Social Fallout: Ukrainian Society and Geopolitics in the Shadow of Chornobyl

By

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Social Fallout: Ukrainian Society and Geopolitics in the Shadow of Chornobyl

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Abstract

Far from being a discrete historical event, the 1986 Chornobyl disaster is still happening. The radioactive particles released during the explosions in reactor 4 of the Chornobyl Nuclear Power Plant (ChNPP) continue to emit harmful radiation, individuals—known as "sufferers"—continue to deal with the bodily effects of that radiation, and various actors continue to keep the disaster politically alive through technoscientific, discursive, and sociomaterial processes. Though built and maintained by the Soviet Union, after the dissolution of the USSR in 1991, dealing with the Chornobyl disaster has largely been the responsibility of Ukraine and Ukrainians. This dissertation examines two cases where the production of scientific knowledge about the Chornobyl disaster and particular political agendas have co-constructed each other at two Ukrainian sites: the role of the Department of Social Expertise in the development of a post-Chornobyl biopolitical regime in Ukraine, and how residents of the city of Slavutych, the home of ChNPP workers and their families since 1988, deployed narratives of their experience and expertise regarding Chornobyl to engage in geopolitical projects. In both of these cases, the framework of critical knowledge production forms the analytical basis for examining the contextual processes of technoscientific knowledge production, reproduction, and representation in investigations of geographies of power relations and political action. Critical knowledge production serves also as a bridge for incorporating theory and method from science and technology studies (STS) into political geography work. This dissertation demonstrates the applicability and malleability of the critical knowledge production framework for arriving at explanations in geography.

Acknowledgements

There are far too many people that helped me complete this dissertation to name each of them individually, but I would be remiss if I didn't at least try. I touch on this in the text below, but I would not have been able to take on this research topic without my initial experience in Ukraine in 2006-7, where I both learned Ukrainian and Russian and gained such an affinity for the country and its people. I am incredibly grateful for that experience in many ways, and for the friends and connections I made there.

The shape of my graduate career was largely set by the influence of one person—Alexander Tsiovkh. At the time, Alex was the head of the Center for Russian, East European, and Eurasian Studies at the University of Kansas, which under his leadership gained a solid reputation for the strength of its Ukrainian Studies program—this was the reason I applied to KU for grad school. Alex was affable and kind, an engaging instructor, and an amazing advisor. I will never forget one of the best pieces of advice that he gave me (and frankly, that I've ever received) when I was working on my master's thesis: you can always research more, but at some point, you have to just stop and write. Alex tragically passed away just before Christmas 2014, but his influence on KU, and myself, remains.

For those I met in CREES—professors Alex Tsiovkh, Edith Clowes, Nathan Wood, Eve Levin, Marie-Alice L'Heureux, Yaroslava Tsiovkh, and Shannon O'Lear; friends and colleagues Patrick Callan, Sarah Bazih, Matt Cotton, Emily Csinsi, Drew Burks, Gloria Funcheon, and Jaron Castilleja—thank you for being there from the beginning.

While I came into CREES from a history background, I left it going into geography. This was in a large part due to the sizeable contingent of geography grad students studying the same region I was, supported by the human geography faculty at KU. Shannon O'Lear, who then

became my PhD advisor, was instrumental in piquing my interest in geography and recruiting me to the department. She has been an amazing ally, advocate, coauthor, sounding board, and instructor. I have never met a more inclusive professor, nor one who has consistently challenged me to produce quality work. I will be forever grateful for everything, Shannon.

For those I met in geography at KU—professors Shannon O'Lear, Steve Egbert, Barney Warf, Vitaly Chernetsky, Alex Diener, Jay Johnson, and Dave Meacham; friends and colleagues John Biersack, Will Price, Austin Charron, Austen Thelen, Nicole Reiz, Dave Trimbach, Vincent Artman, John Oakes, Emily Fekete, JP Henry, Taylor Tappan, and Jen Glabius—thank you for helping me get through the long haul of a PhD program.

Marta Kolomeyets and the staff at Fulbright Ukraine were instrumental in facilitating my research and data collection in Ukraine. Marta was a driving force for the development of strong Ukrainian-American academic relations, and her absence is keenly felt. I am incredibly grateful for all the work she did with and for me; the same goes for the Ukrainian friends I made on my Fulbright and fellow Fulbrighters, especially Viktor Krupyna, Dmytrii Korchak, Ed Johnson, and Charles Bonds, whose friendship and camaraderie were such a great blessing.

I must also thank my supportive and loving family: my parents, Pam and Steve, who encouraged my curiosity from the beginning. Thank you to my siblings Chris, Duncan, Elyse, and Abby, plus "recent" additions Adam, Greg, Sarah, and Kate and my nieces Mia, Altea, and Pamela, who are all the best. Thank you to Ted and Holly for years of support and kindness. Thank you to my Lawrence family Pat, Evan, CK, Emily, Rob, and Rachel, who are the best part about living here.

My most special thanks are reserved for Katie, who has been the best partner anyone could wish for. Your endless love, support, and encouragement mean everything.

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I turned in the completed draft of this dissertation twenty days before Russian forces invaded Ukraine on 24 February 2022. It has been incredibly hard to witness this genocidal war of Russian imperial aggression, seeing the subway stations I used turned into bomb shelters, streets I've walked on scorched and bombed, people I know carting food, water, medicine, ammo, and Molotov cocktails to bunkers and control points in cities I lived in. It's impossible to completely divorce yourself from the people, places, and things you study. Even more so when those people, places, and things are fighting for their existence. Since the invasion, I have been regularly checking up on my friends and contacts in Ukraine, each time unsure if I will get a response. I am fortunate that, so far, I have received one back every time, but I know many others have not been so lucky. This dissertation is dedicated to those Ukrainians that are no longer able to tell their friends they're doing okay, and to those still fighting their former colonial oppressors for the freedom to exist.

Table of Contents

Chapter 1. Introduction: Approaching Chornobyl

It is impossible to approach a place like the Chornobyl Exclusion Zone without bringing in some idea of what it is. The Zone is simply not somewhere you can wander into: if you are visiting as a part of an officially licensed tour or as part of a research contingent, then you are brought through a series of checkpoints. Your guides and the posted military personnel will meticulously check your documents and surveil you for the entire trip along pre-approved routes, "hotspot" locales (both the tourist and the radioactive kinds), and the imported-food canteen. If you visit the Zone in a less official fashion – as in an illegal expedition, likely with the help and accompaniment of an experienced stalker – your journey into and through this space will be no less planned. In any case, approaching Chornobyl requires intent: before anything else, you have to want to go there.

I wanted to go there for several reasons. Many of these were wrapped up in the narratives of the Chornobyl disaster, and the implied horrors the Zone contained – of both the science fiction and the lived tragedy varieties. I had seen Tarkovsky's *Stalker*, played the videogame series based on that film and set in the Exclusion Zone, read Alexievich's *Voices from Chernobyl*, and attended a public lecture from a firefighter on the scene in 1986. By the time I was arranging my first tour of the Zone, my main reason for going was to see for myself the "truth on the ground," to gauge a personal experience of my own against the narratives of Chornobyl. I had figured that seeing the place, being in the Zone, would provide a kind of clarity towards understanding the legacy of the disaster.

And it did, though not in the way that I expected. My first time in the Zone, it was a drizzly overcast day in November, an atmosphere to set the mood if there ever was one. Our tour

guide did a fine job of going through her script, answering our questions, and making the easy upsell to a group of American Fulbright recipients to rent personal dosimeters for the day. The people with whom we interacted in the zone, the drivers, minders, and food service workers employed in the Chornobyl tourism industry, were similarly kind and affable, if a bit stern when one of us started to veer too far off the route. We saw the main attractions—the amusement park, the hotel, the swimming pool, the school, the rooms staged with discarded gas masks and children's dolls, the missile defense radar array—we took our photos, we oohed as we pointed our dosimeters at junked tractors and mushrooms, we were suitably surprised when animals would scurry out of nearby doorways, and we were all disappointed when our minders told us not to pet or feed the dogs. All said, it was perhaps the platonic ideal of the Chornobyl tour experience. However, I did not leave the Zone with the kind of academic, and in hindsight, naïve, epiphany I went in hoping to find. Instead, I returned to my apartment in Kyiv that night far more interested in the mechanics and political purposes of the construction of Chornobyl narratives. I had already conceived of my dissertation project as one that would be concerned with how the co-construction of information and power played out over space and the bodies in that space. My experience in the Zone transformed my approach to Chornobyl from looking at one narrative (what I might have once called What Really Happened) to many.

This dissertation is an exploration of the 1986 Chornobyl disaster through an analysis of specific cases of how narratives of that disaster are, and continue to be, crafted and deployed to accomplish political goals. As such, this project's chief concern is with the politics of the creation, control, and deployment of knowledge. I argue that far from being a discrete event, something that happened at some point in the past, the Chornobyl disaster is still happening. Aside from the tens of thousands of years of radioactive decay remaining before the full

decontamination of the Zone, various actors keep the disaster politically alive through technoscientific, discursive, and sociomaterial processes. As a result, more than three decades after the destruction of reactor 4, the Chornobyl disaster continues to impact Ukraine and Ukrainians in local, national, and global contexts.

The central research question driving this dissertation concerns the geographies of power. Specifically, I am interested in studying the ways in which the production of knowledge regarding elements of the Chornobyl disaster and its aftermath have been used to transform places and spaces in Ukraine. I accomplish this through the framework of critical knowledge production, a methodology heavily inspired by concepts from the field of science and technology studies. This framework centers the situated, contextualized processes of knowledge production, reproduction, and representation in investigations of power relations and political action. The theory involved in this framework, including nonhuman agency and assemblage theory, is an intervention in the field of critical geopolitics, and political geography more broadly, that works to shift the research focus from discourse to process. Assembling the sociomaterial relations in the processes that (co)produce technoscientific knowledge and political narratives and actions expands the explanatory capacity of political geography by embracing partialities, messiness, controversy and contradiction, and nonhuman agency. Two case studies anchor this project, demonstrating the versatility of this framework in political geography. The first examines the role of the researchers of the Department of Social Expertise in helping establish a post-Chornobyl biopolitical regime, and the second explores how residents of the city of Slavutych have leveraged local experience and expertise regarding the disaster and its effects to forge wide-ranging political, cultural, and financial connections.

Definition of terms and notes on translation

Throughout this project I use the Ukrainian transliteration of Чорнобиль – Chornobyl – instead of the more common, Russian-derived Chernobyl. Language, particularly the roles of Ukrainian and Russian, is a major political contention in Ukraine. As I conceived of this project to focus primarily on investigating the effects of the Chornobyl disaster in Ukrainian contexts, from the outset I committed to using Ukrainian-language transliterations. This extends to other place names as well, such as Kyiv instead of Kiev and Odesa instead of Odessa. In cases where titles or quoted texts use other spellings, I do not change them.

For proper nouns, I use the Ukrainian national system of transliteration that the Ukrainian Cabinet of Ministers approved in 2010 (Resolution 55). This system does not use diacritics and it omits the soft sign. Generally, I will use translations rather than transliterations of institutions and government organs, with the exception of the Verkhovna Rada, the name of Ukraine's parliament, and a few government departments with commonly used Russian or Ukrainian acronyms.

Two terms used frequently in the narratives of Chornobyl deserve a specific space for definition. The first, "liquidation" (Russian: ликвидация, Ukrainian: ліквідація), is an umbrella term used to describe the whole of the clean-up efforts in the aftermath of the disaster, though it is not a Chornobyl-specific term. Liquidators are those who participated directly in the clean-up efforts, including firefighters, the civil defense force, police officers, and volunteers.

The second term, "sufferer," is commonly used in English narratives of the disaster as a translation of both потерпілий (Ukr.)/потерпевший (Rus.) and постраждалий (Ukr.)/пострадавший (Rus.). The first pair is derived from the verb "to suffer" and relates to

going through an experience or being the victim of a crime or another's actions. This was also a legal term in the Soviet criminal code, carrying with it historical and institutional weight. The focus of this term is on one's relational subject position, as in "I am a victim/sufferer." The second pair is derived from the verb "to get hurt" and relates to being hurt, being injured, or suffering, whether the cause of pain is intentional. The focus of this term is on the present processes one is enduring, as in "I am suffering." Because both terms translate to "sufferer" and "victim" in English, the nuance of meaning is hard to capture in translation. To further complicate the matter, it is not always clear whether the authors of source material on Chornobyl are necessarily intending to highlight the nuance of meaning between the two words, as some treat the terms as interchangeable and others, writing in both languages, prefer one term in Ukrainian and one term in Russian.

All translations from Ukrainian and Russian are my own unless specified otherwise.

My approach to Chornobyl

The Chornobyl disaster is also a major world historical event and continues to be a relevant touchstone across all kinds of media. For example, in 2019 HBO produced a limited series from Craig Mazin called *Chernobyl* dramatizing the disaster to critical acclaim in a political climate where possible Russian interference was an overwhelming media narrative (Giovannone 2019), and Korean broadcaster MBC caused a scandal in its coverage of the 2020 Tokyo Olympics opening ceremony when they chose to display a number of insensitive and inappropriate images and captions in the introductions of the competing nations' athletes, including a pizza for Italy, Bela Lugosi as Dracula for Romania, and the infamous helicopter photo of the number 4 reactor at the Chornobyl Nuclear Power Plant (ChNPP) for Ukraine (Rashid 2021; Si-Jin 2021). Even in these two examples, the disaster is a malleable signifier: on

the one hand, it serves as a direct criticism of the Russian government, with the show's creator going so far as to state in a now-deleted tweet that "The lesson of Chernobyl isn't that modern nuclear power is dangerous. The lesson is that lying, arrogance and suppression of criticism is [sic] dangerous" (Towhey 2019). On the other hand, the disaster is well-recognized enough that it eclipses in importance anything else that has happened in Ukraine, even though the disaster occurred while there was no Ukrainian state.

Chornobyl continues to capture the imagination. Artists, journalists, scientists, engineers, environmentalists, religious figures, politicians, and scholars have been drawn to the incident and its aftermath for over three decades for a host of reasons. However, as I will argue in this project, perhaps the two biggest draws of the disaster are that there is so much about Chornobyl that is still unknown or not well understood, particularly in regard to the effects of radioactive contamination, and the vast transformative effects the disaster has had in many contexts.

This project initially developed as a way to bring in many of the insights, theoretical foundations, and practices from the field of science and technology studies (STS, also sometimes referred to as science, technology, society) into political geography. As I mentioned above, I wanted to explore the co-constructive relationship between information and political agendas—or more specifically, between the processes of creating, controlling access to, manipulating, and disseminating information and the enacting of political agendas. One reading of the Chornobyl disaster is a story of how the mismanagement of information, specifically hiding or covering up the details and severity of the disaster, combined with specific Soviet policy decisions led to enormous tragedy for individuals, communities, the environment, and the state. I thought therefore that Chornobyl would be a suitable milieu in which to accomplish my research agenda.

One of my first steps in formulating this project was reading Adriana Petryna's *Life Exposed: Biological Citizens after Chernobyl* (2003/2013). In her introduction, she explains one of the reasons why Chornobyl continues to resonate:

> Chernobyl was an "anthropological shock" for Western Europe, bringing the efficacy of everyday knowledge to a state of collapse and underscoring how much the conditions for secure living in what have been termed risk societies lie in the hands of experts of all kinds (Beck 1987). This collapse also took place, but in a different form, in the other Europe. Chernobyl was closely associated with the collapse of the Soviet system as a whole. In this process Chernobyl, or risk itself, became an important resource to be tinkered with. Though this technological disaster has generated a strange world, difficult to comprehend, in its aftermath a postsocialist state, social mobilization, and local knowledge and experiences of health have been constituted anew. (3-4)

This combination of the terrifying unknown and incomprehensible with the exciting strange new worlds makes for fertile territory for exploration. Her book explores both the ways that the Soviet and post-Soviet governments administered Ukraine and Ukrainians in the aftermath of Chornobyl and how those personally affected by the disaster—sufferers—navigated those bureaucracies. What I wanted to do for my own project was to pick up one of the threads that Petryna identifies in the 2013 introduction to her book: "Populations affected by Chernobyl have by and large become vestiges of larger—and mostly unsystematized—bodies of fragmented studies. The heterogenous facts of living that make up their stories of death and recovery have nowhere to live under dominant systems of knowledge. How they survived has become an inexplicable fluke…. What larger assemblages of truth and disposals of truth do they reference? What is missing but somehow present in what remains?" (xiv). As I mentioned above, the first

incarnation of my project was to find some hidden Ur-truth about the Chornobyl disaster that might provide some kind of unifying theory that could fill in the knowledge gaps and bring some kind of justice to survivors. I probably knew at the time that this was too big, ambitious, and naïve an undertaking, but it wasn't until after I returned from my first trip to the Zone that I began to understand that maybe the better, and more feasible, goal was not in attempting to identify or create a comprehensive system for understanding all the changes the disaster wrought on the bodies of the sufferers and various bodies politic, but rather to focus on the heterogeneity and multiplicity of Chornobyl. Instead of zooming out to try to find "larger assemblages of truth" and make the experiences of Chornobyl sufferers fit into "dominant systems of knowledge," by examining specific cases where narratives about Chornobyl were created and deployed, I could better understand the processes and political motivations behind some of the fragmentation Petryna references and afford more constructive agency to sufferers and other actors by treating them on their own terms.

Positionality statement

All research conducted by humans is infused with the biases of the researcher; there is no value-free knowledge or a "god trick of seeing everything from nowhere" (Haraway 1988: 581): the researcher is situated within the world they investigate. However, as Griffiths (1988) states, "Bias comes not from having ethical and political positions—this is inevitable—but from not acknowledging them. Not only does such acknowledgment help to unmask any bias that is implicit in those views, but it helps to provide a way of responding critically and sensitively to the research" (133). my own ethical and political positions are a major reason for undertaking this particular study, as is my relationship with the subject matter.

From December 2005 to November 2007, I served as a missionary for the Church of Jesus Christ of Latter-day Saints in the Ukraine Kyiv Mission, which at that time covered the area from Chernihiv in the north to Mykolaiv in the south, and all of Ukraine west of that line. As training for missionary service, I initially learned Ukrainian so I could freely converse with Ukrainians in their local language, and later learned Russian after being stationed for six months in the Kyiv and three more in Odesa. Although Chornobyl was within the borders of the mission, the mission president, a respected oncologist at the University of Utah Hospital, asked that no one visit the site. In my conversations with many Ukrainians however, particularly around the 20th anniversary of the accident in 2006, I noticed a lingering concern regarding Chornobyl, especially in terms of individual health and the political problems caused by the disaster.

After returning from Ukraine, I finished my bachelor's degree in History in 2009 and in 2010 I enrolled at the University of Kansas in the Russian, East European, and Eurasian Studies (REES) master's degree program, a decision greatly influenced by KU's support of Ukrainian studies. The transition from REES to geography was seamless due to faculty members and other graduate students studying the region. Because geography, like history, is a broad discipline, I have been able to incorporate into my studies knowledge from other disciplines such as sociology, anthropology, political science, philosophy, economics, and architecture that I find compelling and intellectually stimulating. Selecting the Chornobyl disaster as the topic of this study was therefore a decision based both on my personal connection to Ukraine and because, though this topic is rooted in geography, I am also able to draw upon my interdisciplinary training.

I am also keenly aware of my position as an American doing research in Ukraine. In terms of ethics, especially in conducting interviews, I acknowledge the power differential

between a Western academic and a non- or liminally-Western subject. This differential was highlighted during my tenure as a graduate student researcher in the Fulbright Program from September 2015 to June 2016 in a number of ways. For example, the Ukrainian Fulbright staff in Kyiv asked me to participate in a workshop series to present to university faculty in five cities on the subject of publishing in Western academic journals. The government had recently introduced a new condition for job advancement in the professoriate requiring international publications, but many institutions were ill equipped to provide instruction or support on the issue, in no small part because the high costs of subscriptions to Western academic journals prevented many of these scholars from accessing the literature. After the question-and-answer session following the first workshop where these issues were pointedly raised, we retooled the workshop from a justice standpoint to help minimize the obvious knowledge and opportunity gap. In my own research, I endeavored to treat all of my contacts with this differential in mind—not extracting information for use in the West, but working collaboratively and on their terms, including speaking in the language they were most comfortable using, sharing research, and returning favors where I could.

There is also a cultural sensitivity element here as well, as I aim to investigate the impacts of a major tragic event. However, the purpose of this study is not to propose policy or to pass some sort of moral judgment on Ukraine and Ukrainians: it is an effort to understand the long-term effects of a nuclear disaster on a place and its people.

Outline of chapters

Chapter 2. What was and is Chornobyl: A review of the literature on the disaster and its effects

The next chapter broadly covers the literature on the Chornobyl disaster to two ends. First, to demonstrate the wide range of attention scholars of many disciplines, including geography, history, epidemiology, physics, biology, etc.; journalists; novelists; politicians; and others have paid to Chornobyl. Second, to illustrate the many contradictions, knowledge gaps, competing claims of truth and authority, and alternative narratives present in that literature. I begin this chapter with an overview of the disaster, from the explosive events of 26 April 1986 through the immediate efforts to control the fallout. The bulk of this chapter however explores the three decades of the development of the dynamic interactions among the production of knowledge about the disaster and its effects, including the declassification of Soviet archival documents; actions taken at local, state, and international scales to mitigate those effects; and the meaning(s) of the disaster.

Chapter 3. Critical knowledge production: Incorporating STS into political geography

This chapter sets out the methodology of this dissertation. It is comprised of four major sections. In the first, I discuss the ways in which science and technology studies and political geography overlap and inform each other. The second section goes into detail on the concept of critical knowledge production, explaining what it is and how I will use that framework in my analyses. The third section takes a co-constructivist approach toward method in geography and the geopolitics of information, both in general and how I engaged with these ideas in the writing of this dissertation, including expertise, documents, archives, and discourse analysis. The final

section casts the 1986 Chornobyl disaster as an assemblage, which serves both as a demonstration of the concepts of assemblage theory and as a jumping-off point for the two chapters that follow.

Chapter 4. Social monitoring: The Department of Social Expertise and the evolution of biopolitics in post-Chornobyl Ukraine

In chapter 4, I explore the construction of a biopolitical regime in Ukraine, facilitated by the work of a group of dedicated scientists in the Institute of Sociology of the Ukrainian National Academy of Sciences. It begins with a discussion of biopolitics as it developed in the West, how STS approaches can illuminate new paths of inquiry into the topic, and how understandings of Soviet biopolitics fit into or challenge some of the central ideas within biopolitical thought. I then introduce the Department of Social Expertise and how I set out to analyze their body of work on Chornobyl and how their research shaped the development of a post-Chornobyl biopolitical regime. To conclude that chapter, I look at how the Ukrainian state's inability to provide for Chornobyl sufferers is both a symptom of and contributing factor to the breakdown of state authority since independence.

Chapter 5. Emergent stateness: Critical urban geopolitics in Slavutych

The penultimate chapter analyzes the history of Slavutych, Ukraine from a co-constructivist perspective, emphasizing how residents transformed experience, expertise, and knowledge about the Chornobyl disaster, the Chornobyl Nuclear Power Plane (ChNPP), and the Zone into fruitful relations with other cities, states, corporations, and organizations. For twelve years after the disaster, the plant was active and required engineers to keep it running, an operation completely separate from the liquidation efforts. City residents and leaders actively engaged in processes of critical knowledge production with the explicit agenda of saving the

city. The locus of this analysis is on the state-like qualities and actions Slavutych, particularly in its governance and geopolitics.

A version of this chapter was published with the same title in 2019 in the *East/West Journal of Ukrainian Studies* 6(2): 11-31.

Chapter 6. Conclusion: Processes and practices

Finally, the conclusion returns to the geographies of power and how the processes of critical knowledge production reshaped those geographies. Here, I reflect on the project and the usefulness and effectiveness of incorporating STS-inspired inquiry into political geography. I also address future avenues of research beyond this project.

Chapter 2. What was and is Chornobyl: A review of the literature of the disaster and its effects

The history of the 1986 Chornobyl disaster is far more than a recounting of the events thereof; while we now have access to volumes of documentary evidence and scientific calculations, so much of the story of Chornobyl exists in how authors—governments, industries, journalists, sufferers, researchers, entertainers—fill in the gaps among those calculations and that evidence to advance a given agenda. This section is both a history and an exploration of some of those agendas through the literature on the disaster. My aim here is to present several facets of the Chornobyl disaster to explore this subject both as a whole and as a fractured political landscape of sometimes overlapping, sometimes intersecting, sometimes contradictory claims. As I will discuss further in the next chapter, there is no one way to approach Chornobyl, but by looking at a variety of approaches and understanding who is assembling what information into a cohesive Chornobyl narrative, we can uncover hidden geographies of power and better understand processes of knowledge production.

Background to the 1986 Chornobyl disaster

The Chornobyl Nuclear Power Plant (ChNPP) was built in the 1970s in a forested area approximately 110 km north-northwest of Kyiv and about 10 km from the border with Belarus, along the Pripyat River, a tributary of the Dnieper. The town of Pripyat, a closed city built to house workers at the plant and their families, was constructed alongside the reactor. Reactor 1 came online in 1977, followed by reactors 2, 3, and 4 in 1978, 1981, and 1983 respectively. Two more reactors of a similar type were under construction at the plant by the time of the disaster.

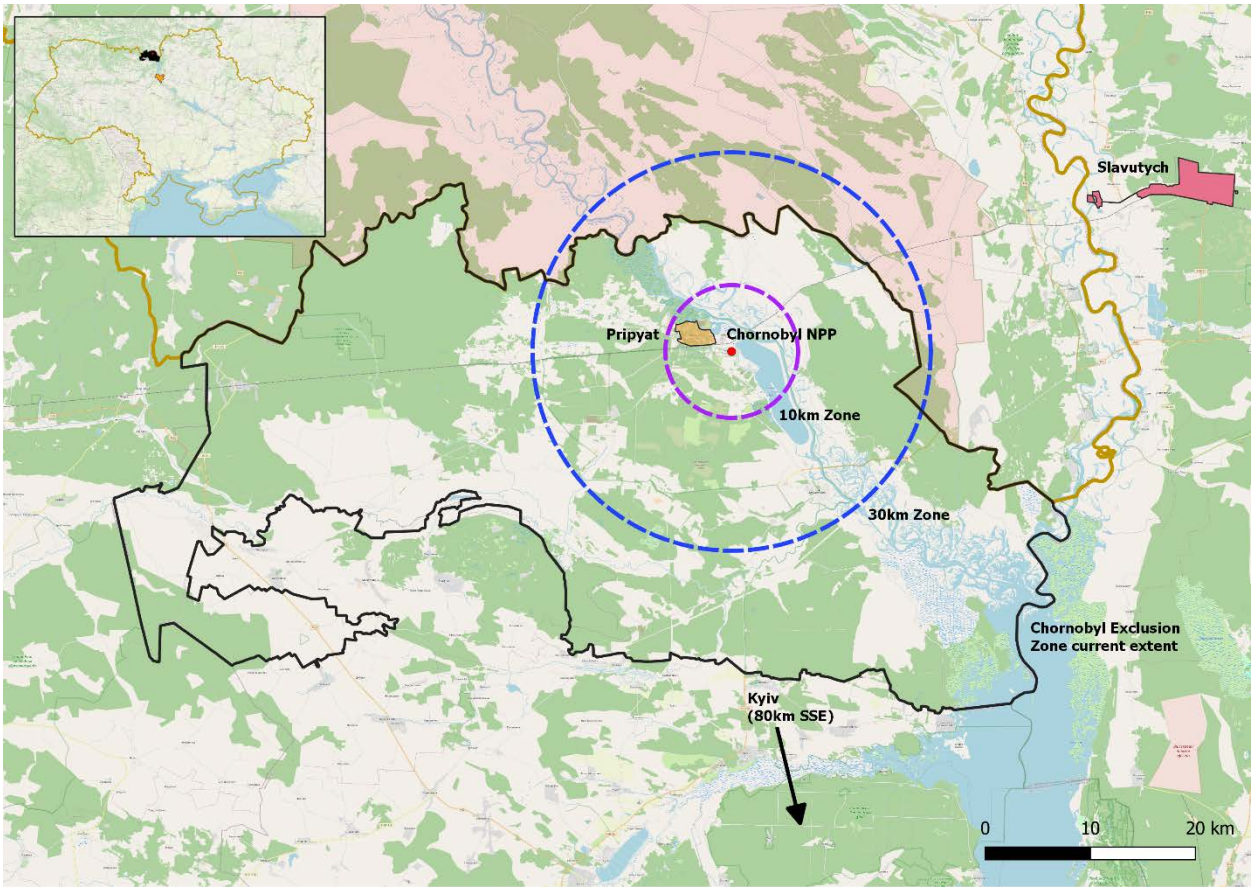

Figure 1. Map of the Chornobyl Exclusion Zones, including the cities of Pripyat and Slavutych. Inset shows the location of the current area of the Zone in Ukraine. By the author.

The reactors at ChNPP were of the RBMK-1000 type, which is a romanization of the Russian acronym “реактор большой мощности канальный,” meaning “high-power channel-type reactor,” capable of a 1000 MW output. Academician Anatoly Petrovich Aleksandrov, who served as president of the Academy of Sciences of the Soviet Union from 1975 to 1986, led virtually all of the USSR’s nuclear programs as the deputy director (1955-1960) and then director (1960-1989) of the Institute of Atomic Energy, including heading up the development and construction of the RBMK reactors. One of the key features of the RBMK reactors was that

they were designed to run on low-enriched uranium and therefore were extremely cost-efficient in terms of fuel. The downside of using un- and low-enriched uranium was that each reactor relied on over 1600 fuel channels that needed essentially constant monitoring by plant technicians (Imanaka 2008, 1-2).

At the time of the disaster, the Chornobyl NPP was one of 19 operational nuclear power plants in the Soviet Union, a technological hallmark of the era. The overarching goal of Aleksandrov's nuclear power plan was to fulfil the old Bolshevik promise to "electrify the whole country" and these plants featured in Soviet propaganda (Josephson 1996). Embarking on such an endeavor was not without risk, but this initiative was ideologically useful and spearheaded by the top-ranking scientist in the entire country. The Chornobyl disaster was not the first nuclear accident in the Soviet Union, but it was the first that was widely known. Geist states (2015), "The problem with the Soviet nuclear energy sector was not that it considered accidents impossible but that it regarded minor accidents as acceptable…. To suggest that these facilities might threaten citizens' health and well-being constituted not merely a contradiction of the party line but a challenge to the legitimizing myths of Soviet power" (106-7). The 1986 disaster was not even the first accident at ChNPP: declassified KGB archival documents show that on 9 September 1982, fuel channel NR 6244 of reactor 1 ruptured, damaging a fuel assembly, causing a crack in the fuel channel, and getting the surrounding graphite masonry wet. In the six days it took to fix the broken channel, the Ukrainian KGB reported a gamma radiation level 10-100 times over the norm within the gas circuit and drainage chambers and gamma radiation doses of 0.01-0.02 microbars/second at various surface sites around the reactor block.[1] There is no record

[1] The following from the document archives of the Security Service of Ukraine (hereafter DA SBU, from the Ukrainian ДА СБУ) discuss the 9 September 1982 accident. "Об аварийной ситуации на Чернобыльской АЭС," 10 September 1982, ДА СБУ. — Ф. 65. — Спр. 1. — Т. 5. — Арк. 164. "Об аварийной ситуации на Чернобыльской АЭС," 13 September 1982, ДА СБУ. — Ф. 65. — Спр. 1. — Т. 5. — Арк. 165–166.

of any changes made to safety protocols or operating instructions at ChNPP after the 1982 accident, and this event was not officially made public until these documents began to be declassified in 2001. The involvement of the KGB in this episode meant that this accident would remain classified—each of the archival documents regarding 9 September 1982 were marked "secret" or "top secret"—as the secrecy was the point. The Party "believed that keeping accidents secret would protect their legitimacy while posing little attendant political risk because they had successfully utilized this strategy in the aftermath of several nuclear disasters" (Geist 2015: 109).

The conflicting goals and directive of various parties at play in 1982—operators trying to efficiently produce power and keep the plant operational, institutional political pressure from the highest scientific figures in the state, KGB agents actively engaged in the monitoring of nuclear accidents, Party officials wanting to keep accidents secret—return in the 1986 disaster, though with significant changes to the political landscape.

Mikhail Sergeyevich Gorbachev became the General Secretary of the Communist Party of the Soviet Union on 11 March 1985 and oversaw the collapse of the Soviet Union as its president in 1991. Two of Gorbachev's major policy decisions, *perestroika* and *glasnost*, would have a direct effect on the handling of the 1986 Chornobyl disaster and, as many argue in both academic and popular histories, on the end of the USSR itself (see, for example, Marples 2004; Plokhy 2014; and Maranzani 2018). Simply put, perestroika, meaning "rebuilding," introduced

"ИНФОРМАЦИОННОЕ СООБЩЕНИЕ Об аварии на АЭС," 14 September 1982, ДА СБУ. — Ф. 16. — Оп. 7 (1985). — Спр. 70. — Арк. 145. "О повышении уровня радиоактивных излучений в реакторном отделении 1 энергоблока ЧАЭС," 14 September 1982, ДА СБУ. — Ф. 65. — Спр. 1. — Т. 5. — Арк. 197–198. "ДОКЛАДНАЯ ЗАПИСКА о состоянии радиационной обстановки в районе расположения Чернобыльской АЭС," 30 October 1982, ДА СБУ. — Ф. 65. — Спр. 1. — Т. 5. — Арк. 239–242. "ДОКЛАДНАЯ ЗАПИСКА о радиационной обстановке на Чернобыльской АЭС и в ее окружении," 5 November 1982, ДА СБУ. — Ф. 65. — Спр. 1. — Т. 5. — Арк. 243-245.

some market elements to the Soviet economy, and glasnost, meaning "openness," lessened the Communist Party's control over media and "made some allowance for ideological pluralism" (Plokhy 2014: 12). Understandably, these reforms rankled many of the party elite not just in the central administration but also in the republics, resulting, in many cases, in a slow and half-hearted rolling out of the reforms. For example, Volodymyr Shcherbytsky, the conservative First Secretary of the Communist Party of Ukraine, resisted implementing the reforms because he was suspicious of Gorbachev's motives (Yekelchyk 2008: 180).

Resistance and skepticism contributed to the poor implementation of these reforms, though they were not the only factors. Perestroika broke down mechanisms of the centrally planned economy before establishing market-based alternatives, leading to an economic downturn in the late 1980s. Chornobyl was in effect the first test of glasnost—despite four decades of nuclear accident secrecy, would the Party be open and transparent about the largest nuclear accident in history?

What happened at Chornobyl

There are hundreds of volumes, from virtually every applicable discipline, written about the events of the disaster and its immediate aftermath. Some are highly specialized, getting into the physics and chemistry of the accident, some are journalistic accounts writing for a lay public; some are emotional histories and ethnographies of sufferers, others are polemics on the failures of individuals and ideologies. Additionally, there are the numerous reports of fact-finding missions for governments, international organizations, charities, and businesses that have sought to quantify the damage done by the disaster (in whatever form the authors wish to define that damage). As a result, there is now a consensus around both the chronology and the amount of radioactive release of the accident.

The accident happened during an experiment to generate energy from free-wheeling turbines during the time between shutting off the main generators and the backup generators getting up to full speed during maintenance shutdowns. However, a request by the city of Kyiv to keep the power output at 1600 MW for the evening of 25 April, a shift change, junior operator inexperience, flawed control rod design, an unpredictable result of the emergency shutdown system while at low power, and pressure from the top to see the experiment through resulted in the xenon-poisoning of reactor 4's core, a massive power surge, and a series of devastating steam explosions that blew the roof off the reactor, ruptured the fuel and coolant lines, and broke the reactor container. Aside from that initial radiation release from the explosions themselves, the reactor ignited when it was exposed to the air, substantially increasing the spread of radioactive fallout during the ten days it took to extinguish the graphite fire.

The initial chronology of the accident was established in a 1991 report by the USSR State Committee for Supervision of the Safe Conduct of Work in Industry and Nuclear Energy (Gospromnadzor). This report drew from built-in recording devices in the control room, the diagnostic parameter recording program (DREG) and PRIZMA program that record and calculate reactor parameters, and recording instruments within the turbogenerators. A safety report by the International Nuclear Safety Advisory Group of the International Atomic Energy Agency (1992) translated that timeline. I have not found any alternative or contradicting chronologies to this one, including in reports from the OECD's Nuclear Energy Agency (2002), multidisciplinary and international research projects like Imanaka (2008), and contemporary histories such as Plokhy (2018).

Calculating the amount of radioactive release of the Chornobyl disaster was not as easily settled. There was no DREG or PRIZMA system automatically recording logs of radioactive

sensor readings. Instead, “radionuclide source terms after releases from major nuclear accidents are obtained by model simulations with distinct assumptions and preconditions. This explains the variability of early estimates” (Steinhauser et al 2014: 802). In fact, much of the sensing equipment on the scene in the weeks following the disaster was functionally unable to get accurate readings of radioactivity in the environment and in people’s bodies, whether because of the damage those instruments sustained or because the levels exceeded the maximums of the devices. Annex J of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR 2000) catalogs the variations and evolution of estimates on the core inventory, or a listing of the amounts of isotopes contained in the nuclear fuel, of reactor 4, and the studies calculating the percentage of that core inventory released during the accident:

> Two basic methods were used to estimate the release of radionuclides in the accident. The first method consists in evaluating separately the inventory of radionuclides in the reactor core at the time of the accident and the fraction of the inventory of each radionuclide that was released into the atmosphere; the products of those two quantities are the amounts released. The second method consists in measuring the radionuclide deposition density on the ground all around the reactor; if it is assumed that all of the released amounts deposited within the area where the measurements were made, the amounts deposited are equal to the amounts released. In both methods, air samples taken over the reactor or at various distances from the reactor were analysed for radionuclide content to determine or to confirm the radionuclide distribution in the materials released. (456-58)

These sophisticated models and algorithms deployed to calculate the radiation release point to a central issue of the Chornobyl disaster: unknowns abound. In the absence of empirical data,

researchers, government officials, and medical professionals have had to build a consensus. As I will discuss later in this dissertation, even basic information about the disaster is inextricable from very human processes of knowledge production.

This UNSCEAR summary excludes much of the messiness in the arrival at consensus. For example, one of the papers the UNSCEAR report cites is much more explicit in its explanation of consensus building. Devell et al (1996), in a paper subtitled "Development of a consensus view" published by the Nuclear Energy Agency, clearly state some of the challenges that researchers have faced in producing calculations of Chornobyl's radioactive release, including that "early attempts were handicapped by imprecise knowledge of the fuel burnup in the reactor" (183); "typographical errors may be responsible for overestimation of the ^{99}Mo inventory by a factor of 10 and underestimation of the ^{239}Np inventory by a factor of 10" (183); at least seven different codes were used by different teams to estimate fuel burnups with "large-enough variations that some caution is needed when inventories are used to calculate release fractions" (184); air samples and ground surveys of radioactive contamination provided the initial numbers in the first official report, but "Materials that went outside the borders of the Soviet Union were not included" (185); new and better sampling has resulted from being able to "re-enter the reactor, take samples, make measurements, and clarify some of the effects of deposited materials and to determine the fate of the core debris" (185); and the surprising revelation that "most of the graphite moderator has burned and disappeared. In 1986, it was thought that only about 20 percent of the graphite had burned" (185). This paper also does some heavy lifting when it comes to consensus building as well, declaring some studies better than others and including those data in its tables under the heading of "Current Estimate" (187). That

current estimate from 1996 has largely made it through the decades, with a total of about 5,300 PBq[2] of radioactivity (not including noble gases) resulting from the Chornobyl disaster.

Annex J of the UNSCEAR report, by taking the estimates by Devell et al., declared the consensus as settled, its numbers appearing in virtually all subsequent reports of figures of Chornobylgenic (from Chornobyl + genesis) radiation. Steinhauser et al (2014), in a comparison of the Chornobyl and 2010 Fukushima Daiichi NPP accident, present a comprehensive table of radioactivity that includes calculations from Annex J – bolded in the table as the accepted values – alongside six other studies that produced different values. They state, "It is important to note that some (soil and plant) analyses after Chernobyl were performed several years after the accident, reducing the apparent activity concentrations due to physical decay and migration into the soil. Naturally, the degree of contamination not only depends on distance but also on weather conditions such as wind direction and precipitation, which, especially for the analysis of the Chernobyl accident remains difficult to determine retrospectively" (807). Nevertheless, for the Steinhauser paper, the consensus view was enough to demonstrate that despite the IAEA rating both accidents a 7 or "major accident" on the International Nuclear and Radiological Event Scale, the radioactive release from Chornobyl was an order of magnitude greater than that of Fukushima in 2010.

[2] There are multiple terms used for measuring radioactivity. 1 becquerel (Bq) is the SI derived unit of radioactive emission of a particle and is equivalent to one disintegrating atom per second. 37 billion Bq is 1 curie (Ci). The estimate of Chornobyl's radioactive emissions is usually given as 5300 petabecquerels, or 5300 x 10^{15} atomic decays per second. When measuring the effects of radiation on organic beings, exposure, absorbed dose, and dose equivalent/effective dose are all calculated differently and employ different units. A roentgen (R) measures exposure, the amount of radiation moving in the air, and is a common unit in dosimeters and other environmental radiation sensing equipment. Rads (short for *radiation absorbed dose*) measure the amount of energy deposited by radioactive particles and 1 rad is calculated as 100 ergs of radiation energy absorbed by 1 gram of material. 100 rads is equivalent to 1 Gy. Measures of dose equivalent account for the different types of radiation (alpha, beta, gamma, x-ray, neutron) and the variable rates that organic tissues absorb radiation. Sieverts (Sv) and rem (short for *roentgen equivalent man*) are calculated from the product of the absorbed dose, the radiation weighting factor, and the tissue weighting factor (if not calculating for the whole organism). 100 rem is equal to 1 Sv.

It is important to reiterate that all of the above information on the amount of radioactive release is the result of complex modeling completed after the fact. At the time of the explosions, there simply were no tools that could accurately record the radiation. The number of people who even knew about the accident at ChNPP was initially very small—the plant workers, and then shortly thereafter, the KGB and the Soviet officials in Moscow they reported to. The protracted timeline of international detection of Chornobylgenic radiation, and how that affected responses to the disaster, plays a central role in narratives of the disaster. It took over 48 hours for anyone outside of the USSR to even have an idea that a nuclear accident had occurred, when alarms at the Forsmark Nuclear Power Plant in Sweden, and then later that day in Finland and Denmark, signaled high levels of radioactive particles in the air (Schmemann 1986; Radio Sweden 2011). Svetlana Alexievich, a future Nobel laureate, quotes from a report entitled "The Consequences of the Chernobyl Accident in Belarus" by the Sakharov International College on Radioecology in the opening pages of *Voices from Chernobyl*:

> On April 29, 1986, instruments recorded high levels of radiation in Poland, Germany, Austria, and Romania. On April 30, in Switzerland and northern Italy. On May 1 and second, in France, Belgium, the Netherlands, Great Britain, and northern Greece. On May 3, in Israel, Kuwait, and Turkey…. Gaseous airborne particles traveled around the globe: on May 2 they were registered in Japan, on May 5 in India, on May 5 and sixth in the U.S. and Canada. (1997/2006: 2)

The big question of who knew what when is inextricable from the events and narratives of the Soviet—and world—response to Chornobyl. The processes of knowledge production regarding the disaster played out in a context of shifting boundaries of what was known, what could be known, and who could know what.

Controlling the immediate aftermath

Containing and liquidating the aftermath of the largest nuclear accident in history is also a major part of Chornobyl narratives. It is useful here to lay out some figures, events, and definitions to provide context to those politics.

The evacuations began on 27 April, a day and a half after the explosions and a day before the Soviet Union publicly announced the disaster. Initially, only the residents of Pripyat were evacuated, though the radius of evacuation expanded to 10km the following day and then 30 km on 2 May. Valentyna Shevchenko, then the Chairwoman of the Presidium of the Verkhovna Rada, recalls that on the first day 53,000 people were evacuated (2011). UNICEF reported that by December of 2000, 304,699 people had been resettled in other parts of Ukraine (2000: 32).

Establishing the Zone of Alienation, or Exclusion Zone (Зона відчуження Чорнобильської АЕС), took place on 2 May under the direction of Nikolai Ryzhkov, Chairman of the Council of Ministers of the USSR and head of the Government Commission on Chornobyl, and enforced by the Soviet military. Its initial greatest extent was a 30 km radius circle centered on the reactor, though its external and internal borders changed shape quickly and often, with the first changes coming on 10 May. Bondarkov et al. (2011: 7) explain the reasoning for the internal boundaries of the Zone:

> Taking into account the provisional annual maximum allowable dose limitation of 100 mSv recommended by the USSR Ministry of Health (Minzdrav) for the population during the first year after the ChNPP accident, the Government Commission established the following three zones:

1) the exclusion zone, from which the population is to be evacuated and never to return: located inside the dose rate line of 0.2 mSv hr-1 (20 mrem hr-1) (“black zone”);

2) the zone of temporary evacuation, where the public may be allowed to return when the radiation situation normalizes: located between the dose rate lines of 0.05–0.2 mSv hr-1 (5–20 mrem hr-1) (“red zone”); and

3) the zone of rigorous monitoring, from which children and pregnant women were evacuated into “clean” areas for the summer of 1986: located between the dose rate lines of 0.03–0.05 mSv hr-1 (3–5 mrem hr-1) (“blue zone”).

These boundaries, derived from dose rates, could not have been put into place before dose measurements could be taken, and were tied directly to evacuation efforts. The Soviet State Committee on Hydrometeorology (Goskomgidromet) produced these earliest maps (Izrael et al. 1990). After Ukrainian independence in 1991, the Verkhovna Rada passed a law, “On the legal status of the territory subjected to radioactive contamination as a result of the Chornobyl catastrophe,” to regulate the Zone. Article 2 of this law defines the Zone’s internal borders based on depositions of ^{137}Cesium, ^{90}Strontium, and Plutonium, and on the calculated dose rates in terms of mSv per year. This law, and many of the numerous addenda over the years, also assigns various government ministries to oversee the Zone and its borders. “The criteria of zones identification are set by the National Commission of Radiation Protection of Ukrainian Population (NCRPU). The zone borders are identified by the Cabinet of Ministers of Ukraine proceeding from the expert conclusions of NCRPU, National Academy of Sciences of Ukraine (NASU), Ministry of Health, Ministry of Chernobyl Affairs, Ministry of Agriculture, Ministry of Ecological Safety, State Hydrometeorological Committee, and on the representation of the Regional deputy councils. According to the additions to the Law, adopted by Verkhovna Rada

(Ukrainian parliament) in 1996, no changes could be done to the zone borders without approval by Verkhovna Rada" (Nasvit 2011: 52). The map on page 6 (above) shows the current borders of the Zone, an area of approximately 2600 km^2 (1000mi^2).

Control over access to the Zone was initially facilitated by the KGB and the Soviet military. As a nuclear monotown, Pripyat at the ChNPP prior to the accident was under the jurisdiction of Moscow and not of Kyiv and the Ukrainian SSR. When news of the accident broke, Ukrainian officials, including Shevchenko and Shcherbytsky, found out from officials in Moscow.[3]

Public knowledge of the accident at the plant rolled out slowly under the direction of officials in Moscow. The first announcement of the accident came with the order to evacuate Pripyat on 27 April, but that broadcast was not widely disseminated beyond the evacuation area. The following evening, 28 April, after the Forsmark NPP detected the radiation, a short news segment on *Vremya* stated that there was an accident at the Chornobyl NPP, that it is being taken care of, and that a commission has been set up to investigate the accident.[4] As news of the accident began to spread, there were only hints at its severity, especially regarding the extent of possible radiological contamination. One major reason for this, as I discussed above, was that quantifying the radioactive release of the disaster was basically impossible to do in those first crucial few months following the accident. Another is that the effects of radiation, on human bodies, on wildlife, on plants and fungi, on soil and water, were largely unknown at the time.

[3] See for example, "О взрыве на ЧАЭС," 26 April 1986, ДА СБУ. — Ф. 65. — Спр. 1. — Т. 34. — Арк. 2–3 and "О взрыве на Чернобыльской АЭС," 26 April 1986, ДА СБУ. — Ф. 65. — Спр. 1. — Т. 33. — Арк. 2–4.
[4] The entirety of the 17 second segment has been uploaded onto YouTube: https://www.youtube.com/watch?v=sC7n_QgJRks

These unknowns were in many ways not unhelpful to Soviet officials undertaking the enormous work of making sense of and handling the myriad consequences of the disaster. The processes of the construction of knowledge—biological, radiological, ecological, sociological, geographical—enjoyed a kind of freedom afforded to them by these unknowns. "A catastrophe whose scale was unimaginable, difficult to map, and 'saturating' became *manageable* through a particular dynamic: non-knowledge became crucial to the deployment of authoritative knowledge, especially as it applied to the management of exposed populations" (Petryna 2003: 39). However, the Soviet Union was not able to manage the fallout from the disaster in the same way that it had hidden other radiation accidents in its territory, such as at Kyshtym in 1957. One early analysis of the Chornobyl disaster looked at these multiple accidents in context with one another. "The one common thread through all of these accidents is the complete failure of the Soviet system to manage modern technology in a safe manner. This failure is due in large part to the secrecy that was endemic in Soviet society… Society existed in compartments, with little communication between them" (Shlyakhter and Wilson 1992: 253-4). As the size and scale of Chornobyl was much greater than any before it, and because the radiation was detected early on by foreign sensors, Soviet management of the disaster was uncomfortably thrust into public view. Whereas with previous nuclear accidents, officials operated in secret, at Chornobyl they had to find a way to adapt their liquidation protocols under the scrutiny of the IAEA and international journalists. The unfolding of the liquidation of the Chornobyl disaster tracked the slippage of the meaning of "liquidation" from its literal sense—elimination and removal—to evolving understandings of what metrics those in charge of the effort could live with.

The lack of consensus around the effects of radiation is a fascinating knowledge gap, and one that drew me to this project. This gap opens up spaces of political activity because the lack

of information on this subject can be leveraged as justification for a wide, and sometimes contradictory, variety of claims. Later in this dissertation I discuss at length two cases of knowledge production that emerge from this gap, but to illustrate this point I want to sketch out two smaller examples here.

Acute radiation sickness (ARS)

Petryna (2002/2013) makes some insightful connections between the scientific knowledge of nuclear radiation—or rather the lack thereof—and Soviet governance strategies. The timing of the disaster in the mid-1980s, in the midst of Reagan's "evil empire" rhetoric, necessitated that Soviet officials maintain at least an image of control over the situation so control could be maintained within the Union as a whole and to save face to the world outside of the Soviet bloc. This was a monumentally hard task in and of itself, only compounded by the fact that on the one hand, there were myriad unknowns—scientific, technical, political, institutional—and on the other, the limited amount of knowns had to be kept secret in order to maintain control and save face. The Soviet response was hindered by knowledge gaps, and the bridging of said gaps was in turn hindered by Soviet policy in a self-defeating cycle. Petryna states that

> The sciences, politics, and international cooperations that informed Soviet state responses to Chernobyl produced an image of control over unpredictable and largely unassessed circumstances of risk…. What was known or not known about the scale of the disaster was the result of policy choices, supported by a base of scientific knowledge that was provisional at best… The apparent arbitrariness of the situation prompted people to search for other resources and clues to render an uncertain and unknowable world knowable and inhabitable in some way. (2003: 63)

Where people looked for experts, either scientific or political, to determine maximum exposure limits or even to outline possible symptoms, none were to be found as there was no consensus regarding the neither the treatment nor the classification of radiation contamination in humans in either community. Petryna notes that even at the time of her writing the book, "there is considerable disagreement as to suitable parameters for interpreting radiation-induced biological risk in human populations. There is also disagreement among [radiologists] as to how various experimental data may be unified in terms of a systematic theoretical approach" (36).

This knowledge gap over the effects of radiation has been approached from many angles (see for example Padovani et al. 1993, 1995; Baranov et al. 1995; Beresford and Copplestone 2011; Møller and Mousseau 2015, 2016; Omar-Nazir et al. 2018; Yeager et al. 2021), but one of the first controversies arising from this gap in the wake of the Chornobyl disaster was regarding ARS.

In *Life Exposed*, Petryna discusses the diagnosis of acute radiation sickness among plant workers and liquidators at Chornobyl. Angelina Guskova, a hematologist, neurologist, and chief radiologist at a clinic in the Institute of Biophysics, and her colleague Alexandr Baranov were tasked by the Soviet Ministry of Health to lead the initial medical response to the disaster. Prior to Chornobyl, Guskova oversaw research into the effects of ionizing radiation on humans, treating a cohort of over 200 patients exposed to high levels of radiation from disasters at the Mayak and Kyshtym NPPs near Chelyabinsk. Her pioneering work with these populations included developing surgeries, classifications, observation and monitoring protocols, legal-medical evaluation procedures, plans for treating victims in a large-scale radiological event, and a "'semi-empirical model' for estimating dose exposures in cases where doses were not known. This model was based on an examination of patients' external symptoms and linked the time of

symptom appearance to an estimation of dose" (Petryna 2003: 40). A person can suffer from acute radiation sickness (ARS) in the dose range of 200-400 rem, the lower limit for bone marrow failure. Beyond 1000 rem there is little chance for survival. When Guskova and her team arrived on-site at Chornobyl on 27 April 1986, officials from the Soviet radiological service could not provide her with accurate dose-related information: it was still too early to provide useable measurements of the amount of radiation released by the reactor. Compounding the issue of treatment was the large number of burns as a result of the graphite fire in the reactor.

Understanding the processes of the creation of scientific knowledge, in particular in medicine and biology, birthed the field of science and technology studies (STS). I will go more into STS in the next chapter, but Latour and Woolgar's *Laboratory Life* (1979), where the authors track the work of a number of endocrinologists at the Salk Institute, marks the beginning of the academic discipline. This book demonstrates that scientific knowledge is not produced in a vacuum but rather by people using an assortment of theories, tools, procedures, and models in a particular social, historical, economic, and political context. Doctors arriving at a diagnosis and treatment plan do so in conjunction with their instruments, their training and experience, the patients, insurance companies, career prospects, personal feelings—an assemblage of actors, human and nonhuman, that influence, inform, constrain, and create the conditions for such major decisions. Dogmas such as "trusting the science" take on new meaning when considering just how human, how social, these scientific processes are.

The social processes in diagnosing Chornobyl patients were evident from the outset, as signified by Guskova's self-described "semi-empirical" model. Because Guskova, the leading expert on ARS, led the treatment efforts at Chornobyl, how those efforts played out was under

her expert[5] discretion. Even as American specialists were brought in to help within two weeks of the disaster (see Schweitzer 1989 on Cold War techno-diplomacy; USSR State Committee 1986 for Gorbachev's invitation to the West for help), it was the Soviet team under Guskova that ran the medical treatment program. Explains Petryna (2002),

> Guskova relied on a higher threshold dose to facilitate sorting patients at the Chernobyl plant in days following its explosion. A threshold dose is the dose limit above which radiation exposure would likely produce long-term biological effects. Symptoms of ARS begin to manifest themselves at 200 rem. Guskova set the dose at which patient recruitment would begin at roughly 250 rem. The use of a threshold generated an on-site social dynamic…. She limited the group of victims who would be subject to early active therapy and delayed medical evaluations and therapies for workers who were potentially injured at doses below 250 rem. I met a person who estimated her dose to be 200 rem, 30 rem shy of the threshold, but who was excluded from the ARS cohort and therefore required to continue working at the disaster site. (41, 43)

This arbitrary moving of the goalposts to set a threshold dose had political reverberations. Soviet Health Ministry officials directed Anatolii Romanenko, the Ukrainian health minister, to instruct local medical professionals to diagnose patients claiming radiation sickness-related symptoms as having vegetovascular dystonia (VvD) instead of considering a diagnosis of ARS. VvD is a Soviet-specific diagnosis that was not recognized outside of the USSR, and even though it can have similar symptoms to ARS, the most important distinction between the two is that VvD is caused by so-called "environmental factors." The purpose of this directive was to suppress the

[5] I discuss the socio-political construction of expertise in chapter 3, "Critical knowledge production."

number of Chornobyl sufferers with ARS, particularly during the height of international collaboration efforts to manage the disaster relief effort. “Between 1987 and 1989, the incidence of registered neurological and neuropsychiatric disorders remained stable. Between 1989 and 1990, it roughly doubled… The numbers for vegetovascular dystonia, however, showed a conspicuous twelve-fold increase” (127). From 1990, there was hardly any increase in VvD diagnoses as Soviet political pressure on Ukrainian doctors waned and then ceased, opening spaces for other diagnoses. Petryna concludes her description of this episode by stating “Nonknowledge became crucial to the deployment of authoritative bioscientific knowledge. Technical laxity fit well with this process, as well as with the way the Soviet administrators attempted to adapt a general population to the postaccident situation” (44).

Counterpoint: hormesis

Radiation hormesis, the idea that a low dose of ionizing radiation can be beneficial to organisms, including humans, is another example where the knowledge gap over the effects of radiation has been leveraged by a group of actors to justify their hypothesis, and more cynically, their careers. I was unfamiliar with the concept of hormesis until I attended a public lecture in Kyiv. The presenter was in the process of authoring a paper on the effects of Chornobylgenic radiation on the butterfly population in the Zone. His research, looking at the genetic changes over dozens of generations of butterflies, showed that the net result of the insects’ exposure to and absorbed doses of radiation had had a deleterious effect, resulting in wing asymmetry, unexpected growths, and stunted limb development. During the question-and-answer portion, a man in the back of the room stood up and loudly asked if any of these genetic mutations, especially among butterflies exposed to lower doses, had any beneficial effects. The response from the presenter was an emphatic no, which prompted the questioner to go on a minutes-long

rant that continued to crescendo until the event organizer asked the man to leave and then moved to bodily remove him from the room. One of the other audience members, an American working in Kyiv who I met through the Fulbright program, told me that that man was her friend, Sergii Mirnyi, and offered to introduce me to him over coffee.

In 1986, Mirnyi was a liquidator, working on radiation reconnaissance patrols for the military in the Zone. Since then, he has published novellas, plays, and research about Chornobyl, and founded one of the first licensed tour companies for excursions into the Zone. He currently works as the scientific advisor for Chernobyl Tour. Mirnyi is a staunch critic of official narratives of the disaster and is quick to correct myths and misconceptions about the disaster and the radiation danger in the Zone based on his personal experiences and the conclusions of his research. In his book *Chernobyl Liquidators' Health as a Psycho-Social Trauma* (2001), Mirnyi explores how the taxing conditions of working as a liquidator—long hours, no days off, poor accommodations, inadequate equipment, contaminated food and drink, being under constant KGB surveillance, unchecked fear of the unknowns of radiation in the Zone—had a major negative effect on liquidators' physical and mental health. He wrote, "Comparing my 'in-zone' experience with that of the liquidators who served in the Chernobyl zone before and after me, and analysing the changes which took place during my term, I noticed a rather interesting phenomenon – *gradual shift of the main traumatic factor from radiation and physical strain and hardships caused by the work – to social pressure*" (Mirnyi 2001a: 24, italics in original). The lack of reliable information from their military superiors, medical staff, and party officials compounded these social pressures. "One should not forget that all liquidators worked in the place which was known to be dangerous. As an almost general rule, the liquidators did not know the values of their irradiation doses (or did not believe the official measurements), did not have

any (or had vague) idea about actual picture of contamination of the terrain. Thus, they were exposed to severe distress caused by the lack of this information essential for their life and health" (25, underline in original). This distress, along with any absorbed doses of radiation, resulted in major health problems that included both damage to their organs and conditions like post-traumatic stress disorder.

Olga Kuchinskaya (2014) discusses the role that the invisibility played in the social and biological effects of the disaster. This includes the invisibility of the radioactive particles and waves themselves, but also how sufferers and their symptoms were rendered invisible by political actors who leveraged the unknowns regarding the effects of radiation to conceal or minimize those effects that could be accurately recorded. She emphasizes the role of government officials in how Chornobylgenic radiation was rendered visible, stating,

> Because radiation is not directly perceptible to the unaided human senses and we do not encounter it as a tangible phenomenon, formal representations of what should be considered dangerous become doubly important in defining the scope of contamination and its risks. By formal representations I refer to standards, categories, and thresholds used in radiation protection. They help us interpret raw numbers by providing a context of what constitutes radiation risks. I also refer to visual maps that systematize quantitative data into graphic representations based on these definitions. These formal representations—including such things as acceptable thresholds of human exposure and acceptable levels of food contamination—are the language of legal and administrative decision making. They also set the general public expectations for what is dangerous. (2014: 95)

Much of Mirnyi's post-liquidator career has involved articulating the invisible dangers of the Zone, though in ways that challenge the narratives of the effects of Chornobylgenic radiation put forward by government officials and international organizations. His career includes his scientific work, quoted above; another part is through his fiction, such as *Worse than Radiation* (2001), and through his work with his tour company. A major feature of his tours, including in the promotional materials, is an educational piece regarding what kind of dose visitors to the Zone can expect to receive, stating "A dose of gamma irradiation received during a regular day trip to the Zone is equal to the dose, received during two days in Kiev (New York, London …) or several hours of jet flight (in the plane, the source is space irradiation: it is the same gamma irradiation, differing only in origin). If you believe that two days in Kiev (New York, London …) or two hours in the plane present radiation danger, don't go to the Zone" (Chernobyl Tour). This particular statement echoes what I heard from numerous people, including government officials, anti-nuclear activists, and residents of Slavutych. What was new to me on that page was the following claim:

> What has been said above can be further elaborated in even more detail. But the fact persists: a human organism is able to sustain even bigger radiation doses than those taken by the Zone's visitor during a one- or a two-day-trip. Moreover, it has been reliably established by experiments (long ago for plants, recently for mice) that ionizing irradiation in low doses and irradiation rates (radiation levels) is BENEFICIAL for living organisms. Radiation hormesis, the beneficial impact of ionizing irradiation at low levels, has been confirmed by UN Scientific Committee on the Effects of Atomic Radiation as general biological phenomenon in a special report. (Chernobyl Tour)

The UNSCEAR report that Mirnyi cites is much less enthusiastic about hormesis than he characterized it. The authors of that report state that "Evidence for the expression of an adaptive response in human populations exposed to low doses of radiation above the natural background level has not until now been clearly demonstrated nor has it been refuted" (1994: 187) because any cellular adaptive response to low-dose radiation could not be disentangled from other factors and because of other studies that demonstrate oncogenesis and carcinogenesis from low-dose radiation.

Radiation hormesis is one of three models of understanding radiation dose-response in organic matter. The linear no-threshold (LNT) model, adopted in the 1940s by the international community, posits that there is a linear correlation between increased deleterious biological effects and increased exposure dose, so even low doses should be avoided if possible. The other model, threshold, suggests that at low doses there is little to no effect, but after a given threshold, there is a linear correlation similar to LNT. The hormetic model speculates that at low doses, there can be positive or adaptive responses to radiation, including DNA repair, up to a certain dose threshold. Radiation hormesis emerged from the field of toxicology, where low doses of toxins and poisons were shown to activate beneficial adaptive responses, well before the discovery of radiation. Calabrese and Baldwin (2000a; 2000b) evaluate many of the studies on radiation hormesis and trace the marginalization of hormesis. "Despite the extensive earlier findings of a low dose stimulation, high dose inhibition to radiation exposure in numerous models, including humans, the belief that radiation hormesis was a general biological phenomenon came to be severely questioned in the mid 1930's and eventually became a marginalized hypothesis at best, and often the source of ridicule" (2000b: 68). Part of this ridicule arose from companies advertising products in the early 20th century touting "miracle"

radiation therapies. Baldwin and Grantham (2015) look at some more recent studies of radiation hormesis, including some that support the hypothesis and others that refute it. They conclude that the reasons for the acceptance of LNT in the 1940s were largely political in nature and that there is sufficient evidence for a limited acceptance of radiation hormesis. Studying and supporting radiation hormesis is therefore both a political and a scientific challenge of authority and consensus, especially given that radiologists looking to further investigate hormesis end their articles with conclusions like this: “Conflicting results from both sides of the radiation hormesis argument demonstrate that the exact effects at low radiation doses are not known. As radiation science moves forward, the validity of the linear no-threshold model at lower doses needs to be questioned and more research put into radiation hormesis” (Baldwin and Grantham 2015: 245).

Filling knowledge gaps

Answering the deceptively simple question of “who knew what when?” regarding the Chornobyl disaster is therefore much harder than it seems. Many, however, have tried to answer that question and fill in the many knowledge gaps. The overall body of literature on Chornobyl is fittingly staggering.

Contemporary histories and investigations into Chornobyl, especially by those in the west, were hampered by limitations on access to knowledge, often relying on publicly released documents and official reports of international bodies, such as the UN or the IAEA, and public archives like those of the Ukrainian Cabinet of Ministers and TsDAHO, the Central State Archive of Public Organizations (Ukrainian: Центральний державний архів громадських об’єднань України), which contains the records of the Central Committee of the Communist Party of Ukraine. In 2015, however, the Verkhovna Rada passed a law (316-VIII) allowing public access to NKVD and KGB files from the Soviet era, including the materials on Chornobyl

held by the State Security Services. These archives demonstrate the changing development of the disaster's liquidation as new information, in the form of Commission and ministerial reports, clarifies the situation on the ground and outlines new directives, including the construction of the sarcophagus (the initial concrete enclosure over reactor 4). The publicly available documents in the KGB archive however cannot be considered complete for three major reasons. One is that this archive, located in Kyiv, does not contain Soviet KGB documents regarding the disaster that were not sent to officials in the Ukrainian SSR. Another is that it is unclear whether the Security Service of Ukraine (SBU, from the Ukrainian Служба безпеки України) has declassified all KGB files on Chornobyl. The third is that because these documents from the KGB archives have been published by a successor organization to the KGB, they must be treated critically and with the recognition that while extensive, the selection of documents "might not represent a whole picture" (Tykhyy in Imanaka 2008: 252). This collection of documents, though, provides a unique take on Chernobyl and its aftermath because the KGB was beholden to neither the nuclear industry nor to the military; "it supervised activities of industry, government and municipal authorities, construction companies and cooperative shops alike. KGB officers collected information from all sources they deemed reliable, they often were able to cross-check it and then to present to higher levels of hierarchy" (Tykhyy in Imanaka 2008: 252). The two collections (Ukrainian: фонд) that contain Chornobyl-related documents that the SBU has released are number 16, containing documents from the secretariat of the GPU-KGB of the Ukrainian SSR, and number 65, containing the operational records of the KGB of the Ukrainian SSR.

Outside of state archives and the reports of international agencies, there has been a significant journalistic inquiry into the disaster and its liquidation as well as academic, popular, and fictional histories.

In the West, David Marples published the first comprehensive academic work on Chornobyl in 1986, *Chernobyl & Nuclear Power in the USSR*, and followed that up two years later with *The Social Impact of the Chernobyl Disaster* (1988). While today these books read as leaning a bit too far into the realm of Kremlinology, where Westerners tried to understand the decision-making processes of Soviet leaders by trying to squeeze meaning from the morsels of information provided in no small part by informants and intelligence agents, they nevertheless form the foundation of Anglophone academic inquiry into the disaster.

Since Marples's work, there has been an abundance of scholarly articles, books, and special issues on Chornobyl from publishing houses and in western academic journals. Some significant ones to mention are a special issue of *Nature* (1996) on the tenth anniversary of the disaster; a special issue of the Annals of the New York Academy of Sciences (Yablokov, Nesterenko, and Nesterenko 2009); and a twenty-fifth anniversary special issue in the *Bulletin of the Atomic Scientists* (2011). These and other pieces touch on the myriad facets of the disaster, though most are focused either on the health or environmental consequences of the disaster. For example, Mycio's *Wormwood Forest* (2005) is a natural history of Chornobyl that ties in popular science, religion and myth, and personal reportage. Biologists Robert Baker and Ron Chesser spent over a dozen years studying the effects of radiation on small mammals in the Red Forest area of the Exclusion Zone (see Chesser and Baker 1996; Chesser et al. 2000) and also wrote on the research and political challenges of conducting studies on the effects of radiation (Chesser and Baker 2006). Ganna Yanskova and Kevin Hannam (2013) approach the Zone from a tourism

perspective. Following Marples's lead, there are also many histories of Chornobyl, including one of the most recent that I have mentioned above, *Chernobyl: The History of a Nuclear Catastrophe* (2018), by Serhii Plokhy, and Kate Brown's *Manual for Survival: An Environmental History of the Chernobyl Disaster* (2019), which is a more recent attempt to cut through the obfuscation of Chornobylgenic dosage figures and their medical and environmental effects.

In the Soviet Union, popular Ukrainian writer Yurii Shcherbak, who would enter Ukrainian politics after independence and found the Green Party of Ukraine, published *Chernobyl* (1987) that dramatized the causes and effects of the disaster but used as much publicly available information as possible to inform his story. Svetlana Alexievich's *Voices from Chernobyl* (original title: *Chornobyl Prayer. A Chronicle of the Future*, Rus: *Чернобыльская молитва. Хроника будущего*; 1997) employed a similar tactic, using oral histories of sufferers, liquidators, self-settlers, and others to tell stories of the disaster and its effects on individuals, families, and communities. In 1997, Ukrainian historian Natalia Baranovska was the lead editor on the first major release of documents relating to Chornobyl, *The Chornobyl Tragedy: Documents and Materials* (Ukrainian: *Чорнобильська трагедія: документи і матеріали*). The 508 documents in this collection are from a number of public archives, including those of the Cabinet of Ministers of Ukraine, TsDAHO, and the Institute of History of Ukraine. Many of these documents formed the basis of Baranovska's follow-up volume, *Ukraine – Chornobyl – World: The Chornobyl Problem in an International Context 1986-1999* (1999; Ukr: *Україна - Чорнобиль - Світ. Чорнобильська проблема у міжнародному вимірі 1986-1999*). Baranovska approaches Chornobyl from three fronts: the global consequences of the disaster, focusing on radioactive contamination and the development of international collaboration in the

liquidation efforts; the creation of the Chornobyl project at the United Nations; and European and American humanitarian, scientific, and technical assistance along various fronts in Ukraine.

International and governmental organizations, especially those with longstanding ties to nuclear energy broadly or Chornobyl specifically, have published many reports on the disaster from the various angles of their remits. In addition to the not-quite-annual UNSCEAR reports (all of which since 1986 at least mention Chornobyl, if it is not featured more prominently in one of the annexes or appendices to a given volume), there are also volumes from the Parliamentary Assembly of the Council of Europe (Ponsonby 2001); the Nuclear Energy Association of the OECD (2002); UNICEF (2002); the Chernobyl Forum (2005), a combined effort involving the IAEA, World Health Organization, Food and Agriculture Association, and four subgroups of the UN; the Ukrainian Ministry of Emergency Situations (Baloha et al. 2006); Greenpeace (2011); and the National Academy of Medical Sciences of Ukraine (Bazyka 2016) to name but a few. As I discuss in chapter 4 on the Department of Social Expertise later in this dissertation, the researchers in that department of the Institute of Sociology produced numerous volumes investigating the effects of Chornobyl on sufferer populations and the environment.

One of the first impactful edited volumes I read was compiled by Tetsuji Imanaka from the University of Kyoto. Written prior to the 2011 Fukushima Daiichi NPP disaster in Japan, this book was a major collaborative effort between Japanese and Ukrainian researchers and is invaluable as a source in discussing Chornobyl from a variety of angles. *Multi-side Approach to the Realities of the Chernobyl NPP Accident* (2008) is the result of a research grant to "make an overview of the 'Chernobyl disaster' by collecting various viewpoints of persons who have been involved in Chernobyl in their own ways: scientists, journalists, NGO activists, sufferers, etc. I thought that a new image of Chernobyl could be constructed through learning different

viewpoints" (i). Important as it is, this report does suffer from some errors in translation; as far as I can tell, none of the pieces were written in English originally and as such, they contain several typographical, spelling, and grammatical errors. Nevertheless, *Multi-side Approach* is true to its name in collecting contributions on a number of topics from a number of individuals, including Ukrainian department ministers. Of greatest import are Nasvit's report on the Chornobyl legislation, Kholosha's chapter on the cost of the accident and its ongoing cleanup, and Tykhyy's survey of the social problems caused by Chernobyl and how the Ukrainian government has attempted to solve them.

One of the major points that Nasvit, a member of the National Security and Defense Council of Ukraine, makes is tied to the knowledge gap regarding radioactivity's effect on the human body and populations in general. He claims that though the main reason for the two major problems with Chornobyl legislation—that none were carried through and none fully satisfied anyone involved—is lack of funding, "there is one more reason of no less importance, which is rarely realized and even less frequently mentioned – it is lack of scientific justification for these measures" (Nasvit in Imanaka 2008: 203). Kholosha, the First Deputy Chief of the department in charge of the administration of the Chernobyl Exclusion Zone and resettlement efforts, estimates that Ukraine's indirect losses (including lost arable land, potable water, forest resources, power production, and industrial production) from 1986 to 2015 will total 163.74B Soviet (1984) rubles, or approximately $297.11B in 2014 USD (Kholosha in Imanaka 2008: 200). The direct losses—those losses caused by "waste of material objects of national economy in the exclusion zone," accidents, evacuation, and abandoned "property and individual facilities of economic importance" (196)—Kholosha estimates at $25.86B in 2004 USD, or $32.63B in 2014 USD (198). When these figures are compounded with the bout of hyperinflation that Ukraine suffered

from 1991-1997 and again, though to a lesser extent, following the global financial crisis in 2008, in addition to its other economic struggles in its "transition" to a market economy, it is no small wonder that Ukraine's economy is still suffering. Tykhyy, a Ukrainian nuclear scientist affiliated with the Kyoto University Research Reactor Institute, provides a very informative overview of some of the social issues caused by Chornobyl.

Crafting Chornobyl's legacy

The gulfs between official reports on the effects of the Chornobyl disaster and collections of people's experiences with the effects are large and stark. For example, in the preface to *The Politics of Invisibility* (2014), Kuchinskaya explains how her attempts at bridging those gaps became the basis of that book: "I had taken it as indisputable that Chernobyl had devastating consequences and that Belarus, the country in which I grew up, was most affected by it. The UNSCEAR reports confronted me with the fact that what I considered *obvious* from my perspective was interpreted as *nonexistent* from a different—expert and institutionally powerful—position; their judgment was buttressed by claims to objectivity" (ix). Kuchinskaya's lived experience, and her friends' and family's experiences and narratives of the disaster and its effects, did not match the official findings supported by the United Nations and other groups like the IAEA and World Health Organization. The specific report she cites, UNSCEAR's *Sources and Effects of Ionizing Radiation* (2000), takes a conservative approach to attributing specific health consequences to Chornobyl, excluding in any counts those effects which cannot *solely* be attributed to Chornobylgenic radiation and only counting radiation sickness and cancer as health consequences.

The 2000 UNSCEAR report was significant as it was the most comprehensive report on the effects of the Chornobyl disaster delivered to the General Assembly of the United Nations.

Prior to the 2000 report, UNSCEAR included an estimate of the amount of radiation released at Chornobyl (Annex D) and presented a paper in 1988 titled “Acute radiation effects in victims of the Chernobyl nuclear power plant accident” (UNSCEAR 1988 Annex G Appendix: 613-27) prepared by Angelina Konstantinovna Guskova, the USSR’s foremost expert on radiation who led the medical team treating Chornobyl sufferers. In 1993, 1994, and 1996, Chornobyl receives only cursory mention in just a handful of paragraphs by the compilers of the reports. The 2000 report however, even solely in the publication context of UNSCEAR, represents a major effort to present the definitive word on the aftermath of Chornobyl. This report also sets the bounds for what the committee will consider within its scope as it continued to investigate the effects of the disaster, with the bulk of the focus on excess rates of thyroid cancers in people who were children in April 1986. For these reasons, though the quote is extensive, I have reproduced below what UNSCEAR presented to the General Assembly regarding the health effects of the disaster in full.

> 99. The Chernobyl accident caused many severe radiation effects almost immediately. Of 600 workers present on the site during the early morning of 26 April 1986, 134 received high doses (0.7-13.4 Gy) and suffered from radiation sickness. Of these, 28 died in the first three months and another 2 soon afterwards. In addition, during 1986 and 1987, about 200,000 recovery operation workers received doses of between 0.01 Gy and 0.5 Gy. That cohort is at potential risk of late consequences such as cancer and other diseases and their health will be followed closely.
>
> 100. The Chernobyl accident also resulted in widespread radioactive contamination in areas of Belarus, the Russian Federation and Ukraine inhabited by several million people. In addition to causing radiation exposure, the accident caused long-term changes in the

lives of the people living in the contaminated districts, since the measures intended to limit radiation doses included resettlement, changes in food supplies and restrictions on the activities of individuals and families. Later on, those changes were accompanied by the major economic, social, and political changes that took place when the former Soviet Union broke up.

101. For the last 14 years, attention has been focused on investigating the association between exposure caused by radionuclides released in the Chernobyl accident and late effects, in particular thyroid cancer in children. A majority of the studies completed to date are of the descriptive type, in which average population exposures are correlated with the average rates of cancer incidence over specific periods of time. As long as individual dosimetry is not available, it is difficult to determine whether the effects are radiation-related and it is also impossible to make reliable quantitative estimates of risk. The reconstruction of individual doses is a key element for future research on radiation-associated cancers related to the Chernobyl accident.

102. The number of thyroid cancers (about 1,800) in individuals exposed in childhood, in particular in the severely contaminated areas of the three affected countries, is considerably greater than expected based on previous knowledge. The high incidence and the short induction period are unusual. Other factors may be influencing the risk. If the current trend continues, additional thyroid cancers can be expected to occur, especially in those who were exposed at young ages.

103. Apart from the increase in thyroid cancer after childhood exposure, no increases in overall cancer incidence or mortality have been observed that could be attributed to ionizing radiation. The risk of leukaemia, one of the main concerns (leukaemia is the first

> cancer to appear after radiation exposure owing to its short latency time of 2-10 years), does not appear to be elevated, even among the recovery operation workers. Neither is there any proof of other nonmalignant disorders that are related to ionizing radiation. However, there were widespread psychological reactions to the accident, which were due to fear of the radiation, not to the actual radiation doses.
>
> 104. There is a tendency to attribute increases in the rates of all cancers over time to the Chernobyl accident, but it should be noted that increases were also observed before the accident in the affected areas. Moreover, a general increase in mortality has been reported in recent years in most areas of the former Soviet Union, and this must be taken into account when interpreting the results of Chernobyl-related studies.
>
> 105. The present understanding of the late effects of protracted exposure to ionizing radiation is limited, since the dose-response assessments rely heavily on studies of exposure to high doses and animal experiments; extrapolations are needed, which always involves uncertainty. The Chernobyl accident might shed light on the late effects of protracted exposure, but given the low doses received by the majority of exposed individuals, any increase in cancer incidence or mortality will be difficult to detect in epidemiological studies. One future challenge will be to develop individual dose estimates including estimates of uncertainty, and to determine the effects of doses accumulated over a long period of time. (UNSCEAR 2000: 14-15)

For people like Kuchinskaya, the language of this report is understandably insufficient an explanation or investigation, and as she states, “Connections between UNSCEAR and the international nuclear industry became apparent rather quickly; it was not surprising that nuclear

industry experts might be motivated to downplay the perceived consequences of a nuclear accident" (2014: viii).

The global nuclear industry certainly took, and continues to take, the Chornobyl disaster seriously. Most prominently, once the causes for the disaster became clear, the IAEA crafted new safety regulations for nuclear power plant operation and the storage and disposal of nuclear waste (International Nuclear Safety Advisory Group 1992) and worked with the NEA to produce a comprehensive report on how Chornobyl changed international law (Nuclear Energy Agency 2006). However, Kuchinskaya's point is salient—it is in the political interest of the nuclear industry to minimize the harm of the disaster, to check radiophobia tendencies, and to continue to promote the operation and opening of new nuclear plants. Similarly, one can argue that it is in the interest of the Ukrainian government to minimize the effects of Chornobyl. At the time of the disaster, the liquidation efforts were borne by the Soviet Union as a whole. After independence, the significant costs of maintaining the Zone, operating the remaining three functional reactors at ChNPP, and caring for the sufferer populations fell solely upon the Ukrainian state. I touched on some of those costs above, but Kholosha's calculations did not include new developments, such as the construction of the New Safe Confinement (NSC) structure that completely encases reactor 4, which was completed in 2019 at the cost of over €2.1 billion (EBRD 2017). As the ARS/VvD vignette above demonstrates, the Soviet government was also motivated to minimize the official counts of individuals suffering from the effects of Chornobyl. For example, there is still disagreement between different camps regarding the death toll of the accident, as evidenced by Imanaka's (2008) comparison of the claims of estimated cancer deaths: Greenpeace counts 93,000 and the Chernobyl Forum, established in 2005, puts the number at 3940 (18). I further

discuss the issue of who counts as a sufferer of the Chornobyl disaster in the chapter on the Department of Social Expertise.

As this review of the literature shows, official reports are not the only source of knowledge about the Chornobyl disaster, and they must be read critically. Personal narratives of survivors and liquidators, such as those recounted in Alexievich (1997), Mirnyi (2001b), or Petryna (2003), illustrate a human cost of the disaster that is not often captured in those reports, and sometimes directly contradicts their findings. There is also the matter of the Chornobyl entertainment complex, which includes films, both documentary and fiction, video games, books, television shows, tourism, and illegal exploration. The cultural weight of Chornobyl is enormous, and while it is outside the scope of this dissertation to do justice to measuring that weight, it is nevertheless fair to say that the 1986 Chornobyl disaster continues to loom large.

Chapter 3. Critical knowledge production:

Incorporating STS into political geography

The approach I take in this dissertation is guided by a methodological intervention to incorporate more science and technology studies (STS) into political geography. The material and nonhuman are vital component parts of assemblages that affect geopolitical narratives and action and suggests a relational ontology that does not necessarily privilege humans over nonhumans (Dittmer 2014). This conceptualization draws clear lines of methodological connection between STS and political geography.

The field of STS originated from the observation that scientific knowledge is not produced in a vacuum but rather by people using an assortment of tools, procedures, and models in a particular social, historical, economic, and political context. John Law in *After Method* (2004) states that "STS argues that science is a set of practices that are shaped by their historical, organisational and social context. It further argues that scientific knowledge is something that is constructed within those practices" (8). Just as STS is a vast discipline, facilitated in no small part by the wide, inclusive definitions of "science" and "technology," there is also a vast diversity of methods in STS, including ethnography (Latour and Woolgar 1979; Mol 2002), ANT-based assembling of networks (Latour 2005), interviews (Law 2002), historical analysis (Mukerji 1997; Hall 1999; Carroll 2006; Hecht 2009), document analysis (Riles 2006), and inter-object analysis (Born 2010; Barry 2013). This methodological diversity reveals the pan-/interdisciplinary scope of STS research and acknowledges the "vague, diffuse or unspecific, slippery, emotional, ephemeral, elusive or indistinct" (Law 2004: 3) aspects of the world that social science methods—derived from modern science's foundation of certainty, stability,

universality, and security—often miss (9). These varied approaches to STS methodology are informed by foundational STS understandings that science, data, and inquiry are variable entities and practices that both shape and are shaped by their historical, social, and organizational context.

Central to this project is the concept of *critical knowledge production*, which I define as "analyzing the processes of the production, reproduction, and representation of scientific knowledge emerging from networks of human and nonhuman actors" (Pickett, O'Lear, and Henkin 2020: 255). Critical knowledge production is rooted in three interrelated STS concepts: co-construction, assemblage, and ontological multiplicity. I will explain briefly how each of these concepts relates to processes of knowledge production. Then, I will discuss the social construction of expertise, especially in how it relates to the geopolitics of information. Finally, I will go into detail on assemblage theory and describe its usefulness in my analysis of the Chornobyl disaster.

Science and Technology Studies approaches in Geography

The field of STS is a relatively young discipline, arising primarily from Bruno Latour and Steve Woolgar's *Laboratory Life: The Social Construction of Scientific Facts* (1979), where the authors track the work of a number of endocrinologists at the Salk Institute for Biological Studies in San Diego, CA, demonstrating that scientific knowledge is not produced in a vacuum but rather by people using an assortment of tools, procedures, and models in a particular social, historical, economic, and political context. Studies in STS are concerned with networks, assemblages, organizations, and practices, often utilizing actor-network theory (ANT) methods. ANT as articulated by Latour was radical in that it did not privilege one set of variables or one kind of knowledge over any other, because all variables and knowledges are dependent on each

other, only gaining meaning in context and as wholes. It was also radical in that it represents and treats human and non-human actors in the same relational terms affording agency to materials, plants, animals—any entity involved in a particular network—that was previously available only to humans. STS however is more expansive than ANT as it moves beyond ANT's materialism and flat ontology, where actors (both human and non-human) are afforded agency and treated as equals in networks (see Sismondo 2010). ANT is also deficient in its treatment of power; Sheila Jasanoff notes that "when actor-network theory confronts the nature of power, as it often does, it side-steps the very questions about people, institutions, ideas and preferences that are of greatest political concern" (2004: 23). In STS however, power and politics are intimately connected to the networks through and contexts within which scientific knowledge is produced. Jasanoff in particular focuses on the co-production of science and its political, social, historical, and other contexts. She states that co-production is a useful idiom in the social sciences, in part because it "offers new ways of thinking about power, highlighting the often-invisible role of knowledges, expertise, technical practices and material objects in shaping, sustaining, subverting or transforming relations of authority" (2004: 4). In the same vein, Patrick Carroll (2006) conceptualizes science in cultural terms to track its significance in the creation of the modern Western state, in his case Ireland: the new science of experimental engineering practices "transformed the activities of governing, the processes of capital accumulation, and the relationship between the two. Government and capital accumulation, in turn, shaped the development of science in a process of coproduction" (13). Works like Jasanoff's edited volume and Carroll's monograph discussed above lay a foundation for a study like this dissertation, where I argue that Chornobylgenic technoscience and political processes that in part led to the creation and development of an independent Ukrainian state were co-produced. The focus on the

political, in particular its ties to biopolitics and governance, provides many avenues of collaboration between STS and political geography.

STS is also a vast interdisciplinary field of study, facilitated in no small part by the wide, inclusive definitions of science, or codified processes of knowledge production (see Sismondo 2010), and technology, "a concept which refers not just to a device in isolation but also to the forms of knowledge, skill, diagrams, charts, calculations and energy which make its use possible" (Barry 2001: 9). To outline but a few examples, Latour and Woolgar (1979) focus on establishing the peptide TRF(H) as a scientific fact in a laboratory ethnography; Annemarie Mol (2002) embeds herself in a hospital to observe practices of diagnosing atherosclerosis; Chandra Mukerji looks at the political role of engineering at Versailles (1997) and in building the Canal du Midi (2009) in France; John Law (2002) tells intertwining stories about attempting to build the TSR2 aircraft; Gabrielle Hecht (2012) investigates the effects of the global, postcolonial uranium trade on a number of sites in Africa; and Andrew Barry (2013) charts the political agency of materials in building the Baku-Tbilisi-Ceyhan pipeline. This dissertation on the co-production of the science of the bodily effects of Chornobylgenic radiation and Ukrainian state formation falls into this body of scholarship.

Many of the monographs mentioned above are a part of the "Third Wave" of STS that questions the notion of scientific expertise and to whom and how far expertise can be extended. H.M. Collins and Robert Evans (2002) characterize the First Wave of science studies as positivist, where "social analysts generally aimed at understanding, explaining and effectively reinforcing the success of the sciences, rather than questioning their basis" (239). Science was viewed as top-down, authoritative, and above or outside the social. The First Wave ends with the collapse of positivism as a major academic movement beginning with Kuhn's *The Structure of*

Scientific Revolutions (1962). The Second Wave, which continues into the present, is often called social constructivist, where science is reconceptualized as a social activity, embedded in social processes. Science now must involve the social and lost its authority as a special kind of knowledge with special access to (the) truth; in turn, scientific expertise is diluted. Where the Second Wave wiped out the First Wave, the Third Wave seeks to take the lessons learned in the Second Wave while at the same time it reconstructs some of what was deconstructed. Collins and Evans explain the relationship between the Second and Third Waves:

> Wave Two deals with the problem: "How is scientific consensus formed?" Some form of relativism in respect of the outcome of that consensus is vital if the answer is not to risk circularity. Wave Three deals with the problem: "How do you make decisions based on scientific knowledge before there is an absolute scientific consensus?" Wave Three does not replace Wave Two because the problems are different. For Wave Three, something in addition to relativism is needed. One way to approach the problem of Wave Three is to look at the way science is granted legitimacy in the political, legal, or other spheres, and much existing writing in science studies which deals with science in the public domain has approached the problem in this way. But what we are trying to understand is why science should be granted legitimacy because of the kind of knowledge it is. (214)

Wave Three is wrapped up in a normative theory of expertise, democratic processes involving extra-science actors, and acknowledging and understanding the variable social allocation of scientific expertise when making political decisions with technoscientific underpinnings. Kevin Forsyth (in Death 2014) sums up the crisis of expertise thus: "the basis upon which people claim, or see, expertise needs to be opened to more public scrutiny in order to see how and why truth claims are considered authoritative or are assumed to be true when there is evidence to question

them" (225). This dissertation takes up this call in making more transparent the co-productive processes of policy and science of Chornobyl's radiation emissions by challenging the expert claims of government officials, radiologists, and medical doctors as they relate to geopolitical narratives and agendas. The production of scientific consensus and tracing political decision-making processes in the absence of consensus are both major through-lines of every part of this dissertation.

Critical knowledge production

My co-authors and I introduced the framework of critical knowledge production (Pickett, O'Lear, and Henkin 2020) as a way to analyze the constructive relationships among knowledge, political action, and discourse that do not discount the role of non-human actors in those processes. As indicated above, the field of STS is broad in its scope, and STS scholars employ a wide variety of approaches in their inquiries. Critical knowledge production is a type of constructivist approach within STS that emphasizes the political dynamics of sociomaterial relations among the many parts that make up the object of study:

> A coconstructivist STS approach repoliticizes science and technology by examining the construction of knowledge as integral to political processes rather than distinct from them…. In other words, science and society could be seen to be coconstructive through iterative processes that shape not only what kinds of science are conducted or valued but how the resulting forms of knowledge influence how people understand and engage with the world. (255)

My co-authors take critical knowledge production into their investigations of non-lethal weapons and political violence (Henkin 2019) and the slow violence of climate change and environmental

geopolitics (O'Lear 2016; 2018; 2021). In this dissertation, I use this framework to look at the co-construction of scientific knowledge about the Chornobyl disaster and the bio- and geo-politics of dealing with the aftermath of the disaster.

Co-construction or co-production emphasizes the mutual influence different people, agendas, institutions, technologies, and narratives have on each other's development. It is less about understanding how actors have tried to "impose order on a part of the world" (Callon and Law 1982: 622) than it is about embracing the inherent messiness of knowledge creation. Jasonoff explains the impetus for taking a co-constructive approach to social science research:

> Briefly stated, co-production is shorthand for the proposition that the ways in which we know and represent the world (both nature and society) are inseparable from the ways in which we choose to live in it. Knowledge and its material embodiments are at once products of social work and constitutive of forms of social life; society cannot function without knowledge any more than knowledge can exist without appropriate social supports. Scientific knowledge, in particular, is not a transcendent mirror of reality. It both embeds and is embedded in social practices, identities, norms, conventions, discourses, instruments and institutions – in short, in all the building blocks of what we term the *social*. (2004: 2-3)

Context, discourse, connection, and sociomateriality are central to tracing the co-construction of technoscientific knowledge and political agendas. This concept is rooted in the central tenet of STS that "understands science and technology as actively social" (Pickett, O'Lear, and Henkin 2020: 253). This epistemological stance underscores the need to explore processes rather than end results and side effects and of necessity considers the central role of complexity, heterogeneity, and interconnectivity. "Processes of knowledge production do not happen in a

vacuum; they are situated in space, contingent on the work of a host of actors, and embedded in, intertwined with, and coproductive of other social, material, political, scientific, and economic processes. Rather than being a backdrop, context is an integral part of STS-based inquiry" (256). Context illuminates the types of relations between knowledge and action: how knowledge is used to accomplish goals is contingent on how that knowledge is talked about (discourse), what its points of reference are (connection), and the people, places, and things that work to co-construct that knowledge and those goals (sociomateriality).

Whereas a co-constructivist approach recognizes that the production of any new knowledge both is indivisible from the social processes that bear on its production and simultaneously bears on those same social processes, assemblage theory is a way of understanding and tracing the relations among the elements—component parts—that co-produce that new knowledge and those social processes. As Manuel DeLanda explains, assemblages are "wholes characterized by *relations of exteriority*" (2006: 10; emphasis in original) and are defined along three axes: materiality, territorialization, and coding (18-19). The tracing of these relations among component parts is to understand causation: this type of analysis is "concerned with the discovery of the *actual mechanisms* operating at a given spatial scale" (2006: 31). In co-constructivist terms, assemblage theory illustrates the *hows* and *whys* of the co-production of knowledge and action.

The two major implications of an assemblage's relations of exteriority are "that a component part of an assemblage may be detached from it and plugged into a different assemblage in which its interactions are different" and "that the properties of the component parts can never explain the relations that constitute a whole" (10). In other words, the distinct elements of an assemblage can be part of any number of assemblages and cannot on their own

explain the whole assemblage; the key is in the relations among the different component parts of an assemblage. There are two corollaries to this concept: every component part of a given assemblage is itself an assemblage, and that there are human and nonhuman elements of any given assemblage. Thinking in assemblages takes nonhuman agency (the capacity of nonhumans, such as beings, things, and objects, to actively affect other elements) seriously and recognizes both the social processes embedded into the material and the material elements of social processes.

The three axes introduced above are analytical tools that establish a methodological foundation for evaluating and comparing assemblages. The materiality axis of an assemblage specifies the roles of the components play in the assemblage, from the material to the expressive, a kind of measure of agency. The second axis, territorialization, involves processes that bound and order the assemblage. "[Processes] of territorialization are processes that define or sharpen the spatial boundaries of actual territories. Territorialization… also refers to non-spatial processes which increase the internal homogeneity of an assemblage, such as the sorting processes which exclude a certain category of people from membership of an organization, or the segregation processes which increase the ethnic or racial homogeneity of a neighbourhood" (13). Coding, the third axis, refers to processes that mediate the specificity of use for the assemblage: "processes which consolidate and rigidify the identity of the assemblage or, on the contrary, allow the assemblage a certain latitude for more flexible operation while benefiting from genetic or linguistic resources" (19).

Assemblage theory, like co-constructivism, requires the researcher to simultaneously follow multiple, sometimes contradictory, threads at once. Such an arrangement, one that can account for messiness and partialities, also requires a reorientation of the researcher's ontological

assumptions. Just as the same set of facts and figures can be reordered and reorganized to fit a range of narratives, researchers are confronted with a multiplicity of constructed realities when using assemblage theory to trace how and why various actors ordered and organized the same base information for various ends: which narrative, which version of the data, which shape of an assemblage are valid, correct, or real is a complicated question that does not have a definitive answer. This ontological multiplicity is an outgrowth of the central understandings of STS, that knowledge and technologies are the co-effects and co-producers of social and material processes:

> Ontological multiplicity indicates that there are multiple simultaneous realities shaping our world(s) and what we know about them. In terms of the coconstructivist STS framework, myriad actors use myriad practices to produce knowledge. The results and processes of knowledge production are both embedded in the realities of those actors and processes and produce new realities. The impact, relevance, and pervasiveness of those new realities, however, is a matter of representation and dissemination of those realities, which involves doing the work of linking the new to old. (Pickett, O'Lear, and Henkin 2020: 255)

Complexity, relationality, and context become all the more important when trying to analyze processes of knowledge production from this co-constructivist approach. "Explanation in an STS framework engages this messiness as a feature; the partial connections among (and within) objects (Haraway 1991; Strathern 1991), the fractionality of objects (Law 2004), and the blurry distinctions between objects (Latour 2004) that are central to work in STS often exceed the limits of tried-and-true methodologies and disciplinary norms" (Pickett, O'Lear, and Henkin 2020: 255). Contingency, indeterminacy, messiness, and variable, co-extant, and possibly conflicting articulations of the same phenomenon complicate the production of knowledge. This

understanding also opens up space to more fully consider the role of the nonhuman elements in social processes as ontological multiplicity also implies a challenge to anthropocentrism by urging the researcher to consider the political lives of objects. The agency and vibrancy of the nonhuman is a major, and hotly debated, feature of much STS scholarship. For example, Langdon Winner (1988) analyzes how technologies are vital to the political transformation of spaces, such as the deliberate planning of low-clearance overpasses in Long Island to discourage the poor and people of color from accessing certain public spaces via public transportation, the rebuilding of roads in Paris to discourage street fighting in the wake of the wave of European revolutions in 1848, introducing robots to replace low-skilled workers in specific attempts to weaken or disband unions, and how a new mechanical tomato harvester destroyed communities and a way of life. In each of these instances, these technologies, these artifacts, were active parts of social processes. The concept of sociomateriality in the STS literature and in this dissertation not only brings a recognition of the material in social processes, but also points to the agency afforded to nonhuman actors in those processes.

Nonhuman agency however is asymmetrical to that of human actors, as is the agency of some human actors to others when analyzing social processes. Following Latour (2005), a co-constructivist STS approaches agency as a spectrum with causality on one end and inexistence on the other and understand that the position of any one actor—human or non—on that spectrum is contingent on its relations to other actors participating in the same process. While these nonhuman participants, or component parts, to jump ahead to the discussion below on assemblages, might not have the ability to act at the full range of the human participants in a given process, they do act: “in addition to ‘determining’ and serving as a ‘backdrop for human action’, things might authorize, allow, afford, encourage, permit, suggest, influence, block,

render possible, forbid, and so on" (72). Taking ontological multiplicity seriously when investigating the processes of knowledge production means expanding the conceptualization of what matters in tracing the co-construction of knowledge and political action first by considering the inclusion of nonhuman elements, for example in moving beyond a discourse analysis, then by considering their vibrancy, and finally by recognizing that the perceptions and representations of the realness and mattering of these nonhuman elements will vary to the other actors in those processes of knowledge production geographically, temporally, relationally, and ontologically.

The growing body of literature on more-than-human geographies has also embraced the ideas of nonhuman agency. Sarah Whatmore (2002; 2006), an early voice in the field, developed the concept of "hybrid geographies" by drawing on STS understandings of the social processes of the nonhuman and performance studies that focus on the human body as a medium for knowing the world. Ruth Panelli (2009) provides an overview of the beginnings of this scholarship within geography as an outgrowth of "human geographers' increasing awareness of the complexity and interconnectivity of life" (79). She identifies three strands that have informed the emergence of more-than-human geographies: the development of animal geographies and socio-animal relations (see Fox 2006; Power 2008), poststructural geographies of the social meanings and politics of "nature" (see Castree 2004; Longhurst 2006), and discourse analysis-driven critiques of the social construction of nature (see Buller 2008; Poe et al. 2014). Jamie Lorimer (2009) describes more-than-human geography as "an approach to geography and social sciences more generally that is open to the agency of nonhumans and recognizes the material and affective interlinkages that cross between humans and nonhumans" (344). In this vein, agency is not an inherent property of nonhumans, but rather a result of their relations to other networked elements. Myung-Ae Choi (2016) explains, nonhuman "agency is viewed as a 'relational

achievement' of the network. In this regard, it differs from the animistic belief that animals and non-living things inherently possess spirit. The capacity to act allows nonhumans to become political subjects who perform in accordance with, disrupt, and exceed humanist orderings" (619). While this dissertation shares many similarities with work done in the field of more-than-human geography, it diverges from that literature in two major ways. First, in relation to the strand of more-than-human geographies that is concerned with the co-productive and affective relations among the human and nonhuman, this work incorporates those relations as part of the investigation into their productive role in political processes. Second, the theoretical considerations of much of the work in more-than-human geographies (including many of the sources referenced above) are rooted in actor-network-theory (ANT), whereas my approach employs assemblage theory. I do not treat the Chornobyl disaster as an actor in the ANT sense, but rather as an assemblage and as a component part in other assemblages, which I go into more detail on later in this chapter.

This approach therefore steps away from traditional understandings of the methodologies of geographical research. This is also a further remove from attempts to identify grand theories or producing a "complete" analysis of any geographic phenomenon. Instead, the methodologies of STS-influenced work are often slow, granular, and seek to explode the possibilities for explanation rather than bound and bundle them into a tidy package. As I will discuss in more detail below, ontological multiplicity is also a robust frame for exploring issues of expertise claims and information control.

Using a case study engages these methods as practice, focusing on the processes of critical knowledge production and discovering the ways that, in the case of this project, specific technoscientific knowledge and specific political action produced each other in specific places.

This approach eschews generalization for nuance, appreciates messy social situations, acknowledges that any one researcher will not be able to (re)present the *totality* of a situation, and allows for methodological multiplicity while still resulting in rigorous and illuminating studies. While the case study has been a contested approach in social science (see Beaulieu, Schamhorst, and Wouters 2007; Jenson 2014; Flyvberg 2001), using case studies can be incisive interventions into geographic literature that intentionally espouses interdisciplinary practices and can disrupt and reshape our disciplinary assumptions. As I and my co-authors wrote in 2020,

> The emphasis on contingency, context, and connectivity invites a methodology that is capable of handling complexity and messiness. Three results emerge from this invitation. First, STS work, leaning on its interdisciplinary roots, can involve the adaptation, innovation, and combination of a variety of methods, tools, disciplines, and frameworks. Second, methods and approaches that highlight relationality, such as assemblage theory and actor–network theory, can be especially useful to trace the roles of human and nonhuman actors in the coconstructive processes of knowledge production and representation. Third, many STS-based projects employ case study as a way both to bound the limits of inquiry so that a project does not spiral into something unmanageably huge and to stress the specificity and contingency of the coproductive relations of interacting parts and emergent wholes. (256-7)

This project employs a case study approach at two sites, each dealing with the co-production of Chornobylgenic knowledge and public policy. The first case is centered on the Department of Social Expertise and explores the ongoing inability of the Ukrainian state to adequately care for those most affected by the disaster and how that has contributed to the erosion of public trust and confidence in Ukrainian officials. The second is based in the city of Slavutych, where Chornobyl

has been transformed into a source of inspiration and urban rebirth whereby the city has leveraged its local experience and expertise in forging local-to-global networks. In both of these chapters, the specific methods I employ vary as they emerged from my inductive approach and are explored in each chapter.

Expertise and the (critical) geopolitics of information

Expertise, and associated claims of authority and truth, are a major recurring topic in STS studies. Forsyth (in Death 2014) describes expertise as "the ability to speak with authority on matters of scientific or public concern (Jasonoff 1990; Turner 2001). Commonly, experts are assumed to be scientists or scientific organizations that have a clear reputation, training, and standing in a field of public concern" (225). Claims of truth, authority, and expertise are not made in a vacuum; rather, they are embedded within hierarchies and other social structures, represent financial and economic stakes, and are inherently political. Forsyth continues,

> But expertise is also highly politicized and contextual. Again, STS does not imply that there is no such thing as expertise, but that the status of expertise is often socially allocated and variable. The basis upon which people claim, or see, expertise needs to be opened to more public scrutiny in order to see how and why truth claims are considered authoritative or are assumed to be true when there is evidence to question them. (Forsyth in Death 2014: 225)

We have seen this process unfold in real time over the past five years with the heightened media scrutiny in the context of "fake news" and the mainstreaming of dis- and misinformation throughout the Trump presidency and the COVID19 pandemic. In regards to Chornobyl, the geopolitics of technoscientific information, and control of that information, has taken a variety of

forms, from the initial Soviet response to the disaster in the social, political, and economic contexts of the Cold War in the 1980s, to Ukrainian nationalist and environmental activists challenging the official knowledges, and responses of Soviet officials in their attempt to leverage the health and environmental concerns raised by the disaster to push for independence, to the construction of a biopolitical regime in post-Soviet Ukraine, to name a few.

The processes of the co-construction of Chornobyl expertise and geopolitics took different forms in each of these periods. For example, after the Soviet Union revealed the source of the plume at Chornobyl, within days Soviet officials invited several international organizations, like the International Atomic Energy Association (IAEA), the Atmospheric Release Advisory Capability (ARAC) at the Lawrence Livermore National Laboratory in California, the World Health Organization (WHO), and the UN Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) to become involved in relief, medical, and scientific efforts. These and other organizations provided expertise, instrumentation, and financing to measure and treat the effects of the radiation. Beyond the initial weeks following the disaster, a number of international charity organizations were formed to serve those affected by Chornobylgenic radiation, the Soviet Union dissolved, and Ukraine turned to the European Union (EU) for both aid for Chornobyl and a path toward membership in the organization. Most recently, a number of transnational or foreign (i.e., non-Ukrainian) corporations have become involved in designing and building the New Safe Confinement shelter over the reactor, replacing the hastily constructed initial sarcophagus.

Both political geography and STS have contended with issues of expertise. Expertise is a power relationship, but it is also contextual, politicized, and, from an STS perspective, socially, temporally, and spatially contingent, produced via consensus of authorities on a subject. In Merje

Kuus's (2014) investigation into the production of expert knowledge and policy at the EU level, she "traces how geopolitical arguments are deployed by policy professionals and how these practices fit into and transform the social milieu of the European Quarter [of Brussels, where most of the EU offices are located]. It thereby tackles the social struggles through which expert authority is created in that place" (2). Her approach to expertise—not necessarily what is said, but rather focusing on the context in which it is said—lays the foundation for this dissertation's assemblage approach to the research questions.

Looking at the context of object-relations in sociomaterial assemblages is not simply an exercise in adding a veneer of detail or simply providing a background. Rather, as Kuus states, "the structuring of the context and the power relationships at work in [institutional analysis] are central to explanation…. A carefully contextualized enquiry is necessary to avoid a linear narrative of clear trends and remain alert to the idiosyncrasies of [the institutions under examination]…. The investigation appears less straightforward perhaps, but it can better account for the many inconsistencies and contradictions of EU policy-making" (2014: 6). Kuus's interviews pay close attention to the everyday actions of EU policy experts and highlight the dynamic practices, relationships, and ambiguities within institutional structures that eventually result in the production and implementation of policy. As she states, "To analyze expertise in this way is not to study what people think or whether they are right. It is rather to examine the political and social technologies that make particular arguments coagulate as legitimate expertise" (40). Interrogating expertise contextualizes those technologies and technoscientific knowledges that result in expertise, policy, and discourse and works to expose biases and agendas (re)produced in those technologies and knowledges.

Expertise does not only exist as discourse or a power differential. The construction of expertise is also material, in a few senses of the word. Institutional and organizational expertise can be read into the physical space they occupy, like a sprawling campus, shelves in libraries or bookstores, or photo ops with heads of state. Likewise, individual expertise can be tracked in terms of flights and drives to public appearances, the frequency of occupation of airwaves, and bytes of storage on hard drives. Claims of expertise, authority, and truth are also bolstered by, recorded on, contested in, and support the contents of documents. A document here is not solely a piece of paper with information displayed thereon but is more broadly defined as a text that encodes information.

Documents and archives

Annelise Riles's *Documents* (2006) explores the role of the documents—defined as "artifacts of modern knowledge practices" (7)—in academic studies in the humanities and social sciences, particular in ethnographic research. A document is simultaneously a material object, a product of structural social relations and norms, a result of and contributor to discourse, an analytical category, and a window into the ontology and epistemology of its authors. Riles notes the connections between analyzing documents from this multifaceted perspective and how STS treats "inscription devices," which are technologies (read: a bundle of social processes solidified into an object capable of assisting in the working of other social processes) that perform a change of state on information from the ephemeral or unarticulated—a thought, hypothesis, feeling, idea, raw data, physical sample, etc.—to the permanent. She states that the pioneers of STS

> Bruno Latour and Steve Woolgar have described scientific documents as 'inscriptions' (1986; cf. Revier 1998), and scientific work as the practice of producing, circulating, and evaluating these inscriptions. Latour and Woolgar describe scientists as 'compulsive and

> almost manic writers' who spend their days making lists, filling in forms, writing numbers on samples, and drafting and redrafting articles (1986, 48). They draw attention to 'transcription devices,' such as the centrifuge machine, that 'transform pieces of matter into written documents' such as graphs or diagrams that in turn are manipulated into documents of yet other kinds (Latour and Woolgar 1986, 51). Documents in this understanding are 'immutable, presentable, readable and combinable' artifacts used to mobilize networks of ideas, persons, and technologies (Latour 1988, 26). (2006:13)

In this way, documents have an agency, or vibrance, that animates the processes in which they are a constitutive part.

The fieldwork I did for this project involved a wide variety of types of documents—legal, biographical, ethnographic, artistic, secret, statistical, polemical, scientific, etc. Many of these documents exist in archives that differ in format, availability, and completeness. Some, like the legal database maintained by the Verkhovna Rada, make their documents free of cost to access, are digitized and available online, and contain every law passed by that body and link to previous versions in cases of revisions and updates. The Security Services of Ukraine (SBU) archive that contains the declassified KGB documents I referenced in the introduction required multiple forms of authorized approval, a request to see specific documents without the benefit of any finding aids, and constant surveillance, including the presence of armed guards, while viewing the materials in the reading room. The other archives I consulted — the Central State Archives of Supreme Bodies of Power and Government (TsDAVO), the Central State Archives of Public Organizations (TsDAHO), the Central State Scientific-Technical Archives (TsDNTA), the Kyivska Oblast archive, the Slavutych city archive, the archive of the Cabinet of Ministers, and

the collections held by the National Chornobyl Museum, Vernadsky National Library, and Kyiv Mohyla Academy—fell at places between those two poles.

Though the Chornobyl accident was a major world event, studies on the subject rooted in archival research are very few. Edward Geist (2015), writing on emergency management at Chornobyl, claims that "despite the publication of numerous works about the accident, the number of studies derived from archival documents has, to date, remained limited. Most accounts of the disaster possess an anecdotal or journalistic character, which often effectively captures individual experiences but proves less successful at delineating the accident's institutional aspects or its precise chronology" (105).

Regarding this lacuna highlighted in Geist's work, one initial basis of this study was to address the lack of archival-based work on Chornobyl by turning to documents in state and institutional archives. Moving beyond Geist's historical perspective and attention to "precise chronology," archives are powerful resources for political geographers working within the tenets and methodologies of STS. I approached my archival work with a critical eye from the understanding that those archival documents could likely be as important as the individuals and institutions making and carrying out policies, agendas, and discourses: the exposure severity readings and instruments, discrepancies between reports, transmissions and translations of information, statements of uncertainty or controversy, decisions, datasets, representations or comparisons of data, changes in terminology, correlation between measurements and responses, institutional hierarchies and chains-of-command, absences of information, chronologies of actions and decision-making, and recommendations. The information in those archives, when embedded within sociomaterial assemblages, becomes vibrant objects (Winner 1980; Bennett 2010) in those assemblages and play a vital role in the immediate handling of Chornobyl's

aftermath, long-term governance and citizen-state relationship issues in Ukraine, and geopolitical discourses. Archival work is necessary in tracing the socio-political assemblages under investigation in this study as it provides the actors that constitute these networks and the metadata (names, dates, locations) that form the connections between them. This approach takes to heart Dittmer's (2014: 396) call for political geographers to "return to the archive with new objects of study and new interpretive resources" and bring assemblage theory into the "doing" of political geography. Archival work is not uncommon in political geography; Kevin St Martin and Marianna Pavlovskaya (in Gomez and Jones 2010) name archives as a repository for all manner of secondary data with a number of attributes that "provide opportunities for particular forms of analysis that simply would not otherwise exist" (176). Rather than mere data or two-dimensional objects, political geographers use archival materials to understand or illuminate social policies and institutional networks of power. Bailey et al. (2009), for example, took receipt lists from a 19th century Methodist church that charged congregants "pew rent," to examine the way that the position of paid and "free pews" created "visible hierarchies… [and] an institutional form of class segregation that demonstrated how the church was complicit with the industrial division of labour and bourgeois culture more generally" (264). By using the seemingly mundane pew rent receipts, the authors demonstrate the benefits of the archive to illuminate overlooked social realities; archival documents sourced a new frame of reference in which to understand, map, and examine the changing social hierarchies of the industrial era over time and space, and at multivariate levels of power. The example of the pew rent receipts demonstrates the rich results that come from close attention to even banal material—a necessary approach to my own work in the Chornobyl archives.

Archival research is well-trod territory in STS as well (see for example Hacking 2002; Collins 2004; Riles 2006). STS's poststructuralist roots, inspiration from feminist theory and politics, and ontological politics, call for recognition of the bias of the researcher and the reflexive nature of the archive-researcher relationship. Just as there is no universal or objective truth, there is no universal or objective interpretation of data or objects. Researchers and "the construction of geographical knowledge [are] always rooted in subjective, historical, and contingent praxis" (Bailey et al. 2008: 266). In this manner, an STS approach in archival research must acknowledge the agency of the archive itself, or rather, the ability of the archive to influence how the researcher finds and interprets information. The SBU archive demonstrates this idea. As I mentioned in the introduction, the SBU published edited collections of historical documents under the title "From the Archives of the VUChK-GPU-NKVD-KGB." Volume 16, published in print in 2001 and online in 2005, is wholly dedicated to the Chornobyl disaster and contains 121 documents of various prior classifications. Volodymyr Tykhyy (in Imanaka 2008) characterizes these documents as "an encyclopedia of everyday technical, professional, social life of Chernobyl NPP before and after the accident of 1986," but advises that "it should be remembered, however, that the selection of documents was made by KGB itself and thus they might not represent a whole picture" (252). The editors offer no methodology for selecting the documents that made it into the publication, nor is there a mention of documents in the KGB archives that were omitted.

Several scholars however have written that the silences of the archive can be just as powerful as the material physically present (Trouillot 1995 [2012]; Carter 2006; Bressey 2006; Digital Humanities Now 2012). Often what archivists or collectors/compilers leave out can be just as, if not more, telling than what they leave in. Richard Schein (in Gomez and Jones 2010)

reminds that “you should try to be aware, as well, of information that is missing from the archives…. we should always remember that archives are fallible—they are, after all, records kept by humans for particular reasons, and sometimes they present outright lies, sometimes they are full of errors” (229). In the case of the SBU, it is impossible to know if some documents that should be in that archive were destroyed or otherwise excluded, how many (if any) documents remain classified, if the archivist brought every available document related to the key words requested, and what their reasoning might have been in any of those cases. This of course is on top of the fact that these documents contain the writings of intelligence officers and political officials, each with their own agendas and biases.

Matthew Kurtz (2001) touches on the politics of the archive, referencing Jacques Derrida, stating,

> The guardianship and localization of the archive [Derrida] suggests, are both essential for the legal, authorial, and hermeneutic significance of these material collections, such that: ‘There is no political power without control of the archive, if not of memory. Effective democratization can always be measured by this essential criterion--the participation in and access to the archive, its constitution, and its interpretation.’ (27)

Access to the archive, and not just its contents, is another active part of the co-constructed processes of knowledge creation: there were specific political motivations for the SBU to declassify documents relating to Chornobyl each time it did so, each time resulting in new, updated, or altered knowledges, narratives, memories, realities, and documents about the disaster with their own constellations of political reverberations. As Bailey et al. (2008) remind,

> archives are not just a collection of historical records; they are active in constructing meanings that depend upon the power-laden interplay of past and present frames of interpretation. Archival material does not yield off-the-peg narratives that can be consumed from a stable past (Kurtz 2001). In practice, the discourses that appear to be crystallised in a homogeneous past are highly contested and in flux. The point at which these discourses crystallise is in the continuous present, as they are constructed alongside and within dominant academic and lay narratives. (260)

Method in geopolitics

Investigating the roles of organizations and the experts they bring with them on the development of Ukrainian geopolitics is a recurring feature in the field of critical geopolitics, where organizations—especially ones that have cultivated a network of mutually-affirming claims of authority in the spheres they operate—feature in the development of geopolitical discourse as geopolitical agents (Müller 2012). These discursive narratives, in this case within and about Ukraine, tell politically motivated narratives about parts of the world, implying threats of violence (from Russia, from nuclear energy) to achieve specific ends—after all, geopolitics and geography generally are about power (Ó Tuathail 1996). Analyzing the relationships among policy making, technoscientific knowledge production, and geopolitical narratives advances the project of critical geopolitics, disrupting the state-centric, political realist idea of geopolitics, and lends itself to conceptualizing the organizations, people, material, narratives, and relations among them as parts of sociomaterial assemblages.

Rather than detail the development of geopolitics and its critical turn, an exercise performed multiple times in great detail by Gerard Toal and others (see for example Ó Tuathail 1996; Ó Tuathail, Dalby, and Routledge 2006; Dodds and Atkinson 2000; Dodds, Kuus, and

Sharpe 2013), I will instead expand on the research context of contemporary critical geopolitics, useful to this study for the deconstruction of geopolitical narratives, identifying agendas and power, and demystifying processes of writing geopolitics concerning Ukraine. Toal differentiates critical geopolitics from conventional or uncritical understandings of geopolitics in two primary ways: moving beyond both the political realism of the interstate system rooted in Westphalian thinking by taking seriously a variety of non-state actors in the creation of geopolitical narratives, and the Kissinger-led resurrection of geopolitics of Great Men imagining themselves working outside of culture and context, free to impose their will on the world. Instead, Toal says, "Geopolitical discourse operates within networks of power and the discourses that emerge as the prevailing ones in any state reflect the influence of that power structure; indeed, these discourses are part of the very operation of this power structure" (Ó Tuathail, Dalby, and Routledge 2006: 12).

Emphasis on geopolitics-as-discourse is an important analytical distinction, allowing for new modes of understanding geopolitics, yet discourse analysis in critical geopolitics draws criticism for its methodological limitations. Nigel Thrift, in his afterword to Klaus Dodds's and David Atkinson's (2000) *Geopolitical Traditions,* criticizes critical geopolitics for its focus on the text, discourse, and representation, which "makes it very difficult to take seriously in all the little things which contribute to geopolitical power" (381), glossing over challenging details and sociomaterial complexity. Martin Müller (2010) also addresses the lack of methodological consensus of discourse analysis, noting that "there is no shared understanding or established methodology of 'doing a discourse analysis' as in the case of content analysis, for example. In contrast to the established routines of traditional methods of text analysis, approaches to discourse analysis are far from drawing on a commonly accepted methodological canon" (para.

4). Though there is no established "methodological canon" in critical geopolitics, the productive synergy between STS and political geography—actors, networks, political relations, claims of authority and expertise—provides a foundation for reconstructing meaning and motive behind geopolitical narratives. Critical geopolitics provides a bridge between STS and political geography because like STS, it is concerned with actors, relationships, and context. Like political geography, critical geopolitics is interested in how narratives of power are shaped and who is shaping them. Though this dissertation does not purport itself to be a complete solution to the problem of critical geopolitics methodology, in the case of Chornobyl and Ukraine, I aim to show that approaching geopolitics from STS is a productive endeavor that provides a more robust toolset for doing critical geopolitics.

One of critical geopolitics' major contributions is the notion of a "geopolitical culture," or a state's "culture of conceptualizing their state and its unique identity, position and role in the world" (Ó Tuathail, Dalby, and Routledge 2006: 7). This culture reflects social structures of power in state institutions, non-governmental organizations, corporations, and civil society. Two themes flow out of this concept. The first is a recognition that the division between the foreign and the domestic constitutes a false binary. For many states, establishing a state's relative position to and relationships with the states around it goes hand in hand with processes of state identity formation and nation-building. A prime example is Toal and Dahlman's *Bosnia Remade* (2011), where the authors develop the idea of ethnic cleansing as a geopolitical act that is nevertheless instrumental in the coproduction of Bosnia and Bosnian identity. In the case of Ukraine, which has been constructed as a borderland since even before the end of Kievan Rus in the thirteenth century (Reid 2004: 13), it is impossible to untangle "domestic" history from non-Ukrainian states and peoples. Though the ChNPP was built in what is now Ukraine, it makes no

sense to try to understand what happened in the aftermath of the Chornobyl disaster, including Ukrainian independence, without examining Ukraine's relationship with the Soviet Union, Russia, and geopolitical narratives of the Reagan and Gorbachev eras. In chapters 4 and 5, I explore how the transition from Soviet to post-Soviet affected the co-construction of Chornobyl knowledge and politics in each case.

The second emergent theme from understanding geopolitical cultures is that processes of writing geopolitics occur differentially at many sites. Three general groupings of geopolitical discourses surface from these sites: formal, practical, and popular. Formal geopolitics involves the work of think tanks, political parties, bureaucracies, and organizations; practical geopolitics incorporates speeches, state actions and policies, diplomacy, and corporate and legal practices; popular geopolitics is comprised of popular culture, the mass media, state rituals, public opinion, and the everyday (Ó Tuathail, Dalby, and Routledge 2006: 8). Though this dissertation will incorporate elements from each of these sites of discourse, especially when scientific knowledge is brought in, like organizational reports and specific political doctrines from the formal and oral histories and media reports from the popular, the greatest emphasis will be placed on the practical geopolitics of Ukraine, focusing on political decisions coproduced with scientific knowledge.

However, one of my intentions with this dissertation is to further dislodge the doing of critical geopolitics from being so firmly cemented at the scale of the state. Deborah Cowen and Neil Smith (2009) state that "Geopolitics was never only about the state's external relations, but rather, we argue, involved a more encompassing 'geopolitical social' that both crosses and crafts the distinction between inside and outside national state borders" (23). For these authors, they urge scholars to engage in a shift from the geopolitical spatial to geoeconomics, a reframing that,

in their formulation, captures understandings of security without a sole focus on state-centric discourse and policy without reinforcing the problematic assumptions and origins of the field of geopolitics (see Dodds and Atkinson 2000). They ask, "Once the central role of the national state, class and racist assumptions, masculinist gaze and metropolitan positioning are stripped away, what is left that is specifically 'geopolitical'? If the language of 'geopolitics' is unmoored from its nationalist and statist practice how can we conceptualize alternative, emergent political geographies?" (24). The bridge that Cowen and Smith offer, this idea of the "geopolitical social," looks inward at how "the same practices, discourses—and importantly, *the acts of violence*—that allowed for the assemblage of national territory" also produced a "national society" (25-26, emphasis in original). My intervention is to recast this idea from a different starting position, that of critical knowledge production, that is capable of both investigating the geopolitical yet does not carry the baggage of (implied, explicit, or overcome) state-centrism.

The foundational thrusts of critical geopolitics mentioned above lead scholars within the field to focus attention on geopolitics' discursive elements. In terms of methodology, work in critical geopolitics has tended towards discourse analysis, which Johannes Angermüller (2001) defines as focusing on "the link between text and its context. For discourse analysis, texts are not containers of self-referential meaning, but the recorded traces of discourse activity which can never completely be reduced to text" (8). Discourse analysis covers a broad umbrella of diverse practices with no one definition or standard of what it means to "do discourse analysis." While some have charted out specific approaches and schemes (see Dalby 1991; O Tuathail 1992; Wodak and Meyer 2009), others value the elasticity of discourse analysis in its ability to be tailored to the research questions at hand (Howarth 2004). Studying geopolitics as discourses involves analyzing contexts, structures, meanings, and researcher reflexivity on his or her

political stances towards the targets of their analysis (Müller 2010). Discourse analysis in critical geopolitics has drawn criticism within the discipline, however, for its tendency to over-focus on text, discourse, and representation, which can gloss over small details and the material aspects of geopolitical power (see Thrift 2000). This dissertation is serious about how the little things—radioactive particles, personal conversations, a small city—are key constitutive elements of far-reaching sociopolitical structures, effects, events, and phenomena.

Discourse analysis as a methodology is a critical tool "for coming to terms with such diverse issues as the rhetorical production of marginality, resistance and otherness through geopolitical discourses or the constitutive and disciplining power of geopolitical truth regimes" (Müller 2010: 1). It accomplishes this by "understanding society to be thoroughly enmeshed in *structures, mechanisms,* and *events,*" that if analyzed, make clear the power relations in which discourses—geopolitical or otherwise—are embedded (Dixon in Gomez and Jones 2010: 389). Generally, work in political geography is characterized by investigating spatial dynamics of power and as such is concerned with the various manifestations of those power dynamics or relations: borders and boundaries, policies, territoriality, organizations, flows and networks, states, world-systems, and so on (see for example Agnew et al. 2004; Cox et al. 2008). Political geography's broad scope and diverse engagements call for a similarly broad range of investigations and interpretations of the "spatialities of politics" (Cox et al. 2008: 2). Two such spatialities of particular relevance to my project are critical geopolitics and biopolitics, which in this dissertation act as lenses for looking at citizen-state-organization-knowledge assemblages. Critical geopolitics is an important mode of research for its rejection of state centricity, moving beyond elitist conceptions, and "contextualization of geopolitical discourses within networks of power" (Ó Tuathail 2006: 9). Discourse analysis has long been held as the primary methodology

of critical geopolitics (see Dalby 1990; Ó Tuathail and Agnew 1992; Murphy et al. 2004; Ó Tuathail 1994, 1996, 2004, 2006; *Geopolitics* 2006). Discourse analysis is an important element in critical geopolitics as discourse binds space and power. Sharpe (1993: 492) expounds upon this relationship: "Strategies of power always require the use of space and, thus, the use of discourses to create particular spatial images, primarily of territory and boundaries in statecraft, is inseparable from the formation and use of power." Toal and Dahlman (2011) build on this idea in their examination of the remaking of Bosnia via ethnic cleansing where the authors trace the linked development of discourse and power in space to demonstrate a form of geopolitics that produces both a "new ethnoterritorial order of space" and an "ethnocratic political order upon that space" (5).

Discourse analysis in critical geopolitics situates discourse in Foucauldian poststructuralist terms (see Ó Tuathail 1996; Ó Tuathail et al. 2006; Hepple, Atkinson in Dodds and Atkinson 2000). Dittmer (2010) defines discourse simply, as "the way in which we talk about things" and states that discourses are "key to any understanding of the world—geopolitical or otherwise" (10). This definition of discourse is also useful in the framework of critical knowledge production, which interrogates what those *ways* are, who the *we* is, what those *things* are, and the processes that co-construct each of these elements. The project of critical geopolitics is to interrogate these discourses, to reveal the embedded power structures and political agendas within them, to question the received wisdom or appeals to common sense, and to trace the transmission and reproduction of these discourses in all manner of media. As discourses are so deeply embedded within networks of power, Ó Tuathail (1996) suggests a tripartite division for the categorization of discourses that emerge at sites of (re)production of geopolitical knowledges: formal geopolitics, associated with academics and think tanks; practical geopolitics,

associated with policymakers; and popular geopolitics, associated with everyday people. Dixon (in Gomez and Jones 2010) proposes another tripartite division, here along lines of investigation: the production of a given discourse (who, how, and why), the character of that discourse (its extent and related discourses), and the consumption of that discourse (who, how, and with what effects). This project incorporates both approaches by looking at the production, character, and consumption of discourse—and extending that to technoscientific knowledge about the Chornobyl disaster— within and across sites of discourse development, as this provides a foundation for comparison of competing discourses, knowledges, and expertise and shows possible multifaceted relations among them.

Discourse analysis in critical geopolitics begins at various points, depending on the site of discourse (re)production—i.e., formal, practical, or popular—and the proclivities of the researcher to answer the questions she has set forth regarding the production, character, and/or consumption of the discourses at hand. Joanne Sharpe (2000) for example traces popular geopolitical discourse on the Cold War as mediated through *Reader's Digest*. She shows how the *Digest*'s imagining or representation of the USSR created a particular popular geopolitical discourse, an understanding of America for its readers by focusing on language, or the "politics of the choice of words and terms" (xvi). Her discourse analysis focuses on the development of the *Digest*'s imagined geographies of Soviet-US relations from 1922 to 1994, revealing the magazine's shifting narratives that both influenced Americans' constructions of their identities and place in the world, and justified the *Digest*'s existence as arbiter of geopolitical discourse.

In many ways, Sharpe's discourse analysis is representative of the predominant method used in critical geopolitics—it investigates the way in which a "we" (the *Digest*) talked about a thing (Soviet-US relations) by focusing on the actual words used and the power of those words to

create worlds (or worldviews) and identities positioned within them. The related field of biopolitics complicates this traditional critical geopolitics approach to discourse analysis by offering a more nuanced framework that focuses on "power relations in a way that [does] not privilege the state or sovereign models of power. Biopolitics acts in the interest of individual and collective life through producing knowledge of the processes that sustain or retard the optimization of various life processes" and "envision[s] seemingly technical, apolitical, and mundane activities as power-laden" (Grove 2013: 22). Though the state is not privileged as an exceptional case nor as the only site of biopolitical action, both the history and doing of biopolitics as a field of research are nevertheless imbricated in the politics, administration, inner workings, and expressions of power of the state. In fact, understanding the biopolitical maneuverings of the Soviet Union and independent Ukraine—such as the state apparatus methods for monitoring, regulating, policing, administering, etc., of particular bodies and biological life of "sufferers"—are a key component of this dissertation. Grove's definition also opens up space for biopolitical discourse analysis, or critical investigation into discourses and narratives of governance. In other words, where geopolitical discourses imagine how people, states, organizations, communities, and other entities relate to the world "out there," biopolitical discourses imagine those relational positions within the immediate social world of everyday life.

My use of discourse analysis in this study is not centered on one discourse producer like in Sharpe's engagement with *Reader's Digest*—a succinct, but narrow analysis confined within popular geopolitics. Instead, this study's methodology takes the forms and insights of discourse analysis into the framework of critical knowledge production, which opens up space to, for example, employ assemblage theory (discussed in the following section) to analyze the intersections of formal, political, and popular discourses, rather than stay within a narrow

purview of discourses as site-specific categories. The objects of this analysis therefore are diverse discursive and non-discursive products and components—policies, laws, institutional practices and organizations, official declarations and forms, agreements and partnerships, party platforms, oral histories, journalist accounts, technologies and instruments, expertise claims, radioactive particles, scientific knowledge, lived experiences and individual behaviors, institutional structures, cultural products, academic research pursuits, urban planning, and so forth—that demonstrate more fully the complex interconnections of power structures and the ways in which they are formed, reformed, and maintained. In enlarging the webs of discourse across multiple sites and to include the broader range of the processes of knowledge production of Chornobyl, I illuminate the many seen and unseen systems, relations, policies, and resources that construct the Chornobyl disaster for various political ends. I will also focus on the uses of technoscientific knowledge regarding the Chornobyl disaster as a tool for constructing discourses and knowledge, especially where the same data are used in competing or conflicting political discourses. I go into more detail on these processes of critical knowledge production and that data I use to trace these processes, structures, discourses, and relations in each of the analysis chapters, as each case study differs in terms of specific research questions, methods, and data.

The usefulness and adaptability of discourse analysis is not without limits however as there is little methodological cohesion in exactly how to "do" discourse analysis. Additionally, for some, the focus on texts, discourse, and representation in critical geopolitics obscures levels of nuance that emerge outside the realm of semiotics (see Thrift in Dodds and Atkinson 2000). Riles, referencing Ian Hodder (1994: 12), states that a "problem with a purely textual or discursive approach… is that sometimes documents may be intended to be representational, and sometimes not. Where they do 'represent,' they often do so differently than through the

representational system of symbols found in oral or written language: precisely because they endure over time, they can also 'work through the evocation of sets of practices within individual experience.'" To address some of these critiques of discourse analysis, Jason Dittmer (2014) has suggested bringing in assemblage theory for its commitment to a posthuman geopolitics. That suggestion was one of the initial impetuses in my conceptualization of critical knowledge production. Dislodging discourse analysis as *the* method of analysis and instead situating it as part of the toolbox for understanding the processes of knowledge production has opened up the possibility to use it in conjunction with other methods, such as thinking in terms of assemblages that connect the constituent parts of processes that can, among other things, produce discourses.

Focusing on the material when investigating discourse is to some extent covered ground in the literature. For example, Stuart Elden asked the following questions of political geographers to urge us to consider a broader understanding of the geopolitical:

> Geopolitics has tended to become conflated with global politics or political geography writ large. But could we turn this back to thinking about land, earth, world rather than simply the global or international?... How would our thinking of geo-power, geo-politics and geo-metrics work if we took the earth; the air and the subsoil; questions of land, terrain, territory; earth processes and understandings of the world as the central terms at stake, rather than a looser sense of the 'global'? (2013: 49)

Incorporating methods, approaches, and insights from STS into the doing of geography provides an answer to these questions, as these physical or material and social processes are constitutive elements of analysis at the outset. The framework of critical knowledge production specifically, and STS more broadly, provides a wide avenue for political geography to make this turn that Elden is describing. A co-constructive approach that begins with an understanding of ontological

multiplicity recognizes the causes and effects of the material, including physical, biological, chemical, and technological processes, and the social have on each other, planting the nonhuman—in all its variations—firmly into analyses of the phenomena that political geographers study. As I will discuss below, assemblage theory provides an approach to see the many constitutive parts of a given research object, the relations among them, and tools to trace the actions that those parts and relations produce.

Assemblage theory

This dissertation adopts assemblage theory from science and technology studies (STS) as a framework to deepen and compliment political geography methods of discourse analysis. Borrowing from STS has been gaining acceptance in political geography, especially recently (for example, see Barry 2001; Bennet 2010; Anderson and McFarlane 2011; Meehan et al. 2013; Dittmer 2013, 2014, 2017; Muller 2010, 2012, 2015; O'Lear 2016). Marrying assemblage theory to discourse analysis is fruitful for its inclusion of the nonhuman and extradiscursive in tracing the developments, deployments, changing natures, connections, relations, and influences of geopolitical processes. I have chosen to take such an approach specifically because the materiality of the Chornobyl disaster—its radioactive particles and their effects, the many billions of dollars spent on cleanup and social benefits, the physical space of the Exclusion Zone, the monuments and museums, Geiger counters and laboratory equipment—occupies a central role in how Chornobyl is discussed and used in different sociopolitical contexts.

Working with assemblages fulfills a main purpose of STS work: to make clear the co-constitutive, enacted relations among objects, knowledge, and society that challenge narratives of nature, objectivity, universalism, and truth. Assemblage theory first emerged from Giles Deleuze and Felix Guattari's rhizomatic explication of a new material ontology in *A Thousand Plateaus*

(1987). The core concept of assemblage theory is that any unit of social analysis—like a state, a group, an organization, an individual, an object—is a result of the interactions among its component parts. These component parts are people, things, concepts, narratives, and so on that are also assemblages. In other words, assemblages are constellations of object-relations, though the objects in question can be people, material entities, or meaningful signs and expressions of any number of temporal or spatial scales. These object-relations, each with its own dynamics and characters, are the *component parts* of sociomaterial assemblages, which De Landa (2006) characterizes as

> wholes characterized by *relations of exteriority*. These relations imply, first of all, that a component part of an assemblage may be detached from it and plugged into a different assemblage in which its interactions are different. In other words, the exteriority of relations implies a certain autonomy for the terms they relate… [and] that the properties of the component parts can never explain the relations which constitute a whole. (10-11)

These relations of exteriority are important to conceptualizing assemblages as arrangements of individual entities that relate meaningfully to other entities in the assemblage, that in turn can be part of many assemblages. This is the fractal element of assemblages; for example, an NGO might play an important role in lobbying for a particular bill and is therefore a part of the assemblage that coalesces around the motive for, drafting of, passing of, opposition to, enforcing of, and resistance to that bill. However, that NGO is also a sociomaterial assemblage of its own, and by continuing to "zoom in," other parts of the NGO-assemblage can be construed as multiple assemblages. Sociomaterial assemblages consist of both the material and the representational; they have their own dynamic histories, shape and are shaped by their social contexts, and the object-relations within a particular assemblage can simultaneously play constitutive roles in

other assemblages. The exteriority of assemblages allows for elements to be plucked from one assemblage into another, without collapsing the whole. The movement of one element, however, changes its nuance and effect according to its context within its new assemblage.

This focus on assemblages is useful in conceptualizing power and following power flows, identified as chains of linked actions within a sociomaterial network. Painter (in Cox et al. 2008) draws on Allen (2003) in defining power as "a 'relational effect of social interaction' and arises only as it is practiced or exercised; it does not exist prior to and separate from its use." Assemblages capture those relations and interactions as objects within them act, or in other words, exercise power through their networked relations. This notion echoes and extends Foucault's (2003: 29) explication of power:

> Power must, I think, be analyzed as something that circulates, or rather as something that functions only when it is part of a chain. It is never localized here or there, it is never in the hands of some, and it is never appropriated in the way that wealth or a commodity can be appropriated. Power functions. Power is exercised through networks, and individuals do not simply circulate in those networks; they are in a position to both submit to and exercise this power. They are never the inert or consenting targets of power; they are always its relays. In other words, power passes through individuals. It is not applied to them.

Understanding power as an effect of actions within or along networks of social relations highlights the role of actors within those networks. An actor's relations to other actors within a given assemblage are both the means by which that actor can exercise power and also the means by which other actors can "authorize, allow, afford, encourage, permit, suggest, influence, block, render possible, forbid, and so on" (Latour 2005: 72) the actions of others. Of course, this power

or agency is afforded to both human and nonhuman actors in sociomaterial assemblages—hence the "material" in the name. For example, in Andrew Barry's *Material Politics* (2013), the author investigates the ways in which material artifacts affected both the production of knowledge in regards to the construction of the Baku-Tbilisi-Ceyhan oil pipeline and how materials are active in political life. He highlights how materials like reports, construction equipment, budgets, and oil are monitored, regulated, assessed, and managed, changing their relations to other component parts of assemblages, but those shifting interrelations can result in "emergent effects, demanding what might be called an inter-object or inter-material analysis. Material artefacts never exist in isolation, but are themselves evolving entities that form part of a constellation of dynamic relations with other evolving entities" (13). Put differently, "because power is enacted through assemblage, it must be understood as distributed among the various components of that assemblage, human and non-human. That is to say, the properties and capabilities of non-human components of an assemblage shape outcomes in highly contingent ways" (Dittmer 2014: 388-9). From this perspective, tracing power flows is akin to tracing assemblages: the former investigates chains of linked actions within sociomaterial relational networks; the latter investigates component parts of sociomaterial relational networks that act contingently upon each other. Either way, these tracings involve the spatializing of difference by marking the boundaries of those assemblages through which power is enacted.

I have adopted the tracing of sociomaterial assemblages as a methodological framework for approaching the research questions of this dissertation. Each question focuses on how the "historical trajectories" (Dittmer 2014: 396) of various assemblages in which Chornobyl (itself an assemblage, a product of some, and a component of others) features have affected Ukrainian policy, biopolitics, and geopolitics. The actual process of tracing assemblages is done via an

inductive approach to the data, or building and bounding the networks of object-relations from the starting point of the data itself. As Latour (2005) put it in ANT terms, "you have to 'follow the actors themselves', that is try to catch up with their often wild innovations in order to learn from them what the collective existence has become in their hands, which methods they have elaborated to make it fit together, which accounts could best define the new associations that they have been forced to establish" (12). From the framework of tracing sociomaterial assemblages, doing archival work uncovers component parts of assemblages—both human and nonhuman—and conducting interviews with individuals that were/are also part of those assemblages provides color and context to those assemblages and the relations within them. Furthermore, approaching discourse analysis from an assemblage perspective embeds the (re)production of discourse into constitutive networks, working to lay bare the means of discourse construction and recognizes the social construction among language, method, material, and data, both in their production and interpretation (see for example Law 2009).

Geography has recently begun to engage with assemblages. John Allen (2011) notes some of the apparent similarities between the discipline and the methodology, "For much of the time, the geography of this or that is made up of relationships and things that jostle, co-exist, interfere and entangle one another. Some of the tangled relationships that lie before us may co-exist uneasily with one another, to the extent that it may seem odd that they are part of the same formation" (154). This interplay of relation and formation, of incorporating methods and approaches from assemblage theory has of yet not entered the mainstream of academic political geography, though there are quality examples of this type of research (see Brandt 2014; Dittmer 2017) and scholarly articles discussing the prospective usefulness of this approach in the field (see MacFarlane 2009; Anderson and McFarlane 2011; Dittmer 2014).

As Blair Ruble (2003) noted: “An examination of urban form and the processes by which it has come into being reveal a great deal about its creators. The building of a city involves every aspect of human existence. It blends the economic with the political, and the social with the cultural, into material expression of otherwise abstract and remote ‘tendencies’ and ‘forces’” (205). This is why the assemblage metaphor is useful—a city is more than just its buildings, roads, parks, monuments, and symbols; more than just its people and their political, social, cultural, and economic interactions. Beyond simply being more than the sum of its parts however, assemblages are also *productive*. The combining and rearranging of an assemblage’s constituent parts constantly produces new effects as those constituent parts relate in new ways in their new combinations.

For example, one particular building in a city, though it might not change location or decoration, can take on new meanings and can be a productive participant in a variety of new social processes as it acquires new relations with other elements of the city and other assemblages and contexts altogether. A movie theater showing a new release on a Friday night is different than on a Sunday morning when it shows old children’s cartoons with discounted tickets, is different than the weekend it hosts an international film festival, is different than when the tornado sirens go off and it becomes a shelter, is different than when the projectionist announces her intent to run for city council there. New arrangements of elements in an assemblage produce new things: the city, its connections, its activities, its meanings—all these things are produced and are effects.

In the case of Slavutych, especially after the 1995 G7 meeting and the subsequent decision to close ChNPP, city leaders and residents first envisioned a particular effect, a future version of the city, democratically functioning with engaged residents and a productive,

diversified economy. The ensuing arranging and rearranging of Slavutych's constituent parts, which also included attracting new constituent parts from other assemblages, such as special state funding or foreign investment, was a conscious effort to re-shape Slavutych to produce that desired effect. Chapter 4 expands on this idea in exploring the development of Slavutych.

Assemblages are constantly being formed and reformed as the elements that comprise them come, go, and are themselves reformed, and as a result are "impossible to authoritatively delimit. Because they are open systems, with elements constantly entering and leaving, the only possibility is to attempt to describe trends in their relational space over time" (Dittmer 2017: 10). The processes of forming and reforming assemblages are referred to in the literature as territorialization and deterritorialization (from Deleuze and Guattari 1972 [1977], 1980 [1987]), and these processes are major components in assemblage theory. Additionally, there is a measure of the roles and mechanisms component parts play and utilize within the assemblage, referred to as *coding*. DeLanda (2006) explains

> In addition to the exteriority of relations, the concept of assemblage is defined along two dimensions. One dimension or axis [coding] defines the variable roles which an assemblage's components may play, from a purely *material* role at one extreme of the axis, to a purely *expressive* role at the other extreme. These roles are variable and may occur in mixtures, that is, a given component may play a mixture of material and expressive roles by exercising different sets of capacities. The other dimension defines variable processes in which these components become involved and that either stabilize the identity of an assemblage, by increasing its degree of internal homogeneity or the degree of sharpness of its boundaries, or destabilize it. The former are referred to as processes of *territorialization* and the latter as processes of *deterritorialization*. One and

> the same assemblage can have components working to stabilize its identity as well as components forcing it to change or even transforming it into a different assemblage. In fact one and the same component may participate in both processes by exercising different sets of capacities. (12, emphasis in original) …[P]rocesses of territorialization are processes that define or sharpen the spatial boundaries of actual territories. Territorialization, on the other hand, also refers to non-spatial processes which increase the internal homogeneity of an assemblage, such as the sorting processes which exclude a certain category of people from membership of an organization, or the segregation processes which increase the ethnic or racial homogeneity of a neighbourhood. Any process which either destabilizes spatial boundaries or increases internal heterogeneity is considered deterritorializing. (13)

These core tenets of assemblage theory—the exteriority of relations, that every component part of an assemblage can itself be read as an assemblage and every assemblage can be read as a component part of other assemblages, territorialization and deterritorialization processes that affect the boundaries and stability of an assemblage, the coding of component parts—form a robust basis of analysis of social processes. In the case of critical knowledge production presented here, assemblage theory incorporates ontological multiplicity, the vibrancy of nonhuman actors, and the co-construction of discourse, politics, and knowledge. Ben Anderson and Colin McFarlane (2011) state that "Part of the appeal of assemblage, it would seem, lies in its reading of power as multiple co-existences – assemblage connotes not a central governing power, nor a power distributed equally, but power as plurality in transformation" (125), which is aligned with the emergent trends in critical geopolitics to move beyond the state. In chapter 4, I situate the role of the Department of Social Expertise in the processes of creating particular

knowledges about Chornobyl sufferers and how that knowledge, and the sociomaterial relations of the DSE in legislative and academic assemblages in Ukraine, that helped shape the development of a post-Chornobyl biopolitical regime. In chapter 5, my research is concerned with the assembling of geopolitical discourses, actions, and relations at the scale of the city.

Chornobyl as assemblage

Assemblage theory therefore demonstrates that how a social process is defined, discussed, and deployed depends on context: politicians, liquidators, and nuclear engineers understand, discuss, feel, and use the Chornobyl disaster differently. Yet this definition does not mean that there are multiple versions of the Chornobyl disaster; rather, Chornobyl is constructed and represented fractionally, highlighting relevant component parts and backgrounding less-relevant parts depending on the context. Thinking of Chornobyl as an assemblage recognizes that it is an emergent process, continually generated in and influencing different contexts. Thinking with assemblages is therefore well-suited to complement discourse analysis in critical geopolitics as it traces the ways in which discourses, organizations, and actions come into being, change, and affect other social relations.

Framing my discourse analysis in terms of assemblages allows me to show how the little things are key to understanding the development and effects of major political and social events and phenomena in post-Chornobyl Ukraine. This approach also affords a deeper contextualization of how, in what forms, and to what effect technoscientific knowledge, political agendas, and policies co-produce each other.

Emphasizing discourse production as a scaffolding mechanism for tracing assemblages serves two major purposes: it provides suitable bases for bounding assemblages and starting

points for tracing those assemblages. By viewing the Chornobyl disaster as a political event, we can see several discourses emerge that deal with various aspects of the disaster and its aftermath in Ukraine. When discussing accomplishing particular political actions, these discourses can act as a mobilizing force, a narrative tool to establish new sociomaterial assemblages or alter existing ones for a new purpose. Put otherwise, and perhaps reductively, assemblages are a mechanism for producing political actions, and discourse is the reasoning or motive behind an assemblage coming together.

In "Social monitoring" (chapter 4), I began my research starting point for tracing the assemblage that produced the definitions of the legal term "sufferer." As I noted in the introduction, there are multiple categories of Chornobyl sufferers, and being assigned one of those categories affords an individual special rights and privileges provided by the state, including financial stipends, food deliveries, specialized medical treatment, and other benefits. I knew from Petryna (2003) that obtaining the document that declared a sufferer as a member of one of the recognized categories could be an ordeal, as individuals fought with, bribed, cajoled, tricked, pleaded with, convinced, subverted, collaborated with, and otherwise attempted to exert power over medical professionals to provide the correct diagnoses and documents and government officials to approve records. Over the course of my tracing, I collected and read through dozens of laws (some with dozens of revisions of their own), conflicting official reports from a range of organizations, and read testimony, journalism, and oral histories of sufferers. I was also fortunate to be connected with Gulbarshin Chepurko at the Department of Social Expertise in the Institute of Sociology of the National Academy of Sciences of Ukraine (NAMU) as my initial faculty sponsor for my Fulbright research in 2015-2016. Chepurko (née Mimandusova) had worked for the DSE since the 1990s and was a core member of the research

team that the state, via NAMU, had tasked with undertaking a longitudinal study program of "social monitoring" of Chornobyl sufferers. In addition to gifting me copies of as many of the DSE's publications as she had on hand, my investigation into this social monitoring program and its results led to tracing the institutional development of both the program and the department, from the Academy's Imperial Russian roots through the Soviet period and into independence. Assembling chapter 4 and the processes of knowledge production in which the DSE was engaged, including advising the Verkhovna Rada on amendments to various laws and suggestions to better serve the sufferer populations, involved investigations into the expertise claims of Soviet and post-Soviet scientists, the tools and technologies used by the DSE, the text of the documents they produced, and their impact on legal, medical, and administrative processes.

The impetus for "Emergent stateness" (chapter 5) was a fascination with Slavutych, the town built between 1986 and 1988 for workers at the ChNPP and their families after Pripyat had to be abandoned. Over multiple marshrutka[6] trips to that small city on the western edge of the Chernihivska oblast, I met and spoke with engineers, scientists, schoolteachers, museum staff, film festival organizers and goers, former liquidators, shop owners, students, and residents. I interviewed the long-term mayor of Slavutych, Volodymyr Udovychenko, and his successor, Yuriy Fomichev, about the history of the town, their visions for it, and the challenges it faced in the past and faces in present. I also had regular access to the city archives; both archivists were at first very confused why I wanted to discover the city's history in their collections—one told me that the official city website had enough information on it to satisfy my curiosity—but as we

[6] A marshrutka (Ukrainian: *маршрутка*) is a fixed-route taxi that often operates outside of municipal control, similar to a shuttle bus.

worked together, they became excited to help, in one case tracking down a lost file, and volunteering to scan files for me so I would not have to make the trip all the way up there just for some paper. Slavutych's past is inextricable from the Chornobyl disaster, yet what I found in that city was a collective (though not unanimous) effort to leverage the decades of intimate experience with and expertise on the disaster to establish a new economic foundation, around tourism and scientific pursuits, and a new political narrative for the town, one of rejuvenation via international connections. All of these experiences led me to the realization that the city, and especially its extremely proactive leader Udovychenko, was engaging in geopolitics. In Slavutych, residents were claiming authority and expertise on Chornobyl; using those claims to negotiate with international organizations, transnational corporations, and governments for their mutual benefit; and then attempting to leverage those geopolitical connections for the material and economic benefit of the city and its people.

In both cases, I followed the threads of relation to myriad component parts to inductively trace the assemblages engaged in the knowledge-making processes of the biopolitics of Chornobyl sufferers and the geopolitics of Slavutych. These tracings went slowly, occasionally resulted in dead ends, surprised, frustrated, exposed gaps, branched, and rejoined. Working from the framework of critical knowledge production as described here resulted in analyses I could not have foreseen before I began working on them. That feeling of discovery is one of the aspects of critical knowledge production that demonstrates its usefulness to the practicing of political geography. Tracing these networks led to new avenues of exploration within data sources and highlighted the interconnectedness and contingencies among constellations of actors, knowledge, and political actions across time and space.

Chapter 4. Social monitoring: The Department of Social Expertise and the evolution of biopolitics in post-Chornobyl Ukraine

Introduction

"Liquidation" is far too hopeful a euphemism for the immediate and long-term management of the 1986 Chornobyl disaster. The term implies a total elimination of the consequences of what remains as the largest nuclear accident in history, an "everything must go!" mentality that in English evokes a secondhand furniture store's going-out-of-business sale instead of recovery from a major international catastrophe. As explored earlier, the immediate efforts to eliminate the effects of the disaster were truly monumental in their scope, including attempts at both the physical containment of the fourth reactor and its exploded contents and the political containment of information. Ukraine and the people that live there are still wrestling with that aftermath.

This chapter is an analysis of the biopolitics of Chornobyl; that is, the conversion of bodies and lives affected by the disaster into harvestable, actionable knowledge. Conceptualizing the biopolitics of Chornobyl involves tracing the coproduction of technoscientific knowledge and (bio)political narratives through structures, like the Verkhovna Rada and the National Academy of Sciences of the USSR and of Ukraine, documents, like the publications of the Department of Social Expertise and legislation, and how sufferers navigate through them in productive ways.

The Soviet government, in response to the Chornobyl disaster, defined a new group of citizens—sufferers. Mapping the political and spatial developments of this new demographic (in its relation to both non-sufferer groups and the evolving contexts of Ukrainian [geo]politics)

demonstrates the continuities and ruptures between Soviet biopolitics and contemporary Ukrainian biopolitics.

The Department of Social Expertise (DSE) in the Institute of Sociology of the Ukrainian National Academy of Sciences has long been involved in the study of Chornobyl sufferers as a distinct social group via a methodology they term "social monitoring." This chapter uses the DSE as a site of the production of biopolitical knowledge and uses their published research to chart the development of post-Soviet Ukrainian biopolitical regimes. I argue that the DSE's research on this population was instrumental in constructing a post-Soviet (denoting continuity to the Soviet era, rather than a break from it) biopolitical regime that is inseparable from questions of Ukraine's and Ukrainians' (geo)political identities. Because of the Soviet heritage of its location in the structures and processes of knowledge production, the DSE perpetuated the goals and practices of Soviet knowledge production if not in content then at least in form.

At the center of this biopolitics is an emphasis on the unmet responsibilities of the governing to the governed, which has resulted in numerous crises of authority, sovereignty, territory, community, and identity in the 28 years of Ukrainian independence. Answering the question of where the fault lies for the Chornobyl disaster, and its lingering aftermath, is rooted in both geopolitical narratives and the materiality of suffering. This chapter explores how processes of coming up with answers to this question of fault have been pivotal in shifting the emphases on, boundaries of, and relationships between the governing and the governed, resulting in a fractious, chaotic, and distrustful framework for political life in Ukraine. I will show how the inability of successive Ukrainian governments to provide restoration and reparation to sufferers is a microcosm of post-independence crises of authority, sovereignty, territory, community, and identity.

Biopolitics

Rutherford and Rutherford (2013a: 415) define biopower as a way to "convert the people, or more properly a segment of humanity, into a governable object" via demography: classifying and dividing political subjects into specific populations. These specific populations become sources of information—the bodies and lives of the individuals within those populations are reduced to the raw data for statistical analysis, for example—and modular governable objects. Biopolitics involves the governance of the life and lives of bodies and populations via biopower. The development of the biopolitics of a space, the choices made and preferences held regarding the selection, harvesting, and governance of these specific populations, co-constructs claims to truth, expertise, and authority. In other words, "Biopolitics as a discourse encouraged a particular way of seeing reality, of discovering, promoting, and managing that reality" (ibid, 416). This conceptualization of biopolitics operates as an analytical orientation: "there is no underlying 'logic' of biopolitics but different ways in which the government of living beings is made a problem of reflection and intervention" (Collier 2011: 17). An investigation into any instance or succession of biopolitical regimes, then, is to investigate the co-constructive dynamics of how, when, and why governing bodies intervene in the life processes of the governed.

This understanding of biopolitics originates with Foucault and his understanding of the relationship between power and how power is used to manage, regulate, and control life. Foucault conceived of biopolitics as a tool for studying "power relations in a way that did not privilege the state or sovereign models of power. Biopolitics acts in the interest of individual and collective life through producing knowledge of the processes that sustain or retard the optimization of various life processes" (Death 2014: 22). These "various life processes" can feasibly include the full range of human activity, plus the reciprocal relationship between

humans and the environment, no matter how apolitical or mundane they may seem. Grove (in Death 2014), paraphrasing a number of Foucault's writings on the subject, outlines four keys to biopower, or the mechanisms by which governments subjugate bodies and control populations:

> First, power is not a quantity to be held, but the effect of a relation between individuals. It is action on the action of another. Second, government does not refer to an institutionalized organization that holds power, but refers instead to practices that attempt to modify the thoughts and actions of others. In his famous phrasing, government is concerned with the "conduct of conduct." Third, power is productive. It is not the property of individual subjects, but instead produces both objects and subjects of government. The former are those whose conduct is targeted for improvement; the latter are those who devise the mechanisms for targeting and transforming conduct. Fourth, freedom is no longer the antithesis of power but is rather a precondition of power relation. Power relies on freedom, but this is not the freedom of individual choice. Rather, freedom refers to the capacity to transgress the limits of any social order: the potential to refuse to be governed as such. (23-24)

Biopower is further broken down into two parts: "disciplinary techniques that operate on individual bodies, and governmental techniques that operate on the population" (24). These techniques usually involve singling out individuals for special treatment and dividing a larger population into more manageable, smaller populations; both are typically accompanied with assigning labels or identities to those individuals or groups. These processes of classification and division change networks of relations by introducing new elements into sociopolitical systems with (at least attempted) preconfigured subjectivities to government. In the case of the Chornobyl disaster, which I will explore in more depth below, the Soviet government quickly established

four categories of sufferers (discussed in detail below on page 140), each with specific criteria for membership and schedules of benefits; as a governmental body, the DSE treated each category separately in its social monitoring activities.

From these definitions of biopower and biopolitics, it is easy to see how these concepts are related to or align well with the other conceptual frameworks employed in this study, namely assemblage theory and the object-oriented ontology of STS. Power is a product of relations: power is not a thing that exists, but rather an effect of things interacting that shapes those interactions. In an assemblage framework, we can identify individuals, organizations, governments, and objects, trace the connections among them, and analyze the effects of those relations. In this chapter, that process takes the form of investigating what the DSE is and does, how it is situated in academic, policy, governmental, ecological, radiological, information, and interpersonal networks, and how the work published by the DSE both helped create and demarcate a transition in biopolitical regimes at a more micro scale—as it impacted Chornobyl sufferers—and a more macro scale—in attempting to define Ukraine after its independence.

Biopolitics after Foucault

As mentioned above, while the key process of the biopoliticization of any group is the instrumentalization of life, the forms that this process can take vary dramatically. Numerous others have picked up the threads that Foucault laid out in his lectures on biopolitics. Lemke (2011a: 166, 172) outlines two distinct and often independent lines of thought through which scholars have continued to develop biopolitics. The first, macro-level line is defined by its shared philosophical foundation of deploying biopolitics as a lens for analyzing Western history and culture, though the range of such deployments is quite varied, from Agamben's ([1995] 1998) thanatopolitical analysis of Nazi death camps and call to transcend biopolitics, to Hardt and

Negri's (2000: 388) embracing and future triumph of "the fundamental forces of biopolitical production" at the hands of the coming multitude.

The second, micro-level line focuses on the biopolitical implications of specific technological, medical, and cultural innovations, drawing on STS, cultural anthropology, and feminist and other critical theory. Like in the first line, there is a diversity of approaches in the work of scholars of the second line, particularly in their stances toward neoliberalism and the bioeconomy, or the commodification of parts of the human body, such as blood, tissue, organs, and gametes, though they are largely united in "[eschewing] the first line's sweeping historical judgments of biopolitics as such in favor of nuanced examinations of specific benefits and dangers of actual biotechnologies" (Tierney 2016: 359).

The arguments I present in this chapter are not an attempt to bring the two lines together per se; rather, this chapter works to shed light on the limits of both of these lines, as they largely remained bounded in their analyses by working in the framework of capitalism. That biopolitics scholarship is tied to working within the confines of a capitalist framework is not necessarily surprising—Foucault's central thesis of *The History of Sexuality* is that the development of biopower has been essential to the development of capitalism—but this situation does, for example, categorically circumscribe analyses of biopolitics and biopolitical regimes in non- and anti-capitalist systems. The case study in this chapter, analyzing the role of the DSE in the construction of post-Chornobyl biopolitics, is not wholly constrained by the logics of capitalism. As I explore below in the section on Soviet biopolitics, the biopolitics of the USSR and its successors emerge from different ideological vectors and intellectual traditions. That said, many of the developments in the field of biopolitics after Foucault, along both the macro and micro

lines, deserve extra attention, such as Agamben's discussion of sovereignty, Esposito's immunization thesis, and affirmative biopolitics.

Agamben: bare life

Giorgio Agamben's theorization of biopolitics is rooted in the concept of "bare life" and the Roman *homo sacer* figure. The idea of "bare life" comes from an extrapolation of the two Greek words that translate to "life" in other languages: "*zoē*, which expressed the simple fact of living common to all living beings (animals, men, or gods), and *bios*, which indicated the form or way of living proper to an individual or group" (Agamben 1998: 1). Arguing that the *bios* meaning of "life" gets lost in translation, Agamben explains that when sovereigns and governments discuss the legislation, regulation, or protection of life, they come to refer to *zoē*, or bare life; that biological existence continues, regardless of the quality of that life, regardless of how that life is lived, regardless of the circumstances or potential of that life, is paramount. These processes are separate, though related, to the governance of *bios*, or political forms of life. To bolster this position, he goes on to discuss the character of the *homo sacer*, a person condemned for a crime who is neither sentenced to death but whose life (*zoē*) is nonetheless irrelevant to the extent that a person who kills the *homo sacer* will not be punished. The *homo sacer* is a kind of inverse of the sovereign, who exists simultaneously within and outside of the law. Both figures exist in spaces of exception, "two symmetrical figures that have the same structure and are correlative: the sovereign is the one with respect to whom all men are potentially *homines sacri*, and *homo sacer* is the one with respect to whom all men act as sovereigns" (84). What emerges as part of modern democracy, Agamben continues, is that both sovereignty and sacredness (here meaning the quality of being deemed *homo sacer*) become distributed, albeit unevenly, among the subjects and subject bodies. What was the exception—a

person declared sacred—becomes the rule—a permanent state of exception where bare life "becomes both subject and object of the conflicts of the political order, the one place for both the organization of State power and emancipation from it" (9).

Such a declension of biopolitics, the focus on the sovereign state of exception that separates bare life from political life, leads to an examination of death. After all, if the hallmark feature of *homo sacer* is "the double exclusion into which he is taken and the violence to which he finds himself exposed… is classifiable neither as sacrifice nor as homicide, neither as the execution of a condemnation to death nor as sacrilege" (82), then we must investigate the perpetrators of that violence. However, in a modern democracy, triangulations of sovereigns, the sacred, and those who go unpunished for killing the sacred resemble overlapping circles rather than linked, discrete individuals. In other words, Agamben's formulation of biopolitics trends towards thanatopolitics, an examination of the rights to death or to let die. Agamben himself notes this in the introductory paragraphs to his discussion of Nazi concentration camps:

> Along with the emergence of biopolitics, we can observe a displacement and gradual expansion beyond the limits of the decision on bare life, in the state of exception, in which sovereignty consisted. If there is a line in every modern state marking the point at which the decision on life becomes a decision on death, and biopolitics can turn into thanatopolitics, this line no longer appears today as a stable border dividing two clearly distinct zones. This line is now in motion and gradually moving into areas other than that of political life, areas in which the sovereign is entering into an ever more intimate symbiosis not only with the jurist but also with the doctor, the scientist, the expert, and the priest. (122)

As I will explore below, in the years following the Chornobyl disaster, successive Ukrainian governments reevaluated and redefined both the disaster and the government's responsibilities towards those affected by the disaster. Davies (2013) connects the experience of Chornobyl sufferers and liquidators to Agamben's conceptualization of biopolitics explicitly, stating that the "double exposure" of these groups, first to radiation and then to the inadequacies of Ukrainian governments to provide support and care, highlights the shifts in that line between bio- and thanatopolitics:

> By reducing Chernobyl from a permanent state of emergency through processes such as eliminating the compensation that surviving liquidators receive, the Ukrainian government both washes its hands of responsibility and reduces the exposed to 'bare life.' Agamben's notion of bare life is apposite when describing Ukrainian citizens whose bodies have been exposed to harmful radiation without adequate state protection or compensation. Like the Roman figure of 'Homo Sacer,' which inspired Agamben's thinking, these exposed and neglected populations have been denied legal status by the state, producing irradiated bodies that 'cannot be sacrificed yet may, nevertheless, be killed.' Their biologies have been tainted by government-caused radiation, yet they remain stripped of rights to adequate legal help and support. (117)

Esposito: the immunitary thesis

Roberto Esposito's theorization of biopolitics is centered on a deconstruction of the term "immunity" and how a framework of immunization in regards to community is a fruitful exploration of the processes of biopolitics. In particular, his work begins with an examination of the *munus*, the Latin root at the center of both immunity and community, and "its complex, bivalent meaning of 'law' and 'gift'—and, more specifically, of the law of a unilateral gift to

others" (Esposito 2013: 84). For Esposito, immunity and community were linked both semantically and in practice. "If *communitas* is what binds its members in a commitment of giving from one to the other, *immunitas*, by contrast, is what unburdens from this burden, what exonerates from this responsibility. In the same way that community refers to something general and open, immunity – or immunization – refers to the privileged particularity of a situation that is defined by being an exception to a common condition" (84). Membership in a community requires a giving of the self to something greater than the self; immunity on the other hand is how to protect the self from outside threats, including from the community itself and from threats to the community. The contradiction between immunization, or the preservation of self, and community, where the meaning of the self's existence is maintained, forms the basis of Esposito's biopolitics. In his preface to *Bios*, Timothy Campbell explains this contradiction as follows: "the modern subject who enjoys civil and political rights is itself an attempt to attain immunity from the contagion of the possibility of community. Such an attempt to immunize the individual from what is common ends up putting at risk the community as immunity turns upon itself and its constituent element" (in Esposito 2008: xi). There is a line, not unlike the line Agamben draws and blurs between biopolitics and thanatopolitics, between immunization, "necessary to the preservation of individual and collective life" (2013: 86), and self- or auto-immunization, where the immune system turns against itself (like an autoimmune disease in a human body) and risks its own continued existence.

This paradigm is useful in an analysis of the response to the Chornobyl disaster in how communities respond to contamination. Certainly, processes of immunization are concerned with protecting the community—and those within it—from the unwanted, the unfit, the unworthy, the unsafe, and the unknown. These processes have played out in various ways at a number of scales

and have changed over time. For example, fluctuating state budgetary constraints have altered both the definitions of what it means for individuals, areas, and foodstuffs to be contaminated, and the allowable amounts of contamination. As I will discuss more in depth below, the DSE also regularly tracked how integrated into or separated from society sufferers felt they were. The immunization paradigm helps to uncover the processes that produce and govern subjectivities and their relations, the hierarchies, inequalities, and asymmetries. Similarly, we can use this paradigm to analyze how the community/-ies of the Ukrainian state conceptualize the self, from lingering questions of defining Ukrainian identity to the evolving meanings of being a Chornobyl sufferer or liquidator, and how those selves immunize against community.

Affirmative biopolitics

In contrast to Agamben, Esposito's immunization paradigm does not suggest a teleology that ends in a negative biopolitics or overt thanatopolitics, though that is certainly one possible result. With so much of biopolitical scholarship, especially after 9/11, heavily influenced by what Rutherford and Rutherford (2013a: 418) call the "Agamben effect," including explorations of eugenics, necropolitics, bio-inequality, and the global war on terror, one might be convinced of that teleology. Esposito's deconstruction of biopolitics however was spurred in part by a desire to explore a more positive biopolitics, where the *dispositifs* and political technologies of biopolitical immunization—classification, objectification, designation, subjectification—can be reoriented and reconstructed to serve a different set of categories, one that "rupture[s] that juncture between biology and politics" (Campbell in Esposito 2008: xix) that has characterized modern governance. Esposito sees this process as an opening of the "black box of biopolitics" and the deconstruction of the *dispositif* of the "double enclosure of the body," which in the case of Nazism took the form of "both as the chaining of the subject onto his own body and as the

incorporation of such a body in that extensive body of the German ethnic community." In that same passage, he goes on to explain:

> The attempt we want to make is that of assuming the same categories of "life," "body," and "birth," and then of converting their immunitary (which is to say their self-negating) declension in a direction that is open to a more originary and intense sense of *communitas*. Only in this way—at the point of intersection and tension among contemporary reflections that have moved in such a direction—will it be possible to trace the initial features of a biopolitics that is finally affirmative. No longer over life but of life, one that doesn't superimpose already constituted (and by now destitute) categories of modern politics on life, but rather inscribes the innovative power of a life rethought in all its complexity and articulation in the same politics. (157)

For Esposito then, developing an affirmative biopolitics, one *of* life rather than *on* life, must begin with a reconceptualization of the common as "neither the public—which is dialectically opposed to the private—nor the global, to which the local corresponds" (Esposito 2013: 89). Much of the scholarship on affirmative biopolitics focuses on the ways that different bodies form communities and how those communities construct their own strategies for living (see Hardt and Negri 2000, 2004; Rose 2007; Hannah 2011; Prozorov 2015; Tierney 2015, 2016; Lynch 2020). This grassroots approach is therefore rooted in biopolitical self-determination, mediated by social context. Lemke, paraphrasing Esposito, characterizes affirmative biopolitics as productive, positive immunizations against outside definition, individual and collective that "defend themselves against attempts at identification, unification, and closure and articulate an immanent normativity of life that opposes the external domination of life processes" (Lemke 2011: 91).

Perhaps the approach to affirmative biopolitics begins with an answer to the question *within a given context, what are all possibilities of being?* When looking at communities in the aftermath of the Chornobyl disaster, we find a variety of narratives of self-determination and strategies for living by sufferers, liquidators, and others who are not legally recognized as being members of either category yet who nevertheless feel their lives have been negatively impacted by the disaster (for example, Alexievich 1997; Petryna 2002/2013; and Kuchinskaya 2014). We also see institutions such as the DSE wrapped up in processes of external and self-determination; as I discuss below, their social monitoring activities both provide scientific support for the state's categorizations and governance as well as reveal emergent communities defining themselves against the state.

Investigating affirmative biopolitics also reveals that any analysis of biopolitics shows that there is no universality or predetermination in the development thereof. The discussion of the DSE below is to uncover the connective tissue behind the biopolitical decision-making both at the level of the state—in the development of major Chornobyl legislation discussed in the previous chapter, for example—and to show how the evolution of the Ukrainian biopolitical regime is imbricated in Ukrainian narratives of community and geopolitics.

Biopolitics and STS

These various approaches to biopolitics highlight the need for a heightened focus on geographical and historical contingencies and idiosyncrasies. Lemke (2011) asserts that "biopolitical phenomena are not the result of anthropologically rooted drives, evolutionary laws, or universal political constraints. Rather, they have to be grounded in social practice and political decision-making. These processes do not follow a necessary logic but are subject to specific and contingent rationalities and incorporate institutional preferences and normative choices." Any

analysis of biopolitics must therefore "reveal and make tangible the restrictions and contingencies, the demands and constraints, that impinge upon it" (122). As I discussed previously, the field of STS has developed a robust analytical toolset for analyzing the ways in which knowledge creation and social processes and structures co-construct each other. First, the STS emphasis on the socio-material in understanding the processes of knowledge production grounds analysis of biopolitical phenomena in their specific relational contexts. Second, approaching biopolitics from an STS-based critique of expertise exposes claims of truth and authority as specific governmental and disciplinary techniques. And third, by refocusing the lens of biopolitics to look more closely at the nexus of scientific knowledge and governance, we can approach biopolitics as a regime, which I will discuss further below.

Critical knowledge production is an analysis of "the processes of the production, reproduction, and representation of scientific knowledge emerging from networks of human and nonhuman actors" (Pickett et al. 2020: 255). It is a framework that understands that knowledge is created in social, material, and relational contexts, and that the processes of the production of knowledge can be messy, chaotic, partial, and imperfect. This approach penetrates arguments of the supposed impartiality and completeness of scientific knowledge, and allows room for discourse, narrative, opinion, outside constraints, identity, assumption, and so on. When analyzing the production of biopolitical knowledge, this orientation explores not just the tools, people, and processes involved in the collection of demographic, medical, and other data from target populations, but also the gaps in those data, how they were patched, the reasons why those gaps might exist, and the sociopolitical and discursive usefulness of those gaps, just to name a few possible other considerations. Examining the production of biopolitical knowledge in post-Chornobyl Ukraine from this perspective opens a space to better understand how the DSE and

the work of its affiliated researchers fits into the larger picture—situating the micro in the macro, so to speak.

How STS critiques claims of expertise, truth, and authority is also useful in biopolitical analysis. As I mention above, the development of a biopolitics in a space is caught up in self-enforcing presentation of reality: someone—a sovereign for Agamben, a community for Esposito—claiming authority over a specific population sets out the rules for and bounds of that population. Deconstructing those claims of authority and truth works to open the black box of biopolitics, interrogating the processes of the governing of lives and bodies as contingent and situated, as emergent effects of relations among human and nonhuman actors. Thinking critically about expertise then means unpacking the intersections of power and knowledge production. Similarly, the recognition of multiple, overlapping, variable realities within an STS framework (ontological multiplicity) bolsters this deconstructive work, carving out the conceptual space for a variety of biopolitical realities to interact with each other. Koljevic defines "biopolitics as a strategic relation between knowledge and power, which takes place in the process of fragmentation and dissolution of sovereignty" (2014:16), but those fragmentations and dissolutions are messy, partial, and unevenly distributed across absolute and relative space. This becomes clear, for example, by tracing the spaces of conflict and cooperation when the affirmative biopolitics of groups of Chornobyl sufferers come up against the biopolitics of the state.

Approaching biopolitics as a regime goes further than focusing on discourse because it establishes ordering structures for arranging actors in relational space and sets forth explicit and implicit rules for administering (enforcing, policing, fulfilling, etc.) those relations. Naming a biopolitical regime recognizes that the biopolitical imperative—the transformation of

populations into governable objects—has become more or less a foundational aspect of a government, where the system of governance at large promotes or reinforces a particular biopolitical reality. This notion follows Judith Butler's (2004) critique of governmentality, the policies and practices that discipline populations according to some biopolitical scheme, especially in regards to her exploration of the outsourcing of governmentality functions to institutions and organizations outside of the formal government, including churches, paramilitaries, entertainment outlets, and academia. These "biopolitical contractors" support the regime through diffuse social, political, economic, and cultural techniques that the sovereign, state, or other government may not necessarily be able to deploy on their own (see also Makarychev and Medvedev 2015: 47). Thinking through the regime also signals the broader social structures and systems that administer and shape that reality: academics, national budgets, policing, infrastructure, international agreements, elections, and so on. In the case of the Chornobyl disaster, the categories of sufferers were created because those who would populate each category required a relation to the state that was different from the extant relations between the state and "normal" medical and disability pensioners, based on the official measures of their irradiated biologies. These new categories, as a result of their creation, required administrators to enforce the population of the category, of which one result was the creation of the DSE after Ukrainian independence. From this perspective, the DSE's program of social monitoring was a biotechnology in service of the state's biopolitical regime, working to administer these categories and contributing to the shaping of the governance of these categories.

Soviet biopolitics

Much of contemporary biopolitics scholarship is rooted in the Foucauldian theory of biopolitics as neoliberalism and the co-constructive relationship between the development of

biopolitics and capitalism. Koljevic (2014) notes that "ever since [Foucault's] *The History of Sexuality,* biopower has been the *sine qua non* for the development of capitalism, and this is precisely the point from which the analysis begins. This is the reason why biopolitics – through its phenomena of the market, liberal economy and multiple techniques of governing – appears as the *practice of the truth* of liberalism" (14). Scholars developing theories of biopolitics after Foucault, largely in Europe and North America, generally stayed in that lane, whether because of the milieu of neoliberal globalization at the end of the Cold War, the inaccessibility of material from non-capitalist countries, or some other reason is anyone's guess. Regardless of the reason, the literature on biopolitics remains largely situated in and on the West, and there is scant work focusing explicitly on Soviet biopolitics, aside from almost throwaway mentions that "subsume [the philosophies of the Soviet Union] along with Nazism under the vague rubric of totalitarianism or dismiss it as a modern version of traditional Russian despotism that is of little philosophical interest" (Prozorov 2013: 208). Of the two monographs on the subject, Prozorov investigates Stalinism as a biopolitical project of enacting the ideology of Marxism-Leninism while Collier looks at Soviet city-building, or the development of Soviet urban infrastructure as a material and political technology, and total planning as biopolitical techniques for assembling the social. As both books take different approaches to understanding the biopolitics of the Soviet Union, I will explore both more in-depth below. Furthermore, I discuss an article by Makarychev and Medvedev (2015) on a recent biopolitical turn in Russia from Putin's third presidential turn in the context of Prozorov and Collier to mark some of the continuities and ruptures of Russian biopolitics from the Soviet era to today in order to contrast some Ukrainian examples. Finally, in this section I will address a common element in Prozorov's and Collier's analyses—what I will

call a *social technocracy*—by way of an overview of the development of Soviet science, and how it directly relates to the creation of the Department of Social Expertise.

Prozorov: Stalin's biopolitics

Sergei Prozorov's central thesis that an analysis of the biopolitics of Stalinism is an inquiry into the biopoliticization of ideology. What he endeavors to accomplish is not an "application of a ready-made theory of biopolitics (of Foucault, Agamben, or Negri) to the empirical reality of Stalinism, nor the empirical study of predefined biopolitical techniques in the Soviet context but rather the reconstitution of the Stalinist problematization of life as an object of power" (Prozorov 2013: 210). This is a broad reading of biopolitics, using it as a framework or orientation from which to analyze Stalinism, to approach Stalinism in biopolitical terms—apropos, Prozorov argues, because of the "centrality of life to its governmental rationality as a whole" (2016: 4). His central thesis is that Stalinism represented a positive and productive biopolitics, one intended to *transform* life, rather than to *protect* it.

> Rather than separate biopolitics from ideology, my approach poses the question of *how ideology itself becomes biopolitical*, that is how its ideas are to be translated into life in governmental practices. This understanding of biopolitics will permit us to isolate the specificity of Stalinism in comparison with the better-known cases of liberalism and Nazism. (2016: x)

Stalinism was a concerted attempt to create and administer a socialist reality. The ideological politics at work under Stalinism on their own were insufficient to accomplish this central task, but by wedding that ideology to the processes of life, the ensuing biopolitics could achieve the desired results. In contrast to the work done by the 1917 Revolution and the Bolshevik Party

under Lenin's leadership, which cemented the Party's roles in the Soviet Union, Prozorov argued that Stalin's intervention was to reformulate Marxism-Leninism into a biopolitical regime, a governance over Soviet life and lives that would transform its population(s)—through policies, propaganda, hygiene initiatives, Lysenkoism, education, sport, and violence—into the New Soviet Person. That Stalinism deployed such a stated messianic, *positive* biopolitics, creating a new kind of life, but did so with "unprecedented *negativity* of terror against the very persons that were to be transformed" (2016: 38) constitutes a rich case study for understanding the conversion of biopolitics into thanatopolitics as it operates at the extremes of both modes of governance. "It is precisely this extremity, whereby the *paradox* that arguably characterizes *all* biopolitics collapses into a *paroxysm*, that makes the case of Stalinism indispensable for understanding the potentiality for violence immanent to biopolitics as well as the limits that restrain this potentiality within various modes of biopolitical government" (40).

Though he disagrees with the nihilism of Agamben's formulation of biopolitics, Prozorov nevertheless seems to agree with his logic that any biopolitics will slide into thanatopolitics, regardless of whether the starting point is positive, an attempt at the production of some new kind of life, or negative, an attempt at the control and regulation of life. In his investigation, Prozorov finds no room for Esposito's immunitary framing of biopolitics as Stalinism's extreme violence was not an excess of protection but rather processes of creation by destruction, "a negation of those forms of life that have been ideologically judged as obsolete and dying" (255). The extreme violence of Stalinism characterizes his discussion of affirmative biopolitics as well: dismantling "the nexus between ideology and life in favour of pure ideology or pure administration of life"—no matter if that ideology is socialism, fascism, or liberalism—will not produce an affirmative biopolitics and over time will return to a thanatopolitical declension

(260). Instead, Prozorov advocated an affirmative biopolitics where "politics is no longer viewed as the activity of the governmental construction of forms of life" (264), arriving at an assertion that "affirmative biopolitics does not and cannot construct anything; no socialism, communism or any other -ism is 'built' in it, since it is entirely contained in the movement of the diffusion of its ideas that is made possible by these ideas first moving, gripping or fascinating the lives of those upholding them" (287). He continues, stating that "Any attempt to construct a real form of life out of socialism *or any other idea* always risks collapsing into disaster that can endanger and ultimately destroy both the idea and the lives into which it is to be forced. And yet, in the absence of some kind of actualization, this idea is bound to remain a mere utopian abstraction that can do little more than entertain or sedate" (294). So, if an affirmative biopolitics cannot be based on an idea (political philosophy, identity, etc.) because it will collapse in on itself, and if it cannot be concerned solely with the management of bare life because that is already within the realm of thanatopolitics, the only truly positive form an affirmative biopolitics can take is one that eschews the politicization of life altogether.

Prozorov's take on affirmative biopolitics emerges from an attempt to discover whether it is possible to wrangle a radical biopolitics that does not devolve into thanatopolitics from the socialist ideology of Marxism-Leninism, or indeed from any ideology at all. In the course of laying out his argument that such a task is impossible however, he also remarks that the waves of de-Stalinization that have swept through Russia, and I would add in many other places in the former Soviet Union, *and* in the rehabilitations of Stalin under Putin, the focus has been on the ideology of Stalinism, "leaving precisely the biopolitical aspects of Stalinism immune to criticism, while endlessly and pointlessly bashing the egalitarian promises that it hypocritically displayed on its banners" (256). Such an analysis produces an effect where the window dressings

and paint color may change, but the structure of the house, in this case the biopolitical regime, remains. Processes of decommunization in Ukraine since its independence have followed a similar pattern—street and city names change, statues are removed, identities shift and evolve, new meanings are created—yet processes, institutions, and infrastructures of the old systems persist.

Collier: biopolitical infrastructure

In *Post-Soviet Social: Neoliberalism, Social Modernity, Biopolitics* (2011), Stephen Collier takes a more traditional approach to Soviet biopolitics than Prozorov. Collier's read of the biopolitics of the Soviet Union is closer to a Foucauldian analysis, emphasizing the enduring physical, or sociomaterial, effects of the Soviet Union's "project to constitute its population's health, welfare, and conditions of daily existence as objects of knowledge and targets of governmental intervention" (2) via an investigation of its infrastructure, namely its efforts in city-building. Beginning with the processes of Soviet city-building allows Collier to expand upon Foucault thesis of *biopolitics as neoliberalism*, mentioned above, which Collier defines as "a form of critical reflection on governmental practice distinguished by an attempt to reanimate the principles of classical liberalism in light of new circumstances" (2). In line with Prozorov, however, Collier recognizes that an investigation of Soviet biopolitics must be done on its own terms, stating, "I understand Soviet government as a distinctive formation of biopolitics, the result of a specific and original response to the most basic problems of modern government: How should the state govern living beings? How should it manage adjustments between population, production, and social welfare provisioning?" (19).

As I discuss more in depth in the following chapter on the development of the city of Slavutych, Soviet city-building was far more involved than the typical work of urban planning,

working from a desire for the creation of a new socialist society, a totalizing approach to constructing collective life. At the core of the blueprints for these new socialist cities was a settlement plan (*расселение*) "that projected the correlative development of the local population and industrial production. On this basis, city-building plans proceeded to lay out a new substantive economy or, to borrow another key term from the vocabulary of Soviet urban modernity, a new city *khoziaistvo* [*хозяйство*]—apartment blocks, schools, and clinics; doctors, teachers, and communal service workers; parks, clubs, and other recreational facilities; pipes, wires, roads, heating systems, electric substations, and other elements of urban infrastructure" (5). City-building was intrinsically tied to other processes of early Soviet modernization, such as collectivization and industrialization, and established a system whereby each new city became a functioning part in the machine of the modern Soviet state and its command economy. This analytical orientation to the formation and functions of Soviet biopolitics grounds Collier's work in the material, highlighting the ways in which biopolitical connective tissues—here, the purposeful infrastructure of and among cities—remain across the periods of rule of governments. Collier explores how Soviet city-building emerged from lively debates in the first decade following the establishment of the USSR that incorporated dealing with inherited cities and industries, critiquing European and American urbanization processes, advancing and realizing socialist ideals, facilitating the industrial economy, and meeting the daily needs of populations in those cities.

Understanding the term *khoziaistvo* is important not just in the narrative that Collier lays out, but also in understanding his larger biopolitical argument in how the Soviet state governed its population. Rogers (2006: 291) provides a simple though incomplete definition of *khoziaistvo* as "economic organization," which he suggests that Soviet officials preferred to the direct

transl(iter)ation of “economy” to circumvent its bourgeois connotations. A more complete definition of the term resides in an etymological deconstruction of “economy” to its Greek roots—*nemeïn*, meaning management, and *oikos*, meaning household—and the relation to the Russian root word *khoz*, which “originally referred to the household, and is closely linked to problems of management” in the most common words in which that root appears (Collier 2011: 81). Collier contrasts this concept of a “substantive” economy, concerned with the managing of the resources and needs of a community, to the idea of a “formal” or market economy, implying our contemporary understanding of the economic. In the Soviet Union, the term *khoziaistvo* took on additional nuance and meaning beyond a reference to “virtually any nexus of production and need fulfillment” (81) as officials captured more spheres of life processes in their mandates of governance. Once such capturing came early in the development of Soviet city-building, as one central figure in this process, Nikolai Milyutin, claimed in 1931 that the primary unit of *khoziaistvo* would be the city rather than the family, making the management and administration of daily needs a function of governance. Housing, food, work, leisure, entertainment: the city, as one part of the greater governmental whole, would take care of everything for its population. This biopolitical turn at the urban scale was a micro version of similar processes occurring at the republic and all-union scale, a collectivization of management over functionally all life processes. One pointed example of this transfer of *khoziaistvo* is the heating of housing: Collier recounts how in these hundreds of small, new cities built around specific enterprises, the entire city’s heating system was centralized at the city level, with the boilers usually under the control of the local enterprise directors and no way for individual housing units to adjust the heat. This had the effect of reducing all users of these cities’ boilers to one unit, whose allotment of coal or gas for heating was distributed according to republic and union norms (100-102).

This example of heat also furthers Collier's argument about how biopolitics are embedded in the infrastructure that endures past the end of a government. The boilers, pipes, wires, and radiators remained after the collapse of the Soviet Union, the effects of city-building *khoziaistvo* imposing constraints on the neoliberalization of the post-Soviet Russian economy. As Collier explains,

> Soviet planners recognized heat as an "elementary need"; through pipes, boilers, transfers, and radiators the norms of social modernity were hard-wired into the very material structure and spatial layout of Soviet cities. After the collapse of socialism, the material infrastructure was still there; and "as such," as the same report observed, heat remained an elementary need. Indeed—Russia, as such, is still pretty cold. But the systems of regulation in which heat systems were embedded have been thrust into crisis. As local governments faced mounting deficits, household incomes fell, and the national gas company enjoyed expanded opportunities to sell its gas to users with more money, shortages became chronic and breakdowns more frequent. But during the Soviet period the provision of heat to the Russian population had been established as a basic responsibility of the state. It is no surprise that as the character of that responsibility was called into question, heat became the topic of contentious debate and urgent political concern. By the early 2000s, as Oleg Kharkhordin (2010) observes, it was widely recognized that Russia faced an "infrastructure crisis" that was simultaneously financial, technical, political, and social. Heat was at its center. (203)

The management of heat is but one example of the physical or sociomaterial of a biopolitical regime. As this example shows, a biopolitical regime not only shapes behavior and relations, but also embeds itself into the landscapes and structures of a place. "[T]he creation and extension of

infrastructure is intimately bound to modernization. And a modern society, from one perspective, is precisely a form of collective life that is articulated by infrastructures. We should add that the construction of infrastructures is central to the history of modern biopolitics: they have been key mechanisms through which the health, welfare, and conditions of existence of populations have been constituted as objects of governmental management" (205). As I will further explore below in a short discussion of the development of Soviet science and academics, the long tails of biopolitical structures continue to order the types and limits of governance techniques over populations. This helps explain how the work of the DSE, founded after Ukrainian independence in 1991, was still immersed in the structures of Soviet knowledge production.

Social technocracy and the Academy of Science

A significant common element to both Collier's and Prozorov's analyses is the elevated role of science, technology, and scientific community in the Soviet Union. From its inception, the bonds between the Party and the technical intelligentsia were tightly woven, and the concept of something like a social technocracy emerged in the early years of the USSR, though its form would morph and its influence fluctuate over the seven decades of the Union's existence. Loren Graham, the pre-eminent historian of Russian and Soviet science, draws a through-line of the oscillating relationship between the state and science in terms of inheritances versus innovations and embrace versus rejection, a framework which is useful to placing Collier's and Prozorov's accounts of Soviet biopolitics in the broader context of the structural and relational development of Soviet science, technology, and society. To paraphrase Graham's (1993) overview of this relationship, during the war and the period of the New Economic Policy (NEP), Lenin "insisted on a policy of watchful reliance on and cooperation with" (159) the new Soviet state's inherited scientists, engineers, and specialists, which, to use one example, resulted in the development of

city-building and the total planning of a socialist society that Collier describes. The ascent of Stalinism brought with it a pointed distrust of the technical intelligentsia, many of whom were deemed insufficiently ideological and represented a threat to Stalin's consolidation of authority, culminating in the arrest of the majority of the USSR's engineers in the 1930s (161-3). The 1930s also saw the explosive growth of the education system, especially in the technical sector, training a new generation of engineers and scientists from the working and peasant classes, cementing their loyalty to the Soviet system; "By the post-World War II period they occupied leading positions throughout the Soviet economy. Thus, by the 1950s the question of the role of engineers in the Soviet Union had been transformed. Industrial managers with engineering backgrounds were often the most stalwart supporters of the Communist Party's policies… The engineers would support the Party's policies and the Party would promote the engineers in industry, agriculture, and the military forces" (164). The scientific and technological successes in the development of nuclear weapons and energy and the space race elevated the role and prestige of the technical intelligentsia in Soviet society—Graham states that between 1956 and 1986, the percentage of Politburo members with technical educations increased from 59% to 89%; the percentage of the Politburo who had worked in their technical fields for at least seven years similarly increased over this period from 24% to 53% (165). The development of Soviet technocracy in political economy and society can therefore be read as an outgrowth of the Stalinist biopolitical regime: in pursuit of a socialist society, both a culling of the old (those individuals, institutions, or ideas incompatible with or potentially wreckers of the new society) and a construction of the new (those individuals and institutions that respectively embody and provide the structures for the reproduction of lived socialism) must be accomplished. Not only was there a technocratic fix offered for virtually every problem the Soviet Union faced, the

structures of Soviet life were configured to produce specific, Soviet, ways of living: in behavior, in thought, in social relations.

The development of this social technocracy, and indeed ideas about the role of science and technology in the state and society generally, was also rooted in a kind of proto-STS developed in the 1920-1930s by major Soviet science figures like Vernadskii, Borichevskii, Bukharin, and Hessen within the context of *naukovedenie* (*науковедение*), or the social study of science. Nikolai Bukharin, who became the first director of the Institute for the History of Science and Technology in 1932, was a staunch critic of bourgeois and liberal science, "maintaining that all science is heavily mediated by social, economic, and political factors, and therefore cannot be separated from the society from which it emerges" (Graham 1993: 140). Though Bukharin was executed in 1937, the constructivist approach to science Bukharin championed remained influential in both the positive biopolitics of Stalinism and Soviet academic and research structures: if the production of scientific knowledge is mediated by its social context, then a context can be constructed in order to produce the kinds of scientific knowledge that a regime would find useful. This orientation to the doing of science—*naukovedenie*—co-constructed the Soviet biopolitical regime in a number of ways: undertaking a sociology of science produced data that informed the policies and practices of total planning, reinforced the technocratic idea that data and scientific expertise could solve social problems, and developed a self-reinforcing structure that fostered the production of the kinds of scientific knowledge that would be useful (economically, ideologically, politically, socially) to the system.

This structure took form as a network of eventually thousands of scientific research institutes (*научно-исследовательский институт*), the highest tier of which was centralized and formalized in the Academy of Sciences of the USSR and its branches in the various

republics. Similar to how Soviet city-building tied urban life to local industrial production, the majority of these research institutes were tied to industries, and were even administered by regional, republic, and all-union industrial ministries. The institutes of the Academy of Sciences, in contrast, were largely in the basic sciences. The Academy system grew in parallel to the Soviet education system, resulting in a soft separation between research and pedagogy as each system, though related, served different purposes. Perhaps the most major of the factors that went into the particulars of the research institute and Academy systems was timing. While the Academy of Sciences itself was a tsarist inheritance, akin to the post-Enlightenment academies of other European empires that eventually devolved into honor societies, by the 1930s it had transformed into the premier Soviet organization for scientific research. Still in the early years of the USSR, the conducting of research was (at least nominally) organized along the same socialist principles as the rest of Soviet society designed to transform life: the collectivization of scientists from working alone into collectives, the centralization of major research efforts in the capitals, the administration by Party organs. The purges of perceived bourgeois wreckers and the elevation of party loyalists in the late 1930s, followed by two more decades of Stalinism and continued oversight by the State Planning Commission (GOSPLAN) until 1991, helped cement the structures of these systems of scientific knowledge production that would largely remain standing through the collapse of the Soviet Union and even into the post-Soviet present.

The Academy of Sciences of the USSR became the Russian Academy of Sciences by Boris Yeltsin's November 21, 1991 presidential decree (No. 228), presaging the official dissolution of the Soviet Union by 34 days. The high level of centralization in the Academy's structure meant that its reorganization into the Russian Academy was procedurally simple: the state transferred ownership of property to the newly created national academy, of which all

members of the Soviet Academy—whether or not they lived in the Russian Federation at the time—automatically became members; the process repeated in the national republics. This form of transition preserved both the structure and purpose of the Academies of Science into the post-Soviet period, even as the contexts in which they were embedded began to rapidly change. In Ukraine, the new political, social, and economic realities of independence would certainly impact the work of the National Academy of Sciences of Ukraine, including the creation of new departments, international and other partnerships, ideological orientations, and budgetary constraints, the overarching structure remains largely as it was when it was named the Academy of Sciences of the Ukrainian SSR. For example, the relations among the General Assembly, the Presidium, and the three major sections of the Academy (physical, technical, and mathematical sciences; chemical and biological sciences; and social sciences and humanities) have remained the same since academician Borys Paton, president of the Ukrainian Academy from 1962 to 2020, penned an entry on the topic in the second edition of the *Ukrainian Soviet Encyclopedia* (1977: 105-108).

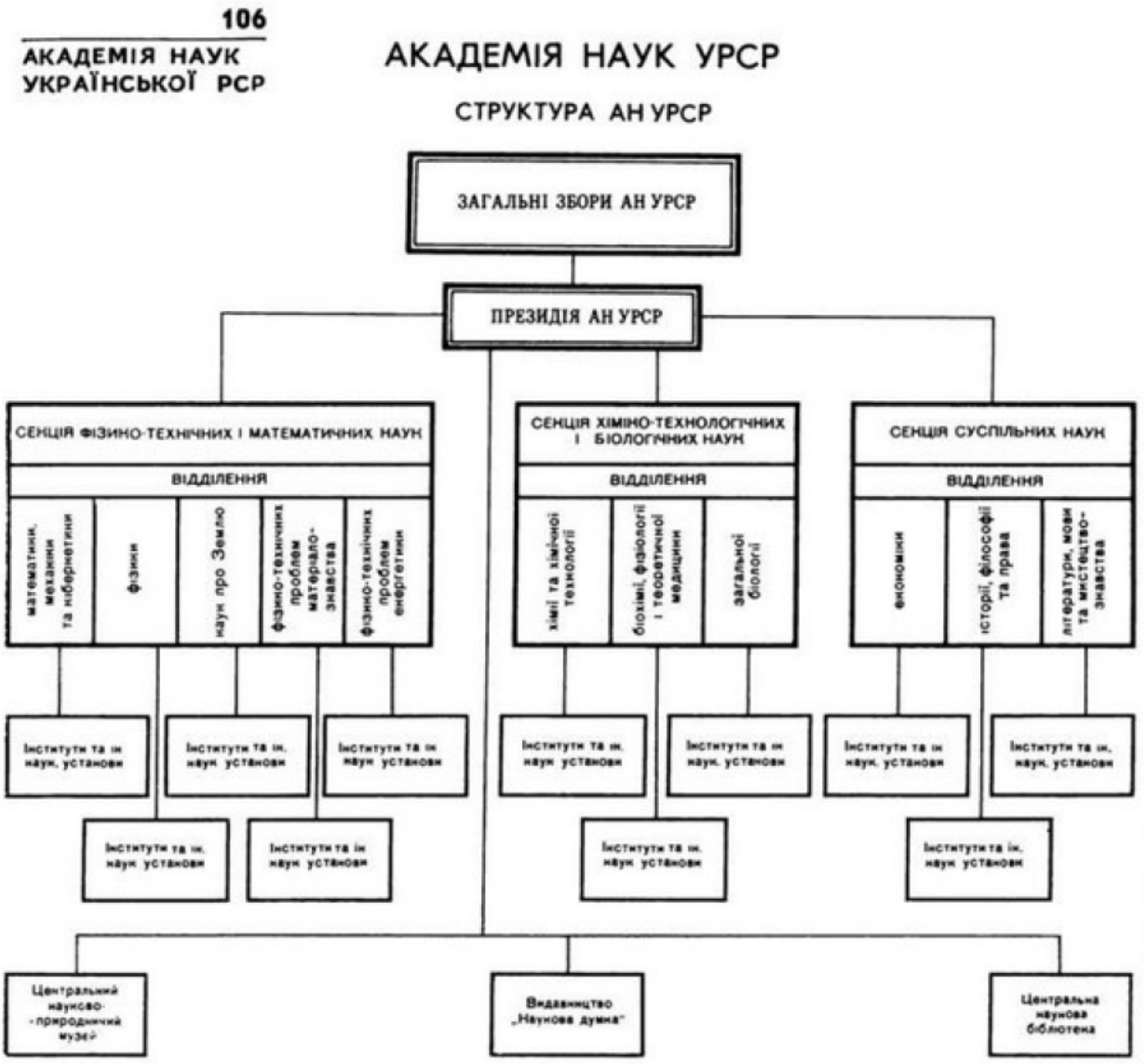

Figure 2. “Structure of the Academy of Sciences of the Ukrainian Soviet Socialist Republic” (Paton 1997: 106).

Examining the Department of Social Expertise functions as an exercise in evaluating the relationship between the state and science in the years immediately following Ukrainian independence. The structure of the Academy of Science tied research efforts directly to the

requirements of the government, in terms of funding allotments, feedback mechanisms, norms and expectations, and (geo)political expediencies. Investigating the DSE's research into those affected by the Chornobyl disaster highlights most clearly the links between the production of scientific knowledge within this sociopolitical context and the evolving post-Soviet biopolitical regime in Ukraine. Unpacking this nexus of governance, responsibility, and identity in the shadow of the largest technogenic disaster in the world leads to questions of affirmative biopolitics: what kinds of life are possible in such a space? This case is a way to explore the (fractured, variable, manifold) development of the biopolitical regime in Ukraine.

The Department of Social Expertise

The Department of Social Expertise (DSE; Ukrainian: *Відділ соціальної експертизи*) is one of eight departments of the Institute of Sociology of the National Academy of Sciences of Ukraine. It was created three months after Ukrainian independence in November 1991 as the Department of Methods of Social Programs and Projects [Ukrainian: *Відділ методики соціальних програм і проектів*] and gained its current name in June 1996. For most of its history, the department was led by Dr. Yurii Sayenko until his death in 2017, when a senior researcher in the department, Dr. Gulbarshyn Chepurko (née Mimandusova), officially assumed leadership responsibilities. In addition to Chepurko, there are nine other faculty members of the department.

For the first half of the department's existence, until roughly 2007, one of the main remits of the research done in the DSE was concerned with its program of "social monitoring" of people affected by the 1986 Chornobyl disaster. While social monitoring remains a major function and methodology of the department, the past decade has seen a diversification of the faculty's research efforts (see table 1 below; translations are my own from the DSE website) and an

expansion in departmental publications on HIV/AIDS research and the impacts of market liberalization in Ukraine.

Основні наукові напрямки діяльності відділу	**The main scientific directions of department activity**
розробка концепції системи соціальних показників	development of a system of social indicators
розробка концепції колегії незалежних експертів як інституту громадянського суспільства	development of the concept of a College of Independent Experts as an institution of civil society
концептуальні підходи до розробки програм соціальної політики в Україні	conceptual approaches to the development of a program of social policies in Ukraine
соціальні наслідки Чорнобильської аварії	social consequences of the Chornobyl accident
проблеми функціонування державної служби	problems of the functioning of the civil service
проблеми аграрної реформи в Україні	problems of agrarian reform in Ukraine
регулятивні функції соціального капіталу в перехідних процесах України	regulatory functions of social capital in transitional processes of Ukraine
соціальні проблеми цивілізаційного вибору українського суспільства	social problems of a civilizational choice of Ukrainian society
модернізація сучасного українського суспільства	modernization of contemporary Ukrainian society

Table 1. DSE's research focus areas. https://i-soc.com.ua/ua/institute/dep/expert

The work of the DSE faculty is largely structured around their definition of social/society. In particular is the distinction between the two words in Ukrainian that mean society, *sotsium* [*соціум*] and *suspilstvo* [*суспільство*]. On this topic, Chepurko has stated that while authors often equate the two words, using them interchangeably, *соціум* is more used to describe society as a formation that determines the subjectivity of individuals in social structures, including the construction of communities and networks of cooperation, whereas *суспільство*

emphasizes the systems of social organization, including "objective social laws" (personal correspondence). The program of social monitoring developed at the DSE is intended to navigate the distinctions between these two terms by taking seriously the agency of its research subjects and their interactions with social systems. Put otherwise, social monitoring is a method of analyzing biopolitical relations, regulations, and resistances.

Between 1995 and 2011, the DSE published a number of edited volumes of research related to its social monitoring program, including thirteen volumes of *Чорнобиль і соціум* (1995-2007) [*Chornobyl and society*; *ChiS* hereafter], and four other books: *Соціальні наслідки чорнобильської катастрофи* (1996) [*Social consequences of the Chornobyl disaster*], *Соціально-економічні наслідки техногенних та природних катастроф: експертне оцінювання* (2000) [*Socioeconomic consequences of technogenic and natural disasters: expert evaluation*], *Постчорнобильський соціум: 15 років по аварії* (2000) [Postchornobyl society: 15 years after the accident], and *Соціальні наслідки Чорнобиля: Час відродження* (2011) [*Social consequences of Chornobyl: A time for rebirth*]. I selected these 17 volumes in consultation with Gulbarshin Chepurko, the current head of the DSE, who also gave me copies of these volumes from the DSE's inventory. That interaction is perhaps indicative of the DSE's current stance on their social monitoring work on Chornobyl: as Chepurko explained to me, they are proud of the work they have done, but after governmental priorities shifted away from the Chornobyl disaster and those suffering from its effects, there has been neither the will nor the funding to continue that work.

The DSE's work on Chornobyl is now mostly in its past; of the ten current members of the DSE, three joined after the end of the *ChiS* project altogether. This shift in focus to other research areas is a logical result of the structure and function of the National Academy of

Sciences rather than, for example, a lack of will to continue social monitoring activities of Chornobyl sufferers. At the beginning of the *ChiS* project in 1992, the DSE received funding from the Міністерство України у справах захисту населення від наслідків аварії на Чорнобильській АЕС [Ministry of Ukraine of the Protection of the Population from the Consequences of the Accident at the Chornobyl NPP, hereafter the Chornobyl Ministry].[7] By as early as 1995 however, in the introduction to *ChiS* 2 Sayenko and Pryvalov were already lamenting a shortfall of funds, stating that "it has been two and a half years since the sociological survey of 1992. Much has changed over these years. It is only thanks to the Chornobyl Ministry of Ukraine ([Vladislav Fedorovich] Torbin) that it was possible to conduct even a short sociological study—science funding is far too reduced" (1995: 4). They had to settle for a sample size of 1200 respondents residing within the Zhytomyr oblast instead of the large-scale survey they initially planned. Similar statements appear in a number of the *ChiS* volumes, including in number 5 (1999: 7), where the editor bluntly states:

> The sample should be even larger [than 1200]. But insufficient funding did not allow the Institute of Sociology to research two more groups: those resettled in Kyiv (150 respondents), and liquidators living in Kyiv (150 respondents). As soon as the financial resources arrive, the work will be completed. A group of liquidators (300-400 respondents), which was to be interviewed by a creative team of sociologists at the Kyiv Shevchenko National University on a single survey that would ensure the comparison of

[7] This ministry was renamed the Міністерство України з питань надзвичайних ситуацій і в справах захисту населення від наслідків Чорнобильської катастрофи [Ministry of Ukraine on the Question of Emergency Situations and in Matters of the Protection of the Population from the Consequences of the Chornobyl Disaster] in 1996, following a Verkhovna Rada decision to establish a ministry for civil defense. The Chornobyl Ministry was expanded in scope and reformed in 2010 as the Міністерство надзвичайних ситуацій України [Ministry of Emergency Situations, MNS]. In 2012, as part of Yanukovich's reorganization of Ukraine's government, the MNS was dissolved and the Державна служба України з надзвичайних ситуацій [State Emergency Service] was established in its place, moving the Service under the authority of the Ukrainian Ministry of Internal Affairs.

all groups of sufferers, remains unexplored. The Ministry of Emergency Situations of Ukraine has financed this work at the university directly in a sufficient amount for the sociological study of the specified sample.

These examples highlight the reliance on personal connections within broader networks of collaboration and the politics of post-Soviet knowledge production; even after three decades, despite incremental reforms, academics in the highest bodies of scientific research can only investigate those topics of which the government approves, from the micro level – individual ministerial backing, such as with Torbin – to the macro – for example administrative, bureaucratic funding cuts to entire Institutes of the NASU.

The overwhelming majority of chapters in the *ChiS* series are analyses based on data collected via social monitoring. As mentioned above, the methodology of social monitoring employed by the DSE is designed to produce data on how a population—in this case, Chornobyl sufferers—sees itself in relation to other social processes. This was largely achieved with the use of self-evaluations: the DSE provided assessment forms on an annual basis to their respondents that asked questions about their socio-psychological and physiological state (how are they feeling), way of life (how are they living), cultural and economic situation (how are they participating in society), and about the quality and conditions of their lived environments. In volume 3 of *ChiS* (1997), Sayenko explained the purpose of social monitoring: "The tasks and functions of monitoring are not only the recording of facts and accumulating a data bank, a knowledge bank, but also the analysis of a situation, predicting the consequences of accepted and developed decisions, as well as suggestions for correcting and preventing adverse consequences" (6). This research design was first to understand the dynamics of change in the socio-psychological and socio-cultural "orientations" and behaviors of sufferers, and second, when

combined with demographic and economic data from other sources and studies, to inform policy decisions regarding the management of a post-Chornobyl society.

Methodology

My dataset for this chapter includes the thirteen volumes of *ChiS* as well as four other volumes mentioned above on the social effects of the Chornobyl disaster edited by the Institute of Sociology of the National Academy of Sciences of Ukraine and featuring authors from the DSE. This set is comprised of 271 chapters written by a total of 133 authors, published between 1995 and 2011 by the Institute of Sociology. While not all 133 of these authors are members of the DSE, all but one of these volumes (*ChiS* 12) features an opening chapter written by Sayenko, the longtime head of the DSE.

The approach I have employed to explore the trends in these 271 chapters, a kind of basic content analysis, focuses primarily on the manifest data of the chapter titles, from which I inductively developed a list of codes. I selected this method for two major reasons. The first is that the inherited Soviet academic tradition of providing rather descriptive titles to scientific articles made it clear in most cases what the chapters were about. In those cases where meaning was not immediately evident, was nebulous, or involved language more flowery than descriptive, I read the chapters in order to code them. In all cases, I verified that the chapter title matched the chapter text in terms of its subject matter in order to ensure that my codes were replicable. The second reason is that this large data set, comprised of thousands of pages of Ukrainian and Russian text, was available only in physical media, as bound books. The inability of OCR technology to accurately produce searchable Cyrillic text in conjunction with the amount of time required to scan and process approximately 4,500 pages limited the scope of the methodology.

Krippendorff (2013: 24) defines content analysis as "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use." There are a number of different approaches to doing content analysis that each have varying emphases on latent and manifest content, deductive and inductive coding methods, and qualitative and quantitative analyses. Manifest content is what is readily present in a text, such as the specific words and their arrangement on the page; latent content is what a text implies or its implicit meanings. Drisko and Maschi (2015) identify three types of approaches to content analysis, while noting that there are "no simple dividing line[s]" (58) among these fuzzy categories. *Basic content analysis* generally is focused on manifest content, uses deductive methods such as prescribed code lists, and is more quantitative in nature, which more easily "allows data collection and data reduction using computer software algorithms" (21-22). *Interpretive content analysis* generally is designed to infer meaning from latent content, including incorporating "both the antecedents and the consequences of communication, allowing exploration of both the causes and effects of communication along with its explicit content" (58), and is especially useful when access to the original sources or subjects is limited or impossible. *Qualitative content analysis* is more nebulously defined, identifying "a set of techniques for the systematic analysis of texts of many kinds, addressing not only manifest content but also the themes and core ideas found in texts as primary content" that eschews quantitative and statistical methods and is closely related to discourse analysis, critical theory, and thematic analysis (82-83). I describe my approach to these texts in this chapter as a basic content analysis based on my choice to focus on the manifest content of the chapter titles (and to a lesser extent, the chapter text), and to track the changes in themes over time, as well as the connections among the authors. In other words, I developed this approach in order to trace the processes of scientific knowledge

production in relation to the institutional, social, and political structures those processes co-produce.

Analyzing the DSE's work

These 17 volumes are comprised of 271 unique chapters, written by 138 individual authors. I coded each of the chapters into ten categories based on their content. These ten categories and codes emerged from the data set:

- the physical and material health of sufferers (PHYS);
- the social and psychological health of sufferers (PSYC);
- gender and family issues of sufferers, including children's issues (FAMS);
- social assistance and social protections for sufferers (PROT);
- comparative analysis of sufferer and other populations (comp);
- mass media, culture, and mass consciousness of sufferers (MASS);
- agricultural, industrial, and economic effects of the disaster (ECON);
- social monitoring and other methods of social expertise (EXPT);
- handling risk and extreme situations (RISK); and
- social models and modeling (MODL).

My code list is shorter than and different from the list of fourteen categories of social monitoring analysis that Sayenko and Durdynets outline in *Postchornobyl Society* (2000: 10-20):

- perception of consequences [*сприйняття наслідків*],
- the problem of resettlement [*проблема переселення*],
- revival of production [*відродження виробництва*],
- social assistance [*соціальна допомога*],
- family and children [*сім'я та діти*],
- families with children [*сім'ї з дітьми*],
- treatment and healing of children [*лікування та оздоровлення дітей*],

- ecological awareness [*екологічна свідомість*],
- sources of ecological information [*джерела екологічної інформації*],
- unemployment [*безробіття*],
- stance toward religion [*ставлення до релігії*],
- social expertise [*соціальна експертиза*],
- risk [*ризики*], and
- the social wellbeing of sufferers [*соціальне самопочуття потерпілих*].

The major differences between my code list and this stated list of categories from the researchers themselves largely stem from the differences in working inductively versus deductively and doing a meta-analysis versus executing a research project from design to analysis. On the one hand, my codes are drawn from the reports, insights, and analyses of survey data, and the contexts of that survey data; on the other hand, these categories of social monitoring analysis also function as directives to the creation of the surveys themselves.

Of the 271 chapters in the data set, 150 of them (55%) are single-coded, meaning that the content of each of those chapters was sufficiently scoped to one code. For example, one of the single-coded chapters in *Postchornobyl Society*, "Формування моделей адаптації різних соціальних груп" ["Formation of models of adaptation of different social groups"] by N. Khodorivska (2000: 139-160), was explicitly about the creation of social models. As a counterexample, I coded the article "Соціальні ризики аграрної реформи на селі: сільська молодь та реформи" ["Social risks of agrarian reform in the village: rural youth and reforms"] by V. Chyhryn in *ChiS 10* (2004: 122-134) with three codes: ECON for the discussion of the impact of postchornobyl regulation of agricultural production, RISK as the central problematic, and FAMS because the chapter was focused on rural youth. The table below summarizes the code counts of the chapters under consideration.

Category	Code	Count	Single Coded
social and psychological health	PSYC	109	45
social assistance and social protections	PROT	46	27
agricultural, industrial, and economic effects of the disaster	ECON	44	18
physical and material health	PHYS	43	8
handling risk and extreme situations	RISK	38	8
gender, family, and children's issues	FAMS	33	7
mass media, culture, and mass consciousness	MASS	33	18
methods of social expertise	EXPT	26	15
comparative analysis	COMP	15	2
social models and modeling	MODL	14	2

Table 2: Code counts.

Over 40% of the articles in these volumes are concerned with the social and psychological health of the sufferers, though given the remit of the DSE this is unsurprising. In the text itself, the authors often do not differentiate social and psychological health; in fact, the compound term *соціально-психойогічний* [social-psychological] is used in the titles of these articles frequently, including the title of the first article in the first issue of *Chornobyl i sotsium* (1995) by Yurii Sayenko, the former DSE director: "Соціально-психойогічний слід Чорнобиля" ["The social-psychological effect of Chornobyl"]. That themes of social psychology feature prominently in the work of a department concerned with the social monitoring of a class of people is not accidental, but is likely rooted in the structures (both physical and metaphorical) of scientific knowledge production that contextualize the DSE. As discussed above, the DSE is a department of the Institute of Sociology [Інститут соціології], which is part of the Department of History, Philosophy, and Law [Відділення історії, філософії

та права], which falls under the Section of Social Sciences and Humanities [Секція суспільних і гуманітарних наук] of the National Academy of Sciences. There is no organized body of academic psychologists within the National Academy of Sciences[8] outside of the Department of Social Psychology [Відділ соціальної психології], which like the DSE is a department within the Institute of Sociology and is located on the same floor as the DSE. This close working relationship is reflected in the authorship of the chapters in this data set, where half of the current faculty of the Department of Social Psychology (M. Shulga, I. Martynyuk, L. Bevzenko, N. Sobolyeva, and N Boyko) appear on the list of authors. Even at an editorial level, across all these volumes, only two editors are Doctors of Psychology [доктор психологічних наук], Serhii Maksymenko and Oleksandr Kyrychuk.

This inherently social understanding of the psychological in the DSE's research reflects not only the institutional structure of Ukrainian academics, but also the legislative treatment of Chornobyl sufferers. As I discuss below, the Soviet government classified those directly affected by the disaster into four categories; the treatment of categories of sufferers as classes extends directly to those individuals and institutions gathering data on and producing knowledge about sufferers. At no point in these volumes are there personal stories or interviews; ethnography was never the point. Instead, the program of social monitoring was intended to understand the effect of the disaster on *populations*, with the expectation that this research would inform the role and responsibility of the state to those in the sufferer population.

[8] The National Academy of Educational Sciences of Ukraine [Національна академія педагогічних наук України] houses the Department of Psychology, Age Physiology, and Defectology; the H.S. Kostyuk Institute of Psychology; and the Institute of Social and Political Psychology. The NAES was established in 1992 and is significantly smaller than the National Academy of Sciences. The Kostyuk Institute was established in 1945 but was organized under the Ministry of Education until the creation of the NAES.

The crux of the technocratic mode of (post-)Soviet governance is the space where treating classes or populations as the base unit of study and measurement and the calculation of state responsibility to those populations meet. The authors of these DSE volumes present their analyses of sufferer populations to an audience that understands that crux. Each of these volumes contains in the front matter a short statement that explicitly identifies its audience and purpose. Though the exact wording varied slightly in the first two issues, the version of this statement in *ChiS* 3-13 reads,

> Для фахівців, управлінців, широкого кола читачів, що цікавляться соціальними проблемами потерпілого населення та вирішення управлінських проблем його соціального захисту.
>
> For experts, administrators, and the wide circle of readers who are interested in the social problems of the sufferer population and the solution of administrative problems of their social protection.

As I mentioned above, the purpose of social monitoring at the DSE was not just to keep tabs on the social wellbeing of Chornobyl sufferers, but also to establish and then execute a method of scientific knowledge production that could provide trustworthy and expert information—if not outright recommendations—to policymakers.

Certainly, some of the chapters in these volumes have been written to be inward-facing, refining and developing the models of social monitoring at the DSE and other institutions, a feedback mechanism that also works as a justification for the claims of scientific accuracy and verifiability present in the analyses. Notably, these chapters that work to "perfect the machine" of social monitoring (coded as EXPT and/or MODL depending on the exact nature of each

chapter) appear most frequently in the period of 1998-2000 (see Table 2); that is to say, after the initial collection and representation of social monitoring data but before the closing of the final active reactor at the Chornobyl NPP.

Code	**-1997**	**1998-2000**	**2001-2004**	**2005-**
PHYS	16	15	5	7
PSYCH	32	33	18	26
FAMS	13	13	6	1
PROT	10	14	7	15
COMP	4	7	4	0
MASS	6	10	10	7
ECON	9	12	12	11
EXPT	8	16	0	2
RISK	4	11	16	7
MODL	0	9	3	2
Total chapters	*71*	*88*	*57*	*55*

Table 3: Codes by time.

The outward-facing chapters largely coalesce around three general themes: developing and promoting a "radiological safety culture" that would prevent Chornobyl-like disasters from reoccurring, public health recommendations, and policy recommendations to government institutions. The method of social monitoring, coming as it did from the Soviet technocratic framework within which it was developed, never denied the politics of information and knowledge production; in other words, those at the DSE and their coauthors understood the biopolitical foundation of the project and actively and knowingly participated in the processes of post-Chornobyl governance.

The overall picture of the state of Chornobyl sufferers that these chapters paint is one of frustration, uncertainty, and distrust. Frequently, the authors of these chapters indicate that many of the sufferers' issues are a direct result of the gap between word and deed; namely, the disconnect between the guaranteed benefits afforded to sufferers and what the state was actually, materially able to provide. A chapter titled "Social protection of sufferers of the ChNPP accident" in *ChiS 2* (Vyshnyak, Mimandusova, and Pylypenko in Sayenko 1995), for example, prefaces its survey findings with an short overview of the history of sufferers' social protections, stating that although a number of laws had been passed guaranteeing sufferers certain rights and benefits (on which I go into more detail below), they have been falling far short of the promises. "Four years have passed [since the ChNPP sufferer laws were implemented], and although amendments have been made to these laws, during this time significant contradictions have accumulated between the proclaimed and legally-enshrined benefits and compensations which should be provided to the different categories of citizens, and the real conditions of their implementation" (60). Writing at the end of a decade of economic turmoil in Ukraine, the authors note that these laws were written when the country was still part of the Soviet Union and could rely on its immense budget to support the sufferers. Within six months of the passing of these social protection laws, the USSR was gone and Russia declined to pitch in. Reflecting on this period sixteen years later, one of the authors of this chapter, Chepurko, states that "Changes in the socio-economic conditions of life, the drop in production, and the deepening of the socio-economic crisis in the 1990s led to a marked lowering in the quality of life for the population of Ukraine. The crisis covered all regions of the state, but most deeply the Chornobyl sufferers. In fact, over half of all Ukrainians fell below the poverty line. The suddenly impoverished country, its production ruined, was not able to ensure real and essential assistance for the majority of the

poor and unprotected strata of the population (pensioners, invalids, the unemployed) and Chornobyl sufferers" (in Sayenko and Khodorivska 2011: 158). The situation for virtually all Ukrainians was so dire in the 1990s, that across all categories the DSE asked about, among both groups of sufferers and the control group they surveyed, the only question criteria that registered a response of "it got better" was faith in God; this table is reproduced and translated below:

	Category 3 sufferers (n=300)			**Category 4 sufferers (n=300)**			**Control group (non-sufferers, n=300)**		
	Worse	**Better**	**Same**	**Worse**	**Better**	**Same**	**Worse**	**Better**	**Same**
Financial situation	72	3	21	90	1	8	83	1	10
State of health	80	1	15	89	1	6	84	1	10
Psycho-nervous state	66	2	28	76	0	19	72	1	20
Generally how you feel	68	1	24	84	1	10	71	3	19
Income	74	6	16	91	2	5	86	2	10
Nutrition	72	2	22	79	2	16	61	1	34
Living conditions	22	9	67	31	5	62	20	7	70
Household management	10	10	76	21	11	65	10	11	72
Dacha	5	5	80	13	8	69	5	4	58
Business activity	10	5	68	14	7	57	9	2	47
Work conditions	38	4	51	52	5	38	36	7	41
Professional level	9	13	66	19	13	63	15	12	53
General cultural level	21	9	59	32	12	53	26	6	42
Achieving life plans	30	9	45	51	4	32	30	2	44
Relations with family	14	16	63	30	9	55	21	15	61

Relations with people	22	14	55	20	8	66	15	12	67
Leisure, vacation	57	9	29	62	0	32	43	4	35
[Health] treatment	79	2	15	86	2	12	75	2	20
Faith in God	6	47	38	10	47	36	5	50	34
Faith in science	27	9	50	34	8	47	23	10	41
Faith in authority	69	2	20	77	2	12	71	2	13
Faith in family	9	35	47	10	34	52	8	38	44
Faith in one's self	16	27	41	17	27	46	7	28	43

Table 4. "What happened with you in the last year? Which conditions of your life, like financial situation, health, income, and other matters got worse, got better, or didn't change?" (Vyshnyak, Mimandusova, and Pylypenko in Sayenko, 1995: 62-3).

In *ChiS 5* (1999), Sayenko provides an executive summary of the findings from that year's survey. Across the board, respondents continued to report negative, deteriorating social-psychological states; the highest rates of negative responses came from the resettled population. In stark terms, the DSE's director reports that overwhelming majorities of groups of sufferers exhibit "distrust of the power structure and active discontent with the social policies of the government" and "distrust of authority" (9), were not provided with adequate information on how to conduct everyday life activities in a contaminated environment (10), felt that "people's wishes were not considered during resettlement" (11), and were in desperate need of material and medical assistance. For example, Sayenko states,

> Among inhabitants of zone 2, the main necessities are: 1) “financial support” and “individual treatment [of disease]” – 80-82%; 2) “treatment of children” – 46%; 3) “job retraining,” “a workplace”, and “relocation” – 34-38%.
>
> Among inhabitants of zone 3 the main needs are: 1) “individual treatment” – 63%; 2) “financial assistance” and “treatment of children” – 53-54%; 3) “a workplace” – 44%; 4) “help with unemployment” – 34%.
>
> Among the resettled the main needs are: 1) “a workplace” and “individual treatment” – 84%; 2) “financial assistance” – 79%; 3) “treatment of children” – 78%; 4) “help with unemployment” – 71%. (12)

These responses show a devastating breakdown in the relationship between the state and the sufferers. Promised benefits were slashed in practice though left in the wording of the law, and the sufferers dependent on those benefits suffered even further. As the DSE turned over its reports to the Chornobyl Ministry and made proposals to the Verkhovna Rada, the law—with its reparative and restorative spirit—remained the same. To again quote Chepurko reflecting the work done by the DSE, the poor economic situation and decimated state and local budgets “necessarily led to leaving only those types of social assistance which were directly tied to the preservation of sufferers’ health (treatments, rehabilitation in the summer, clean products, children’s nutrition, etc.). All other kinds of assistance were subject to cancellation. But, despite our proposals in this direction, which have been expressed for many years, a new concept of the law on the social protection of Chornobyltsi has not been developed” (2011: 159).

The relationship between the DSE's social monitoring and the governance of sufferers

The intertwined and multifaceted processes of the creation of knowledge and the governance of a population requires a definition of that population. In the case of the Chornobyl sufferer population in Ukraine, the Soviet and later Ukrainian governments explicitly outlined the criteria for membership in both the population itself, and the categories thereof. The relevant piece of legislation, "Про статус і соціальний захист громадян, які постраждали внаслідок Чорнобильської катастрофи" ["On the status and social protection of citizens that have suffered as a consequence of the Chornobyl disaster"] (Verkhovna Rada URSR 1991, No. 796-XII), established four categories of sufferers; though this law has been amended 65 separate times, including major amendments that redefined the criteria for category membership, this structure has remained intact through today. To be a recognized Chornobyl sufferer, a person has to prove that they meet the requirements to be a part of one of the categories; without that official recognition, a person cannot access the means of social protection the government has committed to provide them. This situation has resulted in a contested liminal space of identity, where many feel as though their lives have been directly negatively impacted by the Chornobyl disaster, but because they cannot produce the necessary documentation to prove as much, they are barred from accessing the entitlements of sufferers.

This law, 796-XII, indicates that liquidators and sufferers are to be counted separately, though they are grouped together in the categories for purposes of benefits. The law defines sufferers as "citizens, including children, that have experienced the effect of radioactive exposure as a result of the Chornobyl disaster" and liquidators as "citizens who directly participated in any work connected to the elimination of the disaster or its consequences in the exclusion zone in

1986-1987 for any number of days and in 1988-1990 no less than 30 days" (1991: articles 9-10). From these general definitions, additional conditions determined a person's membership in one of the four officially recognized categories of sufferers. (The definitions in the next two paragraphs are from the text of the law as currently amended.)

Those in category 1 include ChNPP liquidators with disabilities and sufferers who meet one of the following four criteria: those who: a) were evacuated from the Exclusion Zone and those that lived in the areas of voluntary resettlement[9] for at least 2 years by 1 January 1993; b) continuously lived, worked, or volunteered in the various areas of the exclusion zone for 2-3 years by 1 January 1993; c) worked outside of the exclusion zone but with radioactive materials connected to the liquidation of the disaster; or d) are now (after 2004) adults that as children had established a causal link of disability from the Chornobyl disaster, pending medical reevaluation.

Those in category 2 include individuals who participated in the liquidation in 1986-87, were evacuated from the exclusion zone, or lived in the area of mandatory resettlement from the moment of the disaster until resettlement. Category 3 covers individuals who participated in the liquidation to a very limited extent in 1986-87 or in 1988-90, worked at exclusion zone check points in 1986, or lived or worked in the area of mandatory resettlement for less than 2 years or in the area of voluntary resettlement for less than 3 years by 1 January 1993. Category 4 includes individuals who worked or lived in the area of enhanced radio-ecological control for 4 years by 1 January 1993.

A 1997 law, "On the approval of the process for issuing identity cards to individual victims of the Chornobyl disaster" (Cabinet of Ministers, 51-97-п), also outlined two other

[9] I discuss the geographies of the Exclusion Zone in chapter 2, p. 23.

groups of sufferers who were also to be counted separately. Those in Series H [Серія Г] are those who worked outside the boundaries of the Zone and have suffered health problems as a result of the disaster. Series D [Серія Д] counts children under the age of 18 and includes children that lived in the Zone in the immediate periods after the disaster, were born to parents that belong to categories 1-3, or with illnesses like thyroid cancer that can be traced back to the Chornobyl disaster. When one of these children turns 18, they are assigned to a category and are no longer counted in Series D.

The table below tracks the changes in the populations of the four categories of sufferers, and the two other groups included in the Chornobyl Ministry's totals. Data for 2019 and 2020 come from the Ministry of Social Policy [Міністерство соціальної політики України], established in 2015 to handle, among other duties, the tracking and distribution of medical and other pensions, including those for Chornobyl sufferers (2019, 2020). Data for 2013 to 2016 is from the Ecological Policy and Nature Management committee of the Verkhovna Rada [Комітет Верховної Ради України з питань екологічної політики та природокористування] (2016). Data for the 1987, 1997, 2000, 2005, and 2006 columns comes from a report from the Chornobyl Ministry (Baloha 2006: 55, 71). The data for 1987 is listed only as a total, as the categories system was not implemented until 1991.

	1987	1997	2000	2005	2006	2013	2014	2015	2016	2019	2020
Category 1		59,582	86,775	105,251	106,824	116,758	117,158	113,268	108,530	106,712	106,334
Category 2		339,666	307,982	276,072	268,815	197,840	191,759	181,848	174,208	157,438	158,770
Category 3		558,637	549,649	537,504	533,144	474,319	464,007	448,748	437,157	402,610	391,296
Category 4		1,169,804	1,150,273	1,081,469	1,065,022	878,891	857,868	837,111	821,458	775,440	763,415
Series H		2,530	2,862	2,780	2,606	2,075	1,932	1,823	1,774	1,426	1,378
Series D		1,083,107	1,264,329	643,030	617,660	462,374	449,412	442,343	418,777	344,670	330,298
Total	**264,857**	**3,213,326**	**3,361,870**	**2,405,890**	**2,594,071**	**2,132,257**	**2,082,136**	**2,025,141**	**1,961,904**	**1,788,296**	**1,751,491**

Table 5: total liquidator and sufferer populations by category.

Despite the gaps in the data, a trend emerges where the maximum number of officially recognized Chornobyl sufferers, including liquidators, peaks near the year 2000 and generally decreases to approximately half of the peak. Predictably, the largest group to shrink is the children, given the low fertility rate in Ukraine generally, which has been below 2.0 for its entire post-Soviet history (World Bank 2019), and that as the children grow up they are placed into categories 1-3. This dynamic fuels in part the increase of category 1 sufferers, the only group to increase in size between 1997 and 2014, and that counts more individuals within it now than at the presumed total peak.

Because category 1 sufferers are guaranteed the highest pensions and the greatest level of services (both medical and otherwise), we cannot assume that children aging into category 1 is the only – or even the greatest – factor in the rate of change for that category. Article 20 of No. 796-XII sets forward the benefits provided to category 1 sufferers, including: free medicine and prosthetics, first-priority service at healthcare facilities and pharmacies, annual free visits to a sanitorium, continued use of clinics after retirement or change of job, annual specialist medical care, guaranteed work or stipend in the case of loss of work, 100% wage equivalent in temporary incapacity benefits up to 5 months in a year, new and improved housing if needed, 50% discount on housing and utilities, a car, 50% discount on groceries, free use of public transport, sick leave, preschool, a free annual trip to anywhere in Ukraine, extra vacation time, first-priority access to new housing co-op developments, priority service at all state-owned enterprises, first-priority access to purchasing high-demand industrial goods, automatic admission to state higher educational institutions, priority placement in social protection institutions, and 50% reduction in phone fees.

As I discuss above, many of the authors of these chapters recognize that the state has been derelict in its responsibilities to sufferers. For most sufferers, even those in category 1, those benefits existed only on paper. Chepurko described that by 2000, when Ukraine was finally exiting the long economic crisis of the 1990s, most benefits set forth in 796-XII had been gutted or discarded. "The reduction of production, a significant deficit of state and local budgets necessarily led to leaving only those types of social assistance which were directly tied to the preservation of sufferers' health (treatments, rehabilitation in the summer, clean products, children's nutrition, etc.). All other kinds of assistance were subject to cancellation. But, despite our proposals in this direction, which had been expressed for many years, a new concept for the law on the social protection of Chornobyltsi has not been developed" (in Sayenko and Khodorivska 2011: 158). For some sufferers, particularly those who were unable to acquire the required documentation to be categorized, not only were they blocked from any stated benefits, but they also carry the burden of dealing with myriad physical, psychological, social, and economic problems stemming from the disaster.

As Petryna explores in *Life Exposed* (2002/2013), there were numerous instances of enterprising individuals who deployed a wide array of tactics to obtain—legally, semi-legally, or illegally—the doctor referrals and state documentation that would (re)classify themselves as category 1 sufferers. For many, especially in the harsh economic climate of Ukraine in the 1990s and 2000s, obtaining the right paperwork to be eligible for that large list of benefits was a matter of survival. Her conceptualization of "biological citizenship" made explicit the link between being able to live and belonging to the newly independent state. For those affected by the disaster, Ukrainian citizenship (granted at the time of Ukrainian independence) is "charged with the superadded burden of survival… a large and largely impoverished segment of the population

has learned to negotiate the terms of its economic and social inclusion in the most rudimentary life-and-death terms" (2013: 7). Those who are officially, legally recognized as sufferers have various levels of access to a variety of benefits, but those who feel like their lives and bodies were adversely affected by Chornobyl yet are not officially, legally recognized as sufferers must endure many of the same problems as sufferers but have no access to sufferer benefits. Petryna's ethnography navigates the ways in which clinics—in particular the Radiation Research Center—operated as sites of translation.

> In order to have their experiences transformed from the status of illness to the status of disease (with a confirmed radiation-related etiology), Chernobyl patients must subject themselves to clinical observation and scrutiny with congeries of assessment tools and technologies. Such interventions not only objectify disease; they remake the very basis through which suffering is expressed and codified. The clinical research process makes connections between ailments and the disaster real, that is, organic. (Petryna 2013: 156-7)

The clinic, an assemblage of doctors, patients, technologies, norms, known unknowns, words, etc., translates the subjective experiences of symptoms into politically actionable material, such as medical records indicating the "correct" diagnosis (see Foucault 1973). This is by no means an automatic process, there are many variables involved here, as Petryna explains: the ideological positions of the doctors and specialists, patients' personal connections and knowledge of the current legal and normative requirements, bed and ward availability, the timing of visits, and so on.

To be officially classified as a sufferer then, is to situate oneself at a particular convergence of biological, medical, geographic, knowledge-producing, legal, and bureaucratic processes. It is to undertake a translation process, where a person shifts from one type of relation

to the state—a citizen—to another, becoming a new type of "governable object" in exchange for a new set of tools to execute the processes necessary to live. Once a person is translated into a Chornobyl sufferer, they also become subject to a different set of state governance tools and mechanisms, including being enrolled in social monitoring programs like that ran by the DSE.

As I discuss above, understanding a biopolitical regime requires an accounting of the rationalities, preferences, choices, restrictions, contingencies, demands, and constraints of the relations among the governing and the governed. The DSE played a major role through its social monitoring of Chornobyl sufferers in creating the knowledge used to justify the shapes, limits, and allowances of the relations between the sufferers and the state in addition to revealing much of the social, economic, and political contexts of both studying and governing those affected by the Chornobyl disaster.

Tracing a contemporary Ukrainian biopolitical regime

To conclude this chapter, I want to tie these many threads together to arrive at an evaluation of the current formulation of Ukrainian biopolitics. At the center of this evaluation is the relationship between governance and responsibility. One way to approach this relationship is to see how the Ukrainian state has tried to answer the question, "what do we do about the Chornobyl sufferers?"

On the one hand, we have the long legacy of Soviet social technocracy both enshrined in law (categories of sufferers) and in the institutional practices of state-backed knowledge production (the DSE). On the other hand, we have a state that has consistently been unable to meet the responsibilities it lays out for itself.

The Soviet Ukrainian government, in response to the Chornobyl disaster, defined of a new group of citizens—sufferers. Tracing the political and spatial developments of this new demographic (in its relation to both non-sufferer groups and the evolving contexts of Ukrainian [geo]politics) demonstrates the continuities and ruptures between Soviet biopolitics and contemporary Ukrainian biopolitics. While this chapter has focused primarily on the biopolitical work of the Department of Social Expertise, it is impossible to discuss the Chornobyl disaster, and what its ramifications have had in the development of a Ukrainian biopolitical regime, completely confined to the borders of the Ukrainian state. Echoing the introductory chapter, Chornobyl was a global event; in other words, we cannot talk about biopolitics without talking about geopolitics.

Part of understanding and evaluating the governance of Chornobyl sufferers is comparing these processes to those applied to the general Ukrainian population. How the Ukrainian state has conceptualized the governable object of *citizen* has undergone a variety of permutations since independence. Drilling down further, attempts at answering the question of "what is Ukraine?" over the past 30 years reveal fluctuations and crises that shift and destabilize the governance/responsibility relationship; they also highlight the importance of geopolitics in the formulation of biopolitics.

The most recent, and perhaps most obvious, bio-geopolitical crisis is the one-two-three punch of the Euromaidan protests, the Russian annexation of Crimea, and the ongoing war in the Donbas, which, as of the Russian invasion of Ukraine on 24 February 2022, escalated into a full-scale war. This chain of events began with a question of whether Ukraine should seek a greater relationship with the European Union or with the Russian Federation. When then-President Viktor Yanukovych disregarded the results of the referendum and declined to sign an EU

association agreement, millions of Ukrainians camped at Maidan Nezalezhnosti in protest, leading to police repression and violence, culminating in the deaths of 130 and the ouster of Yanukovych in February 2014. In the ensuing political crisis, Yanukovych's Party of Regions was forcibly disbanded, US Assistant Secretary of State Victoria Nuland was caught on tape selecting Arseniy Yatsenyuk as the new prime minister over the other two opposition leaders, and anti-Maidan protests expanded and fueled separatists in the southern and eastern regions. The years since have had a major effect on issues of Ukrainian identities. The Russian annexation of Crimea, for example, not only challenged the sovereignty and borders of the Ukrainian state, but it also drove closer relations between Crimean Tatars and ethnic Ukrainians, perhaps best epitomized by the country sending Crimean Tatar singer Jamala to the 2016 Eurovision contest, which she ended up winning, with a song containing the following opening verse:

> When strangers are coming
> They come to your house
> They kill you all
> and say
> We're not guilty
> not guilty

Russian politicians, seeing this song as a thinly veiled critique of the annexation of Crimea, were outraged that the Eurovision organizers allowed such a politically charged song. For their part, Jamala and Ukrainian officials denied that the song had anything to do with the current geopolitical situation (Stern 2016).

The continued tensions with the Russian Federation in Crimea, the Donbas, and along the Ukraine-Russia border have had major effects on how Ukraine and its peoples define themselves.

The 2022 Russian invasion has only sharpened those effects. Since 2014, the government has instituted a new wave of "decommunization," replacing monuments and street names directly tied to Ukraine's Soviet past, now too Russian to be palatable. The second day after Yanukovych's ouster, the Verkhovna Rada initiated the process to repeal the disgraced president's controversial language law that elevated the status of the Russian language. Ukrainian scholar and journalist Mykola Riabchuk (2015) noted that among Ukrainian Russians and Russophone Ukrainians there is increasing support for Ukraine's membership in NATO and accession to the EU, stating "The Russian aggression, paradoxically, not only polarized the Russophone group but also consolidated the major part of it with Ukrainophones around the common cause, against the common enemy" (140). Since the 2022 Russian invasion, recent polls from Rating, a Ukrainian and research agency, have shown Ukrainians' support for joining the EU has risen to above 90%, though support for NATO membership initially rose but has since dropped back to pre-war levels of under 70% (Reuters 2022). The results of that poll arrived days before European Commission President Ursula von der Leyen presented Zelenskyy with a fast-track EU membership plan and the official questionnaire (Deutsche Welle 2002). Riabchuk's observation has proven even more apt in the weeks since the start of Russia's genocidal war of imperial aggression began.

To some extent, a core tenet of Ukrainian nationalism since the 19th century has been the insistence on Ukraine's separateness from Russia. However, the political expediency and salience of that argument over time has determined the volume and tenor of that insistence. As the war in the Donbas and the Crimean occupation continue, it is unsurprising that contemporary Ukrainian identity is more sharply and loudly emphasizing its difference from Russia.

The contradiction of intentionally distancing Ukraine and Ukrainian-ness from anything Russian and Soviet while largely leaving unchanged the underlying biopolitics of the Soviet social technocracy is a hallmark quality of post-Soviet Ukraine. The inability for whatever reason to fully sever, reinforce, or replace the ties binding independent Ukraine to its Soviet past means that Ukraine is spinning its wheels in post-Soviet limbo: the structures of that system are dependent on a strong central authority that no longer exists, yet the implemented reforms are not far-reaching enough to actually change many of the structures of that technocratic mode of governance. For example, Ukrainian Chornobyl sufferers, victims of a Soviet accident (in timing, form, and response), simply are unable to claim the social protections the law guarantees them. This law was written in and assuming a continued Soviet context and was adopted by the newly independent Ukrainian parliament. As I demonstrated above with the work of the DSE, the fulness of this law was never realized, as the reach of the Ukrainian state far exceeded its grasp.

In his most recent monograph, Institute of Sociology deputy director of scientific affairs Mykola Shulga (2018) characterizes the state of Ukrainian society as chronically uncertain and unstable. He argues that while Ukraine has finished the first stage of its transition—from Soviet to post-Soviet—that transition is far from over, with many elements of society seeing little to no reforms, or simply imitations of reform, that continue to (re)produce instability and crises. For Shulga, the ways that the processes of privatization unfolded in Ukraine both promoted a culture of consumerism and impoverished and disempowered the majority of the population. The result is a people in survival mode, caught between the worst excesses of Soviet and capitalist social structures. He states,

> The erosion and destruction of the principle of collectivism in social relations and its replacement by the principle of individualism, the social atomization of society gave rise

> to the phenomenon of a new paternalism, which consists of the fact that the disadvantaged individual, deprived of many social guarantees, places his hope on the state, which is built on the principles of private ownership and market relations. In a crisis society, when opportunities for individual self-realization are narrowed, when the social institutions that ensure the satisfaction of primary human needs are deformed, people lose faith in themselves, carrying the locus of the causes of their failures outside. Such features of the state of Ukrainian society naturally interact and create new defects in the functioning of social institutions. (2018: 11)

The case of the Chornobyl sufferers is a prime example of this pessimistic view on Ukrainian social structures: a population, in a situation where they are unable to produce the conditions for their continued existence, turns to the state for survival. The state, its institutions and mechanisms unable to adequately execute their functions, despite whatever promises it has made, caught up in however many other crises, has to choose between doing nothing for that population, or further contorting its organs to benefit a select few at the possible risk of further deformity. In response, the people reliant on the state, or at least those looking to the state for relief and finding none, grow increasingly distrustful of the state and those making decisions on behalf of the state. Parties are voted out and dissolved, new actors operate the levers of state power, but it does not take long for the wheel to turn again.

The root of this dynamic of chronic distrust of the state in Ukrainian crisis society is a breakdown of expertise and authority. Claims of new solutions to persistent problems are claims to expert knowledge and the ability to transform that knowledge into action. As I discuss in a previous chapter, the social construction of expertise is contingent upon power relations and the structures and practices that (re)produce those relations. In this Ukrainian context, one major

issue is that those structures—whether its holdover Soviet ones like the NASU and the ways of production of scientific knowledge, or populist political ones like the revolutions of 2005, 2010, and 2014—and practices—technocratic ideas, consumerism—have broken down time and time again since independence.

This breakdown of trust in expertise and authority, and state authority in particular, has been a persistent theme in Ukrainian society since the 1990s. The Institute of Sociology NASU document this dynamic by tracing the changes in responses to questions about attitudes toward state leaders, offices, and structures in their regular surveys. Two closely-related questions in that survey get to the issue of trust in political expertise and authority. I reproduce the answers from the latest issue (Figures 3, 4) below:

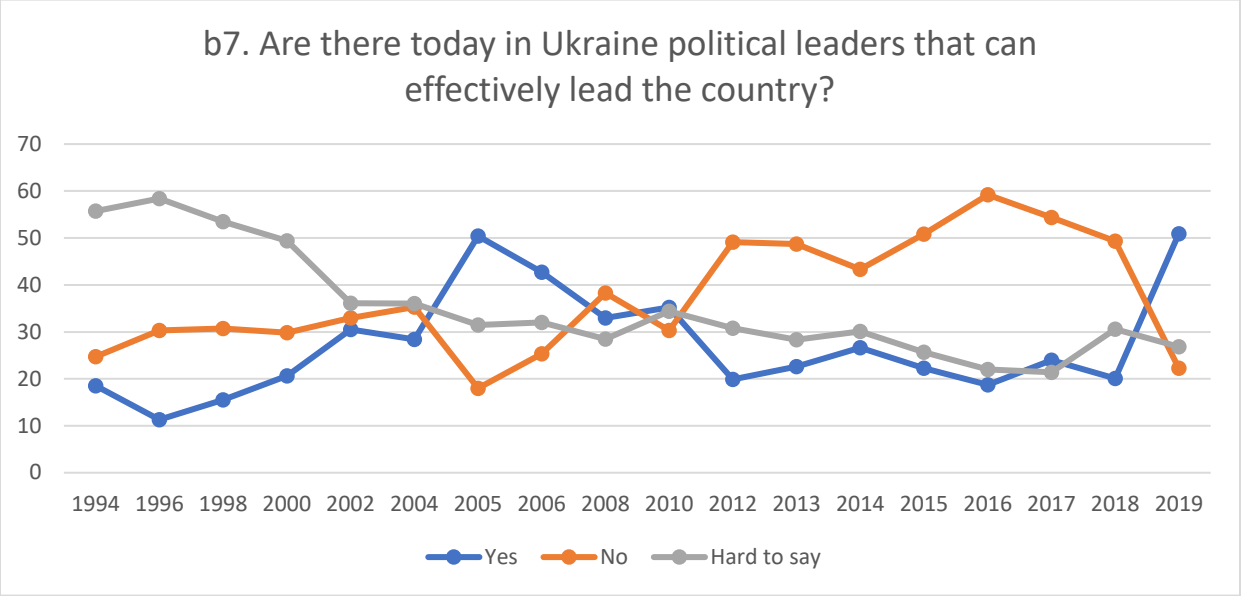

Figure 3: "b7. Чи є сьогодні в Україні політичні лідери, які можуть ефективно керувати країною?" in Vorona and Shulga, eds., Українське суспільство: моніторинг соціальних змін 2019: 423.

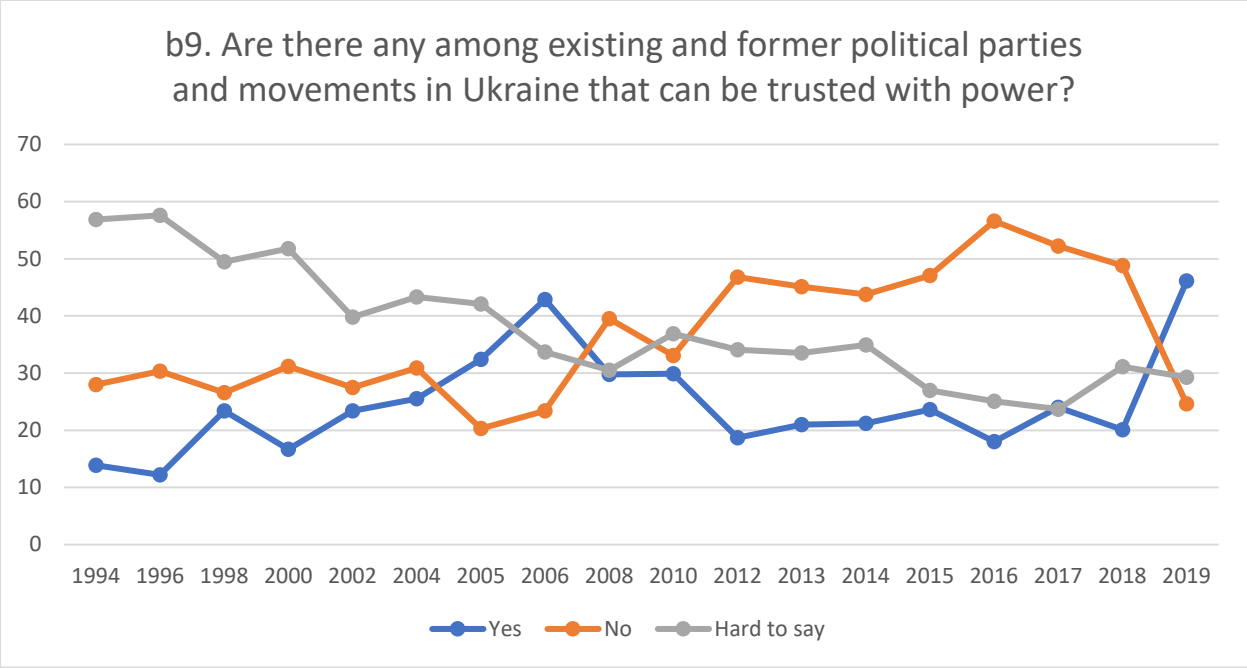

Figure 4: "b9. Чи є серед існуючих на теперішній час в Україні політичних партій і рухів такі, яким можна довірити владу?" in Vorona and Shulga, eds., Українське суспільство: моніторинг соціальних змін 2019: 423.

As the uncertainty in political leadership waned in the late 1990s—precipitously so after the Kuchmagate scandal and murder of Georgiy Gongadze in 2000—the emergent pattern is a growing distrust of political authority that drops off and is overcome in two instances: the immediate aftermath of the Orange Revolution (2004-2005) and the run-up to the election that would replace Poroshenko and his political bloc. The large jump between yes and no answers to these questions in 2018 and 2019 attests to the success of the populist campaign of political outsider Volodymyr Zelensky, a television actor who played an everyman who became the Ukrainian president, that capitalized on the distrust and dissatisfaction of the entire Ukrainian political establishment.

Aside from the political changes, there are also material reasons for the shifting trends shown in the above figures. Figure 5 below superimposes in red the averaged answer to the ranked question, "How do you rate the current economic situation in Ukraine?" from the same survey. Respondents answered from "0 – «ситуація дуже погана» [very bad]" to "10 – «ситуація дуже добра» [very good]." Those who did not answer this question were not included in the average. I multiplied these values by 10 to match the scale of the graph along the y-axis, so an average score of 1.3, as in 1998, appears as 13 on the graph in figure 3.

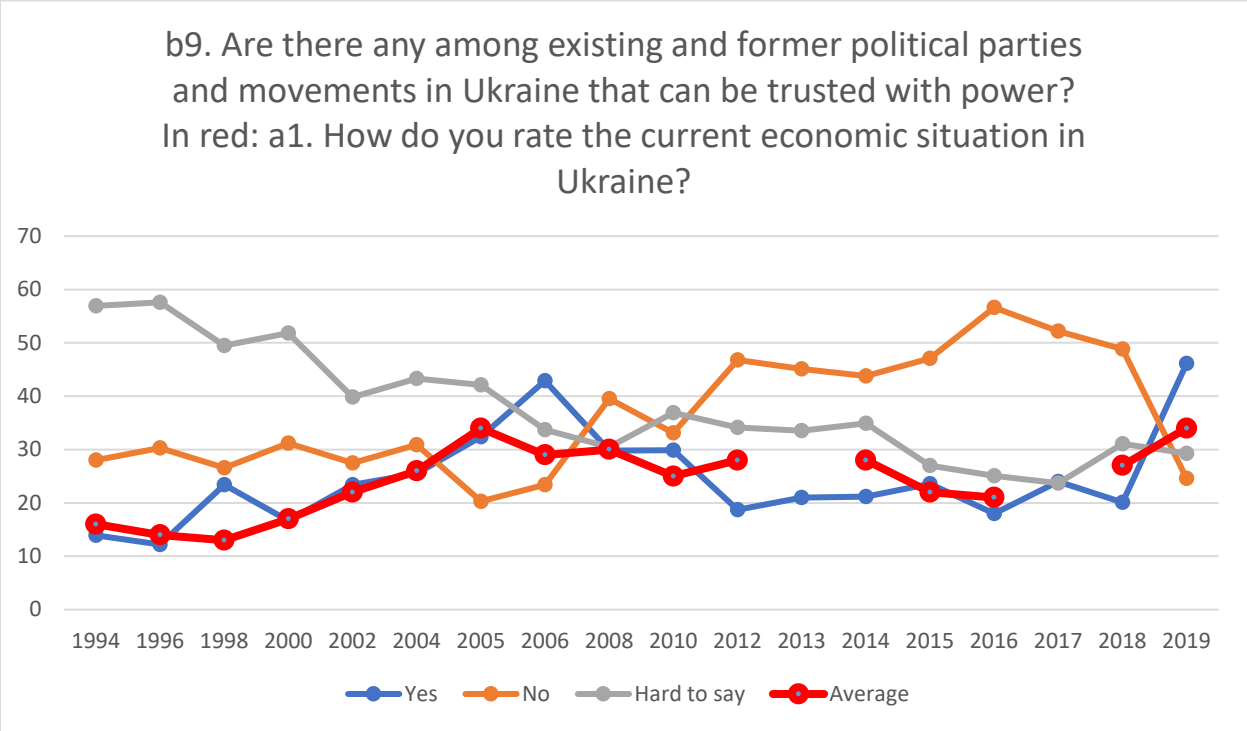

Figure 5. "a1. Як Ви оцінюєте нинішню економічну ситуацію в Україні?" in Vorona and Shulga, eds., Українське суспільство: моніторинг соціальних змін 2019: 415. This question did not appear on the survey in 2013 and 2017.

The most striking elements of this graph are the correlation between Ukrainians' positive responses to the existence of trusted politicians with their evaluation of the economy and that

there are only three years where the average rating of the economic situation was at 3 or above, 2005, 2008, and 2019. For Chornobyl sufferers, as well as Ukrainians on the whole as this survey demonstrates, the trust in political authorities is directly tied to material concerns. At no point have a majority of Ukrainians declared that there is anyone worth trusting with power just as at no point have Ukrainians rated the economy higher than a 3.8/10 average.

These survey responses bear out the narrative of Ukraine as a "crisis society" where the vast majority of the population exists in a state of survival and distrusts authority, a people perpetually in crisis; for Shulga, this is the central problematic of post-Soviet Ukraine. The term "crisis society" contains a double meaning as well, as a society defined by its crises: not only did independent Ukraine emerge in the aftermath of a cascade of late-Soviet crises kicked off by the Chornobyl disaster, but also, as Shulga documents, there has been a steady accumulation of "accidents in industrial-technological and socio-cultural networks (wear and tear of buildings and constructions – dams and locks of large reservoirs, power plants, including nuclear, industrial and agricultural complexes and mines; housing stock and entertainment and theater facilities, museums, archives, sports facilities), and in engineering infrastructure (gas pipelines, water mains, canals, power lines, bridges)" (2018: 22). As systems, institutions, infrastructures, and networks have continued to fail and not be repaired for the past three decades, it is of little wonder that there is so little trust in authority. Once again, taking Chornobyl sufferers as a microcosm of the broader experience of being Ukrainian is instructive.

At the center of the DSE's research on Chornobyl sufferers is the contradiction between what exists on paper and what exists materially, and the serious lack of trust in authority, especially state authority. While it is impossible to claim that the inability of the Ukrainian state to adequately protect and care for the needs of Chornobyl sufferers is the root cause of the

general attitudes of Ukrainians' distrust of authority, it is symptomatic of that relationship. Though, by never adopting "a new concept of the law on the social protection of Chornobyltsi" (Chepurko in Sayenko and Khodorivska 2011: 159), the injuries caused by the state's inability to make good on its promises have only ever festered. Instead, the DSE's funding for continuing its research on Chornobyl sufferers was diverted to other projects, and the plight of Chornobyltsi is increasingly ignored as that population dies off and other pressing matters, such as the war in the Donbas, take precedence in both the public consciousness and the state budget. If we approach the role of Chornobyl sufferers in the creation of a contemporary Ukrainian biopolitics, then this biopolitical regime does indeed seem bleak: victim populations are made visible, treated respectfully, and promised relief when geopolitically and financially beneficial, yet occupy a demographic space that the state is clearly ready to ignore or sacrifice. To put a fine point on it, should Crimean Tatars brace to be pushed aside when the government in Kyiv is no longer engaged in a conflict over the Peninsula? While this thanatopolitical framework is self-destructive, cruel, and cynical, it is also limited; perhaps *too* limited. If the state is engaged in such a regime, there is much room for these sufferers to forge new ways of living outside of, around, and through the state, perhaps just as shrewdly and cynically as the state does. As Petryna recounts, and as the DSE itself even notes: "The resettled most often indicated a poor material situation. But at the time in the families of the resettled, as a rule, there is an atmosphere of understanding and mutual aid – 73% of families indicated as such" (Sayenko 1999: 11) — those citizens with the superadded burden of survival can be extremely motivated to create a grassroots biopolitics, one that affirms their humanity and their worthiness to exist.

An affirmative Ukrainian biopolitics has developed in the gap between the responsibilities to its populations the state has outlined for itself and the ability for the state to

execute those responsibilities. The cascading failures of the inherited Soviet technocratic mode of governance erode public trust in the state and its officials and consign Ukrainian populations—Chornobyl sufferers, etc.—to bare life, but in that gap there is ample room for innovation, creating new communities and networks, developing tools to bypass the state to meet the needs of life, to have a meaningful life intentionally outside of the once-totalizing system. At the beginning of this chapter, I introduced the concept of affirmative biopolitics as "the ways that different bodies form communities and how those communities construct their own strategies for living." Ukrainians, especially those in populations who should be able to make claims of the state, develop these new strategies for living in the times between crises and in the spaces between state responsibility and resources. This affirmative biopolitics cannot therefore be divorced from the notion of Ukraine as a "crisis society," because it is these crises—both those as a result of the crumbling, unfunded vestiges of Soviet social technocracy and those borne of geopolitical conflict—that open the spaces for creating new ways and means of being.

Chapter 5. Emergent stateness: Critical urban geopolitics in Slavutych

Introduction

The emphasis of this dissertation so far has been on state-scale policies and national-scale social transformations and adaptations in the aftermath of the 1986 Chornobyl disaster, a technogenic event with massive political, social, ecological, and biological repercussions. This chapter will continue to investigate the coproductive relations among technoscientific knowledge, non-human actors, people, and institutions by exploring the historical development of Slavutych, the city built as a replacement for the abandoned Pripyat to house ChNPP workers and their families, and its explicit geopolitical interventions. Local policies and practices do not exist in a vacuum; rather, they are a constitutive part of the wide constellation of human political activity, with direct, but often overlooked, ties to institutions, organizations, individuals, and objects in other places and at other scales. Slavutych is no exception, as demonstrated by its efforts to operationalize its local expertise and experiences into forging connections with global, national, and transnational actors to save itself and to drive geopolitical discourse on nuclear energy and Ukraine's geopolitical relationships.

Urban geopolitics is usually framed in terms of the effects that cities have on grand geopolitical narratives, especially ones concerned with conflict and war (see Graham 2004; Rokem et al. 2017). While there is some engagement with critical geopolitics scholarship—for example, in investigating geopolitical relationships that go beyond interstate interactions—the developing literature on urban geopolitics largely leaves out some of the more recent developments in the field, such as the focus on the material and localized expertise. This chapter is an effort to bridge that gap by focusing on how Slavutych, a small city in northern Ukraine, has been able to leverage its technoscientific expertise and lived experience to work directly with

international organizations, other states, and multinational corporations both to serve the needs of this city and to influence geopolitical narratives on the national and international scales.

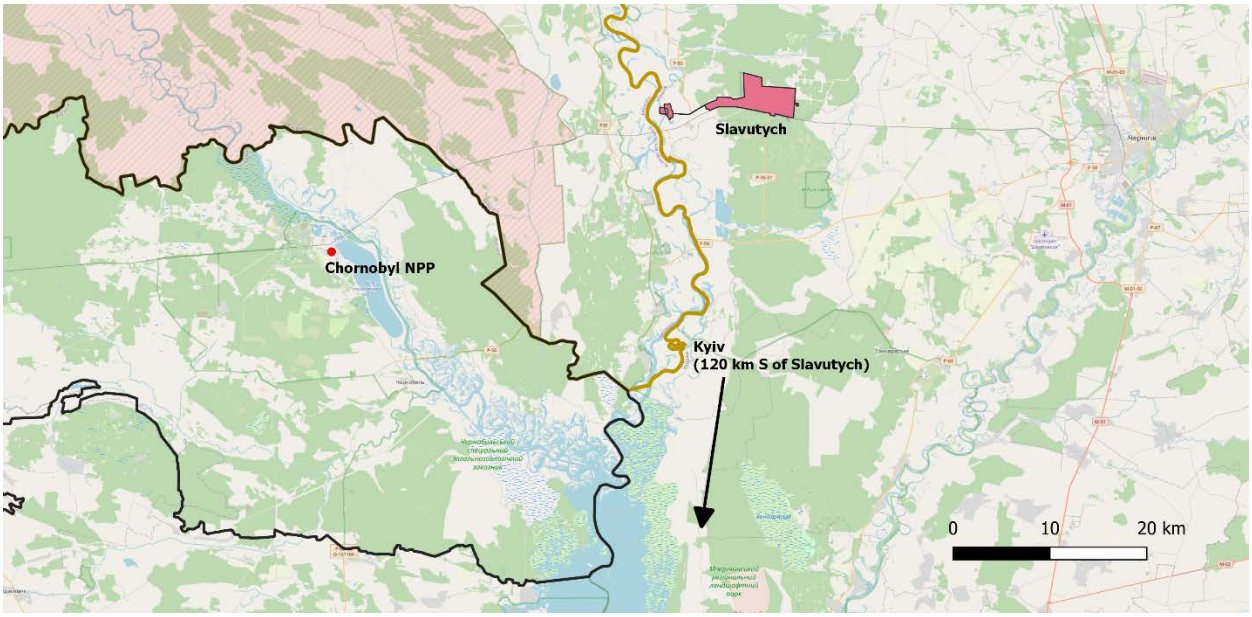

Figure 6. Location map of Slavutych in relation to the Chornobyl NPP and Kyiv. By the author.

This localized technoscientific expertise emerged as a result of the city's development and its direct links to the Chornobyl disaster. After the evacuation of the Zone, Soviet officials deemed it necessary to construct a new city to serve the workers at the ChNPP and their families, as three of the four reactors were still operational. To that end, the headquarters of the State Special Enterprise Chornobyl Spetskombinat, the state-owned company that would oversee the operating, decommissioning, and liquidation work at the reactor, was also situated in Slavutych. By design, this city has become a center of knowledge and expertise about Chornobylgenic radiation, radioactive contamination and exposure, and the realities of living with an ineradicable legacy of a major technogenic disaster.

This chapter begins with a revisiting of critical geopolitics and the co-formative relationships among technoscientific knowledge production, local policy, and inter-/multi-

/supranational organizations. I will also discuss the limits of the current scholarship on urban geopolitics with an eye towards extending those boundaries to intersect with new, emergent dimensions in critical geopolitics. This will frame my analysis of Slavutych as a kind of state assemblage: not as a state-as-object or as a state in the popular sense, but rather as a sociomaterial effect of various other events, phenomena, actors, and materials that exhibits elements of "stateness" in its actions (including its interactions with other such states and organizations). Following that discussion is a short history of Slavutych, the particulars of its construction and development, and the challenges it has faced over three distinct time periods: its construction in 1988 to the Memorandum of Agreement in 1995 that dictated the early decommissioning of the ChNPP, the five-year period of preparing for the early decommissioning of 1995-2000, and from 2000 to the present. The third part of the chapter explores the roles of city officials in forging connections with different entities and organizations across a number of scales, external interventions in Slavutych, and the effects of grassroots activities and activism within the city. The final section explicitly investigates the critical potential of this case and possible further vectors of research with an eye for whether Slavutych's experiences can constitute a suitable model for other post-disaster cities.

Critical geopolitics and technoscientific knowledge production

The Chornobyl disaster was a global in its effects, and its handling—by media, by governments, by scientists, by organizations, by the affected populations—has been rife with explicit geopolitical considerations, particularly in two major arenas: the material and the discursive. As for the first, the Chornobyl disaster was an international incident with international material effects. The radioactive dust cloud resulting from the explosions did not confine itself to the borders of Ukraine, or even to the Soviet Union. In fact, it was Swedish

weather recording instruments that first detected the cloud, alerting Western Europe to its presence, even though Cold War politics and the magnitude of the disaster prevented American and European researchers from pinpointing the source of the plume, though it was presumed to have come from somewhere in the USSR (Petryna 2002: 36-8). After the Soviet Union revealed the source of the plume at Chornobyl, a number of international organizations, like the International Atomic Energy Association (IAEA), the Atmospheric Release Advisory Capability (ARAC) at Lawrence Livermore National Laboratory in California, the World Health Organization (WHO), and the UN Scientific Committee on the Effects of Atomic Radiation (UN-SCEAR), got involved. These and other organizations provided expertise, instrumentation, and financing to measure and treat the effects of the radiation beyond the resources and capabilities the Soviet Union was able to assemble on its own. Within a few short years following the initial disaster response, other major material geopolitical developments occurred: a number of international charity organizations formed to serve those affected by Chornobylgenic radiation, the Soviet Union dissolved, and Ukraine turned to the European Union (EU) for both aid for Chornobyl and membership in the organization. Most recently, a number of transnational or foreign (i.e., non-Ukrainian) entities have become involved in designing and building the New Safe Confinement shelter over the reactor, replacing the hastily constructed initial sarcophagus.

In terms of geopolitical discourse, the constitutive parts of the assemblages that make up the aftermath of the Chornobyl disaster have produced, altered, and deployed various geopolitical narratives about the disaster itself, its political ramifications, the effects of radiation on bodies and ecologies, and the global nuclear industry, to name a few. Tracing the contours of the development of the geopolitical discourse of the Chornobyl disaster is the purview of critical

geopolitics, which de-centers nation-states and the state system in favor of focusing instead on the discourse itself, its authors, its schisms and changes, and its effects. The discursive narratives within and about Ukraine and Chornobyl tell politically motivated narratives about parts of the world, implying threats of violence (from Russia, from nuclear energy) to achieve specific ends—after all, geopolitics and geography generally are about power (Ó Tuathail 1996). Analyzing the relationships among policymaking, technoscientific knowledge production, and geopolitical narratives advances the project of critical geopolitics, disrupting the state-centric, political realist idea of geopolitics, and lends itself to conceptualizing the organizations, people, material, narratives, and relations among them as parts of sociomaterial assemblages.

As I describe in the chapter 3, the field of critical geopolitics is predicated on an understanding of classical or traditional geopolitics as a tool for the (re)production of the modern nation-state and for the justification of various forms of inter-state conflict. Work in critical geopolitics seeks to move beyond, deconstruct, challenge, problematize, and de-center traditional geopolitics in a number of ways, such as charting the development of geopolitical narratives in popular media, identifying the personal or institutional agendas behind national foreign policies, and highlighting the schisms within and oppositions to geopolitical projects by drawing on some of the more recent developments in the critical social sciences, including poststructuralism, postmodernism, assemblage theory, and other radical conceptualizations of how power is expressed across space.

Critical geopolitics scholarship over the past decade or so has introduced a number of insights and methods from STS that have helped the subdiscipline become extradiscursive in its scope, intentionally broadening the focus from discourse and text to include the material (Muller 2010, 2012, 2015; Elden 2013; Dittmer 2013, 2014, 2017; Anderson and McFarlane 2011; Kuus

2014; O'Lear 2016). As discussed in the review of the literature, the production of technoscientific knowledge is seen in STS as a sociomaterial process, or more precisely, that technology and society coproduce each other. The facts, materials, and social processes that result from technoscientific processes are also bound up in political relations. This chapter will draw upon the previous discussion of assemblage theory and how it can act as a framework that provides a way to materiality in the doing of discourse analysis.

Critical urban geopolitics

As discussed above and in chapter 3, critical geopolitics "interrogates how and why we have come to think of the world (or parts of it) in a certain way" by taking seriously the roles, influences, and actions of cultural authorities, the media, academics, think tanks, policymakers, and people (Dittmer 2010: 11). Central to critical geopolitics is a decentering of the nation-state as the only or primary unity of analysis, recognizing that just as power flows multidirectionally across social relations (see Foucault 2003; Ó Tuathail 1996; Ó Tuathail et al. 2006; Hepple and Atkinson in Dodds and Atkinson 2000), political narratives and actions are produced and undertaken in all parts of society. For all this groundwork and continual development of critical geopolitics, there remain some gaps and unexplored vectors. One such less-trodden path is looking at how cities affect and are affected by geopolitical narratives. Work done in this area tends to focus on the development and role of world cities, particularly in the globalization discourse (for example Graham 2004). One aspect of this chapter is to investigate how a small, new city—and its residents—have been able to enact geopolitical relationships and drive geopolitical narratives.

There is a small but growing literature on urban geopolitics; however much of it is concerned with conflict in urban spaces (see Brenner 1999, 2000; Cowen and Smith 2009; Jonas

2013; Rokem and Boano 2018). Rokem et al. (2017) recently sought to expand the scope of urban geopolitics beyond a focus on conflict. They outline four interventions into urban geopolitics: ordinary urban geopolitics of segregation and mobility, domestic urban geopolitics, urban geopolitics of refuge, and geopolitics of urban verticality (2). These interventions all look at how geopolitics is played out in urban spaces.

My intervention into the concept and doing of critical urban geopolitics begins outside of urban studies and urban geography scholarship. Instead, I am interested in how urban spaces incorporate themselves into geopolitical narrative constructions in analyzing cities as assemblages. This approach incorporates insights from the work urban studies scholars bringing assemblage into the analysis of the city, such as McFarlane's (2011a) constructivist orientation to the city, on seeing the city as a set of unequal processes and relations (2011b), and his book on learning the city (2011c); Brenner, Madden, and Wachsmuth (2011) on urban geoeconomics; and Kamalipour and Peimani's (2015) exploratory paper on assemblage's usefulness in urban studies. By taking an assemblage theory approach to political theories of the state and recontextualizing the state not as a subject-object but rather as an emergent affective assemblage, the various tools available for state analysis become available for non-state polities, including cities. What follows in this section expands on the discussion of assemblage theory in previous chapters, attempting to bridge the gap between the desire to decenter the state in political geography work and the paucity of scholarship on critical urban geopolitics.

Jason Dittmer, in *Diplomatic Material* (2017), employs a “microscaled analysis of state foreign-policy apparatuses” (4) to trace the constellation of actors and processes that make up the notion of the state, exposing the state as a becoming-being rather than as a discrete subject-object of analysis. He puts the literature of the politics of everyday life and of the political theory of the

state into conversation with each other, rather than keeping those traditions in their silos to rehabilitate the study of the state. As mentioned above, the trend within critical geopolitics has generally been to disavow and move away from the state—viewing it as both a territorial trap (Agnew 1994) for geopolitical analysis and a tool for advancing imperial/neoliberal agendas—in favor of studying state effects at different scales. Dittmer's intervention—this microscaled analysis via assemblage theory—uses the mundane, prosaic effects and materials of various performances of stateness to demonstrate the translocal nature of the state. Prosaics, here in the Bakhtinian sense (Morson and Emerson 1990; Campbell 1996), refers to the "ebb and flow and complexities of everyday life" that "highlights the intrinsic heterogeneity and openness of social life—its 'manyvoiced' character" (Painter 2006: 760). Prosaics therefore serves as a bridge between everyday life and state theory for Dittmer (2017), who sees the state as an emergent effect "from the enmeshing and interaction of various local events and phenomena" (5), which leads to an understanding that while "the state appears to be a transcendental subject that orders the political world… in reality it is the effect of that political world" (6).

The essence of the state—its stateness—therefore refers to a set of effects, practices, material, and phenomena through which a polity can structure social (or socio-material) relations rather than relying on the tautology of stateness defined as the essential characteristics of a state. Painter (2006) traces the development of theories of the state "from state-as-object to stateness-as-effect" via a discussion of the state in its Weberian institutional definition; in terms of its functions, mechanisms, or spatiality; Giddens's (1981) territorial definition; and as an ideological formal-object before arriving at a synthesis of Mitchell's state as "a set of structural effects" and Poulantzas' "institutional materiality" of the state, or its institutional capacity and mechanisms for statization. By statization, Painter means "the intensification of the symbolic

presence of the state across all kinds of social practices and relations" (755-9), closely related to Foucauldian notions of governmentality (Foucault 2003). In other words, a state is an assemblage of social-material-political effects with the institutional means of inserting itself—symbolically, materially, ideologically—into (this is termed "recoding" by DeLanda [2006]), and thereby ordering, any number of social relations in its relational network. Examining states as effects in the frameworks of prosaics and assemblage theory highlights the "openness, porosity, heterogeneity, fallibility, unevenness, and creativity of state practices" (Painter 2006: 770) on the one hand, and an erosion of the state-nonstate binary on the other: "Instead of ruling certain states 'in' and other polities 'out,' we can begin to think of *all* polities as exhibiting certain qualities associated with stateness, while lacking others" (Dittmer 2017: 7).

Such a conceptualization is especially useful in tracing how microscaled practices affect the macro: if a state is a particular kind of assemblage existing or produced at a particular scale, then the relations among its constitutive parts—actors, both human and nonhuman, materials, forces—inform and are informed by the prosaic, local, micro processes and assemblages that do the work of re/de/territorializing state assemblages. In other words, stately practices and qualities work and are expressed at localities within the state that simultaneously produce the state itself. Extrapolating this concept more broadly, the materials and actors at work in microscales produce effects that act upon their local contexts and in turn affect the material and relational conditions of emergence of macro processes, apparatuses, and forces. Stateness, or those materials, processes, and effects that are indicative of state power, emerges from the relations among its constituent parts and territorializes those parts and relations into a coherent assemblage—a state. Whether a polity is a state from this orientation is a question of a difference of degree of stateness rather than of kind. The emphasis shifts analysis from the state as an object to the

sociomaterial processes that contribute to or detract from a polity's stateness. In thinking of states as assemblages, this approach provides a solution to the problem of centering of the state in geopolitical inquiry by dismantling the category; however, it does not eliminate the concept of the state altogether. Not only do states discursively reify themselves by mutual recognition as such, but the concept of the state has become a kind of "common sense" in popular imaginations, politics, and histories. Nevertheless, the ontological shift from thinking of states as a category to states as territorializations of sociomaterial processes that produce stateness opens spaces for geopolitical analysis that is not bound to one scale and does not necessarily rely on preconceived notions of where geopolitics happens.

This chapter demonstrates that while Slavutych may not possess the same degree of stateness as Ukraine, for example, those same processes that produce many of the same qualities of stateness in Slavutych allow for its analysis as a state in the ways described above: in its prosaics, in its translocalities, in its statizations and governmentalities, in its structuring effects on the sociomaterial relations that constitute it, in its collective will, in its affective orientations, in its re/de/territorializations, in its interactions with other stately polities. This is a deliberate taking in a different direction of Dittmer's (2017) work discussed above on the affective relations among the microscaled and the macroscaled with the scale of the state is situated between the micro and macro. Whereas he turned his attention on foreign policy and diplomatic interstate (in the popular sense of "state") relations, this chapter focuses on the production of Slavutych's stateness through its constitutive local events and phenomena and how the Slavutych state assemblage (or actors within it) activated its various constitutive elements in its interactions with other states to achieve various particular results. My assertion is not that Slavutych *is* a state (recategorization) or that state-like polities can be analyzed as states (decentering the state);

rather, it is a reconceptualization of what a state is without eliminating the ways in which we can understand what states *do*, such as in their governance or geopolitical activities. Approaching this analysis of Slavutych and its leveraging of its local technoscientific expertise in a number of geopolitical configurations in this manner bridges the conceptual gap between the disavowal of the state in political geography at large, including critical geopolitics' emphasis on decentering the state specifically, and the looming (omni-?) presence of states, state technologies, and statizations in political arenas at any scale. From this perspective, this chapter will demonstrate that this approach expands the vistas of political geography for novel research and can serve as a basis for a critical urban geopolitics within the field.

Figure 7. Satellite image of Slavutych from Google Maps.

Figure 8. Model of the plan of Slavutych in the Slavutych City Museum. Taken by the author.

A history of Slavutych

The scope, severity, and material reality of the 1986 accident at the Chornobyl Nuclear Power Plant necessitated, among many things, a large-scale evacuation of hundreds of thousands of people from the most highly-contaminated areas in Polissya, a region in north-central Ukraine and southern Belarus. In addition to hundreds of villages and small towns, the city of Pripyat, the nuclear monotown—a type of Soviet city constructed around a singular industry—built to house and service the workers at the ChNPP, had to be abandoned even as the three other working reactors at the plant continued operation. As such, authorities bussed in essential plant personnel along with the firefighters, police, military, and volunteers taking part in the liquidation efforts while recognizing that such an arrangement was not suitable in the long term. By 2 October 1986, Soviet and Ukrainian officials had decided on the construction of a replacement city for Pripyat 50 kilometers to the east, on the other side of the Dnipro River. The development and construction of the city were overseen and financed by a bevy of Soviet ministries with the

participation of eight Soviet republics: it was indeed an all-Union project. In the years since its opening in 1988 however, Slavutych, named after an old word for the Dnipro River, has weathered major, transformative events that have required a fundamental shift in the city's identity and in the identity of its residents. The argument presented here is that Slavutych has heretofore been able to successfully reinvent itself, simultaneously diversifying its economy away from dependency on the plant and embracing the legacy of the Chornobyl disaster not as tragedy but as opportunity, largely on its ability to leverage local experience and expertise across networks of actors, including international organizations, state governments, multinational corporations, and sympathetic individuals, in effect "doing" geopolitics to save itself.

It is clear from the documentary and archival evidence that Slavutych was, from the beginning, designed to be an international city. Part of this consideration was the function of the city as a nuclear monotown and as such reflected both the Soviet Union's global position as a nuclear leader and originator and major proponent of the Peaceful Atom ideology (discussed in the introduction) and the centralized but all-Union nature of the Soviet nuclear program. The USSR had built nuclear power plants in Russia, Ukraine, Armenia, and Lithuania, used sites in Siberia, Kyrgyzstan, Uzbekistan, and Kazakhstan (among others) for mining, fuel enrichment, and spent fuel storage, and recruited nuclear engineers from all of the member republics to be trained in Moscow. The greater aspect of Slavutych's internationality however was the form of the city, in its planning and material construction. Two Soviet ministries—the Ministry of Energy and the Ministry of Atomic Energy, both reporting to the Central Committee of the Communist Party of the USSR and to the Ukrainian SSR's government—had general oversight for the construction of the city but employed builders from the Russian, Ukrainian, Estonian, Latvian, Lithuanian, Georgian, Armenian, and Azerbaijani SSRs (Zasedaniya 1986). Each

nationality was tasked with the construction of its own quarter within the city that was to reflect aspects of its national heritage to exhibit the multiethnicity of the Soviet Union. Furthermore, the direct rail line that transports ChNPP workers from Slavutych to the plant cuts through the southernmost part of Belarus.

The city's design also served as a showcase of Soviet urban planning, in many ways functioning as the pinnacle of the field as Slavutych would be the last city built in the Soviet Union and is in fact, to this day the youngest city in Europe. Though the city is small, with a planned population of 25,000, there is a significant emphasis on physical activity, education, and public participation evident in the layout of the city. Additionally, city planners prioritized green space: official documents show that only the trees necessary to be cleared for constructing roads and buildings should be removed, resulting in, for example, a grove of old-growth trees in Slavutych's central park (Zasedaniya 1986). Taken as a whole, Slavutych's design demonstrated a conspicuous effort to territorialize a constellation of Soviet political agendas (socialist utopia, the peaceful atom, brotherhood of nations, etc.) in an era where many fundamental givens of the Soviet system were being challenged by Gorbachev's *glasnost* and *perestroika* initiatives.

In many ways however, the construction of Slavutych was anomalous in this socio-historical context. It was at once a revisiting of the Soviet urban planning debates of the 1920s, a refutation of both Stalinist and post-Stalinist urban theory, and dissimilar in form from other small cities built across the Soviet Union in the late stages of what French (1995) calls the third phase of Soviet urban development. Early urban development in the USSR, from the Revolution to Stalin's 1930 clampdown, was characterized as a vigorous debate over building the "City of Socialist Man," where the ideals of socialism would be integral parts of city planning. Ebenezer Howard's concept of the Garden City was perhaps the most influential component of Soviet

planning, its emphasis "on space and greenery for psychological health was to become common ground to all the participants in the 1920s debates and to remain so in Soviet planning thereafter" (31). However, the core idea of this period—that urban planning and architecture could bring about socialist practices and attitudes—was explicitly rejected by Stalin. "It is highly unlikely that [Stalin] had the faintest belief in the ability of architecture and planning to achieve social engineering; after all, one could not unreasonably argue that such a belief is a version of environmental determinism, anathema to Marxism-Leninism.... The ideas of the City of Socialist Man were rejected as Utopian; the cities of the USSR, it was averred, were socialist by virtue of their take-over by the Communist Party" (42). In contrast to this earliest period, urban planning under Stalin was sidelined for the needs of the state, especially rapid industrialization, that paid only lip service to ideas of urban quality of life.

The third phase of Soviet urban development is most recognizable for its material sameness: this is the era of mass-produced prefabricated housing, as typified by the *khrushchyovka*, developed in the 1960s during the premiership of Nikita Khrushchev. These prefabricated apartment blocks were useful in alleviating the housing shortage crisis of Soviet hyperurbanization, yet "The centralized nature of the Soviet command economy resulted in a high degree of uniformity between the cities of the country… From the Baltic to the Pacific and from the Arctic Ocean to the Caspian Sea, differences in the appearance of Soviet cities reflect different periods of construction rather than different areas" (123). Only at the end of third phase, under Gorbachev's premiership, were high-rise apartment buildings making a return and were desires for higher standards of living seriously considered. According to Soviet census data, between 1926 and 1989, 4291 new towns and settlements of town type, or PGTs (the difference between which was a matter of population), had been built across the USSR, the majority of

which were constructed after the Second World War. The result here is that by the end of the Soviet Union, not only was the country heavily urbanized, in virtually all but the pre-revolutionary centers of older cities, but that Soviet urban life was practically identical in terms of the material built environment. With this context in mind, Slavutych becomes something distinct, both a relic from the past in its conscious resurrecting of the oldest ideas in Soviet urban planning traditions and an indication towards the future: a synthesis of high technology in the form of nuclear energy and the radiant future of the Socialist Man.

The construction of the city also required special administrative attention. Because of the nature of its purpose and that the ChNPP primarily served the energy needs of the Kyiv oblast and Kyiv city, Ukrainian authorities established Slavutych as part of the Kyiv oblast administrative structure despite its physical location within the Chernihiv oblast. Furthermore, the city's internal governing structure underwent a number of changes in the first few years of its existence. Initially, Slavutych city leadership was selected by the Kyiv Oblast Executive Committee, following the Soviet model. In 1990, the Ukrainian law "On local councils" (Verkhovna Rada 1990; this law expired in 1997 and was replaced by Verkhovna Rada 1997, "On local self-government") came into effect, restructuring the purpose, scope, and rules for city, village, and territorial councils. Because of this law, Volodymyr Udovychenko, formerly the first deputy chairman for capital construction on the Slavutych City Executive Committee, became head of the city council. Udovychenko was elected mayor for the first time in 1994 and was re-elected four times after that; he led the city for 25 years, until he stepped down in 2015. His figure looms large over the history and development of the city and he has been a major driving force in forging virtually all of Slavutych's international connections.

As a Soviet monotown, Slavutych enjoyed a shared heritage with others of its kind—direct involvement from central Soviet organs, a degree of prestige (especially for nuclear cities, or *atomgrads*), and a higher average standard of living (Brown 2013). With the collapse of the Soviet Union and its centrally planned economy in late 1991, the fate of these monotowns was thrown into question. After the collapse of the Soviet Union, Slavutych could no longer rely on the automatic forms of assistance, dependence, and integration to which it was accustomed. With Ukrainian independence came an immediate stoppage of material, scientific, organizational, and financial support from Moscow to the ChNPP, the lifeblood of Slavutych's economy as a monotown—it was a fundamental rupture of the nested hierarchy upon which the new city relied. For Slavutych however, Ukrainian independence brought no immediate *material* changes: the plant was still running. Rather than national political changes, the major threats to the continued operation of the ChNPP in this period came from technoscientific issues from within the plant, expert technical opinion, scientific bodies, and the state security service. A fire in the plant on 11 October 1991, caused by a short circuit in the electrical system of turbine number 4, is symptomatic of the politics of technoscientific information that play such a key role in the unfolding narrative(s) of Chornobyl. According to a report filed by Ukrainian KGB head Mykola Holushko (1991), citing experts consulted as part of the investigation, the fire was a result of a faulty cable that was probably damaged during the installation of the turbines in 1977 but had no negative effect until the short circuit. He then goes on to explain that the "serious design faults" in RBMK reactors remain serious hazards for the safe operation of the remaining reactors at ChNPP and that the reactor's designer and the scientific supervisor at the Kurchatov Institute of Nuclear Energy "could not justify safe reactor operation in all possible modes, including emergency ones." While the reactors had to remain operational, there was "no guarantee of

continued accident-free operation of the station." There was no technoscientific fix but one—speeding up the process for the early decommissioning of the plant, an option that had been on the table in the immediate aftermath of the 1986 accident. Such a decision could not be taken lightly, however. An early decommissioning of ChNPP would mean that Kyiv's energy needs would have to be met by other means and, for the city of Slavutych, mass unemployment, economic devastation, and an uncertain future for all its residents.

This anxiety about the future was baked into the foundation of Slavutych. City leaders from the beginning endeavored to establish an identity for Slavutych and its residents that would hopefully be resilient enough to weather even something as catastrophic as early decommissioning. In this initial period of the city's history, this largely took the form of fostering Ukrainian identity, even before independence, in the adoption of Ukrainian-only instruction in the city's schools, increased investment into education, and embracing transparency and openness in city administrative functions (Udovychenko interview 2016). Knowing that the city's economy would be fine as long as the ChNPP was operational, however, meant that it was in the city's interest that the plant remained *safely* operational for as long as possible. Nevertheless, when a timeline for the plant's early decommissioning was agreed upon, Slavutychany had no option but to make the best of the situation.

In 1995, after a series of meetings with the European Commission and the G7 countries (Japan, the United States, Germany, Italy, the United Kingdom, France, and Canada), Ukrainian President Leonid Kuchma attested that Ukraine would close the ChNPP by 2000. The resulting Memorandum of Understanding between the G7 and Ukraine that same year outlined the basics of a timeline for the plant closure, programs for mitigating the social and economic issues resulting from an early decommissioning, and an allotment of over $2.3 billion in international

funding to cover power sector restructuring, energy investment, nuclear safety reform and plant decommissioning, and social impact planning (Parliamentary Assembly 2001: appendix IV). This large sum—almost 5% of Ukraine's 1995 GDP—along with the language at the beginning of the document acknowledging that the early decommissioning of the plant would be costly and would possibly result in major economic and social consequences for Ukraine demonstrated the importance of the plant's closure to the international community. The assurances of the assistance of the G7 went a long way in overcoming the Ukrainian government's reluctance to implement a program of early decommissioning, especially as Kuchma's administration was at this time facing a budget crisis (Kuzio 1997).

That the global desire to close ChNPP was backed up by such a large financial commitment also gave the Ukrainian government the upper hand in negotiating the early decommissioning. For example, as outlined in the 1995 Memorandum, the energy sector restructuring plan Ukraine proposed was to complete two partially-constructed nuclear reactors in the country, reactor 2 at the Khmelnitsky NPP and reactor 4 at the Rivne NPP (hereafter K2R4). This solution stands out as seemingly at odds with the rest of the document: if the G7 was as concerned about issues of nuclear safety as this Memorandum implies, and the stated goals in the Memorandum were to develop "an efficient sustainable, market-oriented energy sector well-suited to Ukraine's needs" (Parliamentary Assembly 2001: appendix IV), building K2R4 is an incongruous choice. In fact, two years later, an economic assessment of the K2R4 project found it to be terribly ill-advised, citing decreased energy demand "so reduced by the highly depressed economic situation that there is a large capacity surplus which is likely to last until at least 2010," lack of confidence in K2R4's ability to generate enough revenue to pay back the loans to build them, and Ukraine's poor, wasteful energy infrastructure (Parliamentary

Assembly 2001: appendix V). Despite all this, Ukraine and the G7 could not agree on alternatives and as a result, K2R4 was eventually funded, completed, and operationalized; the two reactors came online in 2004.

The K2R4 saga was demonstrative of the tense negotiation atmosphere between Ukraine and the G7 (and by extension, the European Bank for Reconstruction and Development that financed the decommissioning processes of the ChNPP). On the one hand, Kuchma and other Ukrainian authorities argued that finishing K2R4 would be the easiest and most economically feasible option since the country, in an economic recession, lacked the resources to sufficiently restructure its energy sector and industry. On the other hand, the EBRD and G7 were wary of loaning and granting billions of dollars to a country where there was virtually no guarantee of repayment or returns on investment and that seemed unwilling or unable to implement economic and social reforms to meet European standards. Nevertheless, the G7 and a number of international organizations, like the UN and IAEA, were committed to the early decommissioning of the ChNPP so Ukraine had the upper hand. This led to situations where Ukrainian authorities were able to secure more and more money from its European partners as cost estimates continued to climb, culminating in a situation where Kuchma, after securing an additional $80 million in funding from the United States, finally announced in June 2000 that Chornobyl would close on 15 December of that year (Associated Press 2000).

In this material and (geo)political context, Slavutych faced essentially a hard deadline on a transition out of being a monotown and into having a diverse economic foundation for the city. In a city of about 26 thousand people, where 35% of the population was younger than 16, another third (almost the entire male workforce) were employed at ChNPP, and 22,000 residents received Chornobyl benefits, losing the plant would have had a devastating effect (Slavutych

1997: 80-1). By the mid-1990s, many small and single-industry towns across the former Soviet Union had faced similar issues, and as a result many of these places had experienced high unemployment and rapid depopulation (French 1995: 127-8). In order to avert an economic and demographic catastrophe, Slavutych city leaders, led by Udovychenko, proposed and implemented numerous actions designed to soften the blow of suddenly having six thousand unemployed highly-skilled workers. These actions explicitly combined the local expertise of Slavutychany gained from dealing with, on a day-to-day basis, the aftermath of the Chornobyl disaster. As discussed in a previous chapter, expertise itself is a triangulation of technoscientific knowledge, relational authority, and political usefulness, and from 1995 Slavutych began in earnest to leverage the expertise of its residents in forging connections with state and international institutions.

One such effort was the opening of the Chornobyl Center for Nuclear Safety, Radioactive Waste, and Radioecology on the ten-year anniversary of the accident. Though the Chornobyl Center was initially operating out of Kyiv, by 1997 it had moved to Slavutych. The center contains a number of laboratories, including the International Radioecology Laboratory, a Ukraine-US joint venture, and as such has become a major international site for studying radioecology, radiobiology, ChNPP decommissioning activities, safe operation of WWER reactors, and radioactive waste management. In a 2001 assessment from the EU Parliamentary Assembly on continued European financing of the ongoing efforts to mitigate the long-term consequences of Chornobyl, the establishment of the Chornobyl Center is one of the very few positive remarks in the whole document (7).

In 1997 the Slavutych City Council also published its first Action Plan with support from USAID and the European Commission's Technical Assistance to the Commonwealth of

Independent States (TACIS) program (since replaced by the Instrument for Nuclear Safety Cooperation in 2006). The Action Plan (Slavutych 1997) proposed four major recommendations for the diversification of Slavutych's economy: to establish an organizational foundation for socio-economic development, to create a financial base for the city, to create a Slavutych entrepreneurial development program, and to develop human resources services within the city. Two central features of the specific actions proposed in these general recommendations are the expanded role of local government, especially into business and finance, and intentional international cooperation initiatives:

- Build new business and work places in the city
- Form an agency for business development, the Association of Goods and Services Suppliers to MOU Projects
- Work more closely with contacts in the Chernihiv oblast
- Ensure maximum participation of ChNPP workers in city initiatives
- Create a new tax plan
- Become more energy-efficient
- Establish a mechanism to guarantee investments for economic diversification projects
- Establish a mechanism to attract foreign investment and international cooperation
- Create a city development fund
- Transfer assets from the ChNPP to the city
- Establish an industrial park, a technopark, and an incubator for local small and medium businesses
- Provide counseling and retraining services for ChNPP employees
- Expand the health and medical facilities in the city

In addition to the measures proposed in the Action Plan, the Slavutych City Council was also able to get the national government to establish a Special Economic Zone in Slavutych to provide tax incentives for business growth in the city. Although this scattershot approach to encouraging economic diversification has yielded limited results in terms of spurring economic growth though taken collectively, these activities certainly softened the blow of the plant's closure. After the plant closed on 15 December 2000, in the following months approximately

5800 Slavutych ChNPP employees lost their jobs, and many people moved out of the city. However, largely because of the proactive efforts of city leadership and residents, the situation in the city after the plant's closing was not so dire: unemployment, in 2000 as high as 6.05%, dropped to less than 2% by 2007; average income for Slavutychany has increased every year since 2000 at a rate outpacing the Kyiv oblast as a whole; and as a cost-saving initiative, energy consumption and expenditure in the city has substantially decreased since 2000 (Slavutych 2013).

Slavutychany were also enticed to not give up on the city after the plant's closing in two substantial ways. The first was that the mayor, Udovychenko, had successfully heightened the interconnectedness of the city and its residents (in other words, developed processes of statization for Slavutych). The Chornobyl disaster was already a huge element of daily life for everyone in Slavutych—it was, after all, the reason the city existed at all. Reconceptualizing the Chornobyl disaster as a possible source to be drawn upon for urban regeneration rather than just a tragedy, workplace, or fact of life made Slavutych's urban regeneration personal.

Secondly, the mayor had convinced Slavutychany to trust him. He developed that trust by developing city institutions, like those listed above, involving as many people as possible in various committees and initiatives, and by personally forging connections with other cities, governments, organizations, and businesses. A descriptive example of this is Udovychenko's position as Ukraine's delegate to the Congress of Local and Regional Authorities of the Council of Europe from 1994 to 2015 and as founder and president of the Mayor's Club.

These two factors reinforced each other, and so while it is fair to say, as does the current mayor, Yuriy Fomichev, that, "like him or not, without Volodymyr Petrovych [Udovychenko] there would be no Slavutych today" (Fomichev interview 2016), so is the corollary true, that

without broad public participation in city administrative policies and practices, there would be no Slavutych today. From this perspective, seeing Slavutych as an assemblage is straightforward. The capacities of residents, leaders, physical space, material resources, lived experience, and scientific expertise that make up the city are continually reconfiguring the city. This is not just a discursive construction—it involves the material products of institutions, people, money, and policies—and the constant reconfiguring and reterritorialization of Slavutych expresses the city's desire to be more, its potential to "produce new things, new life, and new ways of being in the world" (Dittmer 2017: 10). This productive potential of Slavutych is best demonstrated in its forging connections with other state-like entities and international organizations.

Connections and disconnections

Much of Slavutych's success in transitioning from a Soviet monotown into a thriving 21st-century city can be attributed to productions and manifestations of its stateness. The local and global processes that have shaped the development of Slavutych are tightly interwoven: the city's leaders and residents have developed these ties in a number of ways, all of which involve, to varying degrees, developing and deploying local experience, knowledge, and expertise along local-to-global networks of their own invention. Slavutych's localism, both as a critical response to processes of globalization and as a deliberate emphasis on diffuse leadership, sustainability, local identity, and community self-reliance, is rooted in interdependence. The very existence of the city itself is a result of global, national, scientific, and intergovernmental processes; rather than spurn its global provenance, Slavutych has embraced it and endeavored to use it to the city's benefit.

Perhaps the most obvious physical manifestation of Slavutych's local-to-global connections is the New Safe Confinement (NSC) object for reactor 4 at the ChNPP. The NSC is

designed to last for 100 years, protecting the ruined reactor housing and crumbling Shelter object (also called the sarcophagus) that was built in the months immediately after the accident. By the time it was finally installed in November 2016, it was decades late and billions of dollars over budget—archival records from the Kurchatov Institute of Atomic Energy (Usatyy 1988) and the KGB (Shramko 1988a, b; Holushko 1988a, b) show that there were issues with the Shelter object as early as 1988 and would need to be replaced far sooner than before the end of its 30-year lifespan. By 1992, the Verkhovna Rada was holding design competitions for a replacement for the Shelter object (Verkhovna Rada 1992).

Funding for the NSC began in 1997 when the EBRD set up the International Chernobyl Shelter Fund and solicited contributions from Ukraine, the G7, and the European Commission with an initial completion date set for 2005. The winning design was a metal arch, 108 meters tall, 162 meters long, and spanning 257 meters, that was built on rail tracks adjacent to reactor 4 so when completed, it would slide over the entire reactor housing, completely covering the reactor and the old Shelter object. After multiple rounds of bidding where all offers were rejected, it was not until 2007 that Novarka, a multinational construction consortium headquartered in France, won the €430 million contract to build the New Safe Confinement object with a new completion date in 2012. Novarka opened an office in Slavutych, which served as their local headquarters, down the block from the administration offices of the ChNPP. Construction was held up by a number of factors, including a successful stabilization of the Shelter object, and in November 2014 the EBRD announced the €2.15 billion fund was short €615 million, soliciting further funds from the G7 and other countries.

For Slavutych, having the Novarka headquarters was key. With a final completion date set in late 2017, Novarka will have spent a decade in Slavutych. The daily contact of Novarka

employees with Slavutychany and the long-term operation of a multinational corporation in the city reinforces the narrative of Slavutych as an international city, which is then used by the city to promote further international ties, especially when trying to attract foreign investments.

One document of Slavutych-international organization collaboration is Resolution 215 (Congress 2006), issued by the Congress of Local and Regional Authorities of the Council of Europe. In it, the Congress thanks Udovychenko for hosting an international conference in Slavutych commemorating the 20th anniversary of the Chornobyl disaster to discuss how local and regional leaders and governments deal with disasters. The Congress also urges "local and regional authorities of the member states of the Council of Europe to put into practice in their actions and policies the principles presented in the Slavutych Appeal" (1). The Slavutych Appeal, printed in the appendix to Resolution 215, was the product of this conference. It outlines five principles intended as guidelines for local governance in area where nuclear safety is a concern, though Udovychenko indicates that nuclear safety is a global concern (Udovychenko interview 2016). The five principles in the Appeal are that the nuclear industry must be a government responsibility if any global nuclear safety is to be attained; local governments must take an active, frontline role in protecting communities and the environment from nuclear disasters; because nuclear disasters know no borders, nuclear safety must necessarily be realized through cross-border cooperation; the nuclear industry must operate with maximum transparency; and that the public, locally, nationally, regionally, and globally, must be involved in major decision making processes regarding nuclear energy (1-2).

The Slavutych Appeal is symptomatic of Udovychenko's, and Slavutych's, experiences and orientations to the ongoing Chornobyl disaster. Each of these elements also demonstrates expressions of Slavutych's stateness. For example, the first principle states that despite

embracing market principles rather wholeheartedly, the nuclear industry should not be privatized but should be regulated by governments, including local and regional ones. The second discusses how local and regional authorities should take the lead in local and regional issues, advocating a more decentralized governance structure. The third states that in the event of a disaster, local and/or regional governments should treat each other as equal partners "irrespective of the state to which they belong" (2), explicitly advocating the kind of local-to-global networks Slavutych had been cultivating. The final two points, on transparency and public involvement, can be seen as direct refutations of Soviet nuclear policies, further political decentralization in elevating the importance of the local, and an expansion of Udovychenko's emphasis on maximal public involvement in governance, which I will explicate in the next section. At every point, these principles are designed to reconfigure the relationships between local governments, states, and international organizations where entities at each scale are empowered to collaborate with any other local, state, or international entity insofar as it furthers a common goal, in this case global nuclear safety. This document therefore sees global effects not as "simply the aggregate of various locals" (Dittmer 2017: 5) but as emergent products, assemblages, of actions and relations at local, and even micro-, such as at this three-day international conference, scales.

This document, and the Slavutych Appeal in particular, can also be read as a material and discursive encapsulation of Slavutych-style governance as a model. In fact, Udovychenko has often stated (Udovychenko interview 2016; Udovychenko speech 2016) that not only is Slavutych unique, it should also be help up as an example to all kinds of different cities, be they small, in post-disaster areas, post-Soviet, European, or any combination of those. By the time the Congress of Local and Regional Authorities produced Resolution 215 in 2006, the governing principles contained therein had already been daily practice in Slavutych for almost two decades.

In conversation, Udovychenko is proud of how he shaped how Slavutych functions, which can largely be characterized as maximizing public participation in local administrative decisions. Of course, this heightened integration also expressed the city's statization in the lives of its residents. Regularly-occurring city governance practices—to name a few: the weekly town hall sessions where residents can voice concerns directly to city administrators, the involvement of the Youth Council in every session of the city council, and the summaries of every city council session, complete with pictures and videos, being made available on the city's Facebook page—highlight the prosaic interconnectedness of Slavutych and its residents. The city exercises its stateness and increases its symbolic and institutional presence in the lives of the people that live there, and in return, Slavutychany—far from a homogenous lot—feel a heightened sense of ownership in the direction of the city's development.

Grassroots actions

Udovychenko and other civic leaders in the city, including the current mayor Yurii Fomichev, a real estate developer whose mayoral campaign was endorsed by Udovychenko, have long touted Slavutych's uniqueness. This narrative has been reinforced in the city's dealings with the Ukrainian central government, supranational organizations such as those touched on above, and in its online branding efforts. Central to the narrative of Slavutych as a unique space are three major factors: its high level of technological expertise afforded by its ties to the ChNPP, its youth and young adults, and a commitment to experimenting with democratic forms and institutions. Each of these three factors has been mobilized in various ways, often directly and explicitly in comparison to other cities, regions, and states, tying Slavutych's uniqueness to its stateness.

In the 1997 Action Plan, one of the city's stated goals was to establish a technopark and a small-business incubator to attract foreign corporations and homegrown startup companies. Though only implied in the 1997 Action Plan yet stated outright since then, Slavutych was most interested in developing a tech sector: to hear Udovychenko tell it, he envisioned Slavutych as Ukraine's future Silicon Valley. Work on the technopark did not begin in earnest until after the closing of the ChNPP. It was organized in collaboration with the National University of Ukraine Igor Sikorsky Kyiv Polytechnic Institute (KPI) to essentially be an offshoot branch of KPI's Science Park, which is an "integration of science, business, and education" (2008). The educational aspect of this arrangement is important also: Slavutych has an extremely large youth population and very highly-ranked schools, but with no options for higher education and few new jobs in the tech sector, or really any sector, in the city, the technopark would in theory allow and encourage young professional Slavutychany to remain in the city. The in-the-works initial project for the technopark is the construction of a research reactor to replace the aging one at the Institute for Nuclear Research (INR) of the National Academy of Sciences. The research reactor, built in 1960 with a proposed shutdown initially scheduled for 2015, will remain in operation until 2023 (Kyiv Institute of Nuclear Research 2014). However, as early as 2007, a number of researchers at the INR submitted a concept document to the IAEA for the construction of a replacement research reactor (Vishnevsky et al. 2007). This concept states that the new reactor will be an integral part of Ukraine's energy industry both for its research-educational capabilities and in its productive capacity, that the research reactor would be "the core installation of a new national nuclear centre" that would include other reactors, laboratories, offices, and a hospital, and that Slavutych was the front-runner in terms of site selection. This document also outlines a number of legislative hurdles to overcome to realize the project, which must ultimately be

approved by the Verkhovna Rada (2005). As of yet, construction has not yet begun on the research reactor in Slavutych.

The focus on the youth of the city has been a priority from the beginning. Like Pripyat, Slavutych would be inhabited primarily by young professionals working at ChNPP and their families. I spoke with one woman, Olha, who was the first (and for a while, only) ninth-grade student in Slavutych when her family was moved into the city in 1988. She told me that she "loved growing up here so much, of course I wanted to raise my own children here" (O. Korchak interview). Her oldest child recently graduated from college and has also returned to Slavutych to work as a press officer for ChNPP; he is also currently active in bolstering the city's online presence, including having lead a branding campaign to select a logo and slogan for Slavutych, seen below.

Figure 9. Slavutych: city of new ideas. City of Slavutych 2017. http://e-slavutich.gov.ua/SitePages/home.aspx

Olha's sentiment that Slavutych is a good place to raise children is reflected in the demographics of the city, especially in contrast to population trends in Ukraine broadly. In 2015, Slavutych City Council produced an "Investing Passport" to sell the idea of the city. Within that brochure, one of the advertised selling points is that in the city of 25,000, seven thousand of its residents are under 18 and the median age is 32. They city council even lists the rate of natural

increase per 1000 people in the city at 4 per year (7). This statistic is almost the inverse of the rest of Ukraine: according to the database of the State Statistics Service of Ukraine, the estimated 2016 rate of natural increase (RNI) for the country was -4.3; there has not been a positive RNI for Ukraine since 1990. The city has consciously invested in and promoted the abundance of youth in the city, from its commitment to high-quality education to the foundation and incorporation of the Youth Council within the city administrative apparatus. The Youth Council sends delegates to city council meetings and the city cannot decide issues that pertain to young Slavutychany without the consultation and agreement of the Youth Council.

Most recently, one of the most significant youth-led, grassroots activities both within and for the benefit of Slavutych has been the development of the Festival of Film and Urbanism «86», held on the weekend closest to the anniversary of the Chornobyl explosion. Founded by Nadia Parfan and Illia Gladshtein in 2012, 86 began as a curatorial initiative to highlight and encourage small-town urban culture in Ukraine, and has expanded to encompass an international film festival, a Ukrainian short-film contest called MYSTREETFILMS, an independent documentary film distribution company, the Slavutych Film Commission, and a local art initiative called Made in Slavutych. The annual festival brings in hundreds of international participants and attracts hundreds more festival goers from within Ukraine that lodge and spend money within the city, which in turns attracts vendors from Kyiv and Chernihiv (the two closest major cities). The group's mission is most concerned with access to and production of culture in smaller cities and the relationship between culture and urban spaces, but its identity and efforts are very much tied to the legacies of Chornobyl. The choice to base 86 in Slavutych and to grow within and from that space was deliberate: one of 86's defining characteristics is in fact its take on the Chornobyl disaster, consciously choosing to take that event and its aftermath not only as

tragedy, but as an opportunity for renaissance on an urban level with Slavutych, on a national-cultural level, and on a global level, especially in dealing with shared issues in post-industrial cities around the world. The film festival has become the primary cultural connector for Slavutych, working parallel to the city's other initiatives of local-to-global cooperation discussed above, yet is also a distillation of the processes by which Slavutych has endeavored to reinvent itself. To wit, there is a conscious mining of local history, expertise, and experience for the purposes of economic diversification; an endorsement of the city's narrative as both a post-disaster urban success story and a unique space within Ukraine; a uniquely Ukrainian space, especially in MYSTREETFILMS, which showcases short films made all over Ukraine, forging important connections between Slavutych and the rest of the country; and an understanding and promotion of the city as a global actor in its own right.

Critical potential

Distance and relation are consciously mediated in Slavutych. It is administratively a part of Kyiv oblast, but not geographically. It is forever tied to ChNPP in its history and in the occupations of its residents, but it is 50 km away by a railway that crosses international borders. It is undeniably Ukrainian, but also proud of how it is differentiated from national trends and material realities. This conscious mediation makes it easier to conceive of Slavutych in assemblage terms: it is a whole, but not a totality; it is a component part of other assemblage-entities—Ukraine, the Chornobyl disaster—yet demands to be considered on its own and acts according to its own will. While it is not my argument that every assemblage has state-like qualities, by investigating Slavutych as an assemblage, its statizations and stateness are revealed as emergent social processes that help to (re)produce both Slavutych itself and the other assemblages it constitutes. In treating Slavutych, or any city, organization, or institution from the

microscaled to the macro that expresses stately qualities, as if it were a state, the methodological tools of political geography and related disciplines for analyzing states and state actions become available. The flatter ontology of what is considered a state (or state-like pol/ent-ity) erodes the notion of "The State" as a discrete, more-or-less neatly bounded category of analysis and further exposes the heterogeneous complexity of the social world and the political relations among participants in it.

The most pressing question for Slavutych now that it seems to have successfully weathered the transition from a monotown to having a diversified economic base is whether the city's development can serve as a model for other post-disaster cities. While some aspects of Slavutych are unique—building new cities in the aftermath of major disasters is not a trend—there are other cities that nevertheless must confront the lingering political and social effects of technogenic disasters. Taking an assemblage approach emphasizes the materials and actors working to continually produce Slavutych and shifts the focus from city-as-subject to a conceptualization of the city as an emergent process and effect of the relations and interactions of its component parts. Additionally, by taking seriously the prosaics of the city, the everyday practices that do the messy work of reterritorializing it, the city is revealed to be produced via multiple competing, or at least contemporaneous, contingencies; no city, or any assemblage for that matter, *is* but rather is always *becoming*. The flat ontology of assemblage too is useful for comparisons—I have argued in this chapter that Slavutych can be analyzed for its state-like qualities, its stateness, on the basis that it both is assembled by the same processes that states and supranational organizations are assembled and that Slavutych performs its stateness in the same prosaic ways that other state-like polities do. One avenue of potential further research building

off of this chapter is to compare the experiences, development, and actions of Slavutych to other polities dealing with the aftermath of major disasters.

Chapter 6. Conclusion: Processes and practices

In May 2016, I was in Slavutych for three days to attend the third Festival of Film and Urbanism «86». Much of the programming at the film festival was linked to Chornobyl in some way, including a virtual reality exhibit where you could explore some of the more "hot" areas of the Zone via drone footage; a performance by a singer-songwriter who self-identified as a stalker, embarking on illegal expeditions of the ruins of the Zone; and films that dealt with the legacy of nuclear power, nuclear material, and nuclear accidents. This festival was also the site of the Ukrainian premier of *Babushkas of Chernobyl* (2016), a documentary film directed by American filmmakers Anne Bogart and Holly Morris and written by Holly Morris. The film follows three self-settler (Ukrainian: самосели) women who returned to live in the Zone after being evacuated in 1986. *Babushkas* provides an introduction to the issues and hardships of living in the Zone, and targets a Western audience presumed to be largely unfamiliar with the details of the Chornobyl disaster (see Pickett 2017: 533). At its Ukrainian premier at 86, the audience had a split reaction that I was not really expecting. The majority of the audience were Ukrainians, and many of their responses to the film in the questions-and-answers session following the premiere were actively hostile to the filmmakers. They called out the directors and producers on stage for adventurism and hardly including any Ukrainian expert voices as talking heads or background contributors. One man, a former liquidator, expressed the offense he took at the film, accusing the filmmakers of descending onto his country, exploiting a major personal, national, and environmental tragedy for profit—none of which would be sent to Ukraine—and contributing little, if nothing, to solving any of the material problems that sufferers continue to bear.

This episode occurred towards the end of my Fulbright fellowship, and it has remained in the back of my mind as I worked on this dissertation. When thinking about the legacies and meanings of Chornobyl, a major world event, we also must interrogate who gets to craft those legacies, who they are for, and what purposes they serve. The effects of Chornobyl reverberate at the atomic level as well as at the level of the cellular, the individual, the family, the community, the urban, the ecological, the national, the continental, and the global. One of my aims with this dissertation was to bring forward some of these under-studied effects and how they co-construct political action and social processes, trying to engage as authentically and ethically as I could with Ukrainian sources. All research conducted by humans is infused with the biases of the researcher; there is no value-free knowledge or a "god trick of seeing everything from nowhere" (Haraway 1988: 581): the researcher is inevitably situated within the world he or she investigates. However, as Morwenna Griffiths (1998) states, "Bias comes not from having ethical and political positions—this is inevitable—but from not acknowledging them. Not only does such acknowledgment help to unmask any bias that is implicit in those views, but it helps to provide a way of responding critically and sensitively to the research" (133). As I crafted my research plan and engaged in the processes of knowledge production to write this dissertation, I made a point to do so in a way that would not cause further harm to those still suffering from the disaster, which I address in chapter 1, "Approaching Chornobyl."

The framework of critical knowledge production contains within it the opportunity, if not the tendency, for social justice-based research and scholar activism. As my coauthors and I explain in our paper on incorporating STS methods into geography fieldwork (Pickett, O'Lear, and Henkin 2020), critical knowledge production "repoliticizes science and technology by examining the construction of knowledge as integral to political processes rather than distinct

from them… Rather than take scientific interpretations as whole, complete, and directly available for public consumption, a coconstructivist STS approach enables an investigation into how elements of science are used within spatial and social settings to shape perceptions, discourse, and actions" (255). From this approach, investigations of knowledge production explicitly challenge or interrogate the politics of expertise, encourage exploration of nonhegemonic narratives and ontologies, and in prying open knowledge gaps, creates opportunities to disrupt Western academic norms, assumptions, and methods. Should geographers incorporate this framework into our research efforts, not only will we find a greater "potential to foster deeper and richer explanations of the interactions of people and things in various places and spaces" (261), but also do so responsibly and ethically.

STS and geography

The case studies presented in "Social monitoring" (chapter 4) and "Emergent stateness" (chapter 5) represent my efforts to develop the framework of critical knowledge production as one possible vehicle for bringing in methods, methodologies, ontologies, epistemologies, and other practicable insights from STS to geography. As I discussed in "Critical knowledge production" (chapter 3), the connective tissue between these disciplines exists, or as at least implied, in the aims and practices of critical geopolitics. Exploring the actors, relations, and contexts in the shaping of narratives of power, expertise, and truth fits nicely as a research agenda within the remit of critical geopolitics and its decentering of wholes, whether those wholes be states or Kissingerian "great men." My intervention here into the field of critical geopolitics is shifting the research focus from *discourse* to *process*, and from there assembling the constituent parts that produce (geo)political actions and narratives of power.

This focus on process, on the hows, whys, and sociomaterial relations of the production of political action and narratives of power, is my explicit bridge between the disciplines of geography and STS. From the starting point of STS, the framework of critical knowledge production pays attention to small details, accounts for fractionalities and messiness, and embraces the human and nonhuman contributing elements to processes. From a geographical perspective, this framework is also capable of explaining the causes and effects of political phenomena across spaces and places. As I state in chapter 3, my methodological intent with this dissertation is not to "solve" the problem of critical geopolitics' over-reliance on discourse (Dodds and Atkinson 2000) or the confusion around doing discourse analysis (Müller 2010), but rather to explore and expand methods in the discipline by approaching research in political geography from science and technology studies. Below I reflect on the usefulness of this approach and how I used critical knowledge production and assemblage in my case studies.

These case studies illustrate how an emphasis on process reveals the co-construction of technoscientific knowledge, political action, and narratives of power. In practice, undertaking this research agenda revealed levels of nuance, messiness, contradictions, and partialities that may otherwise have remained unexplored if approached from a more traditional methodology. While assembling and tracing the productive relations among the many parts of these processes—the evolution of a post-Chornobyl biopolitical regime and the urban geopolitics of a small city—certainly took more time and attention than other methods might have, I feel that this approach has achieved important results in my analyses as I discuss below. Neither of these cases purports to be a final word on or total explanation of their subjects, nor was that ever the goal. They do, however, demonstrate the applicability and malleability of using a framework of critical knowledge production for arriving at explanations in geography. In addition to my

findings themselves, doing this work of assembling and tracing, and the unforeseen and exciting revelations and connections inherent to the process, sparked numerous explorations of side roads, dead ends, and detours; delving into histories, structures, and organizations I otherwise may not have considered, and related questions to other phenomena.

Critical knowledge production, biopolitics, and the DSE

One of the original research questions I had at the very beginning of this research concerned the role of the Chornobyl disaster on the biopolitics of Ukraine. The shape of chapter 4 ("Social monitoring") however, and the focus on the Department of Social Expertise, did not emerge until I was in Ukraine on a Fulbright research fellowship. Every student Fulbrighter has a contact person at an academic institution to help guide and mentor them. Mine originally was Dr. Gulbarshin Chepurko, now the head of the DSE, but due to some administrative issues, I instead worked with Dr. Natalia Amelchenko at the National University of Kyiv Mohyla Academy. Because Dr. Chepurko had been willing to work with me, I reached out to her for a meeting, where I quickly realized that I wanted to explore the relationship between the work the DSE did with Chornobyl sufferers and biopolitics, which in turn led me to investigate the situation of the DSE itself within the structures and practices of academic research and knowledge production in Ukraine.

Far from being an anecdote about a happy accident, having that one point of contact within the National Academy of Sciences and working through the contexts and connections in which Dr Gulbarshin and her colleagues at the DSE operated exemplifies the "doing" of tracing assemblages. Working inductively opened up new avenues of research—from the work of one department in one institute in the National Academy to the historical development of the NASU, Chornobyl discussion and legislation in the Verkhovna Rada, budget documents, government

archives and the National Library, electoral politics, political scandals, protest movements, and surveying organizations, to name a few. Starting with the DSE as a site of knowledge production and tracing how it fit into broader assemblages that all worked to produce a biopolitical regime afforded me the opportunity follow leads and connections, some interesting and useful, some opaque and inaccessible, to understand the *processes* of biopolitics.

Part of this research involved understanding the methodology of the DSE in its social monitoring work with Chornobyl sufferers. There were two sides to this: the first is in the ways social monitoring takes lived experience and specific circumstances and turns them into actionable knowledge; the second is reflexive, in seeing how the DSE incorporated the products of the actions taken on the knowledge they produced in their social monitoring practices. Taken together, these two sides provided insight into the processes of biopolitics, the "rationalities, preferences, choices, restrictions, contingencies, demands, and constraints of the relations among the governing and the governed" (147, above).

As I demonstrate in that chapter, at the center of the relations among the governing and the governed in post-Chornobyl Ukraine is the chasm between the discursive and the material, or specifically in this case, the desire and legislated obligation to provide for Chornobyl sufferers and the inability to do so. I also explain how this chasm, of which the Chornobyltsi are symptomatic, has worked to erode public trust in political authority. The lingering vestiges of Soviet technocratic governance, of which the DSE's processes of knowledge production are a part, have proven insufficient to solve many of the pressing problems of Ukraine's "crisis society," such as infrastructure failings; issues of language, identity, and history; and the ongoing conflicts in Crimea and the Donbas, as I discuss in the chapter.

This chapter demonstrates how a framework of critical knowledge production, incorporating many elements of and insights from STS, has both broad and deep applicability to research in geography. The inductive qualities of this framework allow researchers to play and explore emergent threads and the encouraging freedom of a mixed method approach within the framework affords researchers an openness in how they wish to tackle those threads, resulting in compelling analyses that do not lack for rigor.

Prosaics, stateness, and geopolitics in Slavutych

The impetus for my investigation into Slavutych (chapter 5, "Emergent stateness") was firmly rooted in critical geopolitics, particularly in its overarching goal to de-emphasize the state in political geography. To that end, I wanted to focus on the local. As I spoke with residents, leaders, and visitors of Slavutych, it became clear to me that there were motivated actors in that city who had a clear political goal, and that their actions were organized around advancing a geopolitical narrative about the role of Slavutych that cast the city as uniquely positioned to tackle questions of nuclear power, technogenic disasters, and urban resilience.

As I discuss in that chapter, local policies and practices are not confined to the space of that locality, as they co-construct policies, practices, environments, and actions in other spaces. From an assemblage point of view, taking a city like Slavutych as a starting point involves investigating the constitutive parts that make up the city and through which political action is undertaken and narratives of meaning and power are constructed. This point of view also involves exploring the assemblages in which Slavutych itself is a constituent part insofar as it affects the political actions and narratives of power of processes in, for example, Ukrainian politics, international organizations like UNSCEAR and the IAEA, and financial institutions and systems like charities, the nuclear industry, and tourism. Geopolitics as an object and area of

study is cast as a process, an assemblage of actors and the sociomaterial connections among them.

The focus of this chapter was to consider the prosaics, or the everyday actions and practices of critical knowledge production that residents of the city engaged in to reterritorialize Slavutych itself and establish relations between Slavutych and other assemblages and processes like those mentioned above. What emerged in my research was not an end product, a tidy, complete explanation of what Slavutych is and means to itself, its residents, and as a part of other assemblages, but rather a view into the often-messy processes by which those politics, meanings, and relations—in other words, its stateness—are being produced. Such an approach is related to the concept of the glocal, a recent focus in political geography that seeks to find the connections between global and local political, social, and economic processes, especially in the context of globalization (see Barber 1995; Bauman 1998; Croucher 2003; Roudometof 2015, 2016), but takes a different research trajectory by beginning at one point and tracing the connections instead of looking for the connections between two starting points.

To reiterate what I state in the chapter, my approach in "Emergent stateness" also takes a different tack to the problem of the state in political geography. Not a recategorization, claiming that a city is a state, or a decentering, analyzing polities as if they were states, but rather a "reconceptualization of what a state is without eliminating the ways in which we can understand what states do" (170, above). This approach can yield very interesting analyses within political geography without taking away any of the research methods we in the field are trained to use and consider, an opening rather than a pruning.

Further avenues of research

A dissertation can only contain so much, and in the process of research and writing this study, I identified for myself other possible projects to follow this work that continue to utilize and develop this critical knowledge production framework within the field of political geography.

One such project is to further explore the role of fieldwork in understanding biopolitics, and especially formations of affirmative biopolitics that extend beyond, explicitly challenge, and problematize mechanisms of state and corporate surveillance and population control. In particular, the role of the internet and social media in these processes is fascinating, particularly in the context of the politics of the COVID19 pandemic and the critiques—popular and formal, from the political right and left—of vaccine and mask mandates and the implementation of vaccine passports in places in the United States. This case is doubly intriguing because of the geopolitical narratives touted by the media, officials, and people's Facebook posts about the roles that Chinese and Russian actors have played in physical and discursive spaces.

Another future project will involve revisiting the themes I present in "Emergent stateness" and explore other instances where non-state actors are engaging in the practices of states and statecraft, such as in diplomacy, security, and economics. For example, how useful is it to analyze a major transnational corporation such as Disney, Chevron, or Amazon as a state-like entity? What role do international scientific and research associations, such as the IAEA, play in the governance of supranational organizations, states, cities, and facilities?

In the more immediate term, I wish to take the insights I gained while doing this dissertation into research into a project on justice efforts surrounding the slow violence (see

Nixon 2011; O’Lear 2021) of the Chornobyl disaster. These future avenues of work demonstrate not only the breadth of topics relating to Chornobyl, but also the important methodological contributions that arise from studying the people, places, and processes involved in major world events.

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