakkar, "Introduction: Trauma Studies, Film and the Scar Motif," *Scars and Wounds* (Palgrave Macmillan Cham, 2017), 15.
481 Richter, "Keeping Company in Hollywood," 161.

narrative ethics questioning even further: "Under what circumstances do life writers have ethical obligations to those they portray? […] Is there an obligation to seek consent? […] I am especially concerned here with the representation of subjects who are vulnerable to misrepresentation or betrayal because of some disadvantageous condition, particularly certain kinds of disability."[482] As shown through the portrayals of Lyudmila's experiences, there are indeed extra ethical considerations regarding the way testimonies might negatively impact vulnerable populations – particularly in the realm of nuclear disaster, where people exposed to even low-doses of radiation are known to suffer social marginalization and discrimination based on health-related stigmas.

In episode 3, when Lyudmila goes to Hospital NO 6 in Moscow to find her husband, Vasily, a nurse tells her "You can't be here. It's not safe." After a bribe, but before letting Lyudmila see Vasily, the nurse asks "You're not pregnant, are you?" Implying that the foetus might be affected by radiation emitted by the patients. Later in the same episode, Khomyuk happens upon Vasily's room and sees his hand on Lyudmila's abdomen, she rushes in to rip Lyudmila away (rather violently) and yells at a passing nurse: "Did you know she's pregnant? […] what kind of a place is this? Where is her protection?"

An interview by Vanity Fair of Alla Shapiro – a Ukrainian radiation and medical expert that was present and active during the time of the Chernobyl explosion and is currently Medical Officer at the Office of Counter-Terrorism and Emergency Coordination at the US Food and Drug Administration, suggests that some of these perceptions may indeed be due to stigma more than scientific facts: "People with acute radiation sickness – they're not radioactive, they're not contagious to adults, to pregnant women, or to children." She furthermore specifies that the repercussions of this stigma can be harmful, echoing (to an extent) the observations of both Robert Jacobs, Aya Kimura and Masaharu Tsubokura and other scholars in the wake of the Fukushima Daiichi catastrophe: "Many children were evacuated to Moscow and many families in Moscow were offered to host these children. They rejected, because they claimed that these children are contaminated, or they call them dirty and they don't want them in their household."[483]

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482 Couser, *Vulnerable Subjects* (2004), 6-7

483 Alla Shapiro, "Chernobyl Doctor Fact Checks the HBO Series," Youtube video, Interview, *Vanity Fair*, September 19, 2019, https://www.youtube.com/watch?v=m1GEPsSVpZY.

This contradiction is reminiscent of the phenomenon of genetic stigma explored in the previous chapter, particularly in the context of the Fukushima Daiichi meltdowns as well as the Hiroshima and Nagasaki bombings, wherein stigmatization was mostly encountered when survivors came into contact with outsiders,[484] and targeted women in particular for their role in marriage and reproduction[485] -- leading not only to women in European countries like Italy, Greece, Denmark and Sweden to choose abortion in fear of their future children being contaminated by radiation from the Chernobyl meltdowns,[486] but also to the stigma itself being played on as a common storytelling device in nuclear narratives from Louise Lawrence's *Children of the Dust* (1986) and Tokihisa Morikawa's *Natsushōjo* ("Summer Girl", 1995), to Kawakami Hiromi's short story "God Bless You, 2011" (Kamisama, 2011) and Friese and bo Odar's *Dark* (Netflix, 2017), echoing the wider history of gender, sexuality and household themes in nuclear literature and thus nuclear safety imaginaries.[487]

Mazin himself recognized, towards the end of the third companion podcast, that "there was a certain amount of… discrimination that went on, at least initially. People were terrified of, you know, the people who had been moved out of Pripyat and maybe put into other communities. There was a sense of fear and dread of those people, for some. And also there was, for a very long time I think, a sense that… people like Akimov and Toptunov were to blame." By finishing this passage with a wish that the audience will understand that the victims evacuated from disaster zones did not deserve any health-related blame, the author acknowledges that *Chernobyl* makes use of genetic stigma to better develop its political drama, without addressing the issue of stigma itself.

Regarding Khomyuk's claim in particular, in the fourth episode, that "they say" Lyudmila's foetus "absorbed" the radiation and that is why her baby died four hours after birth, Shapiro says that there is "no science" behind it. And yet, Mazin says: "When Khomyuk tells him what happened to Lyudmila's baby, what she's driving home here is "This has to stop!" and calls the ending of the fourth episode (when a grieving Lyudmila is standing alone waiting outside the nursery where her baby would

484 Michelle A. Heath, "Radiation stigma, mental health and marriage discrimination," 98.
485 *Ibid*, 99.
486 Bertollini et al., "Reduction of births in Italy after the Chernobyl accident," 96-101. LB Knusden, "Legally-induced abortions in Denmark after Chernobyl," 229-231. D. Trichopoulos et al., "The victims of Chernobyl in Greece," 295. Ericson and Kallen, "Pregnancy Outcome in Sweden After the Chernobyl Accident," 149-159.
487 Cordle, *Late Cold War Literature and Culture,* 122.

have been had she survived) "an expression of the truth." He elaborates with: "The truth is that these young men were sent to this place to be radiated, the truth is that women lost their children, and there's other brutally difficult and sad and heartbreaking stories in *Voices from Chernobyl*." Whether the underlying cause of the baby's death was radiation or not, here we see how the surrounding fiction (in the form of a fictional character) accidentally misrepresents Lyudmila's subjective experience by anchoring it in a narrative about recognizing truth – thus stripping her experience from any ambiguities from the audience's perspective.

Again, in this context, the *viral exemplum* is especially relevant, as Lyudmila's experiences were shared via various digital platforms including X (formerly Twitter) – leading to a social backlash that parallels the examples analysed by Mäkelä et al. as they show the "danger" of "a story of personal experience gaining disproportionate representativeness and normativity through affective sharing."[488] I only add that this is particularly "dangerous" in a context of clashing nuclear safety imaginaries, where the health of anyone within reach of a nuclear power plant is potentially at stake and where many people in the vicinity of nuclear disaster will spend the rest of their lives burdened with social discrimination, health anxieties and radiation hyper-vigilance.

The question here is not about whether or not it was really possible for Lyudmila's foetus to "absorb" radiation from Vasily, but whether or not, in narratives contributing to imaginaries surrounding radiological safety, it is ethical to leave socially stigmatizing beliefs as they are – unquestioned. The ultimate irony in Mazin's retelling of the Chernobyl meltdown is that by incorporating Lyudmila's personal testimony into a narrative that was not her own – in order to tell as story about how the Soviet State exploited its working class by controlling the "narrative", and consequently by robbing the inhabitants of Pripyat of their autonomy – the digital success of *Chernobyl* subjected her to a new exploitation, reflecting one of the differences Mäkelä and her colleagues perceive between online and offline storytelling – that stories told through social media "detach" narrative authority from narrative agency, thus curtailing narrative-ethical accountability.[489]

488 Mäkelä et al., "Dangers of Narrative," 155.
489 Dawson and Mäkelä, "The Story Logic of Social Media," 28.

# Conclusion

David Richter poses an interesting question: "Can nonfiction films be good ethically even when they are bad history?" In answer, he proposes that "[t]he less the filmmaker falsifies the representational field the better," and thus: "[f]ilmed bad history, especially film that includes documentary footage, can be immeasurably worse than bad history in prose, since film gives its audience the illusory sense of having actually experienced as true what may only be speculation, and wild speculation at that."[490] Critiques notwithstanding, HBO's *Chernobyl* carefully constructed an illusion of the past through both the meticulous imitation of the visual evidence left behind and the adaptation of personal testimonies that survived – successfully capturing widespread audience attention and validation through both traditional and social media. Thus, *Chernobyl* enters the realm of historiography as defined by both Richter and de Groot – but by Richter's ethical standards, the mini-series is an unethical production, as it so convincingly wraps its oversimplified narrative in the visual trappings of an imagined past.

The notion of the *viral exemplum* gives extra weight to such "narrative judgments" (to use Phelan's terminology) as it proposes that the "truth" embodied by personal experiences gone viral can't be easily undone after the fact, perhaps even less so than for traditional written and oral media offline. One of the added features of the non-fiction film is its "density of visual detail" which allows it "to convey more about the texture of life of a past era in a few shots then a book about the period could in many pages"[491] and thus makes its combination with the quasi-unfalsifiable nature of viral story sharing particularly concerning in the case of series like *Chernobyl* – as its overflowing visual emulations of old photos and personal memories spill across both social and traditional media.

On the one hand, by acknowledging only in the paratexts outside of the main body of his work that he is a "narrative salesman" and thus "aware that there are perfectly good uses" for narrative such as "undermin[ing] the point of narrative" (which one can only assume to mean *lying*, given the subject of this particular interview),[492]

490 Richter, "Keeping Company in Hollywood," 160.
491 *Ibid*., 143-144.
492 Mazin, "HBO's *Chernobyl* is a terrific miniseries." For a bit more context: "I work in a narrative business. I'm a narrative salesman. So I'm a little bit like a drug seller. And I am aware that there are perfectly good uses for this drug. […] If I can do narrative to undermine the point of narrative, well,

Mazin inadvertently echoes Richter's ethical analysis of violence in film: "[m]any films are hypocritical about combining a professed ethic that violent crime does not pay with spectacular cinematic representations of violence that the filmmakers hope will pay very well indeed."[493] In this sense, among the many ethical arguments that could be made regarding *Chernobyl*'s narrative is that it falls short in providing a nuanced critique of narrative itself. After all, in the context of a real-world nuclear disaster and of real-life radiation exposure, telling stories about one's health- or stigma-related experiences are perhaps better examples of the potentially "good uses" of narrative. In fact, Mazin himself relies on the personal anecdotes found in Alexievich's *Voices from Chernobyl* to construct such a heavily moralized story about narrative lies – somewhat contradicting himself.

On the other hand, by extensively framing *Chernobyl* with epitexts the way any other historiography would be framed by numerous footnotes and bibliographies, Mazin has been highly engaged in trying to not only acknowledge but combat the limits of his narrative medium, indirectly addressing some of those delineated by Richter for non-fiction film in general – that non-fiction films cannot easily or clearly present conflicting evidence or multiple motives the way that written texts can, and that non-fiction film cannot resemble "shapeless chronicles" full of loose-ends, the way written histories can.[494] By (re)claiming authorial ownership of *Chernobyl* through the series' many external paratexts, and thus attempting to acknowledge the aforementioned conflicting views, critics and the complexities of researching and writing a non-fiction scenario (including parts of history that didn't make it into the final cut of the series), Craig Mazin attempts to overcome these limitations – with mitigated success.

Ultimately, Mazin echoes Richter's trouble with elaborating an ethics of non-fiction film, which boils down to the difficulty of distinguishing between "true stories" and fiction: "Both are forms of narrative, and both contain truths about value – social and moral truths particularly. Indeed, fictions can convey with certainty what true stories can only approximate, when they fall silent before the gaps in what can be

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fuck it."

493 David H. Richter, "Your Cheatin' Art: Double Dealing in Cinematic Narrative," *Narrative* 13, n°1 (January 2005): 21.

494 Richter, "Keeping Company in Hollywood," 143-144.

known".[495] This is particularly resonant in the context of radiation visibility in non-fiction film and TV series such as HBO's *Chernobyl*.

Referring back to the notion of sociotechnical imaginaries, and thus the real-world post-Fukushima-disaster context in which *Chernobyl* was written and disseminated, it can be said that one of the mini-series' contributions to nuclear safety imaginaries is the further entrenching of health stigmas and social marginalization associated with radiation exposure in the aftermath of nuclear disaster. Not only does it vehiculate the ideas that individuals exposed to radiation are a danger to others and that foetuses can "absorb" dangerous levels of radiation that don't affect the mother – it made them viral by slipping them between layers of a heavily moralized but illusory pastness, partially constructed via social media engagement. Going by Richter's concerns with non-fiction film as *de facto* historiography and Mäkelä et al.'s research on the *viral exemplum*, this combination of characteristics can reasonably be argued to have led to the public backlash against Lyudmila Ignatenko (this not being the first time her story was widely shared).

In completing this analysis, I therefore add to Mäkelä and her colleagues' attempts to "bridge the gap between narrative theory and contemporary narrative practices"[496] by demonstrating how both concepts of the *viral exemplum* and the illusory pastness of non-fiction film can help better understand the potential reach of nuclear narratives in wider nuclear safety imaginaries, and thus the dangers and limits of "storytelling" in nuclear disaster contexts.

495 *Ibid*., 161.
496 Mäkelä et al., "Dangers of Narrative," 139-157.

# Chapter 6 – General Conclusions

At the start of this thesis, I proposed a narrative ethics analysis of Craig Mazin's *Chernobyl* – a non-fiction portrayal of the 1986 Chernobyl nuclear meltdown, focused on the investigation that unfurled in its immediate aftermath. In particular, I suggested Sheila Jasanoff and Sang-Hyun Kim's characterisation of "sociotechnical imaginaries" as binding science and technology to political power, and James Phelan's narrative ethical judgments, according to which narrative can be gleened for the values that emerge in the face of any exercise of power, as a frame of reference for my thesis question about what the series contributes to broader understandings of nuclear safety with respect to genetic stigmas in particular.

As the subject of this study, *Chernobyl* was selected not only for its wide reaching audience, nor its extensive use of paratexts to further guide the viewers' reception of the drama and the research that went into creating it, but also for the public response made by one of the living subjects represented in the series – Lyudmila Ignatenko, whose experience after the series aired is reminiscent of the social marginalization faced by sufferers of the genetic stigma that now predictably emerges in the wake of radiological disaster, but also frequently features as a storytelling device to convey wider social and political critiques in nuclear literature, as I demonstrate through the thesis. Adapting both David Richter's critique of non-fiction film as historiography and Maria Mäkelä's concerns with social media erasure of the distinction between fact and fiction, I also question the narrative ethics ramifications of *Chernobyl*'s contributions on this particular topic to wider nuclear safety imaginaries, as a popular work of non-fiction suspended in an online matrix of traditional and social media external paratexts.

I first undertook this study in Chapter 2, in which I began by examining the notion of radiation "in/visibility" politics in relation to the popular data collection efforts that emerged in the wake of the Fukushima Daiichi meltdown and then the wider concepts of competing risk "rationalities" found through STS and radiation risk communication scholarship as well as recent international nuclear safety guidelines. I weighed the portrayal of citizen science efforts and interest in more open dialogue with

safety regulators, imagined to improve both the public and authorities' grasp of acceptable radiation exposure risks, against the idea that sociopolitical identity and trust-based relationships determine the acceptablility of information regarding radiation exposure and associated health risks. In this context, I examined the "lessons learned" in Fukushima Daiichi radiation risk communication scholarship, which point to the nuclear narratives that emerge and circulate outside of official communications, namely through fiction and widely shared social media stories, as competitors that impede access to appropriate information on radiation risks due to their overwhelming number, their potentially misleading nature and their timing relative to the unfolding disaster, to better situate nuclear narratives within the context of the above political discourse surrounding radiation visibility, risk perceptions and trust. I concluded from this chapter that pop-culture nuclear narratives constitute an important area of study for further understanding the alternative nuclear safety imaganaries shaped by these considerations, *as such* requiring closer ethical scrutiny.

This allowed me to proceed, in Chapter 3, with my focus on the portrayals or use of genetic stigma in pop-culture fiction in particular. I started with an overview of the nuclear narrative studies that have emerged since the beginning of the Cold War era, gleening how genetic stigma has been approached as a story element. This showed that although fears of hereditary genetic impacts resulting from radiation exposure have been acknowledged as themes used to convey wider political commentaries about nuclear technologies and atomic energy or military policies, often in relation to sexuality, family and the home (and women's place, therein), the actual health stigma itself passes largely unaddressed (both in the fictions studied, and the studies themselves) – with the exception of Jerome Shapiro's brief assessment of what he calls *hibakusha* exploitation films and Rachel DiNitto's work on Kawakami Hiromi's short story "God Bless You, 2011" (Kamisama, 2011). I went on to show that this lack of attention exists despite the reality of victims of radiological disaster who suffer from social marginalization from the onlookers that they come in contact with, and the fact that women's bodies become fraught with anxieties about reproduction, resulting in marriage discrimination and abortions – and in this situation, the accentuated but justifiable anxiety over contamination itself becomes yet another source of both political and domestic tension. After briefly exploring the theme of hereditary sickness that

prominently features in another work of post-Fukushima pop-culture nuclear fiction, Netflix's *Dark* (2017), I concluded that the exploitation of genetic stigma to dramatize or moralize political commentary remains largely unquestioned (and at times justified) in both pop-culture nuclear narratives and much of the scholarly work surrounding it – thereby rendering it (and the reality of its sufferers) "invisible," according to the political framings studied in the previous chapter.

Having laid the groundwork for my narrative ethics analysis of Mazin's *Chernobyl*, I began Chapter 4 with an examination of the dichotomous relationship it proposes between scientific truths and narrative lies (which it reiterates in its external paratexts) to construct a political commentary about the Soviet regime, with somewhat violent and combative undertones. I then showed how this aggressive conflict between truth and lies is transposed onto the series' characters, and that the creative liberties of non-fiction film in constructing logical consistency and a coherent political or moral paradigm within its chosen frame of reference allows it to reshape the more complex experiences of those whom the story is about, in order to fit this narrative. The original storytellers, in this case, are not the creators of *Chernobyl*, but Legasov, Dyatlov, Ignatenko, and many others whose experiences were altered to illustrate a political war between truth and lies, in an ethically reproachable process of transforming personal narratives into public property. Ultimately, *Chernobyl* uses this technique to distinguish between different political approaches to knowledge production, associating scientific truth with Western liberalism and narrative lies with Soviet authoritarianism – and, by extension, characterising empirical science as having a simple and straightforward relationship with truth that merely needs measuring with the right tools. Beyond noting the potential hypocrisy (based on Richter's ethical framing of good and bad non-fiction films) in knowingly using "narrative lies" to construct a story about narrative lies, I showed how this message was utilized in both traditional news media and social media platforms to express doubts or critiques about official responses to the Covid-19 pandemic that emerged in the months after the series aired, thus cementing its elevation from a lone vision to a collective imaginary concerning nuclear safety and public health issues, in which individuals who disrupt or ignore the practice of (unrealistically pure) science can easily be tarred as politically or morally corrupt.

This allowed me to look deeper at *Chernobyl*'s use of artifice, in Chapter 5, to create the illusion of historical and scientific authenticity, and the ethical questions that arise when addressing the traumatic experiences of nuclear disaster victims and survivors, as a work of non-fiction limited by constraints dictated by the medium. In doing so, I explored how the realist style of *Chernobyl* is used to convey a truth in and of itself by making appeals to authenticity – in great part by building a network of its own external paratexts (or epitexts), reinforced by the reactions of audience members in both traditional and social media, to validate the audiovisual techniques used to evoke a sense of "pastness" through embellished mimicry, as well as to go into further detail on the real people and events that inform the story. Thus, I addressed not only Richter's suggested limits of non-fiction as historiography, but also Mäkelä et al.'s concerns with the increasing difficulty of distinguishing between fact and fiction because of social media driven storytelling. These are both highly relevant areas of questioning in regards to non-fiction representations of nuclear disaster, as studies on radiation risk discussions after the Fukushima Daiichi catastrophe show the confusion and anxiety caused by being submerged in increasingly difficult to verify information online and the potential influence of fiction outside the disaster context on both the public and authorities' perceptions of radiation risk. I concluded that by (re)claiming authorial ownership of *Chernobyl* through the series' many external paratexts, and thus attempting to acknowledge conflicting views, critics and the complexities of researching and writing a non-fiction scenario Craig Mazin actually attempts to overcome these limitations – but that his success is mitigated in particular by the series' exploitation of the victims of radiation poisoning and of commonly held genetic stigmas against people (particularly women) exposed to radiation in order to make its grand point about the "cost of lies," resulting inadvertantly in the harrassment of one of the rel victims of the catastrophe.

## 6.1 Findings and Contributions

Referring back to the primary question of my *Chernobyl* analysis, it can be said that one of the mini-series' contributions to nuclear safety imaginaries is the further entrenching of genetic stigmas and social marginalization associated with radiation exposure in the aftermath of nuclear disaster. Not only does the series perpetuate the idea that individuals exposed to radiation are a danger to others, it made this view viral by

creating itself an online network of traditional and social media through which it engaged with the audience to promote itself as a representation of authentic Soviet society and nuclear sciences.

Although I drew some insights about how radiation exposure was represented in pop-culture media from the previous work of nuclear narrative and culture scholars, my thesis constitutes a serious departure from these previous studies insofar as I focused on the ethical dimensions of narrative production in nuclear plant disaster contexts. In doing so, this thesis adds to Mäkelä and her colleagues' attempts to "bridge the gap between narrative theory and contemporary narrative practices by demonstrating what it could mean for a narratologist to provide the general audience as well as various professional groups with critical tools for navigating today's textual and social environments, dominated as they are by storytelling,"[497] by not only calling attention to the stigmatizing gaze exploited through the nuclear narratives regularly identified as contributors to wider nuclear safety imaginaries, but also by showing how many of their points about the way social media affects our ability to distinguish fact from fiction can also be applied to modern day film and television series ensconced in a matrix of traditional and social media epitexts to validate their authenticity – particularly in the case of non-fiction representations of historical events.

Furthermore, I showed that although there has been much scholarship on notions of the "deficit model," competing "rationalities," as well as notions of identity and trust in trying to elucidate discrepancies in radiation risk perceptions (particularly between authority figures and members of the general public), issues such as genetic stigma cannot be so easily boiled down to the recurring expert *versus* layman dichotomy, since stigmatization appears strongly bound to physical proximity with the radiological disaster, as opposed to institutional, educational or political differences alone (as was also briefly noted for disaster myths in general). According to the context outlined in the introduction, wherein the nuclear energy industry continues to grow in tandem with an increasingly polarized and politically unstable world, radiological accidents are likely to occur again – in which case a more rounded grasp of the different ways people react to potential radiation exposure or radiation health risks would help prepare for future challenges.

497 Mäkelä et al., "Dangers of Narrative," 139-157.

Finally, in terms of narrative ethics scholarship itself, the application of such theories to studying health themes in pop-culture narratives is not common, particularly regarding health stigmas, and even more so radiation or genetic stigmas – making this thesis an original contribution that could serve to invite future history and literary scholars, as well as radiological protection policy makers or advisors interested in pop-culture nuclear narratives, for further study.

## 6.2 Limitations and Further Study

### 6.2.1 The sociotechnical imaginaries framing

The first limitation of this study is the sociotechnical imaginaries framing. The "imaginaries" concept employed by Jasanoff and Kim to elaborate their theory of sociotechnical imaginaries in nuclear policy-making, and by extension in understanding pop-culture nuclear fiction as overlapping or challenging the ideas that partake in policy decisions, rests on the premise that "the capacity to imagine futures is a crucial constitutive element in social and political life," suggesting that imaginaries produce "systems of meaning that enable collective interpretations of social reality," form "the basis for a shared sense of belonging," and (in the realm of STS) perpetuate the "promises, visions and expectations of future possibilities embedded in the social organization and practices of science and technology," which then go on to informing policy decisions.[498] As pointed out in Tadeuz Rudek's overview of the use of this framing in research papers published between 2009 and 2021, Jasanoff and Kim's framing "does not explain why and how particular sociotechnical imaginaries become collectively held," and struggles to answer questions such as: "What are the mechanisms of sociotechnical imaginaries emergence and performativity? What are the processes and relations between dominant and alternative imaginaries? How can the performativity of imaginaries be explained and measured? Is the role of specific actors in creating a desirable future crucial?"[499] Much of the research that has come after has therefore been selective in its application of the framework, leading to an increasingly varied theoretical background and thus to questioning the concept's stability.[500]

498 Jasanoff and Kim, "Containing the Atom," 122.
499 Rudek, "Capturing the invisible," 221.
500 Rudek, "Capturing the invisible," 232.

Although my thesis shows one way in which a pop-culture work of nuclear non-fiction like *Chernobyl* might rise from lonesome nuclear narrative to widely held nuclear safety or policy imaginary (through a narrative ethics analysis of its relationship with surounding paratexts), many questions "about the emergence of imaginaries, their diversity, how some become dominant or alternative, and their relations between each other" remain to be studied.[501]

### 6.2.2 Understanding literary paratexts

Another limitation of this thesis is the framing of the external paratexts. Outside of being used as a tool to trace the evolution of works of nuclear fiction from small scale nuclear narrative to wider nuclear or energy imaginary by roughly gauging audience engagement, and to characterise some of the ways author engagement serves to further frame the main corpus' story, the paratext's actual role in guiding audience perception is not very clear. This is particularly the case for non-fiction representations of historical events wherein epitexts are used by authors to supplement the viewers' knowledge on the people and events discussed in a film or television series, as was the case for *Chernobyl*. More research would be needed in this area to reveal whether epitexts would actually help non-fiction representations of the past to transcend some of the historiographical limitations of the medium outlined by David Richter – namely the difficulty with representing multiple viewpoints and the non-sense of real life events.

### 6.2.3 Beyond storytelling as a political tool

The final limitation of this study is the highly political and identitarian framing of knowledge production that is common across the STS theories studied to erect nuclear fictions as "alternative" imaginaries. As pointed out by Mäkelä through multiple publications, the narrative turn of the 21st Century would transform storytelling into, among other things, a tool to promote mutual dialogue or collective action, which is one of the central concerns of the previously studied radiation risk communication scholarship, particularly on the theoretical STS level, given the risk of it becoming a one-sided pedagogical tool (following the *deficit model*). But storytelling is more than an information exchange (or lecture) or the site of a political struggle, and may serve either private or public radiation risk management interests in different ways.

501 Rudek, "Capturing the invisible," 222.

For instance, Latin American countries have increasingly relied on storytelling activities in the wake of severe natural disasters to improve community resilience and recovery, since the late 1990s. Such activities were outlined in the *Leer para Vivir* project, after major flooding in Caracas, Venezuela (1999); in the *Palabra Memoria, Palabra Vida* project, after floods and landslides in Colombia (2002–2003), in which participants developed personal and collective histories; and in *Palabras que acompanan: La lectura en los tiempos de crisis,* developed after the earthquake on February 27, 2010 in Chile, which also implemented training sessions to improve public accessibility to books and literature.[502] After a major earthquake in 2018, public reading protocols (*La fuerza de las palabras*) were developed in Mexico, showing that the subject of books mattered when dealing with complex social topics, as it was noted that "[c]hildren's literature, and more specifically picturebooks, was the main instrument of intervention and, more importantly, the critical element that helped to create a 'safe space' for those who participated in the sessions. […] Stories shared in picturebooks can provide counter narratives of danger, immediately reducing the impact of biologically induced stress."[503]

Storytelling via other media, such as drawing, has also been explored, for instance in Julissa Alexandra Galarza-Villamar, Cees Leeuwis, Geovanna Maribel Pila-Quinga et al.'s "Local understanding of disaster risk and livelihood resilience: The case of rice smallholders and floods in Ecuador" (2018). The authors showed "that using drawings and storytelling was valuable in facilitating participants to narrate and express themselves in detail about facts, feelings, and views in regard to an event (floods)."[504] More specifically, they showed that "creating drawings as a prior step to the story sharing allowed participants to enrich their stories, not only focusing on their tangible livelihoods (shown in the drawings), but also including their household members, neighbors, and other actors in the stories, revealing other intangible strengths and limitations (recognizing the neighbor who helped their family, the social mechanism to

502 Lavinia Hirsu, Evelyn Arizpe and Julie McAdam, "Cultural interventions through children's literature and arts-based practices in times of disaster," *International Journal of Disaster Risk Reduction* 51 (2020), 1.

503 *Ibid*., 4.

504 Julissa Alexandra Galarza-Villamar, Cees Leeuwis, Geovanna Maribel Pila-Quinga *et al*. "Local understanding of disaster risk and livelihood resilience: The case of rice smallholders and floods in Ecuador." *International Journal of Disaster Risk Reduction*. (Elsevier, 2018): 1119.

exchange food and water with others, and so forth),” and this led to spontaneous and enjoyable moments of reminiscence among the participants.[505]

Likewise, Christina Kargillis, Mayumi Kako and David Gillham discuss “the use of narrative practice in relation to emotional recovery from disaster events”.[506] The authors propose that narrative and storytelling “may be applied to address individual recovery through the construction of stories as well as assisting social community recovery through the sharing of these stories” during the reconstruction phase following a disaster.[507] They theorize that “[t]he sharing of positively constructed narratives would then inform understanding of the elements involved in the landscapes of action and identity experienced by individuals and communities” building “social networks, norms and trust” to “assist recovery and the building of social capital,” and as such, narrative “could potentially influence disaster recovery policy and funding towards a more holistic approach.”[508]

Going back to Japan, Shingo Nagamatsu, Yoshinobu Fukasawa and Ikuyo Kobayashi specifically define “Disaster Storytelling” as “a means for transmitting lessons, sharing emotions, and developing empathy for others that arises from the experience of a disaster through narratives in oral or written form, as well as other forms of expression like drawing, painting, singing, drama, or photography.” They argue that: “Disaster Storytelling can be conceived of as a spontaneous activity, and is thus often considered to be the unintentional behavior of those affected by a disaster. However, some scholars and practitioners have recognized the positive meaning of such activities and have tried to encourage them or utilize them for specific purposes.”[509]

The authors describe the spontaneous formation of storytelling groups in Japan, in the aftermath of the Kobe earthquake: “Some of the local leaders who devoted themselves to the recovery of the local community in Kobe formed a team to discuss their experiences one year after the earthquake disaster. They called the team a “caravan” and visited many other local communities, most of which welcomed their visit. Many listeners were moved by their vivid descriptions of the devastation, damage, and misery contrasted by the hope and joy they received with support from other

505 *Ibid*.
506 Kargillis, Kako and Gillham, “Disaster survivors,” 25.
507 *Ibid*.
508 *Ibid.*, 27.
509 Shingo Nagamatsu, Yoshinobu Fukasawa and Ikuo Kobayashi, “Why Does Disaster Storytelling Matter for a Resilient Society?” *Journal of Disaster Research* 16, n°2 (2021), 127.

people. The team found that sharing disaster stories was their responsibility to the dead as survivors. This helped them decide to establish "Kobe Recovery Academy" (Kobe Fukko Juku) to pass on their activities to the next generation."[510] Another example they refer to is the Machizukuri Lab, which "has been working actively to guide visitors and student trips from both inside and outside Kobe. Their activities have allowed local people to share their stories with visitors, which has been a great motivation for them to survive the destruction and sadness caused by the disaster."[511]

This development suggests that storytelling has already emerged in Japan as a means to make sense of the tragedy and pain incurred by disaster – but the ways radiation-induced genetic stigmas might be processed or utilized in these kinds of settings has yet to be studied, and although the opposing rationalities or identity-based trust framings of STS research would still be interesting in this context, it might be worth pursuing novel theories to examine the social values imbricated in storytelling beyond power struggles.

### 6.2.4 Pushing the boundaries of genetic stigma

Although sufficient personal and scholarly accounts of genetic stigma in the wake of nuclear disaster exist to begin its study as a literary theme in nuclear fiction, much more work is required to both document and understand the dynamics of radiation induced genetic stigmatisation, and especially the role that pop-culture narratives play in this regard (but not only). For instance, HIV stigmatisation has been much more thoroughly explored since its appearance in the late 1980s, though this was due to comparatively more pressing public health needs at the time and to a wider variety of social and cultural factors influencing its spread. The findings of this thesis suggest more work can be done to assess discussions and exploitation of radiation induced genetic stigma in different settings, to help fill the gap. In this context, the emergence of novel medical treatments (such as the oncological immunotherapies that will start to lose their patents in the next few years) and the evolving accessibility of healthcare (for political, financial or other reasons) should be anticipated as opportunities to trace the evolution of such stigmas in pop-culture narratives.

510 *Ibid*, 130.
511 *Ibid*.

### 6.2.5 Emerging disasters: From Covid-19 to the AI revolution

The narrative ethics framings of this thesis and its use in elucidating how traditional and new media work together in modern-day storytelling to convincingly construct illusory alternate realities through which it defines and/or reifies the wider social imaginaries that inform political (and perhaps even mundane) decision-making would be useful to exploring the kinds of social marginalization and stigmatization that emerge in the wake of other disasters. For instance, as the Covid-19 pandemic unfolded, many people were discriminated against based on their asian heritage and there was widespread discussion about the health risks of certain travel and consumer habits (like visiting "wet markets," or eating wild animals such as bats), as well as some debate about the role played by urban sprawl and increasingly intensive exploitation of the land in creating opportunities for zoonotic illenesses to spread. The framework used in this thesis could therefore help identify the ways in which different narratives or representations of risk emerge in these contexts, providing the tools necessary to question their exploitation in contexts of stigmatisation.

Another area of interest to explore with this narrative ethics analysis framework is actual human conflict. This is not only because we appear to be heading towards an increase in confrontations (or risk of confrontations) on the ground between larger world powers, but also because both domestic and foreign opponents on the national or world stage have already been known to try manipulating social media to promote destabilizing narratives (fracturing the "social imaginaries" that tie social groups together, in a sense). In this vein, governments across the West have recently shown alarm at the rise of AI generated texts, images – and now, particularly film. Some have floated the possibility that it will quickly change the telecommunications, social media and story telling landscapes as we currently know them. The use of these new modes of "storytelling" certainly raise many questions about the relationship between the story and the image, and of course about the ways such tools will perhaps aggravate what Mäkelä calls the "dangers of narrative".

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