

# Notes

## PROLOGUE

- 1 *Saturday, April 26, 1986*: Precise time given on Alexander Logachev's dosimetry map of Chernobyl station from April 26, 1986, archive of the Chernobyl Museum, Kiev, Ukraine.
- 1 *Senior Lieutenant Alexander Logachev loved radiation*: Alexander Logachev, Commander of Chemical and Radiation Reconnaissance, 427th Red Banner Mechanized Regiment of the Kiev District Civil Defense, author interview, Kiev, June 1, 2017; Yuli Khariton, Yuri Smirnov, Linda Rothstein, and Sergei Leskov, "The Khariton Version," *Bulletin of the Atomic Scientists* 49, no. 4 (1993), p. 30.
- 1 *Logachev knew how to protect himself*: Logachev, author interview, 2017.
- 1 *As he sped through the suburbs*: Alexander Logachev, *The Truth* [Истина], memoir, 2005, later published in another form in *Obozreniye krymskikh del*, 2007; Colonel Vladimir Grebeniuk, commander of 427th Red Banner Mechanized Regiment of the Kiev District Civil Defense, author interview, Kiev, February 9, 2016.
- 2 *But as they finally approached the plant*: Logachev, *The Truth*.
- 2 *Their armored car crawled counterclockwise*: Logachev dosimetry map of Chernobyl station, the Chernobyl Museum.
- 3 *2,080 roentgen an hour*: Logachev, *The Truth*.

## Part 1. Birth of a City

### 1. THE SOVIET PROMETHEUS

- 7 *At the slow beat*: Viktor and Valentina Brukhanov (husband and wife; director and heat treatment specialist at Chernobyl nuclear power plant in April 1986), author interviews, Kiev, September 2015 and February 2016. Author visit to Kropotkin, Ukraine, February 17, 2006. Cognac and the driving of the stake are mentioned in the documentary film *The Construction of the Chernobyl Nuclear Power Plant* [Будівництво Чорнобильської АЕС], Ukrainian Studio of Documentary Chronicle Films, 1974. A still photograph of the ceremony is included in the documentary film *Chernobyl: Two Colors of Time* [Чернобыль: Два цвета времени], directed by I. Kobrin (Kiev: Ukrtelefim, 1989), pt. 3 mark 40:05, [www.youtube.com/watch?v=keEcEHQipAY](http://www.youtube.com/watch?v=keEcEHQipAY).

- 7 *If the Soviet central planners had their way*: Zhores A. Medvedev, *The Legacy of Chernobyl* (New York: Norton, 1990), 239; “Controversy Around the Third Phase of the Chernobyl NPP,” *Literaturnaya Gazeta*, May 27, 1987, translated in “Aftermath of Chernobyl Nuclear Power Plant Accident, Part IV,” Joint Publication Research Service, Soviet Union: Political Affairs (hereafter, JPRS, Soviet Union Political Affairs), 111.
- 7 *They had considered a few options*: Vitali Sklyarov, *Chernobyl Was . . . Tomorrow*, trans. Victor Batachov (Montreal: Presses d’Amérique, 1993), 22.
- 8 *A small but ancient town*: Alexander Sich, “The Chornobyl Accident Revisited: Source Term Analysis and Reconstruction of Events During the Active Phase” (PhD diss., Massachusetts Institute of Technology, 1994), 203.
- 8 *The town of Chernobyl*: Richard F. Mould, *Chernobyl Record: The Definitive History of the Chernobyl Catastrophe* (Boca Raton, FL: CRC Press, 2000), 312.
- 8 *Two and a half million citizens*: Between 1979 and 1989, Kiev’s population grew from about 2.2 million to 2.6 million: V. A. Boldyrev, *Results of USSR Population Census [Итоги переписи населения СССР]* (Moscow: USSR State Committee on Statistics, 1990), 15: [http://istmat.info/files/uploads/17594/naselenie\\_sssr\\_po\\_dannym\\_vsesoyuznoy\\_perepisi\\_naseleniya\\_1989g.pdf](http://istmat.info/files/uploads/17594/naselenie_sssr_po_dannym_vsesoyuznoy_perepisi_naseleniya_1989g.pdf). Also see Sich, “The Chornobyl Accident Revisited,” 196.
- 8 *Viktor Brukhanov had arrived*: Viktor and Valentina Brukhanov, author interview, 2015; author visit to the city of Chernobyl, April 25, 2016.
- 8 *The oldest of four children*: Viktor Brukhanov, interview by Oleg Nikolaevich, “Stories about Tashkent Natives: True and Sometimes Unknown. Part 1” [Истории о ташкентцах правдивые и не всем известные. Часть 1], *Letters about Tashkent*, April 29, 2016: <http://mytashkent.uz/2016/04/29/istorii-o-tashkentsah-pravdivye-i-ne-vsem-izvestnye-chast-1>.
- 8 *He had an exotic look*: Major Vasily Lisovenko (head of the Third Division of the Sixth Department, Ukrainian KGB), author interview, September 2016.
- 9 *At the Ministry of Energy*: Lisovenko, author interview, 2016. Since the revolution, it had been common Soviet practice to appoint loyal Party members to the top jobs in technical enterprises and have them be advised by specialists. Grigori Medvedev, transcript of interview made during the production of *The Second Russian Revolution*, a 1991 BBC documentary film series: 2RR archive file no. 1/3/3, 16 (hereafter 2RR).
- 9 *In July 1969*: Neporozhny argued for this step in a letter to Soviet Premier Alexei Kosygin on July 4, 1969. Sonja D. Schmid, *Producing Power: The Pre-Chernobyl History of the Soviet Nuclear Industry* (Cambridge, MA: MIT Press, 2015), 34n97.
- 9 *He set ambitious targets*: Charles Dodd, *Industrial Decision-Making and High-Risk Technology: Siting Nuclear Power Facilities in the USSR* (Lanham, MD: Rowman & Littlefield, 1994), 73–74.
- 9 *The first atomic power plant in Ukraine*: V. A. Sidorenko, “Managing Atomic Energy,” in V. A. Sidorenko, ed., *The History of Atomic Energy in the Soviet Union and Russia [История атомной энергетики Советского Союза и России]* (Moscow: Izdat, 2001), 219.

9 *400 million rubles*: The total cost estimate for building Chernobyl was 389.68 million rubles in 1967. See Document No. 1 in N. Baranovska, ed., *The Chernobyl Tragedy: Documents and Materials* [Чорнобильська Трагедія: Документи і матеріали] (Kiev: Naukova Dumka, 1996): “Appeal from the Council of Ministers of USSR to the Central Committee of Communist Party of Ukraine to approve the project of building the Central Ukrainian nuclear power station near the village of Kopachi, Chernobyl district, Kiev region,” February 2, 1967.

9 *He drew up lists of the materials*: Viktor and Valentina Brukhanov, author interview, 2015. Brukhanov also described his responsibilities during these early days in an interview with Maria Vasyl, *Fakty i kommentarii*: “Former ChNPP director Brukhanov: ‘Had they found legal grounds to have me shot, they would have done so.’” [Бывший директор ЧАЭС Виктор Брюханов: «Если бы нашли для меня расстрельную статью, то, думаю, расстреляли бы.»], October 18, 2000, <http://fakty.ua/104690-byvshij-direktor-chaes-viktor-bryuhanov-quot-esli-by-nashlidlya-menya-rasstrelnuyu-statyu-to-dumayu-rasstreliali-by-quot>.

10 *Before Brukhanov could start*: Baranovska, ed., *The Chernobyl Tragedy*, Document No. 7: “The joint decision of subdivisions of the USSR Ministry of Energy and Electrification on constructing a temporary cargo berth for the Chernobyl NPP,” April 29, 1970.

10 *A cluster of wooden huts*: Brukhanov, interview by Vasyl, *Fakty i kommentarii*, 2000.

11 *As shock-work brigades excavated*: Vasily Kizima (construction supervisor at Chernobyl), author interview, Kiev, Ukraine, February 2016. Gennadi Milinevsky (Kiev University student sent to Chernobyl construction site to assist with building work in the summer of 1971), author interview, Kiev, April 2016. “Shock workers”—*udarniki*—was the name given to those members of the Soviet workforce who regularly exceeded plan targets and participated in Communist labor competitions. By 1971 there were 17.9 million shock workers in the USSR: Lewis Siegelbaum, “Shock Workers;” *Seventeen Moments in Soviet History*, <http://soviethistory.msu.edu/1929-2/shock-workers/>.

11 *The first group of nuclear specialists to arrive*: Nikolai Steinberg, author interview, Kiev, Ukraine, September 2015.

11 *According to Soviet planning regulations*: Schmid, *Producing Power*, 19.

11 *Its residents began to build summer houses*: Alexander Esaulov (deputy chairman of the Pripyat *ispolkom*), author interview, Irpin, Ukraine, July 2015.

11 *Viktor Brukhanov’s initial instructions*: Brukhanov, interview by Vasyl, *Fakty i kommentarii*, 2000; Steinberg, author interview, 2015.

12 *Enough to serve at least a million modern homes*: Electricity consumption varies according to many factors, including geographical location, but this conservative estimate is based upon figures provided by the Nuclear Regulatory Commission for twenty-first-century homes in the northeastern United States: “What Is a Megawatt?”, February 4, 2012, [www.nrc.gov/docs/ML1209/ML120960701.pdf](http://www.nrc.gov/docs/ML1209/ML120960701.pdf).

12 *The deadlines set by his bosses*: Baranovska, ed., *The Chernobyl Tragedy*, document

No. 10: “Resolution of the USSR Ministry of Energy and Electrification on the organization and implementation of operations to oversee the physical and energy launch of the NPPs under construction on USSR territory,” July 29, 1971. Steinberg, personal communication with author, August 6, 2018.

12 *The USSR was buckling under the strain*: Some Soviet historians estimate that, in real terms, the USSR’s annual spending on troops and armaments before 1972 amounted to between 236 and 300 billion rubles a year—and by 1989 represented almost half of the state budget. Yevgenia Albats, *The State Within a State: The KGB and Its Hold on Russia—Past, Present, and Future*, trans. Catherine Fitzpatrick (New York: Farrar, Straus and Giroux, 1999), 189.

12 *From the beginning*: Baranovska, ed., *The Chernobyl Tragedy*, document No. 13: “Resolution of the Communist Party of Ukraine and the Council of Ministers of the USSR on the Construction Progress of the Chernobyl Nuclear Power Plant,” April 14, 1972.

12 *Key mechanical parts*: Schmid, *Producing Power*, 19; George Stein, “Pipes Called ‘Puff Pastry Made of Steel,’” *Los Angeles Times*, May 16, 1986; Piers Paul Read, *Ablaze: The Story of the Heroes and Victims of Chernobyl* (New York: Random House, 1993), 30 and 46–47.

12 *The quality of workmanship*: Sklyarov, *Chernobyl Was . . . Tomorrow*, 163. (The Russian term *pred-montazhnaya reviziya oborudovaniya* is translated here as “pre-erection overhaul,” but “installation” is closer to the sense of “montage” in the original. See the original Russian edition of the book, *Завтра был . . . Чернобыль*. Moscow: Rodina, 1993, 165.)

12 *Throughout late 1971*: Baranovska, ed., *The Chernobyl Tragedy*, document no. 13; Vladimir Voloshko, “The Town That Died at the Age of Sixteen” [Город, погибший в 16 лет], undated, Pripyat.com, <http://pripyat.com/people-and-fates/gorod-pogibshii-v-16-let.html>.

13 *And still there was more*: These construction targets were mandated by Ukrainian Party leaders for the period 1972 to 1974. See Baranovska, ed., *The Chernobyl Tragedy*, document no. 13.

13 *For an appointment with his boss*: Brukhanov’s supervisor Artem Grigoriants headed the Ministry of Energy’s directorate for nuclear power (Glavatomenergo), tasked with overseeing Chernobyl construction and enforcing deadlines.

13 *The Party had originated*: The genesis of the Communist Party is described in detail in Robert Service, *A History of Modern Russia* (Cambridge, MA: Harvard University Press, 2010), 47–99.

13 “*a classless society*”: Raymond E. Zickel, ed., *Soviet Union: A Country Study* (Washington, DC: US Government Printing Office, 1991), 281.

13 *Known collectively as the nomenklatura*: Theodore R. Weeks, *Across the Revolutionary Divide: Russia and the USSR, 1861–1945* (Chichester, UK: Wiley-Blackwell, 2010), 77.

14 *This institutionalized meddling*: The confusion and infighting of the early years of Party bureaucracy was revealed in the captured archives described by Merle

Fainsod in *Smolensk Under Soviet Rule* (Cambridge, MA: Harvard University Press, 1958).

14 *By 1970, fewer than one in fifteen*: Communist Party membership in 1970 was approximately 13.4 million. A. M. Prokhorov, ed., *Great Soviet Encyclopedia [Большая Советская Энциклопедия]*, vol. 24 (Moscow, 1997), 176.

14 *Viktor Brukhanov joined in 1966*: Viktor Brukhanov, interview by Sergei Babakov, “I don’t accept the charges against me . . .” [«С предъявленными мне обвинениями не согласен . . .»], *Zerkalo nedeli*, August 27, 1999, [https://zn.ua/society/c\\_predyavlennymi\\_mne\\_obvineniyami\\_ne\\_soglasen.html](https://zn.ua/society/c_predyavlennymi_mne_obvineniyami_ne_soglasen.html).

14 “*Had the face of a truck driver*”: Read, *Ablaze*, 31.

14 *The humiliation*: Sklyarov, *Chernobyl Was . . . Tomorrow*, 172.

15 *Seated at the top*: Vladimir Shlapentokh, *A Normal Totalitarian Society: How the Soviet Union Functioned and How It Collapsed* (Armonk, NY: M.E. Sharpe, 2001), 56; Stephen Kotkin, *Armageddon Averted: The Soviet Collapse, 1970–2000*, 2nd ed. (New York: Oxford University Press, 2003), 67.

15 *A game of chance*: Angus Roxburgh, *Moscow Calling: Memoirs of a Foreign Correspondent* (Berlin: Birlinn, 2017), 28–30.

16 *Crops rotted in the fields*: David Remnick, *Lenin’s Tomb: The Last Days of the Soviet Empire* (New York: Vintage Books, 1994), 249.

16 *Soft spoken but sure of himself*: See Sklyarov, *Chernobyl Was . . . Tomorrow*, 119 and 122. Vitali Sklyarov, Ukrainian Energy Minister at the time of the accident, encountered Brukhanov frequently both in the years leading up to April 26, 1986, and immediately afterward.

16 *Yet when Brukhanov arrived*: Viktor and Valentina Brukhanov, author interviews, 2015 and 2016.

16 *Thirteen years later*: Viktor and Valentina Brukhanov, author interview, 2016. A photograph of an earlier November 7 celebration in Pripyat, in 1984, is available at “*Pripyat Before the Accident. Part XIX*,” Chernobyl and Pripyat electronic archive titled *Chernobyl—A Little About Everything* [Чернобыль: Обо Всём Понемногу], November 14, 2012, [http://pripyat-city.ru/uploads/posts/2012-11/1352908300\\_slides-04.jpg](http://pripyat-city.ru/uploads/posts/2012-11/1352908300_slides-04.jpg).

16 *Hailed for his illustrious achievements*: Viktor and Valentina Brukhanov, author interview, 2016.

16 *Construction was also well under way*: Zhores Medvedev, *Legacy of Chernobyl*, 239; Lyubov Kovalevska, “*Not a Private Matter*” [Не приватна справа], *Literatura Ukraina*, March 27, 1986, online at [www.myslenedrevo.com.ua/uk/Sci/HistSources/Chornobyl/Prolog/NePryvatnaSprava.html](http://www.myslenedrevo.com.ua/uk/Sci/HistSources/Chornobyl/Prolog/NePryvatnaSprava.html).

17 *The Soviet counterpart to MIT*: Paul R. Josephson, *Red Atom: Russia’s Nuclear Power Program from Stalin to Today* (Pittsburgh, PA: University of Pittsburgh Press, 2005), 55.

17 *A glossy book*: Yuri Yevsyukov, *Pripyat* [Припять] (Kyiv: Mystetstvo, 1986), available online at <http://pripyat-city.ru/books/57-fotoalbom.html>.

17 *The average age*: Vasily Voznyak and Stanislav Troitsky, *Chernobyl: It Was Like*

*This—The View from the Inside* [Чернобыль: Так это было—взгляд изнутри] (Moscow: Libris, 1993), 223.

17 *Watched as a pair of elk*: Viktor and Valentina Brukhanov, author interview, 2015.

17 *Financed directly from Moscow*: Esaulov, author interview.

17 *In the Raduga—or Rainbow—department store*: Raduga sold everything from furniture to toys. Natalia Yuvchenko (teacher at School Number Four, Pripyat; wife of Chernobyl senior mechanical engineer Alexander Yuvchenko), author interview, Moscow, Russia, October 2015.

18 *An office on the fifth floor of the ispolkom*: Svetlana Kirichenko (chief economist of the Pripyat ispolkom), author interview, Kiev, April 2016.

18 *Trouble was confined*: Alexander Esaulov, *The City That Doesn't Exist* [Город, которого нет] (Vinnytsia: Teza, 2013), 14; Viktor Klochko (head of Pripyat department of the KGB), interview by Taras Shumeyko, Kiev, September 2015.

18 *Each spring, the river*: Anatoly Zakharov (fire engine driver and lifeguard in Pripyat), author interview, Kiev, Ukraine, February 2016.

18 *Could look back on a year of triumphs*: Viktor and Valentina Brukhanov, author interview, 2016.

19 *Speaking unselfconsciously*: Remnick, *Lenin's Tomb*, 144–47.

19 *Hammered on the anvil*: Sklyarov, *Chernobyl Was . . . Tomorrow*, 123.

19 *Orders of merit and pay bonuses*: For example, the Party granted medals to seven Chernobyl engineers involved in the launch of Unit Four in December 1983. “Resolution 144/2C of the Central Committee of the Communist Party of the Soviet Union” [Постановление Секретариата ЦК Коммунистической Партии Советского Союза № СТ 144/2C], March 6, 1984, Microfilm, Hoover Institution, Russian State Archive of Contemporary History (RGANI), Opis 53, Reel 1.1007, File 33.

20 *Not even being manufactured in the USSR*: Kizima, author interview, 2016.

20 “*Go build it!*”: Viktor Brukhanov, interview by Vladimir Shunovich, “Former director of the Chernobyl Atomic Power Station Viktor Brukhanov: ‘At night, driving by Unit Four, I saw that the structure above the reactor is . . . gone!’” [Бывший директор Чернобыльской Атомной Электростанции Виктор Брюханов: «Ночью, проезжая мимо четвертого блока, увидел, что верхнего строения над реактором . . . нету!»], *Fakty i kommentarii*, April 28, 2006, <http://fakty.ua/104690-byvshij-direktor-chaes-viktor-bryuhanov-quot-esli-by-nashlidlya-menya-rasstrelnyu-statyu-to-dumayu-rasstreliali-by-quot>.

20 *He found the extra funds*: Viktor and Valentina Brukhanov, author interview, 2015.

20 *The last day of December*: The commissioning date of Unit Four is specified in Nikolai Karpan, *From Chernobyl to Fukushima*, trans. Andrey Arkhipets (Kiev: S. Podgornov, 2012), 143.

20 *At the beginning of the 1980s*: Sich, “The Chernobyl Accident Revisited,” 148.

20 *A dense network*: Schmid, *Producing Power*, 34.

20 *Brought forward by a year*: David R. Marples, *Chernobyl and Nuclear Power in the USSR* (New York: St. Martin's Press, 1986), 120.

20 *Labor and supply problems*: Kovalevska, “Not a Private Matter.” David Marples translates and discusses excerpts of Kovalevska’s article in *Chernobyl and Nuclear Power in the USSR*, 122–24. Also see an interview with Kovalevska by the journalist Iurii Shcherbak in his book *Chernobyl: A Documentary Story*, trans. Ian Press (New York: St. Martin’s Press, 1989), 15–21.

20 *A team of dedicated KGB agents*: By the time of the accident the station was monitored by 91 KGB agents, 8 residents, and 112 “authorized persons,” according to Volodymyr Viatrovych, head of the Ukrainian Institute of National Remembrance (lecture in Kiev, April 28, 2016, [www.youtube.com/watch?v=HJpQ4SWxHKU](http://www.youtube.com/watch?v=HJpQ4SWxHKU)). For an example of KGB reports on Chernobyl supply and construction problems, see Document No. 15, “Special report of the 6th department of the UkrSSR KGBM . . . concerning the facts of shipping of poor-quality equipment for the Chernobyl NPS from Yugoslavia,” from January 9, 1984, in Yuri Danilyuk, ed., “The Chernobyl Tragedy in Documents and Materials” [Чорнобильська трагедія в документах та матеріалах], Special Issue, *Z arkhiviv VUCHK-GPU-NKVD-KGB* 1, no. 16 (2001).

20 *Brukhanov received instructions*: Viktor Kovtutsky (chief accountant at Chernobyl construction department), author interview, Kiev, Ukraine, April 24, 2016.

21 *An office at the top*: Viktor and Valentina Brukhanov, author interview, 2016.

21 *Any time of the day or night*: Sklyarov, *Chernobyl Was . . . Tomorrow*, 123.

21 *If something went wrong*: Author interviews: Viktor and Valentina Brukhanov, 2015; Steinberg, 2015; Serhiy Parashyn (Communist Party secretary of ChNPP), Kiev, November 30, 2016.

21 *Despite his technical gifts*: Author interviews with Parashyn and Kizima.

21 *Derided him as a “marshmallow”*: Vasily Kizima, account in Grigori Medvedev, *The Truth About Chernobyl*, trans. Evelyn Rossiter (New York: Basic Books, 1991), 141.

21 *A moral decay*: Steinberg, author interview, 2017; Valery Legasov, “My duty is to tell about this,” a translated recollection of the Chernobyl accident provided in full in Mould, “Chapter 19: The Legasov Testament,” *Chernobyl Record*, 298.

21 *The USSR’s economic utopianism*: Alec Nove, *The Soviet Economy: An Introduction*, 2nd rev. ed. (New York: Praeger, 1969), 258.

21 *The inexorable construction work*: Brukhanov described twenty-five thousand construction workers in need of steady employment in his interview with *Fakty i kommentarii* in 2000. Details on Jupiter employees, many of them women, come from Esaulov, *The City That Doesn’t Exist*, 13, as well as the author’s interview with Esaulov in 2015.

21 *The highly qualified technical elite*: Schmid, *Producing Power*, 87.

22 *The “power men”*: Ibid., 90.

22 *“you could spread it on bread”*: Alexander Nazarkovsky (senior electromechanical engineer at Chernobyl), author interview, Kiev, February 2006.

22 *“like a samovar”*: Legasov, “My duty is to tell about this,” 300.

22 *Drank from glassware*: Anna Korolovska (deputy director for science of the Chernobyl Museum), author interview, Kiev, July 2015.

22 *Listlessly filled out their shifts*: Read, *Ablaze*, 45.

22 *Group of Effective Control*: Ibid.

22 *At the top*: Steinberg, author interview, 2017; Schmid, *Producing Power*, 153. For a discussion of how staff turnover amplified the problem, see Marples, *Chernobyl and Nuclear Power in the USSR*, 120.

22 *The chief engineer*: Grigori Medvedev, *The Truth About Chernobyl*, 44.

22 *Pushed through by the Party*: Gennadi Shasharin, who in 1986 served as Deputy Minister of Energy and Electrification of the USSR, discusses Fomin's appointment in "The Chernobyl Tragedy," in A. N. Semenov, ed., *Chernobyl. Ten Years On. Inevitability or Accident?* [Чернобыль. Десять лет спустя. Неизбежность или случайность?] (Moscow: Energoatomizdat, 1995), 98.

22 *Physics through a correspondence course*: Expert testimony in trial transcript, Karpan, *From Chernobyl to Fukushima*, 148.

22 *The decision had already been taken*: Shasharin, "The Chernobyl Tragedy," 98.

23 *The news would be announced*: Esaulov, author interview, 2015.

23 *A lush variety of trees and shrubs*: "Chernobyl NPP: Master Plan of the Settlement" [Чернобыльская АЭС: Генеральный план поселка], Ministry of Energy and Electrification of the USSR, 1971, 32.

23 *But Brukhanov was especially fond of flowers*: Author interviews, 2015: Esaulov, Kirichenko, and Viktor and Valentina Brukhanov; Viktor Brukhanov, interview by Anton Samarin, "Chernobyl hasn't taught anyone anything" [Чернобыль никого и ничему не научил], *Odnako*, April 26, 2010, [www.odnako.org/magazine/material/chernobil-nikogo-i-nichemu-ne-nauchil-1/](http://www.odnako.org/magazine/material/chernobil-nikogo-i-nichemu-ne-nauchil-1/).

23 *On the elevated concrete plaza*: Maria Protsenko (chief architect for the city of Pripyat), author interview, Kiev, September 5, 2015. A photo of the placeholder monument can be seen at "Pripyat Before the Accident: Part XVI," Chernobyl and Pripyat electronic archive, December 2011, [http://pripyat-city.ru/uploads/posts/2011-12/1325173857\\_dumbr-01-prc.jpg](http://pripyat-city.ru/uploads/posts/2011-12/1325173857_dumbr-01-prc.jpg).

## 2. ALPHA, BETA, AND GAMMA

25 *Unimaginably dense*: Robert Peter Gale and Eric Lax, *Radiation: What It Is, What You Need to Know* (New York: Vintage Books, 2013), 12.

25 *"the strong force"*: Robert Peter Gale and Thomas Hauser, *Final Warning: The Legacy of Chernobyl* (New York: Warner Books, 1988), 6.

25 *"neither mass nor energy"*: Ibid.

25 *In 1905 Albert Einstein*: Ibid., 4–6.

26 *580 meters above the Japanese city*: Richard Rhodes, *The Making of the Atomic Bomb* (New York: Simon & Schuster, 1988), 711.

26 *The bomb itself was extremely inefficient*: Emily Strasser, "The Weight of a Butterfly," *Bulletin of the Atomic Scientists* website, February 25, 2015; Jeremy Jacquot, "Numbers: Nuclear Weapons, from Making a Bomb to Making a Stockpile to Making Peace," *Discover*, October 23, 2010.

26 *Some seventy-eight thousand people died instantly*: As a result of the chaos and de-

struction caused by the bombing, and uncertainty about the number of people present in the city at the time, figures for the total death toll directly attributable to the explosion vary significantly, and the true numbers will never be known. These figures are part of a “best estimate” for casualties from Paul Ham, *Hiroshima Nagasaki: The Real Story of the Atomic Bombings and Their Aftermath* (New York: Thomas Dunne Books/St. Martin’s Press, 2014), 408.

- 26 *The atoms of different elements vary by weight*: Gale and Hauser, *Final Warning*, 6.
- 26 *Adding to or removing neutrons*: Fred A. Mettler Jr., and Charles A. Kelsey, “Fundamentals of Radiation Accidents,” in Igor A. Gusev, Angelina K. Guskova, Fred A. Mettler Jr., eds., *Medical Management of Radiation Accidents* (Boca Raton, FL: CSC, 2001), 7; Gale and Hauser, *Final Warning*, 18.
- 26 *Radiation is all around us*: Craig Nelson, *The Age of Radiance: The Epic Rise and Dramatic Fall of the Atomic Era* (New York: Simon & Schuster, 2014), 3–4.
- 27 *Radon 222, which gathers as a gas*: Gale and Lax, *Radiation*, 13 and 17–18.
- 27 *Polonium 210, a powerful alpha emitter*: Ibid., 20.
- 27 *It was also the poison*: John Harrison et al., “The Polonium-210 Poisoning of Mr Alexander Litvinenko,” *Journal of Radiological Protection* 37, no. 1 (February 28, 2017). The FSB was organized in 1995 as the principal Russian state security service and the successor to the KGB.
- 28 *Gamma rays—high frequency electromagnetic waves*: Gale and Hauser, *Final Warning*, 18–19.
- 28 *Severe exposure to all ionizing radiation*: Mettler and Kelsey, “Fundamentals of Radiation Accidents,” 7–9; Dr. Anzhelika Barabanova, author interview, Moscow, October 14, 2016.
- 28 *To the atomic pioneers*: Gale and Lax, *Radiation*, 39.
- 28 *“I have seen my own death!”*: Timothy Jorgensen, *Strange Glow: The Story of Radiation* (Princeton, NJ: Princeton University Press, 2016), 23–28.
- 28 *In 1896 Thomas Edison devised*: Ibid., 31–32; US Department of the Interior, “The Historic Furnishings Report of the National Park Service, Edison Laboratory,” 1995, 73, online at [www.nps.gov/parkhistory/online\\_books/edis/edis\\_lab\\_hfr.pdf](http://www.nps.gov/parkhistory/online_books/edis/edis_lab_hfr.pdf). A photograph of the box can be found in Gilbert King, “Clarence Dally: The Man Who Gave Thomas Edison X-Ray Vision,” Smithsonian.com, March 14, 2012.
- 28 *Even as the damage caused*: Jorgensen, *Strange Glow*, 93–95.
- 29 *In 1903 Marie and Pierre Curie*: Gale and Lax, *Radiation*, 43–45.
- 29 *Because radium can be mixed*: Jorgensen, *Strange Glow*, 88–89.
- 29 *A successful lawsuit*: Gale and Lax, *Radiation*, 44.
- 29 *Some radionuclides*: Timothy Jorgensen, associate professor in the Department of Radiation Medicine at Georgetown University, author interview, telephone, June 19, 2016.
- 29 *The survivors of the atom bomb*: National Research Council, *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2* (Washington, DC: National Academies Press, 2006), 141.

30 *Of those who lived through the initial explosion in Nagasaki*: Data provided by Masao Tomonaga (head of the Atomic Bomb Disease Institute at Nagasaki University), cited in Gale and Lax, *Radiation*, 52–57.

30 *The effect of ionizing radiation*: James Mahaffey, *Atomic Awakening: A New Look at the History and Future of Nuclear Power* (New York: Pegasus, 2009), 286–89 and 329–33. Also see Dwayne Keith Petty, “Inside Dawson Forest: A History of the Georgia Nuclear Aircraft Laboratory,” *Pickens County Progress*, January 2, 2007, online at <http://archive.li/GMnGk>.

30 *On August 21, 1945*: Daghlian’s estimated whole-body dose was 5,100 millisieverts, equal to 510 rem. Jorgensen, *Strange Glow*, 111; James Mahaffey, *Atomic Accidents: A History of Nuclear Meltdowns and Disasters: From the Ozark Mountains to Fukushima* (New York: Pegasus Books, 2014), 57–60.

31 *Admitted himself to medical care*: A colleague of Daghlian’s at Los Alamos, Joan Hinton, recalls driving him to the hospital after he walked out of the building just as she happened to pull up in her car. See Ruth H. Howes and Caroline L. Herzenberg, *Their Day in the Sun: Women of the Manhattan Project* (Philadelphia: Temple University Press, 1999), 54–55.

31 *Attributed his death to burns*: “Atomic Bomb Worker Died ‘From Burns,’” *New York Times*, September 21, 1945. See also Paul Baumann, “NL Man Was 1st Victim of Atomic Experiments,” *The Day*, August 6, 1985.

31 “*the Article*”: David Holloway, *Stalin and the Bomb: The Soviet Union and Atomic Energy, 1939–1956* (New Haven, CT: Yale University Press, 1996), 213. The Soviet bomb’s American predecessor, the device detonated in New Mexico’s Jornada del Muerto desert in 1945, was known by the scientists who constructed it as “the Gadget.”

31 *Noted by his secret police minders*: Svetlana Kuzina, “Kurchatov wanted to know what stars were made of—and created bombs” [Курчатов хотел узнать, из чего состоят звезды. И создал бомбы], *Komsomolskaya Pravda*, January 10, 2013, [www.kp.ru/daily/26012.4/2936276](http://www.kp.ru/daily/26012.4/2936276).

32 *Initially modeled on the ones in Hanford*: Although the production reactor was at first slated to follow a horizontal design like those in Hanford, it was ultimately based on a vertical design by the Soviet engineer Nikolai Dollezhal (Holloway, *Stalin and the Bomb*, 183; Schmid, *Producing Power*, 45).

32 *Kurchatov had succeeded*: Mahaffey, *Atomic Awakening*, 203. The full title of the book was *Atomic Energy for Military Purposes: The Official Report on the Development of the Atomic Bomb Under the Auspices of the United States Government, 1940–1945*. Fifty thousand copies of the Russian translation were printed and made available to Soviet scientists (Josephson, *Red Atom*, 24).

32 *Nuclear work was the responsibility*: In Russian, the First Main Directorate was known as PGU, short for *Pervoye Glavnoye Upravleniye*. Roy A. Medvedev and Zhores A. Medvedev, *The Unknown Stalin*, translated by Ellen Dahrendorf (New York: I. B. Tauris, 2003), 133; Simon Sebag Montefiore, *Stalin: The Court of the Red Tsar* (New York: Knopf, 2004), 501–2.

32 *By 1950, the First Main Directorate*: Medvedev and Medvedev, *Unknown Stalin*, 134 and 162.

32 *In direct proportion to the punishment*: Holloway, *Stalin and the Bomb*, 218–19.

32 *Only as a concession*: *Ibid.*, 347.

32 *It was not until the end of 1952*: Josephson, *Red Atom*, 20–26.

33 *Theoretically capable of wiping out humanity*: Gale and Lax, *Radiation*, 48.

33 *Kurchatov was shaken*: Holloway, *Stalin and the Bomb*, 307 and 317.

33 *Part of an attempt to mollify*: Stephanie Cooke, *In Mortal Hands: A Cautionary History of the Nuclear Age* (New York: Bloomsbury, 2010), 106–11.

33 *No one was especially surprised*: Josephson, *Red Atom*, 173.

33 *It marked the first time in twenty years*: Cooke, *In Mortal Hands*, 113.

33 *Just enough to drive a locomotive*: Schmid, *Producing Power*, 97.

34 *Arrested, imprisoned, and shot*: Montefiore, *Stalin*, 652.

34 *The First Main Directorate was reconstituted*: Schmid, *Producing Power*, 45 and 230n29.

34 *Newly appointed Soviet premier*: Josephson, *Red Atom*, 11.

34 *With the success of Atom Mirny-1*: *Ibid.*, 4–5.

34 *The physicists who worked on AM-1*: Paul Josephson, “Rockets, Reactors, and Soviet Culture,” in Loren Graham, ed., *Science and the Soviet Social Order* (Cambridge, MA: Harvard University Press, 1990), 174.

34 “*near-mythic figures*”: Josephson, *Red Atom*, 11. The Great Patriotic War was the name given to the Soviet fight against Nazi Germany, beginning with the German invasion of the USSR in June 1941.

34 *Not all that it seemed*: *Ibid.*, 25; Schmid, *Producing Power*, 45.

35 *Atom Morskoy, or “Naval Atom”*: *Ibid.*, 46.

35 *Inherently unstable*: Josephson, *Red Atom*, 26–27.

35 *Has even aligned spontaneously in nature*: Evelyn Mervine, “Nature’s Nuclear Reactors: The 2-Billion-Year-Old Natural Fission Reactors in Gabon, Western Africa,” *Scientific American*, July 13, 2011.

36 *30 billion fissions every second*: Ray L. Lyerly and Walter Mitchell III, *Nuclear Power Plants*, rev. ed. (Washington, DC: Atomic Energy Commission, 1973), 3; Bertrand Barré, “Fundamentals of Nuclear Fission,” in Gerard M. Crawley, ed., *Energy from the Nucleus: The Science and Engineering of Fission and Fusion* (Hackensack, NJ: World Scientific Publishing, 2016), 3.

36 “*shakes*,” for a “*shake of a lamb’s tail*”: Chuck Hansen, *U.S. Nuclear Weapons: The Secret History* (Arlington, TX: Aerofax, 1988), 11.

36 *Fortunately, among the remaining 1 percent of neutrons*: World Nuclear Association, “Physics of Uranium and Nuclear Energy,” updated February 2018, [www.world-nuclear.org/information-library/nuclear-fuel-cycle/introduction/physics-of-nuclear-energy.aspx](http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/introduction/physics-of-nuclear-energy.aspx); Robert Goldston and Frank Von Hippel, author interview, Princeton, NJ, February 2018.

36 *By inserting electromechanical rods*: Goldston and Von Hippel, author interview, 2018.

37 *To generate electricity*: The first reactor in the United Kingdom was the GLEEP, or Graphite Low Energy Experimental Pile, which began operation at Harwell, Oxfordshire, in 1947. In the United States, the first experimental boiling water reactor was created by the Argonne National Laboratory in 1956. See “Nuclear Development in the United Kingdom,” World Nuclear Association, October 2016; and “Boiling Water Reactor Technology: International Status and UK Experience,” Position paper, National Nuclear Laboratory, 2013.

37 *The first Soviet reactors*: Frank N. Von Hippel and Matthew Bunn, “Saga of the Siberian Plutonium-Production Reactors,” Federation of American Scientists Public Interest Report, 53 (November/December 2000), <https://fas.org/faspir/v53n6.htm>; Von Hippel and Goldston, author interview, 2018.

37 *It was a risky combination*: Mahaffey, *Atomic Awakening*, 206–7.

37 *Three competing teams*: Josephson, *Red Atom*, 25; Schmid, *Producing Power*, 102.

37 *But the Soviet engineers’ work*: Holloway, *Stalin and the Bomb*, 347.

37 *The more experimental*: Josephson, *Red Atom*, 56.

37 *The first major defect with their design*: Ibid., 27.

37 *When working normally*: “RBMK Reactors,” World Nuclear Association, June 2016, [www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-power-reactors/appendices/rbmk-reactors.aspx](http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-power-reactors/appendices/rbmk-reactors.aspx).

38 *Revealed a fantastical vision*: Igor Kurchatov, “Speech at the 20th Congress of the Communist Party of the Soviet Union,” in Y. N. Smirnov, ed., *Igor Vasil’evich Kurchatov in Recollections and Documents* [Игорь Васильевич Курчатов в воспоминаниях и документах], 2nd ed. (Moscow: Kurchatov Institute/Izdat, 2004), 466–71.

39 *Four different reactor prototypes*: V. V. Goncharov, “The Early Period of USSR Atomic Energy Development” [Первый период развития атомной энергетики в СССР], in Sidorenko, ed., *The History of Atomic Energy*, p. 19; Schmid, *Producing Power*, 20.

39 *But before construction could begin*: Schmid, *Producing Power*, 22 and 26–27.

39 *Like their counterparts in the West*: Ibid., 18.

39 “*too cheap to meter*”: This infamous phrase was coined in September 1954 by Lewis Strauss, chairman of the U.S.’ Atomic Energy Commission, in a speech to the National Association of Science Writers, and has haunted the nuclear industry ever since. Thomas Wellock, “‘Too Cheap to Meter’: A History of the Phrase,” United States Nuclear Regulatory Commission Blog, June 3, 2016.

39 *Yet the sheer size of the Union*: Schmid, *Producing Power*, 22.

40 *Apparently convinced by Kurchatov’s promises*: Ibid., 21. The first station, in its design stage in 1956, would become Novovoronezh nuclear power plant. The second, under construction since 1954, was the Beloyarsk Nuclear Power Station (103 and 275n125).

40 *Construction costs skyrocketed*: Ibid., 29.

40 *In the meantime, the Ministry of Medium Machine Building*: Ibid., 106 and 266n41; Holloway, *Stalin and the Bomb*, 348.

40 *The EI-2, or “Ivan the Second”*: Holloway, *Stalin and the Bomb*, 348 and 443n16.

40 *A new emphasis*: Schmid, *Producing Power*, 34.

40 *A toothy, young Queen Elizabeth II: The Atom Joins the Grid*, London: British Pathé, October 1956, [www.youtube.com/watch?v=DVBGk0R15gA](http://www.youtube.com/watch?v=DVBGk0R15gA).

41 *A costly fig leaf*: In the film *Windscale 1957: Britain’s Biggest Nuclear Disaster* (Sarah Aspinall, BBC, 2007), British journalist Chapman Pincher says, “I believe there were times when it was taking electricity out of the grid rather than pumping it in.” See also Lorna Arnold, *Windscale 1957: Anatomy of a Nuclear Accident* (New York: St. Martin’s Press, 1992), 21; and Mahaffey, *Atomic Accidents*, 181.

41 *Two thousand tons of graphite*: For a diagram of the Windscale reactor, see Mahaffey, *Atomic Accidents*, 163.

41 *It burned for two days*: Rebecca Morelle, “Windscale Fallout Underestimated,” October 6, 2007, BBC News; Arnold, *Windscale 1957*, 161.

41 *A board of inquiry*: Arnold, *Windscale 1957*, 78–87.

41 *Did not fully acknowledge the scale*: Mahaffey, *Atomic Accidents*, 181. The unexpurgated account of the Windscale fire, known as the Penney Report, was declassified and released to the public in January 1988. Mahaffey gives a detailed description of the fire in *Atomic Accidents*, 159–81.

42 *They began using gamma rays*: Josephson, *Red Atom*, 4, 142–43, 147, and 248. It is only fair to add that US scientists also pursued food irradiation with some enthusiasm, with the FDA approving bacon irradiated using a cobalt 60 source for human consumption, in 1963 (160). The physicist Edward Teller was also a keen—but frustrated—proponent of “peaceful nuclear explosions,” or PNEs, and the US military developed several mobile reactors of their own.

42 *A dedicated Communist*: Ibid., 113–17.

42 *Ozymandian dreams*: Ibid., 117–18 and 246–49.

43 “*Big Efim*” and “*the Ayatollah*”: Sklyarov, *Chernobyl Was . . . Tomorrow*, 10–11. Also see recollections about Slavsky collated by V. Y. Bushmelev, “For Efim Pavlovich Slavsky’s 115th Birthday” [К 115-летию Ефима Павловича Славского], Inter-regional Non-Governmental Movement of Nuclear Power and Industry Veterans, October 26, 2013, [www.veteranrosatom.ru/articles/articles\\_276.html](http://www.veteranrosatom.ru/articles/articles_276.html).

43 *Although as young men*: Angelina Guskova, interview by Vladimir Zubarev, “On the Edge of the Atomic Sword” [На лезвии атомного меча], *Nauka i zhizn*, no. 4, 2007; Igor Osipchuk, “The legendary academician Aleksandrov fought with the White Guard in his youth” [Легендарный академик Александров в юности был белогвардейцем], February 4, 2014, *Fakty i kommentarii*, <http://fakty.ua/176084-legendarnyj-prezident-sovetskoy-akademii-nauk-v-yunosti-byl-belogvardejcem>.

43 *A massive nuclear empire*: Schmid, *Producing Power*, 53; “The Industry’s Evolution: Introduction” [Эволюция отрасли: Введение], Rosatom, [www.biblioatom.ru/evolution/vvedeniye](http://www.biblioatom.ru/evolution/vvedeniye).

43 “*post office boxes*”: Fedor Popov, *Arzamas-16: Seven Years with Andrei Sakharov* [Арзамас-16: семь лет с Андреем Сахаровым] (Moscow: Institut, 1998), 52; Schmid, *Producing Power*, 93.

43 *Led by Slavsky*: Schmid, *Producing Power*, 50 and 234n55.

43 *The clandestine impulse persisted*: Although most nuclear research would eventually be conducted by scientists answering to the seemingly transparent State Committee for the Utilization of Atomic Energy, this was also simply a public front for Sredmash. Nikolai Steinberg recalls that, long before the fall of the USSR, this false distinction between Sredmash and the State Committee was well known to foreign specialists—"as they say, 'everything is confidential, but nothing is secret.'" Georgi Kopchinsky and Nikolai Steinberg, *Chernobyl: On the Past, Present and Future* [Чернобыль: О прошлом, настоящем и будущем] (Kiev: Osnova, 2011), 123. Later, the Soviet government established a regulatory body—the State Committee on Safety in the Atomic Power Industry, which sent representatives to oversee operating conditions at every nuclear power plant in the Union. But the committee never published reports and operated under conditions of strict secrecy. Zhores Medvedev, *Legacy of Chernobyl*, 263–64; Schmid, *Producing Power*, 50–52, 60, and 235n58.

44 *As one of the twelve founding members*: David Fischer, *History of the Atomic Energy Agency: The First Forty Years* (Vienna: IAEA, 1997), 40 and 42–43.

44 *The safest nuclear industry in the world*: In contrast to the representatives of the apparently more troubled industries in the United States, Britain, and France, the Soviet delegation never reported a single incident at a reactor or reprocessing plant (Medvedev, *Legacy of Chernobyl*, 264–65).

44 *At 4:20 p.m on Sunday, September 29, 1957*: Kate Brown, *Plutopia: Nuclear Families, Atomic Cities, and the Great Soviet and American Plutonium Disasters* (Oxford: Oxford University Press, 2015), 232.

44 *An underground waste storage tank*: G. Sh. Batorshin and Y. G. Mokrov, "Experience in Eliminating the Consequences of the 1957 Accident at the Mayak Production Association," International Experts' Meeting on Decommissioning and Remediation After a Nuclear Accident, IAEA, Vienna, Austria, January 28 to February 1, 2013.

45 *Light rain and a thick, black snow*: Brown, *Plutopia*, 239.

45 *It took a year to clean up*: Ibid., 232–36.

45 *In the remote villages*: V. S. Tolstikov and V. N. Kuznetsov, "The 1957 Radiation Accident in Southern Urals: Truth and Fiction" [Южно-уральская радиационная авария 1957 года: Правда и домыслы], *Vremya* 32, no. 8 (August 2017): 13; Brown, *Plutopia*, 239–44.

45 *Up to a half million people*: Some scientists estimate that 475,000 people could have been exposed (Mahaffey, *Atomic Accidents*, 284), but others, in particular official Russian sources, cite much lower numbers of about 45,500 people. See Russian Ministry of Emergency Situations, "The Aftermath of the Man-Made Radiation Exposure and the Challenge of Rehabilitating the Ural Region" [Последствия техногенного радиационного воздействия и проблемы реабилитации Уральского региона], Moscow, 2002, [http://chernobyl-mchs.ru/upload/program\\_rus/program\\_rus\\_1993-2010/Posledstviy\\_Ural.pdf](http://chernobyl-mchs.ru/upload/program_rus/program_rus_1993-2010/Posledstviy_Ural.pdf).

45 *Shot down by a Soviet SA-2*: Oleg A. Bukharin, “The Cold War Atomic Intelligence Game, 1945–70,” *Studies in Intelligence* 48, no. 2 (2004): 4.

### 3. FRIDAY, APRIL 25, 5:00 P.M., PRIPYAT

46 *Almost everyone was looking forward to the long weekend*: Kovtutsky, author interview, 2016.

46 “*Let the atom be a worker, not a soldier!*”: Maria Protsenko, author interview, Kiev, September 2015. A photograph of the slogan can be seen at “*Pripyat Before the Accident: Part IX*,” Chernobyl and Pripyat electronic archive, March 25, 2011, [http://pripyat-city.ru/uploads/posts/2011-04/1303647106\\_50008255-pr-c.jpg](http://pripyat-city.ru/uploads/posts/2011-04/1303647106_50008255-pr-c.jpg).

47 *Yuvchenko had worked at the station for only three years*: Alexander Yuvchenko, author interview, 2006.

47 *It was only over the objections of his trainer*: Alexander’s younger brother Vladimir chose rowing and represented the USSR in the 1988 Olympics in Seoul. Natalia Donets et al., *25 Years of the National Olympic and Sports Committee of the Republic of Moldova* [25 de ani ai Comitetului National Olimpic si Sportiv din Republica Moldova] (Chisinau: Elan Poligraph, 2016), 16.

47 *Something futuristic and spectacular*: Natalia Yuvchenko, author interview, Moscow, October 2015.

47 *In spite of the long hours he put in at work*: Natalia Yuvchenko, email correspondence with author, December 2015; Maria Protsenko, author interview, April 2016.

47 *Borrowed a neighbor’s small motorboat*: Natalia Yuvchenko, author interview, 2015.

48 *Like all newly qualified Soviet specialists*: Alexander Yuvchenko, author interview, 2006.

48 *When their son was born*: Natalia Yuvchenko, author interview, 2015; author visit to the Yuvchenkos’ flat in Pripyat, April 27, 2016.

49 *Still, with no family nearby to provide help*: Read, *Ablaze*, 61; Natalia Yuvchenko, author interview, 2015.

50 *Rich Man, Poor Man*: Natalia Yuvchenko, email correspondence with author, 2015.

50 *He seemed restless*: Natalia Yuvchenko, author interview, 2015.

50 *She left the TV*: Read, *Ablaze*, 61.

50 *A few hundred meters away*: Alexander (Sasha) Korol, author interview, Kiev, September 2015.

51 *Toptunov was born within sight*: Vera Toptunova, author interview, Kiev, September 2015.

51 *Toptunov’s father liked to boast*: Korol, author interview, 2015.

51 *When Toptunov was thirteen*: Toptunova, author interview, 2015.

51 *Established with the patronage of Kurchatov*: Originally established as the Moscow Mechanical Institute of Munitions in 1942, the university shifted its focus almost exclusively to nuclear physics after the war, with Kurchatov’s encouragement and support. “History,” National Research Nuclear University MEPhI, <https://mephi.ru/about/index2.php>.

51 *The examination was notoriously difficult*: Andrei Glukhov, author interview, Chernobyl nuclear power plant, February 2016.

52 *The course work was tough*: Alexey Breus, author interview, Kiev, July 2015.

52 *Long banished from television*: Kristin Roth-Ey, *Moscow Prime Time: How the Soviet Union Built the Media Empire That Lost the Cultural Cold War* (Ithaca, NY: Cornell University Press, 2011), 258–59.

52 *Shy-looking, with glasses and a lingering hint of puppy fat*: Author interviews, 2015: Toptunova, Breus, and Glukhov.

52 *At MEPhI, Toptunov took up*: Korol, author interview, 2015.

52 *Against the advice of his tutors*: Breus, author interview, 2015.

52 *One night after class*: Korol, author interview, 2015.

52 *After four years of study*: Korol, interviews by the author (2015) and Taras Shumeyko (April 2018, Kiev).

53 *Like all other new engineers*: Breus, author interview, 2015.

53 *During the summer and autumn of 1983*: Ibid.; Korol, author interview, 2015. Date of first criticality is provided in Sich, “The Chernobyl Accident Revisited,” 83.

54 *Toptunov organized a gym*: Korol, author interview, 2015; Toptunova, author interview, 2015; R. Veklicheva, “A Soviet way of life. The test” [Образ жизни—Советский. Испытание], *Vperiod* (official newspaper of Obninsk Communist Party Committee), June 17, 1986, Vera Toptunova’s personal archive.

54 *He had a girlfriend*: Korol, author interview, 2015; Josephson, *Red Atom*, 6–7. Radionuclides accumulated in the water during its passage through the reactors were intended to become trapped in sediment that fell to the bottom of the cooling pond, filtering them out before the water reached the Pripyat River (Zhores Medvedev, *Legacy of Chernobyl*, 92). Because reactor outfall maintained the pond at a year-round temperature of 24 degrees centigrade, in 1978 local Soviet authorities decided to develop the radioactive lake for commercial fish farming. Subsequent tests established that fish caught there contained potentially dangerous levels of strontium 90, and three years later their sale was forbidden. Local fishermen continued regardless. Danilyuk, ed., *Z arkhiviv*, document no. 6: “Report of the UkrSSR KGBM on Kiev and Kiev region to the UkrSSR KGB concerning violations of the radiation safety requirements while studying the feasibility to use the Chernobyl NPS cooling pond for the purposes of industrial fishery,” March 12, 1981.

54 *The operators spoke their own coded language*: Sergei Yankovsky, author interview, Kiev, February 2016.

54 *There were thick stacks of manuals*: The operators’ manual is described by Anatoly Kryat (chief of the nuclear physics laboratory at the plant), in court testimony reproduced by Karpan, *From Chernobyl to Fukushima*, 190.

54 *After one of these safety exams*: Korol, author interview, 2015.

54 *Only after all of this study*: Anatoly Kryat, author interview, Kiev, February 2016.

55 “*Let’s go together*”: Korol, author interview, 2015.

55 *A warm, sultry night*: Svetlana Kirichenko (chief economist of the Pripyat *ispol-kom*), author interview, April 24, 2016; recollections of Pripyat residents quoted in

Vasily Voznyak and Stanislav Troitsky, *Chernobyl: It Was Like This—The View from the Inside* [Чернобыль: Так это было—взгляд изнутри] (Moscow: Libris, 1993).

55 *On the bus*: Boris Stolyarchuk, author interview, Kiev, July 2015; Iurii Shcherbak, “Chernobyl: A Documentary Tale” [Чернобыль: Документальная повесть], *Yunost*, nos. 6–7 (1987), translated by JPRS Political Affairs as “Fictionalized Report on First Anniversary of Chernobyl Accident,” Report no. JPRS-UPA-87-029, September 15, 1987 (hereafter, “Report on First Anniversary of Chernobyl Accident”), pt. 1, 24.

55 *Taking the polished marble stairs*: Read, *Ablaze*, 61; author visit to the Chernobyl nuclear power plant, February 10, 2016. The route and routine for entering the building had remained largely unchanged since 1986.

56 *The turbine hall housed*: Sich diagrams a cross-section of the turbine hall in “The Chornobyl Accident Revisited,” 192.

56 *The deaerator corridor*: Author visit to the Chernobyl nuclear power plant, 2016; Steinberg, personal communication with author, August 6, 2018; Sich, “The Chornobyl Accident Revisited,” 191. The deaerator corridor became more widely known after the accident as the “gold” corridor.

57 *A little more than five hundred meters away*: Anatoly Zakharov, author interviews, February 2006 and February 2016; Piotr Khmel, author interview, July 2015; author visit to Fire Station Number Two, Pripyat, April 25, 2016; Leonid Shavrey, testimony in Sergei Kiselyov, “Inside the Beast,” trans. Viktoriya Tripolskaya-Mitlyng, *Bulletin of Atomic Scientists* 52, no. 3 (1996): 47.

57 *They had already been called*: Kiev Region Fire Department Dispatch Log for April 25–26, 1986 (Chernobyl Museum archive, Kiev), 109–11.

58 *There was never much action*: Alexander Petrovsky, author interview, Bohdany, Ukraine, November 2016; Zakharov, author interview, 2016.

58 *Behind the doors*: Piotr Khmel, author interview, 2016.

58 *At the back of the building*: Zakharov, author interview, 2016.

58 *The third watch lacked discipline*: Piotr Khmel, author interview, 2015; Leonid P. Telyatnikov, account, in Iurii Shcherbak, *Chernobyl* [Чернобыль], trans. Ian Press (London: Macmillan, 1989), 26–27; Shcherbak, trans. JPRS, “Report on First Anniversary of Chernobyl Accident,” 46–66.

58 *“Major Telyatnikov will get back”*: Piotr Khmel, author interview, 2015.

59 *“people’s champagne”*: Graham Harding, “Sovetskoe Shampanskoye—Stalin’s ‘Plebeian Luxury,’” *Wine As Was*, August 26, 2014.

59 *At around eleven*: Khmel, author interview, 2015.

59 *Over at the power station*: Alexander Yuvchenko, author interview, 2006.

#### 4. SECRETS OF THE PEACEFUL ATOM

60 *On September 29, 1966*: International Atomic Energy Agency, International Nuclear Safety Advisory Group, “The Chernobyl Accident: Updating of INSAG-1,” Safety series no. 75-INSAG-7, 1992 (hereafter INSAG-7), 32; Schmid, *Producing Power*, 111.

60 *A direct descendant of the old Atom Mirny-1*: For a discussion of how economies of scale influenced this choice, see Marples, *Chernobyl and Nuclear Power in the USSR*, 111.

60 *Twelve meters across*: International Atomic Energy Agency, INSAG-7, 40; the weight of graphite in the core is provided in Zhores Medvedev, *Legacy of Chernobyl*, 5.

60 *These channels contained*: Zhores Medvedev, *Legacy of Chernobyl*, 236; Alexander Sich, telephone interview, May 2018.

60 *The power of the reactor*: Sich, “The Chornobyl Accident Revisited,” 185.

61 *To help protect the plant*: Reactor pit dimensions (21.6 m × 21.6 m × 25.5 m) are given in Sich, “The Chornobyl Accident Revisited,” 429. See also 179 for a cross-sectional view of the reactor vault. Also see USSR State Committee on the Utilization of Atomic Energy, “The Accident at the Chernobyl Nuclear Power Plant and Its Consequences,” information compiled for the August 1986 IAEA Experts’ Meeting in Vienna (hereafter “USSR State Committee Report on Chernobyl”), “Part 2: Annex 2,” 7 and 9. Sich (244) describes serpentinite as a hydrous magnesium silicate.

61 *A biological shield*: Alexander Sich provides a detailed breakdown of the reactor shaft construction materials, showing that the combined mass of Structure E was at least two thousand tonnes (“Chornobyl Accident Revisited,” 427). The same number is noted by the International Atomic Energy Agency in its report on Chernobyl (INSAG-7, 9). These calculations revise the lower estimate of a thousand tonnes cited in 1987 by the US Nuclear Regulatory Commission in *Report on the Accident at the Chernobyl Nuclear Power Station* (NUREG-1250), 2-12.

61 *Pierced by ducts*: USSR State Committee Report on Chernobyl, Part 2 Annex 2, 7, and 9; Sich, “Chornobyl Accident Revisited,” 196.

61 *Known by the plant staff as the pyatachok*: Grigori Medvedev, *The Truth About Chernobyl*, 73-74.

61 *The RBMK was a triumph*: Alexander Sich notes that the typical core of a 1,300-megawatt PWR reactor used in the West was 3.4 meters in diameter and 4.3 meters high (“Chornobyl Accident Revisited,” 158). See also Josephson, *Red Atom*, 299t6.

61 *Soviet scientists proclaimed it*: Sich, “Chornobyl Accident Revisited,” 156-57; Schmid, *Producing Power*, 115 and 123.

61 *Personally taken credit for its design*: Schmid, *Producing Power*, 290n124.

61 *In contrast to its principal Soviet competitor*: Ibid., 123; Josephson, *Red Atom*, 36.

62 *Aleksandrov also saved money*: Schmid, *Producing Power*, 112.

62 *A less costly solution*: Zhores Medvedev, *Legacy of Chernobyl*, 236.

62 *A break in the pressure tubes*: Nikolai Steinberg, author interview, September 2015.

62 *Worse accidents were theoretically possible*: International Atomic Energy Agency, INSAG-7, 9.

63 *Yet the designers saw no need*: Charles K. Dodd, *Industrial Decision-Making and High-Risk Technology: Siting Nuclear Power Facilities in the USSR* (Lanham, MD: Rowman & Littlefield, 1994), 83-84.

63 *The Ministry of Medium Machine Building ordered*: Schmid, *Producing Power*, 110.

63 *One scientist from the Kurchatov*: The physicist was Vladimir Volkov (*ibid.*, 145).

63 *Another recognized that the hazards*: This expert was Ivan Zhezherun, also of the Kurchatov Institute (Zhores Medvedev, *Legacy of Chernobyl*, 258–59).

63 *But by then, the government*: Schmid, *Producing Power*, 110 and 124; International Atomic Energy Agency, INSAG-7, 37.

63 *It was not until 1968*: Schmid, *Producing Power*, 110–11.

63 *So, to save time*: International Atomic Energy Agency, INSAG-7, 37; Anatoly Dyatlov, *Chernobyl: How It Was* [Чернобыль: Как это было] (Moscow: Nauchtekhizdat, 2003), online at <http://pripyat-city.ru/books/25-chernobyl-kak-yeto-bylo.html>, 27.

63 *Construction began*: Dodd, *Industrial Decision-Making and High-Risk Technology*, app. A.

64 *The republic's new 2,000-megawatt atomic energy station*: At this point, Sredmash officials had yet to decide which type of reactor they would build at this second site. They considered three options: a gas-cooled graphite model known as the RK-1000, the VVER, and the RBMK. At first, they dismissed the RBMK as technically and economically the worst of them all. They chose the more advanced, and safer, gas-cooled RK-1000 instead. But by mid-1969, Moscow's ambitious nuclear construction targets were already slipping out of reach, and time was precious. Sredmash recognized that—whatever its limitations—the graphite-water colossus could be manufactured more quickly than the more sophisticated gas-cooled model. It reversed its decision, and went with the RBMK after all. Six months later, at the dawn of a new decade, Viktor Brukhanov was summoned to the headquarters of the Ministry of Energy and Electrification in Moscow and given instructions to build the first two RBMK-1000 reactors of the Chernobyl nuclear power plant (International Atomic Energy Agency, INSAG-7, 32–33; Schmid, *Producing Power*, 120–25).

64 *The first RBMK unit*: Construction start dates for RBMK units across the USSR are given in Sich, “Chornobyl Accident Revisited,” 148.

64 *But the initial Leningrad reactor*: The Leningrad station’s Unit One reached full power eleven months after its start-up, on November 1, 1974 (Schmid, *Producing Power*, 114).

64 *The first problem arose*: International Atomic Energy Agency, INSAG-7, 35–37.

65 *Even as it went into full-scale*: *Ibid.*, 37.

65 *The RBMK was so large*: *Ibid.*, 6.

65 *One specialist compared it to a huge apartment building*: Veniamin Prianichnikov, author interview, Kiev, February 13, 2006.

65 *Isolated hot spots*: Kopchinsky and Steinberg, *Chernobyl*, 140; International Atomic Energy Agency, INSAG-7, 39–40.

65 *“experience and intuition”*: International Atomic Energy Agency, INSAG-7, 4–5.

65 *A third fault*: *Ibid.*, 43; Sich, “Chornobyl Accident Revisited,” 185. The original design documentation for the RBMK proposed seven-meter-long RCPS rods with a

seven-meter absorber and displacer, which would completely span the core top to bottom when lowered; 68 of these would be Emergency Protection System (EPS) rods. But in the final design, none of the rods would be long enough to completely span the core, and instead of 68 EPS rods, there would be only 21. For second-generation RBMK reactors, this was amended to 24 EPS rods, and the total number of rods increased to 211.

65 *Yet the AZ-5 mechanism was not designed*: International Atomic Energy Agency, INSAG-7, 45.

66 *Starting from their fully withdrawn position*: Ibid., 41.

66 *Fuel assemblies became stuck in their channels*: Schmid, *Producing Power*, 114.

66 *The valves and flow meters in other RBMKs*: Kopchinsky and Steinberg, *Chernobyl*, 140–41.

66 *On the night of November 30, 1975*: Vitali Abakumov, a former Leningrad station engineer, shared details and personal recollections of the accident in “Analyzing the Causes and Circumstances of the 1975 Accident on Unit One of Leningrad NPP (Perspective of an Engineer-Physicist, Participant and Witness to the Events)” [Анализ причин и обстоятельств аварии 1975 года на 1-м блоке ЛАЭС (комментарий инженера-физика, участника и очевидца событий)], April 10, 2013, <http://accidont.ru/Accid75.html>. Also see Valentin Fedulenko, “Versions of the Accident: A Participant’s Memoir and an Expert’s Opinion” [Версии аварии: мемуары участника и мнение эксперта], September 19, 2008, [www.chernobyl-by/accident/28-versii-avarii-memuary-uchastnika-i-mnenie.html](http://www.chernobyl-by/accident/28-versii-avarii-memuary-uchastnika-i-mnenie.html).

66 *But the commission knew otherwise*: Kopchinsky and Steinberg, *Chernobyl*, 161.

67 *Sredmash suppressed the commission’s findings*: Ibid.; International Atomic Energy Agency, INSAG-7, 48–49.

67 *The day after the Leningrad meltdown*: The government decree no. 2638 R was issued on December 1, 1975 (International Atomic Energy Agency, INSAG-7, 33).

67 *On August 1, 1977*: Nikolai Steinberg, author interview, Kiev, May 28, 2017.

67 *Ukraine’s first nuclear electricity*: Kopchinsky and Steinberg provide the date in *Chernobyl*, 116. For a history of Ukraine’s electricity grid, see “Section 3: Ukraine’s Unified Power Grid,” in K. B. Denisevich et al., *Book 4: The Development of Atomic Power and Unified Electricity Systems* [Книга 4: Развитие атомной энергетики и объединенных энергосистем] (Kiev: Energetika, 2011), <http://energetika.in.ua/ru/books/book-4/section-2/section-3>.

67 *Together they sang*: Kopchinsky and Steinberg, *Chernobyl*, 139–40. (The preceding part of the chant was a sardonic recognition that the more sophisticated VVER reactors that had been planned to go into operation were mired in production problems and delays.)

67 *Making dozens of adjustments every minute*: Steinberg, author interview, 2015.

68 *Rumors reached them*: Ibid.; Kopchinsky and Steinberg, *Chernobyl*, 140.

68 *“How can you possibly control”*: Georgi Reikhtman (at the time of this exchange, a trainee reactor operator at Chernobyl Unit One), author interview, Kiev, September 2015.

68 *The reactor was riddled with faults*: Kopchinsky and Steinberg, *Chernobyl*, 140–42.

68 *In 1980 NIKIET completed*: International Atomic Energy Agency, INSAG-7, 48–49.

68 *The report made it clear*: Ibid., 82.

68 *But the staff of Soviet nuclear power plants*: Schmid, *Producing Power*, 62–63; Read, *Ablaze*, 193.

69 *One of the new directives stipulated*: International Atomic Energy Agency, INSAG-7, 72.

69 *Deprived of information*: Ibid., 48–50.

69 *Early on the evening of September 9, 1982*: The KGB's report on the incident the following day is provided in Danilyuk, ed., *Z arkhiviv*, Document no. 9: "Report of the UkrSSR KGBM on Kiev and Kiev Region to the 2nd KGB Head-office of the USSR and the 2nd KGB Managing the UkrSSR Concerning the Emergency Stop-page of the Chernobyl' NPS Power Unit 1 on September 9, 1982," September 10, 1982.

69 *Nikolai Steinberg was sitting at the desk*: Steinberg, author interview, 2015.

70 *"to prevent the spread of panic-mongering"*: The purported lack of radioactive releases was mentioned in a KGB report from September 13, 1982, available in Danilyuk, ed., *Z arkhiviv*, Document no. 10: "Report of the UkrSSR KGBM on Kiev and Kiev Region to the USSR KGB and the UkrSSR KGB Concerning the Results of Preliminary Investigation of the Cause of the Emergency Situation on the Chernobyl' NPS as of September 9, 1982," September 13, 1982. The fact that radiation was indeed released was noted by KGB on September 14. See KGB of the Ukrainian SSR, *Report of USSR KGB on the number of foreigners from capitalist and developing countries in the Ukrainian SSR, England-Based Combatants of the Organization of Ukrainian Nationalists, the Consequences of the Accident at the NPP* [Информационное сообщение КГБ УССР о количестве иностранцев из капиталистических и развивающихся стран в УССР, ОУНовских боевиках в Англии, последствиях аварии на АЭС на 14 сентября 1982 г.], September 14, 1982, declassified archive of the Ukrainian State Security Service, <http://avr.org.ua/index.php/viewDoc/24447/>.

70 *In fact, radioactive contamination*: Danilyuk, ed., *Z arkhiviv*, Document no. 12: *Report of the UkrSSR KGBM on Kiev and Kiev Region to the USSR KGB and UkrSSR KGB concerning the Radioactive Contamination of Chernobyl' NPS Industrial Site Due to the Accident on 9 September 1982*, September 14, 1982; and Document no. 13: *Report of the Chief of the UkrSSR KGBM on Kiev and Kiev Region to the Chairman of the UkrSSR KGB Concerning the Radiation Situation Which Occurred on the Chernobyl' NPS Industrial Site Due to the Accident on September 9, 1982*, October 30, 1982; Viktor Kovtutsky, chief accountant at Chernobyl construction department, author interview, Kiev, April 2016; Esaulov, *City That Doesn't Exist*, 19.

70 *When the reactor had been brought back online*: Read, *Ablaze*, 43–44.

70 *Workers carried blocks*: Andrei Glukhov, author interview, Slavutych, Ukraine, 2015.

70 *The incident was classified*: Author interviews with Steinberg and Glukhov.

70 *Nikolai Steinberg would wait years*: Kopchinsky and Steinberg, *Chernobyl*, 141; Steinberg, author interview, 2015.

70 *In October 1982 a generator exploded*: Grigori Medvedev, *Truth About Chernobyl*, 19 and 44–45.

71 *Both incidents were concealed*: Author interviews with Steinberg, Glukhov, and Kupny; Grigori Medvedev, *Truth About Chernobyl*, 19.

71 *The severity of this “positive scram” effect*: The ORM, or operational reactivity margin, measured the total number of control rods—or their equivalent in power-quenching capacity—inserted into the core at any one time. For example, an ORM of 30 might indicate 30 rods completely inserted, 60 rods inserted to half their length, or 120 inserted to a quarter.

71 *If more than 30 of these rods*: International Atomic Energy Agency, INSAG-7, 39–43.

72 *The source of the positive scram effect*: Steinberg, author interview, 2017; Sich, “Chernobyl Accident Revisited,” 159.

72 *Like all the manual control rods*: Steinberg, author interview, 2017; Kopchinsky and Steinberg, *Chernobyl*, 144; International Atomic Energy Agency, INSAG-7, 42–44, 90n24. The letter (ref. no. 33-08/67) was dated December 23, 1983.

72 *But they weren’t*: At a 1983 interdepartmental meeting in Moscow hosted by Aleksandrov, Efim Slavsky reacted with fury when discussion turned to the shortcomings of the RBMK. His stance helped “close the door to a serious conversation about this type of reactor,” recalls Georgi Kopchinsky, then the head of the nuclear energy sector at the Central Committee, who attended the meeting. See Kopchinsky and Steinberg, *Chernobyl*, 145. There is more detail on the failures to address the known design faults of RBMK reactors in Nikolai Karpan, *Chernobyl: Revenge of the Peaceful Atom* [Чернобыль: Месть мирного атома] (Kiev: CHP Country Life, 2005), 399–404.

72 *Some partial modifications*: INSAG-7 (45) reports that modification of the control rods was proposed by NIKIET as early as 1977 but implemented in only a few RBMK reactors. Kopchinsky mentions that the idea came from the atomic power plant in Kursk and “was never incorporated into the reactor blueprint.” Instead, alteration of each RBMK unit required individual confirmation from NIKIET, a process that “dragged on for months” (Kopchinsky and Steinberg, *Chernobyl*, 144).

73 *The news never reached the reactor operators*: Steinberg, author interview, 2015; Alexey Breus, author interview, Kiev, July 2015; Kopchinsky and Steinberg, *Chernobyl*, 144; Andrei Glukhov recalled that the staff of the nuclear safety department at Chernobyl received a document notifying them of the “tip effect” in 1983 but that it was marked for limited distribution only, and the operating instructions of the reactor were not revised to mention the phenomenon (Glukhov, telephone interview, July 2018).

73 *The last day of 1983*: The commissioning date of Unit Four is confirmed by Ni-

kolai Fomin, chief engineer of Chernobyl NPP, in Karpan, *From Chernobyl to Fukushima*, 143.

73 *Early in the morning of March 28, 1979*: There is a brisk account of the accident in Mahaffey, *Atomic Accidents*, 342–50, and Mahaffey, *Atomic Awakening*, 314–17. More detail can be found in Mitchell Rogovin and George T. Frampton Jr. (NRC Special Inquiry Group), *Three Mile Island: A Report to the Commissioners and to the Public* (Washington, DC: Government Printing Office, 1980).

74 *News of Three Mile Island was censored*: Grigori Medvedev, *Truth About Chernobyl*, 7.

74 *The failings of capitalism*: William C. Potter, *Soviet Decisionmaking for Chernobyl: An Analysis of System Performance and Policy Change* (report to the National Council for Soviet and East European Research, 1990), 6; Edward Geist, “Political Fallout: The Failure of Emergency Management at Chernobyl,” *Slavic Review* 74, no. 1 (Spring 2015): 107–8.

74 *Its operators were far better trained*: Leonid Bolshov, a senior physicist at the Kurchatov Institute at the time, recalls that the official line went as follows: the American operators were poorly educated former navy cadets, who never completed college, while the Russian operators were all nuclear science majors from top universities with superior training (author interview, 2017). Also see Zhores Medvedev, *Legacy of Chernobyl*, 272–73.

74 *Privately, Soviet physicists began to analyze*: Virtually the only public admission of these professional doubts that made it to print was a 1980 article coauthored by four physicists—Legasov, Sidorenko, Babayev, and Kuzmin—who wrote: “Under certain circumstances, despite existing safety measures, there might arise conditions for an accident at a [nuclear power plant] that would damage its active zone and release a small amount of radioactive substances to the atmosphere.” It was promptly criticized by Sredmash as alarmist. “Safety Issues at Atomic Power Stations” [Проблемы безопасности на атомных электростанциях], *Priroda*, no. 6, 1980. For discussions of the USSR’s evolving state oversight committees for nuclear power, see Schmid, *Producing Power*, 59–60 and 92.

74 *But neither Sredmash nor NIKIET*: International Atomic Energy Agency, INSAG–7, 34–35.

74 *A ten-page report on the wonders of nuclear energy*: “Nuclear Power Industry,” *Soviet Life* 353, no. 2 (Washington, DC: Soviet Embassy, February 1986), 7–16.

74 *In the thirty years*?: Valery Legasov, Lev Feoktistov, and Igor Kuzmin, “Nuclear Power Engineering and International Security,” *Soviet Life* 353, no. 2, 14.

74 *“one in 10,000 years”*: Vitali Sklyarov, interview by Maxim Rylsky, “The Nuclear Power Industry in the Ukraine,” *Soviet Life* 353, no. 2, 8. When I spoke to Sklyarov in 2017, he claimed to have no memory of this statement or the article it appeared in.

##### 5. FRIDAY, APRIL 25, 11:55 P.M., UNIT CONTROL ROOM NUMBER FOUR

75 *A rancid haze of cigarette smoke*: Alexey Breus, author interview, Kiev, July 2015. Smoking was forbidden in most parts of the plant, and the control rooms were one

of the few places where it was tolerated. The reactor control engineers smoked at the control panels, and Leonid Toptunov (along with an overwhelming number of others in the USSR at the time) was a smoker.

75 *Now entering his second day without sleep*: Dyatlov's defender, cross-examining Fomin in court, in trial proceedings reproduced in Karpan, states that Dyatlov managed the operations of Unit Four alone for two days. Fomin responds that Dyatlov had gone home for a "break" on the afternoon of April 25, but remained available by telephone. *Chernobyl to Fukushima*, 148.

75 *Exhausted and unhappy*: Boris Stolyarchuk, author interview, Kiev, July 2015.

75 *It was one scenario*: A total loss of power of this kind had already occurred at the Kursk nuclear power plant in 1980: Zhores Medvedev, *Legacy of Chernobyl*, 269.

75 *The station had emergency diesel generators*: Sich, "Chornobyl Accident Revisited," 225.

75 *The rundown unit*: Nikolai Steinberg, former senior engineer at Chernobyl NPP, recalls that three similar tests took place before 1986—not one of them able to generate the amount of electricity that a total external power failure would require (author interview, 2015). The International Atomic Energy Agency report (INSAG-7) summarizes the history of the rundown test on p. 51. The fact that Reactor Number Four was commissioned without this test being completed is noted by the trial judge in the transcript of Chernobyl court proceedings in Karpan, *Chernobyl to Fukushima*, 143.

76 *Factories and enterprises throughout Ukraine*: This practice of *shturmovshchina* before important production quota deadlines—literally, taking them "by storm"—was a regular feature of Soviet working life: Zhores Medvedev, *Legacy of Chernobyl*, 25–26. See also the account of Igor Kazachkov, who supervised the first shift at Unit Four that day, in Shcherbak, *Chernobyl*, 34.

76 *The dispatcher said*: Gennadi Metlenko (chief engineer of Dontekhenergo), court testimony, in Karpan, *Chernobyl to Fukushima*, 178.

76 *By midnight on Friday*: Metlenko, questioned by Dyatlov in court testimony, in Karpan, *Chernobyl to Fukushima*, 180.

76 *He hadn't shown up at all*: Karpan, *Chernobyl to Fukushima*, 146 and 191; Glukhov, author interview, 2015.

76 *Twenty-five-year-old*: Leonid Toptunov's date of birth (August 16, 1960) is provided by his mother, Vera Toptunova, in author interview, 2015.

76 *If the test wasn't completed that night*: Zhores Medvedev, *Legacy of Chernobyl*, 28.

76 *At fifty-five*: Anatoly Dyatlov's date of birth (March 3, 1931) is given in the court verdict reproduced in Karpan, *Chernobyl to Fukushima*, 194.

76 *A veteran physicist*: Dyatlov, court testimony, in Karpan, *Chernobyl to Fukushima*, 151.

76 *The son of a peasant*: Read, *Ablaze*, 33–34 and 46.

77 *As the head of the classified Laboratory 23*: V. A. Orlov's and V. V. Grischenko's recollections, parts III and V in "Appendix 8: Memories about A. S. Dyatlov," in Dyatlov, *Chernobyl: How It Was*, 183 and 187. For a history of the Lenin Kom-

somol shipyard, see “Komsomol’sk-na-Amure,” Russia: Industry: Shipbuilding, GlobalSecurity.org, November 2011.

77 *By the time he arrived in Chernobyl*: Dyatlov, court testimony, in Karpan, *Chernobyl to Fukushima*, 156.

77 *These small marine reactors*: Dyatlov, *Chernobyl: How It Was*, 25–32; Dyatlov, court testimony, in Karpan, *Chernobyl to Fukushima*, 152.

77 *But the manner Dyatlov had developed*: Anatoly Kryat’s recollections, part IV in Appendix 8 of Dyatlov, *Chernobyl: How It Was*, 186; Steinberg, author interview, 2015; Glukhov, author interview, 2015.

77 *Even those colleagues*: Valentin Grischenko, who worked with Dyatlov at both the Lenin Komsomol shipyard and Chernobyl, notes that out of all Dyatlov’s colleagues in Chernobyl, only one—another longtime collaborator, Anatoly Sitnikov—could be considered a close friend of his. Grischenko’s recollections in Dyatlov, *Chernobyl: How It Was*, 187.

77 *He could be high-handed*: Korol, author interview, 2015.

77 *He demanded that any fault*: Dyatlov, court testimony, in Karpan, *Chernobyl to Fukushima*, 152; Breus, author interview, 2015.

78 *Even when overruled from above*: Grischenko’s recollections, in Dyatlov, *Chernobyl: How It Was*, 187.

78 *And Dyatlov’s long experience*: Dyatlov, *Chernobyl: How It Was*, 25–26.

78 *Dyatlov had fulfilled*: Steinberg, author interviews, 2015 and 2017; Read, *Ablaze*, 47; Grischenko’s recollections in Dyatlov, *Chernobyl: How It Was*, 187.

78 *Only long afterward would his secret emerge*: Anatoly Dyatlov, personal letter (unpublished) to Toptunov’s parents, Vera and Feodor, June 1, 1989, from the personal archive of Vera Toptunova; Sergei Yankovsky (investigator for the Kiev Region Prosecutor’s Office), author interview, Kiev, February 7, 2016; Read, *Ablaze*, 47. Dyatlov describes the dose of radiation he received during his time at the shipyard—without attributing it directly to the accident—in an interview given to A. Budnitsky and V. Smaga, “The Reactor’s Explosion Was Inevitable” [Пактор должен был взорваться], *Komsomolskoye Znamya*, April 20, 1991, reproduced in Dyatlov, *How It Was*, 168.

78 *Many admired him*: Description in Read, *Ablaze*, 47; V. V. Lomakin’s recollections, part VI in Appendix 8 of Dyatlov, *Chernobyl: How It Was*, 188; Kopchinsky and Steinberg, *Chernobyl*, 151. Georgi Reikhtman, a submarine reactor room officer cashiered from the Soviet navy as part of a political purge, said that Dyatlov was a fair man, instrumental in having Reikhtman hired to work at the Chernobyl station when no one else would give him a job (Reikhtman, author interview, September 2015).

78 *Eager to learn, they believed*: Steinberg, author interview, 2015.

78 *For all his hours spent poring*: Nikolai Steinberg recalls that Dyatlov “would sometimes make offhand remarks about the RBMK being unknowable. We, the young, found this odd. We thought that Dyatlov, for one, knew everything.” Kopchinsky and Steinberg, *Chernobyl*, 151; Steinberg, author interview, 2017.

79 *On the left sat*: The acronym SIUR stands for *starshiy inzhener upravleniya reaktorom*. Author visit to Chernobyl nuclear power plant Control Room Number Two, and interview with Alexander Sevastianov, February 10, 2016; Stolyarchuk, author interview, 2016.

79 *Forming a wall*: Author visit to Chernobyl nuclear power plant Control Room Number Two, and interview with Alexander Sevastianov, February 2016; Stolyarchuk, author interview, 2016.

80 *In the strict technical hierarchy*: Glukhov, author interview, 2015.

80 *Akimov, a gangling thirty-two-year-old*: Akimov's date of birth is given as May 6, 1953, in "List of Fatalities in the Accident at Chernobyl" [Список погибших при аварии на Чернобыльской АЭС], undated, Chernobyl Electronic Archive, available at <http://pripyat-city.ru/documents/21-spiski-pogibshix-pri-avarii.html>.

80 *He and his wife, Luba*: Read, *Ablaze*, 38–39.

80 *Akimov was clever*: Steinberg, author interview, 2015. When tasked with calculating the hypothetical probability of a serious accident occurring at Chernobyl, Akimov had estimated it at one in ten million a year (Read, *Ablaze*, 43).

80 *Control Room Number Four had now grown busy*: See the account of Yuri Tregub, who supervised the second shift at Unit Four that day, in Shcherbak, *Chernobyl*, 39; Grigori Medvedev, *Truth About Chernobyl*, 72.

80 *Perhaps assuming*: This explanation was suggested by Fomin in court testimony provided by Karpan, *Chernobyl to Fukushima*, 146.

80 *Akimov, a copy of the test protocol*: Stolyarchuk, author interview, 2016; Tregub, court testimony, in Karpan, *Chernobyl to Fukushima*, 180–81.

81 *When Toptunov had assumed responsibility*: International Atomic Energy Agency, INSAG-7, 4–5.

81 *So Toptunov began the process*: Sich, "Chornobyl Accident Revisited," 211; Alexander Sich, author telephone interview, December 2016. The subsequent accident report by a working group of Soviet experts likewise faults Toptunov for the power fall: INSAG-7, "Annex I: Report by a Commission to the USSR State Committee for the Supervision of Safety in Industry and Nuclear Power," 1991, 63. However, the authors of the INSAG-7 report mention that Dyatlov himself attributed the incident to equipment malfunction (International Atomic Energy Agency, INSAG-7, 11).

81 *Now Toptunov watched in dismay*: International Atomic Energy Agency, INSAG-7, p. 73; Tregub, testimony in Shcherbak, *Chernobyl*, 40.

81 *"Maintain power!"*: Tregub, court testimony, in Karpan, *Chernobyl to Fukushima*, 181.

81 *At this point*: On two previous occasions when operators had attempted to raise power in ChNPP reactors without waiting out the poison override time, word had reached nuclear safety inspectors in Moscow about what was happening, and they called Brukhanov immediately to have the power increases halted. Yuri Laushkin, court testimony, in Karpan, *Chernobyl to Fukushima*, 175.

81 *Dyatlov himself would maintain*: In his memoir, Dyatlov describes leaving the con-

trol room before Toptunov transferred the system to Global Automatic, in order to “more thoroughly inspect areas with heightened radiation risk,” which he thought had been made safer by the reduction of the reactor’s power. He states that he did not return to the control room until 00:35 a.m. (*Chernobyl: How It Was*, 30).

82 *The recollections of others*: Tregub also testifies to Dyatlov’s presence in the control room at this time (court testimony in Karpan, *Chernobyl to Fukushima*, 180–81). So does Metlenko (179), who says that Dyatlov stepped away from the console at about 00:28 a.m. “mopping his brow.”

82 “*I’m not going to raise the power!*”: Grigori Medvedev, *Truth About Chernobyl*, 55–56. Medvedev writes that Toptunov would recount his thoughts at this moment while in the medical center in Pripyat, less than twenty-four hours later. This view is expanded upon by Shcherbak’s interviews with Igor Kazachkov and Arkady Uskov, quoted in *Chernobyl*, 366–69 and 370–74.

82 *The deputy chief engineer withdrew*: Metlenko, testimony in Karpan, *Chernobyl to Fukushima*, 179.

82 “*Why are you pulling unevenly?*”: Tregub’s account in Shcherbak, *Chernobyl*, 41. The elapsed time period is noted in Sich, “Chornobyl Accident Revisited,” 212.

83 *By one in the morning*: International Atomic Energy Agency, INSAG-7, 71.

83 *Yet the engineers knew*: Ibid.

83 *Running the pump system*: Stolyarchuk, author interview, 2016.

83 *The rush of water*: Sich, “Chornobyl Accident Revisited,” 212–14.

83 *A few moments later*: International Atomic Energy Agency, INSAG-7, 8.

83 *Some of the operators*: Razim Davletbayev (deputy chief of the Turbine Department), court testimony in Karpan, *Chernobyl to Fukushima*, 188; Dyatlov, *Chernobyl: How It Was*, 31.

83 *Ten men now stood*: Grigori Medvedev, *Truth About Chernobyl*, 71–72.

84 “*What are you waiting for?*”: Davletbayev, court testimony, in Karpan, *Chernobyl to Fukushima*, 188.

84 *Simulating the effects*: Stolyarchuk, author interview, 2016. The test was initiated by the electrical shop, according to Fomin’s court testimony provided in Karpan, *Chernobyl to Fukushima*, 142.

84 *The test program closely duplicated*: Metlenko states in his court testimony that the 1984 test was conducted on Turbo-generator no. 5, which was in Unit Three: Karpan, *Chernobyl to Fukushima*, 178.

84 *The chief engineer, had ordered that test himself*: Fomin, court testimony, in Karpan, *Chernobyl to Fukushima*, 142–44; International Atomic Energy Agency, INSAG-7, 51–52; Supreme Court of the USSR, court verdict for Brukhanov, Dyatlov, and Fomin, July 29, 1987, provided in Karpan, *Chernobyl to Fukushima*, 198.

84 *Fomin made two important changes*: Fomin, court testimony, in Karpan, *Chernobyl to Fukushima*, 145.

85 *Dyatlov, Akimov, and Metlenko*: Tregub’s account in Shcherbak, *Chernobyl*, 41.

85 *Upstairs at mark +12.5*: Room description is from author visit to Main Circulating Pump room of Unit Three, Chernobyl nuclear power plant, February 10, 2016.

85 *164 of the 211 control rods*: Figure II-6, International Atomic Energy Agency, INSAG-7, 119.

85 “*Oscilloscope on!*”: Dyatlov, *Chernobyl: How It Was*, 40.

85 *Inside the reactor, the cooling water*: International Atomic Energy Agency, INSAG-7, 8.

85 *Toptunov’s control panel revealed nothing unusual*: International Atomic Energy Agency notes in INSAG-7 (p. 66): “Neither the reactor power nor the other parameters (pressure and water level in the steam separator drums, coolant and feedwater flow rates, etc.) required any intervention by the personnel or by the engineered safety features from the beginning of the tests until the EPS-5 button was pressed.”

86 “*SIUR—shut down the reactor!*”: Court testimonies of Yuri Tregub and Grigori Lysyuk (senior foreman of the electrical shop), in Karpan, *Chernobyl to Fukushima*, 182 and 184; Dyatlov, *Chernobyl: How It Was*, 40. Although Lysyuk maintains that the power surge was reported by Toptunov *before* the AZ-5 button was pressed, Dyatlov would say that this happened afterward, which also corresponds to further testimony and evidence from the computer data recovered after the accident.

86 *A transparent plastic cover*: Description of AZ-5 button provided by Nikolai Steinberg in author interview, 2017.

86 “*The reactor has been shut down!*”: Tregub, court testimony, in Karpan, *Chernobyl to Fukushima*, 182.

86 *Oustripped the recording capacity*: International Atomic Energy Agency, INSAG-7, 66.

86 *For one scant second*: Ibid., 119.

86 *But then the graphite tips*: Dyatlov, *Chernobyl: How It Was*, 48; International Atomic Energy Agency, INSAG-7, 4 (section 2.2).

86 *The chain reaction began to increase*: International Atomic Energy Agency, INSAG-7, 67; Sich, “Chornobyl Accident Revisited,” 220.

86 *A frightening succession of alarms*: International Atomic Energy Agency, INSAG-7, 55.

86 *Electric buzzers*: Author visit to Control Room Number Two and interview with Alexander Sevastianov, February 10, 2016.

86 “*Shut down the reactor!*”: Dyatlov, *Chernobyl: How It Was*, 41.

86 *Standing at the turbine desk*: Tregub’s account in Shcherbak, *Chernobyl*, 41–42.

86 *But the reactor was destroying itself*: Sich, “Chornobyl Accident Revisited,” 231m; International Atomic Energy Agency, INSAG-7, 67.

87 *The channels themselves broke apart*: International Atomic Energy Agency, INSAG-7, 67–68.

87 *The AZ-5 rods jammed*: Dyatlov, *Chernobyl: How It Was*, 31.

87 *Out on a gantry at level +50*: Sich, “Chornobyl Accident Revisited,” 219 and 230nl; Grigori Medvedev, *Truth About Chernobyl*, 73–74.

87 *At Toptunov’s control panel, the alarm sounded*: International Atomic Energy Agency, INSAG-7, 55.

87 *The walls of the control room*: Tregub's account in Shcherbak, *Chernobyl*, 42.

87 *A rising moan*: Stolyarchuk, author interview, 2015.

87 *As the fuel channels failed*: Sich, "Chornobyl Accident Revisited," 221–22.

87 *The temperature inside the reactor rose*: Karpan, *Chernobyl to Fukushima*, 63.

87 *The lights of the Selsyn dials flared*: Grigori Medvedev, *Truth About Chernobyl*, 71.

87 *Releasing the AZ-5 rods from their clutches*: Dyatlov, *Chernobyl: How It Was*, 57.

88 *A mixture of hydrogen and oxygen*: This hypothesis is supported by the USSR Vienna report (USSR State Committee on the Utilization of Atomic Energy, "The Accident at the Chernobyl Nuclear Power Plant and Its Consequences"), 21; and Sich, "Chornobyl Accident Revisited," 223. For an alternative explanation, and discussion of the location of the second explosion, see Karpan, *Chernobyl to Fukushima*, 62–63.

88 *As much as sixty tonnes of TNT*: Estimates of the force of the explosion that destroyed the reactor vary enormously. An estimate of around twenty-four tonnes of TNT is cited in K. P. Checherov, "Evolving accounts of the causes and processes of the accident at Block 4." Valery Legasov's estimate would be just three to four tonnes of TNT (Legasov Tapes, Part One, p. 12). Karpan (*Chernobyl to Fukushima*, 62) says thirty tonnes, citing "Expert Conclusions" of state investigators reached on May 16, 1986. Finally, the KGB report of May 15, 1986, specified "no less than 50 to 60 tonnes" (Danilyuk, ed., *Z arkhiviv*, Document no. 34: "Report of the UkrSSR OG KGBM and the USSR KGB in the town of Chernobyl' to the USSR KGB concerning the radioactive situation and progress in investigating the accident at the Chernobyl' NPS").

88 *The blast caromed off the walls of the reactor vessel*: Although this continues to be a matter of debate, a 1989 report by the USSR State Committee on Safety in the Atomic Power Industry explains that the shield was thrown far enough in the air to be flipped over: A. Yadrihinsky, "Atomic Accident at Unit Four of Chernobyl NPP and Nuclear Safety of RBMK Reactors" [Ядерная авария на 4 блоке Чернобыльской АЭС и ядерная безопасность реакторов РБМК], Gosatomenergonaadzor Inspectorate at the Kursk Nuclear Power Station, 1989, 10–11. See also US Nuclear Regulatory Commission in "Report on the Accident (NUREG-1250)," 2–16 and 5–6. Further details of damage caused by the initial explosion are given in Sich, "Chornobyl Accident Revisited," 84–85.

88 *Almost seven tonnes of uranium fuel*: Sich, "Chornobyl Accident Revisited," 84. Radioactive fallout from the accident was detailed in a top-secret report on May 21 by Yuri Izrael, chairman of the State Committee for Hydrometeorology and Environmental Monitoring (Goskomgidromet) to Nikolai Ryzhkov, chairman of the USSR Council of Ministers: "Regarding the assessment of the radioactivity situation and radioactive contamination of the environment by the accident at the Chernobyl NPP" [Об оценке радиационной обстановки и радиоактивного загрязнения природной среды при аварии на Чернобыльской АЭС], May 21, 1986, Microfilm, Hoover Institution, *Russian State Archive of Contemporary History (RGANI)*, Opis 51, Reel 1.1006, File 23.

88 *1,300 tonnes of incandescent graphite rubble*: Sich, “Chornobyl Accident Revisited,” 405.

88 *Inside his workspace*: Alexander Yuvchenko, author interview, 2006.

88 *Over in the turbine hall*: Yuri Korneyev (turbine operator, fifth shift, Unit Four Chernobyl nuclear power plant), author interview, Kiev, September 2015.

89 *Former nuclear submariner Anatoly Kurguz*: Karpan, *Chernobyl to Fukushima*, 21.

89 *Tiles and masonry dust fell*: Dyatlov, *Chernobyl: How It Was*, 49.

89 *A gray fog bloomed*: Stolyarchuk, author interviews, 2015 and 2016.

89 *Outside the plant*: Karpan, *Chernobyl to Fukushima*, 11–12.

## 6. SATURDAY, APRIL 26, 1:28 A.M., PARAMILITARY FIRE STATION NUMBER TWO

91 *A purple cone of iridescent flame*: Eyewitness testimony in Karpan, *Chernobyl to Fukushima*, 12.

91 *In the telephone dispatcher’s room*: Anatoly Zakharov, author interview, Kiev, February 2016.

91 *Many of the fourteen men*: Ibid. They arrived at the scene at one thirty in the morning, according to the Kiev Region Fire Department Dispatch Log, archive of the Chernobyl Museum.

91 *Pravik gave the order to go*: Alexander Petrovsky, author interview, Bohdany, Ukraine, November 2016. Times and details of alarms and equipment are provided in the Kiev Region Fire Department Dispatch Log, archive of the Chernobyl Museum.

92 *Two extra tanker trucks*: The Pripyat brigade was called out at 1:29 a.m. (Kiev Region Fire Department Dispatch Log). See also Leonid Telyatnikov’s account in Shcherbak, “Report on First Anniversary of Chernobyl,” trans. JPRS, pt. 1, 18.

92 *A number three alarm*: Pravik confirmed the number three alarm by telephone at 1:40 a.m., according to the Kiev Region Fire Department Dispatch Log, Chernobyl Museum. Additional details: V. Rubtsov and Y. Nazarov, “Men of the Assault Echelon,” *Pozharnoye delo*, no. 6 (June 1986), translated in JPRS, *Chernobyl Nuclear Accident Documents*, 24–25.

92 *Now the giant superstructure of the plant*: Zakharov, author interview, 2016; Petrovsky, author interview, 2016.

92 *Everyone was talking at once*: Stolyarchuk, author interviews, 2015 and 2016.

92 *A constellation of warning lamps*: This description is based on author visit to the control room for Unit Number Two at the Chernobyl plant, February 10, 2016, and Dyatlov’s court testimony in Karpan, *Chernobyl to Fukushima*, 157.

93 *In desperation, Dyatlov turned*: Dyatlov, *Chernobyl: How It Was*, 49; Anatoly Dyatlov interviewed by Michael Dobbs, “Chernobyl’s ‘Shameless Lies,’” *Washington Post*, April 27, 1992.

93 “*Lads*,” he said: Read, *Ablaze*, 68; Dyatlov, *Chernobyl: How It Was*, 49. In his memoir, Dyatlov denied giving the order to supply water to the reactor, insisting it was

given after his departure from the control room by Chief Engineer Fomin. Dyatlov, *Chernobyl: How It Was*, 53.

93 *Engulfed in dust, steam, and darkness*: Yuvchenko, author interview, 2006.

93 *From beyond the shattered doorway*: Alexander Yuvchenko, testimony in *Zero Hour: Disaster at Chernobyl*, directed by Renny Bartlett, Discovery, 2004. Further description of the second operator, Alexander Novik, is from Alexander Yuvchenko, interview by Michael Bond, "Cheating Chernobyl," *New Scientist*, August 21, 2004.

94 *Then Yuvchenko saw*: Alexander Yuvchenko, author interview, 2006; Yuvchenko, interview by Bond, *New Scientist*, 2004. The moon was full at the time of the explosion, according to [www.moonpage.com](http://www.moonpage.com). Tregub's own memory of the sequence of events, recalled in an interview with Yuri Shcherbak, differs from Yuvchenko's (Shcherbak, *Chernobyl*, 42–43).

94 *The two men turned into the transport corridor*: Alexander Yuvchenko, author interview, 2006. Although Yuvchenko would later be convinced the ethereal glow he saw was the result of Cherenkov's Light, this phenomenon is visible only in mediums with a high refractive index, such as water—and unlikely to have been possible in the open air above Reactor Number Four (Alexander Sich, author interview, 2018).

95 "Tolik, what is it?": Zakharov, author interview, 2016.

95 *A scene of total chaos*: This description is drawn from the testimonies of Korneyev and Shavrey (in Kiselyov, "Inside the Beast," 43 and 47) and Razim Davletbayev (account in Kopchinsky and Steinberg, *Chernobyl*, 20).

96 *Pravik and Shavrey*: Shavrey, account in Kiselyov, "Inside the Beast," 47; Kiev Region Fire Department Dispatch Log, Chernobyl Museum.

96 *By two in the morning*: Kiev Region Fire Department Dispatch Log, Chernobyl Museum.

96 *Established a crisis center*: "Order No. 113: The measures concerning the emergency at the Chernobyl NPP" [О мерах в связи с ЧП на Чернобыльской АЭС], signed by Major General V. M. Korneychuk, April 26, 1986, "Operational Group of the Department of Internal Affairs of Kiev Oblast Lettered File on Special Measures in Pripyat Zone" [Оперативный Штаб УВД Киевского облисполкома, Литерное дело по спецмероприятиям в припятской зоне], April 26 to May 6, 1986, 5–6, Archive of Chernobyl Museum.

96 "There's a fire in Unit Four": Piotr Khmel, author interview, Kiev, 2016.

96 *In his flat on Lenina Prospekt*: Viktor and Valentina Brukhanov, author interview, 2015.

97 I'm going to prison: Viktor and Valentina Brukhanov, author interview, 2015.

97 *Designed as a refuge*: Details from author's visit to the bunker, February 2016.

97 *Brukhanov went upstairs*: Details of Brukhanov's movements here are drawn from a transcript of Brukhanov's trial testimony on July 8, 1987, taken contemporaneously in shorthand by Nikolai Karpan and published in *Chernobyl to Fukushima*

(126–34). The plant’s civil defense chief, Serafim Vorobyev, states that Brukhanov instructed him to personally see to the opening of the bunker (Shcherbak, *Chernobyl*, 396). Brukhanov’s order to announce a General Radiation Accident is confirmed by the telephone operator L. Popova, in Evgeny Ignatenko, ed., *Chernobyl: Events and Lessons* [Чернобыль: события и уроки] (Moscow: Politizdat, 1989), 95. When she tried to turn the automated system on, Popova discovered that the tape player was broken, so she began making the calls herself, one by one.

97 *The mayor of Pripyat arrived*: Brukhanov, court testimony in Karpan, *Chernobyl to Fukushima*, 128–29. The head of the Pripyat City Executive Committee—the Soviet equivalent of the mayor—was Vladimir Voloshko. Major V. A. Bogdan, whose formal title was the plant’s head of security, is identified as a KGB officer in a KGB memo from May 4: Danilyuk, ed., *Z archiviv*, Document no. 26: “Report of the UkrSSR KGB 6th Department to the USSR KGB Concerning the Radioactive Situation and Progress in Investigating the Accident at the Chernobyl’ NPS.”

98 “*There’s been a collapse*”: Parashyn, testimony in Shcherbak, *Chernobyl*, 76.

98 *Then he informed*: For a list of his calls, see Brukhanov, court testimony, in Karpan, *Chernobyl to Fukushima*, 129.

98 *Soon afterward, the director took the first damage reports*: Brukhanov, court testimony in Karpan, *Chernobyl to Fukushima*, 129; Parashyn, account in Shcherbak, *Chernobyl*, 76.

98 *There were soon thirty or forty men*: Parashyn, account in Shcherbak, *Chernobyl*, 76.

98 *After witnessing the horror*: Alexander Yuvchenko, author interview, 2006; Yuvchenko, interview by Bond, *New Scientist*, 2004; Vivienne Parry, “How I Survived Chernobyl,” *Guardian*, August 24, 2004.

99 *Standing emergency regulations*: Karpan, *Chernobyl to Fukushima*, 18.

100 *Amid the radioactive steam*: Ibid., 18 and 20–22; Razim Davletbayev, “The Last Shift” [Последняя смена], in Semenov, ed., *Chernobyl: Ten Years On*, 371–77.

100 *Remained locked in a safe*: Karpan, *Chernobyl to Fukushima*, 25.

100 *Razim Davletbayev told himself*: Davletbayev, “The Last Shift,” 377–78.

100 *Busy shutting down Turbine Number Eight*: Yuri Korneyev, testimony in Kiselyov, “Inside the Beast,” 44; Korneyev, author interview, Kiev, 2015. Further details of Baranov’s actions are provided at “Materials: Liquidation Heroes” [Материалы: Герои-ликвидаторы], the website of the Chernobyl NPP, <http://chnpp.gov.ua/ru/component/content/article?id=82>.

101 *The engineers had begun to comb the rubble*: Karpan, *Chernobyl to Fukushima*, 19; Nikolai Gorbachenko (radiation monitor at Chernobyl NPP), testimony in Grigori Medvedev, *Truth About Chernobyl*, 99.

101 *So three men picked their way*: Grigori Medvedev, *Truth About Chernobyl*, 101.

101 *Their path was strewn with wreckage*: Gorbachenko, testimony in Kiselyov, “Inside the Beast,” 45.

101 *The fire escape that zigzagged*: Zakharov, author interview, 2015; Petrovsky, author interview, 2016.

101 *A handful of men*: Telyatnikov’s account in David Grogan, “An Eyewitness to Di-

saster, Soviet Fireman Leonid Telyatnikov Recounts the Horror of Chernobyl,” *People*, October 5, 1987; “Firefight at Chernobyl,” transcript of Telyatnikov’s appearance at the Fourth Great American Firehouse Exposition and Muster, Baltimore, MD, September 17, 1987, online at Fire Files Digital Library, <https://fire.omeka.net/items/show/625>.

- 101 *Dozens of small fires*: A detailed description of the location of the fires is provided in Karpan, *Chernobyl to Fukushima*, 12–15.
- 102 *Ignited by fragments of blazing debris*: Description of fires in Telyatnikov, “Firefight at Chernobyl”; and Felicity Barringer, “One Year After Chernobyl, a Tense Tale of Survival,” *New York Times*, April 6, 1987.
- 102 *The air was filled with black smoke*: Telyatnikov in Barringer, “One Year After Chernobyl.”
- 102 *In the darkness around their feet*: Karpan, *Chernobyl to Fukushima*, 13.
- 102 *A more tangible threat*: Piotr Khmel, author interview, 2015.
- 102 *“Give me some pressure!”*: Zakharov, author interview, 2016.
- 102 *Just as they had been trained to do*: Ibid. A report of laying foam hoses to the Unit Three roof was made by Pravik to the dispatcher and noted in the Kiev Region Fire Department Dispatch Log at 3:00 a.m.
- 102 *Kibenok had a separate line*: Zakharov, author interview, 2016.
- 102 *Even then, the handful of men*: Petrovsky, author interview, 2016; Rogozhkin, recalling a conversation with Telyatnikov in court testimony reproduced in Karpan, *Chernobyl to Fukushima*, 170.
- 102 *Pellets of uranium dioxide*: Karpan, *Chernobyl to Fukushima*, 13. According to the US National Institutes of Health, uranium fires cannot be effectively extinguished with water, unless the burning material is submerged in liquid: “Even this will not immediately extinguish the fire because the hot uranium metal dissociates the water into H<sub>2</sub> and O<sub>2</sub>, providing fuel and oxygen for the fire. If the quantity of water is sufficient, eventually the water will provide enough cooling to extinguish the fire, but a significant amount of water can boil away in the process” (“Uranium, Radioactive: Fire Fighting,” NIH, US National Library of Medicine, webWISER online directory).
- 103 *Down on the ground*: Petrovsky, author interview, 2016.
- 104 *A fatal dose of radiation*: Estimates of what constitutes a fatal dose are based on a “median lethal dose,” or LD50, that which—if sustained instantaneously over the whole body and left untreated—kills half of the individuals irradiated. Based on data drawn from the bombings of Hiroshima and Nagasaki, these estimates ranged from 3.5 to 4.0 Gy—or 350 to 400 rem. But experience with the victims of Chernobyl led to an upward revision of these estimates, suggesting that, with medical treatment, healthy men could survive whole-body doses of at least 5.0 Gy, or 500 rem. Gusev et al., eds. *Medical Management of Radiation Accidents*, 54–55.
- 104 *At a rate of 3,000 roentgen an hour*: Radiation levels on the rooftops are described by Starodumov, commentary in *Chernobyl 1986.04.26 P. S.* [Чернобыль.1986.04.26

P. S.] (Kiev: Telecon, 2016); B. Y. Oskolkov, “Treatment of Radioactive Waste in the Initial Period of Liquidating the Consequences of the Chernobyl NPP Accident. Overview and Analysis” [Обращение с радиоактивными отходами первоначальный период ликвидации последствий аварии на ЧАЭС. Обзор и анализ], Chernobyl Center for Nuclear Safety, January 2014, 36.

104 *“Fuck this, Vanya!”*: Petrovsky, author interview, December 2016.

104 *On the other side of the complex*: Leonid Shavrey, testimony in Kiselyov, “Inside the Beast,” 47.

104 *The first men to arrive*: Vladimir Prischepa, recollections quoted in Karpan, *Chernobyl to Fukushima*, 15–16.

104 *Had arrived to take command*: Leonid Shavrey would later recall that Telyatnikov smelled of vodka and seemed completely intoxicated, although Petrovsky contested this. He insisted that Telyatnikov barely drank at all: “Maybe a shot at home—but at work? Never.” Petrovsky, author interview, 2016.

104 *Still drunk on the People’s Champagne*: Piotr Khmel, author interviews, 2006 and 2016.

105 *In the bunker*: Parashyn, account in Shcherbak, *Chernobyl*, 76; Brukhanov, court testimony in Karpan, *Chernobyl to Fukushima*, 140.

105 *Yet not everyone had succumbed*: Serafim Vorobyev, account in Shcherbak, *Chernobyl*, 397; Grigori Medvedev, *Truth About Chernobyl*, 152–54.

106 *Less than a hundred meters away*: Valentin Belokon, ambulance doctor, remembers seeing people coming from Unit Three toward the main administrative building a few minutes after 2:00 a.m. See Belokon’s account in Shcherbak, “Report on First Anniversary of Chernobyl,” trans. JPRS, pt. 1, 26–27.

106 *At 3:00 a.m., Brukhanov called*: Kiev Region Fire Department Dispatch Log, Chernobyl Museum.

106 *Vorobyev stood by and listened*: Vorobyev, account in Shcherbak, *Chernobyl*, 397.

106 *Yet Vorobyev knew*: Ibid., 398.

107 *“There’s no mistake”*: Ibid.; Grigori Medvedev, “Chernobyl Notebook” [Черно-быльская тетрадь], *Novy Mir*, no. 6 (June 1989), trans. JPRS Economic Affairs, October 23, 1989, 35.

107 *Dyatlov assured him*: Read, *Ablaze*, 68–69; Grigori Medvedev, *Truth About Chernobyl*, 95.

108 *Outside in the corridor*: Dyatlov, *Chernobyl: How It Was*, 50.

108 *Running back upstairs*: Ibid., 53–54; Arkady Uskov, account in Shcherbak, *Chernobyl*, 71–72.

108 *By now, the levels of radiation*: Bagdasarov (shift foreman, Unit Three, Chernobyl NPP), account in Kopchinsky and Steinberg, *Chernobyl*, 17; Dyatlov, *How It Was*, 17.

108 *It was 5:15 a.m.*: Viktor and Valentina Brukhanov, author interview, 2016; Parashyn, recollections in Shcherbak, *Chernobyl*, 76.

109 *Ignoring instructions from above*: The shift foreman was Yuri Bagdasarov, who disobeyed the order of the plant’s chief engineer, Boris Rogozhkin, to keep his reactor

going. See Bagdasarov's recollections in Kopchinsky and Steinberg (*Chernobyl*, 17) and the operating log of Unit Three in Dyatlov, *Chernobyl: How It Was*, 56–57.

109 *At the other end of the plant*: Uskov, account in Shcherbak, *Chernobyl*, 71–72.

109 “*Get that water in!*”: Viktor Smagin (Unit Four foreman on the 8:00 a.m. shift, the “Second Shift” following Akimov’s), recollections in Vladimir M. Chernousenko, *Chernobyl: Insight from the Inside* (New York: Springer, 1991), 62.

109 *Inside the narrow pipeline compartment*: Arkady Uskov’s sketch of the scene, collection of the Chernobyl Museum, Kiev.

109 *Their white overalls*: Karpan, *Chernobyl to Fukushima*, 19.

110 *Akimov barely had enough strength*: Uskov, recollections in Kopchinsky and Steinberg, *Chernobyl*, 19.

110 *Helped from the compartment*: Uskov, account in Shcherbak, *Chernobyl*, 71–72.

110 *Gushed uselessly from shattered pipes*: Stolyarchuk, author interview, Kiev, December 2016; Dyatlov, *Chernobyl: How It Was*, 76; International Atomic Energy Agency, INSAG-7, 45.

110 *Thirty-seven fire crews*: Zhores Medvedev, *Legacy of Chernobyl*, 42.

110 *I’m so young*: Stolyarchuk, author interview, 2016.

## 7. SATURDAY, 1:30 A.M., KIEV

111 *For all the comforts*: Vitali Sklyarov, author interview, Kiev, February 2016; author visit to Koncha-Zaspa, February 6, 2016; Vitali Sklyarov, *Chernobyl Was . . . Tomorrow* (Montreal: Presses d’Amérique, 1993), 21–24.

111 *At fifty, Sklyarov had been a power man*: Sklyarov, *Chernobyl Was . . . Tomorrow*, 8 and 27; Vitali Sklyarov, *Sublimation of Time* [Сублимация времени] (Kiev: Kvic, 2015), 62–83.

112 *He had been kept informed of problems at the station*: In public, Sklyarov naturally stuck to the official line. See chapter 4.

112 *Even in conventional stations*: Sklyarov, author interview, 2016; Sklyarov, *Chernobyl Was . . . Tomorrow*, 27–28; Sklyarov, *Sublimation of Time*, 496–500.

112 “*There’s been a series*”: Sklyarov, author interview, 2016.

112 *Sklyarov immediately called*: Sklyarov, author interview, 2016; Vitali Cherkasov, “On the 15th anniversary of the atomic catastrophe: Chernobyl’s sores” [К 15-летию атомной катастрофы: язвы Чернобыля], *Pravda*, April 25, 2011, [www.pravda.ru/politics/25-04-2001/817996-0](http://www.pravda.ru/politics/25-04-2001/817996-0).

112 *From Kiev*: “Special Report” [Спецсообщение], handwritten document signed by Major General V. M. Korneychuk, April 26, 1986, document 1 in File on Special Measures in Pripyat Zone, maintained by the local *militsia* (Department of Internal Affairs of the Party Committee of Kiev Oblast), archive of the Chernobyl Museum.

113 “*One, two, three, four*”: Boris Prushinsky, “This Can’t Be—But It Happened (The First Days After the Catastrophe)” [Этого не может быть—но это случилось (первые дни после катастрофы)], in A. N. Semenov, ed., *Chernobyl: Ten Years On. Inevitability or Accident?* [Чернобыль. Десять лет спустя. Неизбежность

или случайность?] (Moscow: Energoatomizdat, 1995), 308–9. OPAS is the Russian acronym for *gruppa okazaniya pomoschi atomnym stantsiyam pri avariyyakh*, or “group for rendering assistance to nuclear power plants in case of accidents.”

113 *At 2:20 a.m., a call from the central command desk*: Read, *Ablaze*, 94; Sergei Akhromeyev and Georgi Korniyenko, *Through the Eyes of a Marshal and a Diplomat: A Critical Look at USSR Foreign Policy Before and After 1985* [Глазами маршала и дипломата: Критический взгляд на внешнюю политику СССР до и после 1985 года] (Moscow: Mezhdunarodnye otnosheniya, 1992), 98–99.

113 *The head of the USSR's civil defense*: Read, *Ablaze*, 93.

113 *By the time he left Moscow*: B. Ivanov, “Chernobyl. Part 1: The Accident” [Чернобыль. 1: Авария], *Voennye Znaniya* 40, no. 1 (1988), 32; Edward Geist, “Political Fallout: The Failure of Emergency Management at Chernobyl,” *Slavic Review* 74, no. 1 (Spring 2015): 117.

114 *For the first time in its existence*: Leonid Drach, author interview, Moscow, April 2017.

114 *Knew the plant and staff well*: Kopchinsky's job titles at Chernobyl were deputy chief engineer for science (1976–1977) and deputy chief engineer for operations (1977–1979).

114 *Kopchinsky called for a car*: Kopchinsky, author interview, 2016.

114 *As the members*: Kopchinsky and Steinberg, *Chernobyl*, 8–9.

115 *Vladimir Marin was still at home*: Grigori Medvedev, *Truth About Chernobyl*, 152–54. In *The Legacy of Chernobyl*, Zhores Medvedev speculates that Brukhanov had orders to inform Party leaders before anyone else in the event of major industrial accidents (*The Legacy of Chernobyl*, 47). Piers Paul Read expands upon this in *Ablaze*, 77.

115 *As dawn broke*: Sklyarov, *Chernobyl Was . . . Tomorrow*, 32; Grigori Medvedev, *Truth About Chernobyl*, 117.

115 *Recalled from his holiday*: The deputy energy minister was Gennadi Shasharin.

115 *Ryzhkov told Mayorets*: Nikolai Ryzhkov, interview transcript, 2RR archive file no. 3/7/7, 16.

116 “*There's nothing left to be cooled!*”: Kopchinsky and Steinberg, *Chernobyl*, 8–9; Kopchinsky, author interview, 2016. Kopchinsky believes that the telephone connection was deliberately cut by the KGB operative on the switchboard at the Chernobyl plant, as part of the effort to keep details of the accident secret.

116 *From his office in Kiev*: Sklyarov, *Chernobyl Was . . . Tomorrow*, 32.

117 “*The station might not be Ukrainian*”: Sklyarov, author interview, 2016; Sklyarov, *Sublimation of Time*, 105.

117 “*What happened? What happened?*”: Serhiy Parashyn, author interview, Kiev, November 2016. The scene inside the bunker is also described by Parashyn in Shcherbak, *Chernobyl*, 75–78.

117 *Samples taken by technicians*: Nikolay Karpan, “First Days of the Chernobyl Accident. Private Experience,” [www.rri.kyoto-u.ac.jp/NSRG/en/Karpan2008English.pdf](http://www.rri.kyoto-u.ac.jp/NSRG/en/Karpan2008English.pdf), 8–9; Karpan, *Chernobyl to Fukushima*, 29–30.

117 *By 9:00 a.m.:* Alexander Logachev, interview by Taras Shumeyko, Kiev, June 2017; and Alexander Logachev, *The Truth [Истина]*. The time of Malomuzh's arrival is specified by Parashyn (in Shcherbak, *Chernobyl*, 76) as somewhere between seven and nine in the morning on April 26.

117 *Inside Brukhanov's office:* The meeting is detailed by Serafim Vorobyev, the head for civil defense at the plant, in Shcherbak, *Chernobyl*, 400.

118 "Sit down": *Ibid.*

118 *Malomuzh instructed Brukhanov:* Parashyn in Shcherbak, *Chernobyl*, 76–77; Karpan, *Chernobyl to Fukushima*, 26.

118 *The document was brief:* "On the Accident at the V. I. Lenin Nuclear Power Plant in Chernobyl" [Об аварии на Чернобыльской АЭС имени В. И. Ленина], signed by Viktor Brukhanov, April 26, 1986, classified, in the archive of the Chernobyl Museum. Brukhanov would later say that he knew radiation levels reached at least 200 roentgen per hour around the plant but signed the letter anyway because he "did not read [it] closely" (Brukhanov, court testimony, in Karpan, *Chernobyl to Fukushima*, 133).

118 *But it failed to explain:* Nikolai Gorbachenko and Viktor Smagin, testimonies in Grigori Medvedev, *Truth About Chernobyl*, 98–99 and 170; Dyatlov, *Chernobyl: How It Was*, 51–52.

118 *Just as a military transport plane was lifting off:* Prushinsky, "This Can't Be—But It Happened," 311–12. The time of the plane's departure is given as between eight thirty and nine in the morning by G. Shasharin, "The Chernobyl Tragedy" [Чернобыльская трагедия] in Semenov, ed., *Chernobyl: Ten Years On*, 80.

118 *He usually made it into his office:* Ryzhkov, interview transcript, 2RR, 17–18. According to Read, *Ablaze*, 95, Mayorets's team departed at ten o' clock. The text of the decree establishing the commission was provided to the author by Leonid Drach.

119 *In charge of all fuel and energy:* Drach, author interview, 2017.

119 *Ryzhkov located him:* V. Andriyanov and V. Chirskov, *Boris Scherbina [Борис Щербина]* (Moscow: Molodaya Gvardiya, 2009), 287.

119 *Academician Valery Legasov:* Margarita Legasova, *Academician Valery Alekseyevich Legasov [Академик Валерий Алексеевич Легасов]* (Moscow: Spektr, 2014), 111–13; Valery Legasov, "On the Accident at Chernobyl AES" [Об аварии на Чернобыльской АЭС], transcript of five cassette tapes dictated by Legasov in early 1988 (henceforth *Legasov Tapes*), <http://lib.web-malina.com/getbook.php?bid=2755>, Cassette One, 1–2.

120 *The head of the Communist Party Committee at the Kurchatov Institute:* Leonid Bolshov, author interview, Moscow, April 2017.

121 *Aleksandrov liked to drop round:* Inga Legasova, author interview, Moscow, April 2017.

121 *Only one man stood in his way:* Bolshov, author interview, 2017; Evgeny Velikhov, *Strawberries from Chernobyl: My Seventy-Five Years in the Heart of a Turbulent Russia*, trans. Andrei Chakhovskoi (CreateSpace Independent Publishing Platform, 2012), 5–12.

121 *He had traveled abroad*: Frank Von Hippel and Rob Goldston, author interview, Princeton, NJ, March 2018; Frank Von Hippel, “Gorbachev’s Unofficial Arms-Control Advisers,” *Physics Today* 66, no. 9 (September 2013), 41–47.

121 “*Tell him less about your successes*”: Legasova, author interview, 2017.

121 *When he arrived*: Margarita Legasova, *Academician Valery A. Legasov*, 113.

121 *Despite the fine weather*: Read, *Ablaze*, 96–97, 197; Legasov, account in Shcherbak, *Chernobyl*, 414.

121 *The first of the planes from Moscow*: Grigori Medvedev, *Truth About Chernobyl*, 142; Shasharin, “Chernobyl Tragedy,” 80; Drach, author interview, 2017; Anzhelika Barabanova, author interview, Moscow, October 2016.

121 *When he landed, Prushinsky learned*: Prushinsky, “This Can’t Be—But It Happened,” 312–13.

122 *The shell-shocked director*: For example, Vladimir Marin, who supervised the nuclear energy sector in the Central Committee apparatus in Moscow and arrived in Pripyat by early evening on April 26, writes that at five o’clock on Saturday afternoon, Brukhanov reported that the reactor was under control and being cooled (V. V. Marin, “On the Activities of the Task Force of the Politburo of the CPSU Central Committee at the Chernobyl NPP” [О деятельности оперативной группы Политбюро ЦК КПСС на Чернобыльской АЭС], in Semenov, ed., *Chernobyl: Ten Years On*, 267–68).

123 *It passed from the General Department*: Dmitri Volkogonov and Harold Shukman, *Autopsy for an Empire: The Seven Leaders Who Built the Soviet Regime* (New York: Free Press, 1999), 477.

123 “*An explosion occurred*”: “Urgent Report, Accident at Chernobyl Atomic Power Station,” April 26, 1986, History and Public Policy Program Digital Archive, Volkogonov Collection, Manuscript Division, Library of Congress. Translated for NPIHP by Gary Goldberg, <http://digitalarchive.wilsoncenter.org/document/115341>.

123 *The second—more senior—wave*: This party also included Alexander Meshkov (deputy minister of Sredmash) and Viktor Sidorenko (vice chairman of Gosatomenergonadzor, Sredmash’s nuclear energy oversight committee) (Shasharin, “Chernobyl Tragedy,” 80–81; Sklyarov, *Chernobyl Was . . . Tomorrow*, 33).

123 “*Don’t try to frighten us*”: Grigori Medvedev, *Truth About Chernobyl*, 154; Sklyarov, author interview, 2016.

123 *Bumping down on a dirt airstrip*: Sklyarov, *Chernobyl Was . . . Tomorrow*, 37–39; Shasharin, “Chernobyl Tragedy,” 80–81; Colonel General B. Ivanov, “Chernobyl. Part 2: Bitter Truth Is Better” [2: Лучше горькая правда], *Voennye Znaniya* 40, no. 2 (1988): 22.

124 *Conducting a radiation reconnaissance*: This radiation surveillance work had been hampered by the continuing secrecy surrounding the station. When Logachev, the civil defense lieutenant responsible for scouting the power plant, was given his orders, he pointed out that Unit Four didn’t appear to be shown anywhere on the schematic he had. Malomuzh himself took a pen and scribbled a rough outline of the reactor in an otherwise blank space in the middle of the map (Alexander Lo-

gachev, author interview, 2016). Logachev's dosimetry map of Chernobyl station from April 26, 1986, is in the archive of Chernobyl Museum.

124 *Circling the reactor at low altitude*: Prushinsky, "This Can't Be—But It Happened," 315.

125 *Fomin finally conceded*: Gennadi Berdov, Ukraine's deputy minister of internal affairs, testimony in Voznyak and Troitsky, *Chernobyl: It Was Like This*, 199.

125 *Worse news was to come*: Karpan, *Chernobyl to Fukushima*, 28.

125 *His armored personnel carrier*: The vehicle's top speed and weight are given in Logachev, *The Truth*.

125 "You mean milliroentgen, son": Logachev, interviews by author and Taras Shumeyko, 2016; Logachev, *The Truth*; Logachev, dosimetry map of Chernobyl station, Chernobyl Museum.

126 *7:20 p.m. on Saturday evening*: Alexander Lyashko, *The Weight of Memory: On the Rungs of Power* [Груз памяти: На ступенях власти], vol. 2 in a trilogy (Kiev: Delovaya Ukraina, 2001), 351.

126 *They were greeted by a delegation*: Legasov Tapes, Cassette One, 5.

126 *Boundless levels of marsh*: Author visit to Pripyat, April 25, 2016.

126 *But in Pripyat, Scherbina*: Drach, author interview, 2017; Sklyarov, *Chernobyl Was . . . Tomorrow*, 40.

126 *Intelligent, energetic, and hardworking*: Drach, author interview, 2017; Sklyarov, author interview, 2016; Scherbina's date of birth is given as October 5, 1919, in Andriyanov and Chirskov, *Boris Scherbina*, 387. This description also draws on Kopchinsky and Steinberg, *Chernobyl*, 53.

126 *Respect and admiration*: Drach, author interview, 2017.

126 "So, are you shitting your pants?": Sklyarov, *Chernobyl Was . . . Tomorrow*, 40; Sklyarov, author interview, 2016.

127 "We have to evacuate the local population": Prushinsky, "This Can't Be—But It Happened," 317. In spite of this exchange, and a weight of conflicting testimony from others, Prushinsky records that the issue of evacuation was resolved "without any delay" at the meeting that followed.

127 *The first meeting of the government commission*: Description of the crowd, tension: Vasily Kizima, author interview, Kiev, February 2016. Description of the room, smoking: Alexander Logachev, interview by Taras Shumeyko, Kiev, June 2017. Legasov gives the time of his arrival as around 8 p.m., and Prushinsky writes that the first meeting began two hours later (Prushinsky, "This Can't Be—But It Happened," 317).

127 *Academician Legasov listened*: Legasov Tapes, cassette One, 5.

127 *They said only*: Ibid., cassette One, 4.

127 *Scherbina divided the members*: Ibid., 5.

128 *Like the station's own physicists*: Shasharin, "Chernobyl Tragedy," 85–86; Karpan, *Chernobyl to Fukushima*, 78.

128 *But the Rovno station director was reluctant*: Sklyarov, author interview, 2017; Sklyarov, *Chernobyl Was . . . Tomorrow*, 41–42.

128 *At the same time, Legasov realized*: Read, *Ablaze*, 105–6.

129 *Everyone knew that something must be done*: Kizima, author interview, 2016.

129 *They found the figures alarming*: Logachev, interview by Taras Shumeyko, 2017.

129 “*They never evacuated people there!*”: Drach, author interview, 2017. This account is confirmed by Legasov and General Berdov: Voznyak and Troitsky, *Chernobyl: It Was Like This*, 218.

129 *According to the state document*: The document (Russian name “Критерии для принятия решения по защите населения в случае аварии атомного реактора”) is cited in Voznyak and Troitsky, *Chernobyl: It Was Like This*, 219.

129 *Even the regulations*: Geist, “Political Fallout,” 115–16.

129 *He had little reason to believe*: Less than a year earlier, a radio station in Kiev conducting a training exercise had accidentally broadcast a recorded message announcing that the city’s hydroelectric dam had burst, and urged citizens to gather their belongings and immediately leave their homes for higher ground. The announcement was met with inaction and indifference. Such was Kievans’ distrust of official news sources that, instead of fleeing the supposed catastrophe, more than eight hundred people phoned the radio station to ask if the report was true. Nigel Raab, *All Shook Up: The Shifting Soviet Response to Catastrophes, 1917–1991* (Montreal: McGill-Queen’s University Press, 2017), 143–44.

129 *By daybreak on Saturday*: Esaulov recalls hearing about the KGB order to cut off the phones from his boss, Pripyat *ispolkom* chairman Vladimir Voloshko, sometime in the early morning (Esaulov, *City That Doesn’t Exist*, 16–17).

130 *The plume of vapor from the reactor had been drifting*: Read, *Ablaze*, 101–2; Akhromeyev and Korniyenko, *Through the Eyes of a Marshal and a Diplomat*, 100.

130 *It would bring down radioactive fallout*: Zhores Medvedev, *Legacy of Chernobyl*, 141.

130 *He resolved to wait until morning*: Ivanov, “*Chernobyl. Part 3: Evacuation*” [3: Эвакуация], *Voennye Znaniya* 40, no. 3 (1988): 38.

130 *A ruby glow*: Karpan, “First Days of the Chernobyl Accident,” 2008.

130 *Taking samples from the coolant canal*: Kopchinsky and Steinberg, *Chernobyl*, 65; Armen Abagyan (head of VNIIAES), account in Voznyak and Troitsky, *Chernobyl: It Was Like This*, 213.

131 “*He’s a panicker!*”: Sklyarov, author interview, 2016; Sklyarov, *Sublimation of Time*, 105–6. In the author interview, Sklyarov recalled that Scherbina used the phrase “*skandal na ves’ mir*,” which may be literally translated as “a scandal before the whole world,” but *skandal* in Russian carries a combined meaning of a “humiliation” and a “mess.” In *Sublimation of Time*, Sklyarov explains that he had first included an account of this episode in the manuscript of his 1991 memoir *Tomorrow . . . Was Chernobyl* but removed it before publication at the request of Vladimir Ivashko, who by then had succeeded Scherbitsky as Ukraine’s Communist Party chief.

## 8. SATURDAY, 6:15 A.M., PRIPYAT

132 *It was sometime after 3:00 a.m.:* Alexander Esaulov, author interview, Irpin, July 2015; Shcherbak, “Report on First Anniversary of Chernobyl Accident,” trans. JPRS, pt. 1, 30.

132 *There was always something going wrong:* Esaulov, *The City That Doesn’t Exist*, 11–12.

132 *On the phone was Maria Boyarchuk:* Ibid., 16.

133 *But then another ambulance sped past:* Eventually a total of four ambulances were involved, according to Vitaly Leonenko, director of Medical-Sanitary Center No. 126 (author interview, Vepryk, Ukraine, December 2016). Arkady Uskov (account in Shcherbak, *Chernobyl*, 69) would remember passing two ambulances on his way to the plant at four thirty, and Piers Paul Read writes that by five o’clock, the vehicles were performing “a shuttle service” (*Ablaze*, 85).

133 *Esaulov began to suspect:* Esaulov, author interview, 2015; Esaulov, *City That Doesn’t Exist*, 16.

134 “*Good morning, Boris*”: Andrei Glukhov, author interview, Slavutych, Ukraine, 2015.

134 *Glukhov climbed to the top floor:* Glukhov, author interview, 2015; author visit to Toptunov’s apartment in Pripyat, April 25, 2016.

135 *The Pripyat hospital:* Leonenko, author interview, 2016; author visit to Hospital No. 126, April 27, 2016.

135 *Formally diagnosed radiation sickness:* Ibid.; according to Angelina Guskova, the staff of the hospital initially reported to her that the injuries were the result of a chemical fire. Angelina Guskova, interview by Vladimir Gubarev, “On the Edge of the Atomic Sword” [На лезвии атомного меча], *Nauka i zhizn*, no. 4 (2007): [www.nkj.ru/archive/articles/9759](http://www.nkj.ru/archive/articles/9759).

135 *The men and women arriving from the plant:* Tatyana Marchulaite (medical assistant at Hospital No. 126), account in Voznyak and Troitsky, *Chernobyl: It Was Like This*, 202–5.

135 *At first, Dyatlov refused treatment:* Read, *Ablaze*, 85–86.

136 “*You don’t vomit at fifty*”: This account was shared by Alexander Yuvchenko in Vivienne Parry, “How I Survived Chernobyl,” *Guardian*, August 24, 2004, <https://www.theguardian.com/world/2004/aug/24/russia.health>.

136 *Burns and blisters covered his body:* Read, *Ablaze*, 85.

136 “*Get away from me*”: Marchulaite, testimony in Voznyak and Troitsky, *Chernobyl: It Was Like This*, 205. Shashenok’s time of death is specified by Nikolai Gorbachenko (radiation monitor at ChNPP) in Kiselyov, “Inside the Beast,” 46.

136 *It was not yet 8:00 a.m.:* Natalia Yuvchenko, author interview, 2015; Read, *Ablaze*, 85 and 91.

136 *Around the corner, at home:* Maria Protsenko, author interview, Kiev, September 2015.

137 *When persuasion wouldn’t work:* Anatoly Svetetsky, head of technological safety systems reactor and turbine departments of Units Three and Four, Chernobyl Nuclear Power Plant, interview by Taras Shumeyko, Kiev, May 28, 2017.

137 “proletarian aesthetics”: For an exploration of the role of proletarian aesthetics in Soviet energy-related construction, see Josephson, *Red Atom*, 96–97.

138 *As many as two hundred thousand people*: Sich, “The Chernobyl Accident Revisited,” 204; Igor Kruchik, “Mother of the Atomgrad” [Мати Атомограда], *Tizhden*, September 5, 2008, <http://tyzhdenua/Publication/3758>.

138 “We’re going to chase away the shitiki!”: See the interview with Vasily Gorokhov (Chernobyl deputy director for decontamination from July 1986 to May 1987) for evidence that liquidators, too, believed in *shitiki*: Alexander Bolyasny, “The First ‘Orderly’ of the First Zone” [Первый «санитар» первой зоны], *Vestnik* 320, no. 9 (April 2003): [www.vestnik.com/issues/2003/0430/koi/bolyasny.htm](http://www.vestnik.com/issues/2003/0430/koi/bolyasny.htm).

138 “You’ve got a phone call”: Protsenko, author interview, 2015.

138 *Hundreds of members of the militsia*: “Background information on the Town of Pripyat,” April 26, 1986, *Pripyat militsia*, File on Special Measures in Pripyat Zone, 14, archive of Chernobyl Museum.

138 *An emergency meeting*: Description of the city administration meeting on Saturday morning: Protsenko and Esaulov, author interviews, 2015.

139 *Warming up for an afternoon match*: The fixture, part of the semifinal competition for the top soccer teams in the Kiev region, was canceled later that day (“Soccer in Pripyat: The History of the ‘Builder’ Soccer Club” [Футбол в Припяти. История футбольного клуба «Строитель»], *Sports.ru* blog, [https://www.sports.ru/tribuna/blogs/golden\\_ball/605515.html](https://www.sports.ru/tribuna/blogs/golden_ball/605515.html)., April 27, 2014.

139 *Malomouzh had arrived*: Parashyn, account in Shcherbak, *Chernobyl*, 76; Zhores Medvedev, *Legacy of Chernobyl*, 37.

139 “There has been an accident”: Protsenko, author interview, 2015.

139 *In the meantime, he explained*: Shcherbak, “Report on First Anniversary of Chernobyl Accident,” trans. JPRS, pt. 1, 48.

139 *Naturally, there were questions*: Ibid., 37.

139 “And please do not panic”: Protsenko, author interview, 2015.

140 *A solitary armored car*: The time of the column’s arrival is given in Vladimir Maleyev, *Chernobyl. Days and Years: The Chronicle of the Chernobyl Campaign* [Чернобыль. Дни и годы: летопись Чернобыльской кампании] (Moscow: Kuna, 2010), 21. Additional details: Colonel Grebeniuk (commander of the 427th Mechanized Regiment), interviews by author and Taras Shumeyko, Kiev, July 2016. By this time Senior Lieutenant Alexander Logachev’s machine, which had suffered brake failure on the road from Kiev, had been replaced at the head of the column by another vehicle; in an attempt to catch up with his comrades, Logachev drove directly toward the station instead. (Logachev, author interview, Kiev, 2017.)

140 *Controlled tightly by the KGB*: Kotkin, *Armageddon Averted*, 42.

140 *Protsenko sat down*: Protsenko, author interview, 2015.

140 *225th Composite Air Squadron*: Sergei Drozdov, “Aerial Battle over Chernobyl” [Воздушная битва при Чернобыле], *Aviatsiya i vremya* 2 (2011), [www.xliby.ru/transport\\_i\\_aviacija/aviacija\\_i\\_vremja\\_2011\\_02/p6.php](http://www.xliby.ru/transport_i_aviacija/aviacija_i_vremja_2011_02/p6.php).

140 *In the pilot’s seat*: Sergei Volodin, author interview, Kiev, July 2015.

140 *An airborne radiation survey*: Colonel Lubomir Mimka, author interview, Kiev, February 2016.

140 *On the way there*: Sergei Volodin, unpublished memoir, undated.

141 *And although he and his crew*: Volodin, author interviews, 2006 and 2015.

141 *Volodin knew Chernobyl well*: Ibid.; Volodin, unpublished memoir.

142 *At the construction headquarters*: Kovtutsky, author interview, 2016.

142 *From her desk in the White House*: Protsenko, author interview, 2016.

143 *A manager working on the Fifth and Sixth Units*: Grigori Medvedev, *Truth About Chernobyl*, 88–89 and 149–51.

143 *The technician's next-door neighbor*: Ibid., 150.

143 *Knowing that the KGB*: The engineer was Georgi Reikhtman (author interview, September 2015), who told his wife to pack all of the family's winter clothing. Because it was late spring, she thought he was talking nonsense and ignored him.

143 *Another persuaded Director Brukhanov*: This engineer was Nikolai Karpan: *Chernobyl to Fukushima*, 32–33.

143 *Arrving at Yanov station*: Veniamin Prianichnikov, author interview, Kiev, February 2006.

144 *Militsia officers everywhere*: An internal Ukrainian Interior Ministry memo specifies that by nine o'clock on Saturday morning, 600 *militsia* troops and 250 authorized "civilian persons" were deployed to the Pripyat area from local and regional bases. "Background Information on the Town of Pripyat," April 26, 1986, File on Special Measures in Pripyat Zone, 14, archive of Chernobyl Museum.

144 *Prianichnikov suspected*: Prianichnikov, author interview, 2006.

144 *When the civil defense major returned*: Volodin, author interview, 2006. The time of the first helicopter flight for air radiation reconnaissance on April 26 is specified by Major General M. Masharovsky in "Operation of Helicopters During the Chernobyl Accident," in Current Aeromedical Issues in Rotary Wing Operations, Papers Presented at the RTO Human Factors and Medicine Panel (HFM) Symposium, San Diego, October 19–21, 1998, RTO/NATO, 7–2.

145 *On his right, he could see the village*: Ibid.; Volodin, unpublished memoir.

146 *Natalia Yuvchenko had spent all morning*: Natalia Yuvchenko, author interview, 2015.

147 *Vodka, cigarettes, and folk remedies*: Read, *Ablaze*, 87–88.

147 *Alexander said*: Natalia Yuvchenko, author interview, 2015.

147 *At 4:00 p.m., the members of the OPAS medical team*: Voznyak and Troitsky, *Chernobyl: It Was Like This*, 207.

147 "Many are in grave condition": Esaulov, *City That Doesn't Exist*, 23–24.

148 *After some debate*: Leonenko, author interview, 2016.

148 *Second Secretary Malomuzh summoned Esaulov*: Esaulov, *City That Doesn't Exist*, 25.

148 *By nightfall on Saturday*: Protsenko, author interview, 2016; David Remnick, "Echo in the Dark," *New Yorker*, September 22, 2008.

148 *When the boxes were silenced*: Protsenko, author interview, 2016; Kovtutsky, author interview, 2016.

149 *And then officials*: Author interviews: Natalia Yuvchenko, 2015; Natalia Khodemchuk, 2017; Alexander Sirota, 2017.

149 *Alexander Korol had spent*: Korol, author interview, 2015.

149 *It was past 9:00 p.m.*: The time of the convoy's departure is given by Esaulov as ten at night (*City That Doesn't Exist*, 27) and confirmed by Valery Slutsky, bus driver, author interview, Pripyat, February 2006.

149 *Two red Ikarus buses*: Esaulov would recall later that although there weren't too many passengers during this first trip—twenty-four people who could ride upright (plus two others who couldn't and were transported by ambulance)—he requested a spare Ikarus bus just in case, for fear that one might break down along the way. Esaulov, *City That Doesn't Exist*, 26–27; Shcherbak, "Report on First Anniversary of Chernobyl Accident," trans. JPRS, pt. 1, 31.

149 *Sheets of plastic*: Leonenko, author interview, 2016.

149 *"The rods came halfway, and then stopped"*: Korol, author interview, 2015.

150 *30 percent burns*: Shcherbak, *Chernobyl*, 51.

150 *In their big corner apartment*: Viktor and Valentina Brukhanov, author interview, 2015.

150 *When Veniamin Prianichnikov got through*: Prianichnikov, author interview, 2006.

150 *In the small hours*: Esaulov writes that the convoy arrived at Boryspol at three thirty in the morning (*City That Doesn't Exist*, 28–29).

151 *"People are resting"*: Handwritten log of events for April 26–27, in File on Special Measures in Pripyat Zone, Internal Affairs Department of the Kiev Oblast Party Committee, archive of Chernobyl Museum, 13.

## 9. SUNDAY, APRIL 27, PRIPYAT

152 *The first of the transport helicopters*: Nikolai Antoshkin, author interview, Moscow, October 2015.

152 *Dispatched from the central command post*: The expert was Colonel Anatoly Kushnin. See his account of events in Kiselyov, "Inside the Beast," 50. Additional details: Lubomir Mimka, author interview, Kiev, February 2016.

152 *As soon as he arrived*: He reported first to Ivanov, head of civil defense, and the commander of the Soviet chemical troops Vladimir Pikalov, who finally arrived at eleven thirty on Saturday night, according to Voznyak and Troitsky, *Chernobyl: It Was Like This*, 214.

152 *"We need helicopters"*: Antoshkin, author interview, 2015.

152 *Using a telephone*: Ibid.; Mimka, author interview, 2016; Colonel Boris Nesterov, author interview, Dnipro, Ukraine, December 2016; Major A. Zhilin, "No such thing as someone else's grief" [Чужого горя не бывает], *Aviatsiya i Kosmonavtika*, no. 8 (August 1986): 10.

153 *Inside the hotel*: Prushinsky, "This Can't Be—But It Happened," 318.

153 *Legasov estimated*: Legasov, "My duty is to tell about this," in Mould, *Chernobyl Record*, 292.

153 *The intense heat could soon melt*: Legasov Tapes, cassette One, 8.

153 *A rate of around one tonne an hour*: Legasov, “My duty is to tell about this,” in Mould, *Chernobyl Record*, 292; Legasov Tapes, cassette One, 8. For Legasov’s report to the Politburo about his analysis, see Maleyev, *Chernobyl: Days and Years*: “Meeting of the Politburo of the CPSU Central Committee: Protocol No. 3” [Заседание Политбюро ЦК КПСС 5 мая 1986 года: Протокол № 3], 249–52.

153 *The blaze could roar on for more than two months*: Legasov’s guess for the total weight of graphite in Unit Four, both before and after the explosion, significantly exceeded most others. But even the lower estimates for how much graphite remained inside the core after the accident—such as the 1,500 tonnes cited by a KGB memo on May 11, 1986—made for around two months of continuous burning. See the KGB memo in Danilyuk, ed., “Chernobyl Tragedy,” *Zarkhiviv*, document no. 31: *Special Report of the UkSSR OG KGB Chief in the Town of Chernobyl to the UkSSR KGB Chairman*.

153 *Ordinary firefighting techniques*: V. Bar’yakhtar, V. Poyarkov, V. Kholosha, and N. Shtensteinberg, “The Accident: Chronology, Causes and Releases,” in G. J. Vargo, ed., *The Chornobyl Accident: A Comprehensive Risk Assessment* (Columbus, OH: Battelle Press, 2000), 13.

153 *The graphite and nuclear fuel were burning*: Legasov Tapes, cassette One, p. 8; Grigori Medvedev, *The Truth about Chernobyl*, 176; Zhores Medvedev, *The Legacy of Chernobyl*, 43.

154 *Colossal fields of gamma radiation*: Bar’yakhtar et al., “The Accident: Chronology, Causes and Releases,” 13.

154 *One physicist, unable to find the answer*: Evgeny Ignatenko, ed., *Chernobyl: Events and Lessons* [Чернобыль: события и уроки] (Moscow: Politizdat, 1989), 128.

154 *In his office at the Kurchatov Institute*: Legasov Tapes, cassette One, 9; Grigori Medvedev, *Truth About Chernobyl*, 176.

154 *Meanwhile, the team*: Armen Abagyan, account in Voznyak and Troitsky, *Chernobyl: It Was Like This*, 220.

154 *At 2:00 a.m., Scherbina telephoned*: Vladimir Dolgikh, interview transcript, June 1990, 2RR archive file no. 1/3/5, 4. The fact that Scherbina’s mind was not yet made up at 2:30 a.m. is attested to by a senior Kiev transportation official who, at around that time, arrived near Pripyat with the column of buses and came to the White House, where he reported to Scherbina. The chairman asked him, “And who sent you?” V. M. Reva, first vice president of the Ukrainian State Automobile Transport Corporation, testimony at the 46th session of the Supreme Rada, December 11, 1991, transcript online at <http://rada.gov.ua/meeting/stenogr/show/4642.html>.

154 *By the time the scientists finally crawled into their beds*: Drach, author interview, 2017; Nesterov, author interview, 2016.

155 *“I’ve made my decision”*: Ivanov’s diary entry, reproduced in “Chernobyl, Part 3: Evacuation” [Часть 3: Эвакуация], *Voennye Znaniya* 40, no. 3 (1988): 38.

155 *Ivanov gave him the radiation report*: Ibid.; Leonenko, author interview, 2016. A different view is presented by Leonid Drach (author interview, 2017), who recalls that between 1:00 a.m. and 2:00 a.m. on Sunday, Pikalov was among those who told Scherbina he had no choice but to evacuate the city.

155 *But he still held back from giving the order*: According to the handwritten notes in the log kept at the Pripyat *militsia* headquarters, at 6:54 a.m., the first secretary of Kiev Oblast Party Committee, G. I. Revenko, reported that “the decision on evacuation will be made after 9:00 a.m.” The KGB confirmed this forecast at 7:45 a.m. *Pripyat militsia*, File on Special Measures in the Pripyat Zone (Chernobyl Museum), 12–13.

155 *Soon after 8:00 a.m.*: Time of the flight is given by Antoshkin in *Regarding Chernobyl* (unpublished memoir) as 8:12 a.m.

155 *They were joined by Generals Pikalov and Antoshkin*: Nesterov, author interview, 2016; Zhilin, “No such thing as someone else’s grief,” 10.

156 *To even the most recalcitrant Soviet eye*: Legasov Tapes, cassette One, p. 6; Mould, *Chernobyl Record*, 291; Margarita Legasova, *Academician Valery A. Legasov*, 119.

156 *As the helicopter headed back to Pripyat*: Legasov in Mould, *Chernobyl Record*, 290.

156 *At ten o’clock*: Vladimir Pikalov, “Interview with Commander of Chemical Troops,” interview by A. Gorokhov, *Pravda* (December 25, 1986), translated in JPRS, *Chernobyl Nuclear Accident Documents*, 92; Ivanov, “Chernobyl, Part 3: Evacuation,” 38.

156 *At 1:10 p.m.*: The time of the broadcast is given as 1:10 p.m. in Voznyak and Troitsky, *Chernobyl: It Was Like This*, 223. Others recall this happened on or before noon: Drach, author interview, 2017.

156 *In a strident, confident voice*: For the original text of the announcement, see Andrei Sidorchik, “Deadly Experiment. Chronology of the Chernobyl NPP Catastrophe” [Смертельный эксперимент. Хронология катастрофы на Чернобыльской АЭС], *Argumenty i fakty*, April 26, 2016, [www.aif.ru/society/history/smertelnyy\\_eksperiment\\_hronologiya\\_katastrofy\\_na\\_chernobylskoy\\_aes](http://www.aif.ru/society/history/smertelnyy_eksperiment_hronologiya_katastrofy_na_chernobylskoy_aes). A recording of the announcement can be found at [www.youtube.com/watch?v=1l3g3m8Vrgs](https://www.youtube.com/watch?v=1l3g3m8Vrgs).

156 *Drafted that morning*: Leonid Drach (author interview, 2017), said that he worked on a draft of the announcement with Nikolai Nikolayev, deputy chairman of the Ukraine Council of Ministers. Sklyarov recalls working on it as well, together with Ivan Plyushch, deputy chairman of the Kiev region *ispolkom* (Sklyarov, author interview, 2016).

157 *The emergency proclamation*: Esaulov, *City That Doesn’t Exist*, 45. Vitali Sklyarov explained that the proclamation was designed not only to preclude panic but also to discourage the citizens from filling the available transport with heavy luggage and personal possessions. Sklyarov, author interview, Kiev, February 2016.

157 *They should close their windows*: Lyubov Kovalevskaya, quoted in Shcherbak, “Report on First Anniversary of Chernobyl,” trans. JPRS, pt. 1, 41.

157 *Earlier that morning*: Natalia Yuvchenko, author interview, 2015.

158 *Almost a month's salary*: As a schoolteacher, Natalia was earning 120 rubles a month.

158 *On the second floor of the White House*: Protsenko, author interview, 2016.

159 *In all, there were some 51,300*: These numbers are from the handwritten log of emergency response measures kept by the local *militsia* major general, who noted later that 47,000 people had been evacuated and that up to 1,800 plant operators and 2,500 construction workers remained behind. Also staying in Pripyat were 600 to 700 staff of the Department of Internal Affairs and armed forces, in addition to city administrators and civil defense personnel (*Pripyat militsia*, File on Special Measures in the Pripyat Zone, April 27, 1986, 29). However, a large proportion of the population had left the city by other means long before the evacuation began, although the estimated numbers of those who did so vary considerably (see detailed note below).

159 *To get all the families out safely*: Protsenko, author interviews, 2015 and 2016; Ukrainian Ministry of Internal Affairs, Report no. 287c/Gd [287c/Гд], April 27, 1986 (confidential, signed by Interior Minister Ivan Gladush), archive of the Chernobyl Museum.

159 *At the same time, in Kiev*: "Report of the Ministry of Transport of the Ukrainian SSR to the Ukraine Central Committee of the Communist Party," April 27, 1986 (no. 382c, confidential, signed by Minister Volkov), archive of the Chernobyl Museum.

159 *By 3:50 a.m.*: Pripyat *militsia*, File on Special Measures in the Pripyat Zone, 10–13.

159 *The bus stops of Kiev were crowded with frustrated passengers*: Shcherbak, "Report on First Anniversary of Chernobyl," trans. JPRS, pt. 1, 42–43.

159 *Boiled potatoes, bread, lard*: Natalia Khodemchuk, author interview, Kiev, 2017.

159 *Despite warnings to stay inside*: Anelia Perkovskaya (the secretary of the Komsomol at Pripyat *gorkom*), account in Shcherbak, "Report on First Anniversary of Chernobyl," trans. JPRS, pt. 1, 40 and 43.

159 *Some families set off*: Boris Nesterov, *Heaven and Earth: Memories and Reflections of a Military Pilot* [Небо и земля: Воспоминания и размышления военного летчика] (Kherson, 2016), 240.

160 *At the same time, the crews of two helicopters*: Antoshkin would later insist that "bombing" of the reactor was forbidden before the evacuation was complete (author interview, 2017), but it seems likely this is wishful thinking, with the benefit of hindsight, and is contradicted by other accounts. For example, Boris Nesterov, who flew these first missions, said he began dropping material into the reactor at around 3:00 p.m. and could see the evacuation unfold from his cockpit (author interview, 2016).

160 *The operation, approved by Boris Scherbina*: A. A. Dyachenko, ed., *Chernobyl. Duty and Courage* [Чернобыль. Долг и мужество], vol. 1 (Moscow: Voenizdat, 2001), 233.

160 *A complex cocktail of substances*: Legasov Tapes, cassette One, 10; Shasharin, "The Chernobyl Tragedy," 91.

160 *Lead, in particular: Sklyarov, Chernobyl Was . . . Tomorrow*, 61 and 69.

161 *In the meantime, Scherbina sent General Antoshkin: Shasharin, testimony in Grigori Medvedev, Truth About Chernobyl*, 192; Protsenko, author interview, 2015; Mimka, author interview, 2016; Antoshkin, author interview, 2017. In the interview, Antoshkin disputed Shasharin's suggestion that during this episode the general was filling sandbags while still wearing his full dress uniform.

161 *The quantities required were enormous: Dyachenko, ed., Chernobyl. Duty and Courage*, 234.

161 *Eventually between 100 and 150 men and women: Mimka, author interview, 2016; Logachev, author interview, 2017.*

161 *Scherbina remained implacable: Gennadi Shasharin and Anatoly Zagats (chief engineer of Yuzhatomenergomontazh), testimonies in Grigori Medvedev, Truth About Chernobyl*, 192–93.

162 *If he was aware of the rising level of contamination: Sklyarov, Chernobyl Was . . . Tomorrow*, 52.

162 *Early on Sunday afternoon, the first ten bags of sand: Shasharin, testimony in Grigori Medvedev, Truth About Chernobyl*, 193; Mimka, author interview, 2016; Nesterov, author interview, 2016.

162 *There were 1,225 buses in all: Report of Ukraine Ministry of Transport of the Ukrainian SSR to the Ukraine Central Committee of the Communist Party of Ukraine on April 27, 1986 (no. 382c), archive of the Chernobyl Museum; Protsenko, author interview, 2016; Natalia Yuvchenko, author interview, 2016.*

162 *At 2:00 p.m.: The time is given as one thirty in the report of the Ministry of Transport to the Ukraine Central Committee, archive of the Chernobyl Museum; but as 2:00 p.m. in the handwritten chronology of events in the Pripyat *militsia* log of Chernobyl accident response measures (File on Special Measures in the Pripyat Zone, Chernobyl Museum, 29–30). A Kiev transport official who oversaw the buses also states 2:00 p.m. (Reva, testimony at the Supreme Rada, December 11, 1991).*

162 *Maria Protsenko was waiting: Protsenko, author interview, 2015.*

163 *Outside the 540 separate entrances: Ivanov, "Chernobyl. Part 3: Evacuation," 38; Voznyak and Troitsky, Chernobyl: It Was Like This*, 223.

163 *At around 3:00 p.m., Colonel Boris Nesterov: Nesterov, author interview, 2016; Nesterov, Heaven and Earth*, 236–43.

164 *At 5:00 p.m., Maria Protsenko folded her map: Protsenko, author interview, 2015.* A large number of residents left by their own means, either before learning of the accident or after. The local branch of the Ukrainian Interior Ministry estimated this number to be 8,800 people: "Situation report as of 8 p.m., April 28, 1986," in Pripyat *militsia* log of Special Measures in the Pripyat Zone, Chernobyl Museum, 30. Other sources estimate this number to be as high as 20,000: Baranovska, ed., *Chernobyl Tragedy*, document no. 59: "Memorandum of the Department of Science and Education of the Central Committee of Communist Party of Ukraine on Immediate Measures Pertaining to the Accident at Chernobyl NPP," April 29, 1986.

This memorandum states that only 27,500 people were evacuated using buses and other transport specially provided by officials.

- 165 *As the multicolored convoy of buses wound its way*: Natalia Yuvchenko, author interview, 2015.
- 165 *Part of the convoy was well beyond*: Logachev, author interview, 2017.
- 165 *One member of the power station staff*: Glukhov, author interview, 2015.
- 165 *Viktor Brukhanov's wife, Valentina, wept*: Viktor and Valentina Brukhanov, author interview, 2016.
- 165 *The passengers whispered anxiously*: Natalia Yuvchenko, author interview, 2015.
- 165 *On the third floor of the White House*: Protsenko, author interview, 2015.

## Part 2. Death of an Empire

### 10. THE CLOUD

- 169 *Unleashed in the violence of the explosion*: World Health Organization (WHO), “Chernobyl Reactor Accident: Report of a Consultation,” Regional Office for Europe, report no. ICP/CEH 129, May 6, 1986 (provisional), 4.
- 169 *The cloud carried gaseous xenon 133*: Helen ApSimon and Julian Wilson, “Tracking the Cloud from Chernobyl,” *New Scientist*, no. 1517 (July 17, 1986): 42–43; Zhores Medvedev, *Legacy of Chernobyl*, 89–90.
- 169 *At its heart, it pulsed*: ApSimon and Wilson, “Tracking the Cloud from Chernobyl,” 45; Zhores Medvedev, *Legacy of Chernobyl*, 195.
- 169 *By the time Soviet scientists finally began regular airborne monitoring*: At this point, the cloud initially released by the explosion had already crossed into Poland and Finland: Zhores Medvedev, *Legacy of Chernobyl*, 195.
- 169 *Within twenty-four hours*: WHO, “Chernobyl Reactor Accident: Report of a Consultation,” 4.
- 169 *At midday on Sunday, an automatic monitoring device*: Zhores Medvedev, *Legacy of Chernobyl*, 196–97.
- 169 *Late that night, the plume encountered rain clouds*: ApSimon and Wilson, “Tracking the Cloud,” 42 and 44; Zhores Medvedev, *Legacy of Chernobyl*, 197.
- 170 *Shortly before seven o'clock on Monday morning*: Cliff Robinson, author interview by telephone, March 2016.
- 170 *They were building a large underground repository*: The facility was finished in 1988. See “This is where Sweden keeps its radioactive operational waste,” Swedish Nuclear Fuel and Waste Management Company (SKB), November 2016, [www.skb.com/our-operations/sfr](http://www.skb.com/our-operations/sfr).
- 170 *The reactor was only six years old*: Erik K. Stern, *Crisis Decisionmaking: A Cognitive Institutional Approach* (Stockholm: Swedish National Defence College, 2003), 130.
- 171 *At 9:30 a.m., the plant manager, Karl Erik Sandstedt*: Stern, *Crisis Decisionmaking*, 131–32; Nigel Hawkes et al., *The Worst Accident in the World: Chernobyl, the End of the Nuclear Dream* (London: William Heinemann and Pan Books, 1988), 116.
- 171 *Thirty minutes later*: Robinson, author interview, 2016.

171 *But by then, state nuclear and defense agencies*: Stern, *Crisis Decisionmaking*, 134–36.

172 *At around eleven in the morning Moscow time, Heydar Aliyev*: Heydar Aliyev, interview transcript, 2RR archive file no. 3/1/6, 14–15.

172 *One of the most powerful men in the Soviet Union*: Aliyev headed the KGB in Azerbaijan from 1967 to 1969: “Heydar Aliyev, President of the Republic of Azerbaijan” [Гейдар Алиев, президент Азербайджанской Республики], interview by Mikhail Gusman, TASS, September 26, 2011, <http://tass.ru/arhiv/554855>.

172 *Authorities in Kiev, without prompting from Moscow*: Angus Roxburgh, *The Second Russian Revolution: The Struggle for Power in the Kremlin* (New York: Pharos Books, 1992), 41–42.

172 *Aliyev realized*: Aliyev, interview transcript, 2RR, 14–15.

172 *The dozen men*: List of participants: minutes from the Politburo meeting (April 28, 1986), in Maleyev, *Chernobyl. Days and Years*, 241; Gorbachev’s office: Aliyev, interview transcript, 2RR, 14–15.

172 *In spite of recent renovations*: Valery Boldin, *Ten Years That Shook the World: The Gorbachev Era as Witnessed by His Chief of Staff* (New York: Basic Books, 1994), 162–63.

172 “*What happened?*”: Alexander Yakovlev, interview transcript, 2RR archive file no. 3/10/7, 5.

172 *Vladimir Dolgikh, the Central Committee secretary*: Dolgikh, interview transcript, 2RR archive file no. 1/3/5, 4.

172 *He described an explosion*: Working record of the April 28, 1986, Politburo meeting reproduced in Rudolf G. Pikhoya, *Soviet Union: The History of Power 1945–1991* [Советский Союз: История власти. 1945–1991] (Novosibirsk: Sibirsky Khronograf, 2000), 429–30.

173 *Information was still scant, and conflicting*: Yakovlev, interview transcript, 2RR, 5. Some Party elders struggled to grasp the significance of even the few hard facts they did receive. In a copy of one of the first KGB reports on the accident delivered to the Ukrainian Central Committee in Kiev on April 28, someone underlined the recorded radiation figures and scribbled in the margin, “What does this mean?” See the second page of the document titled “On the Explosion at the NPP” [О взрыве на АЭС], April 28, 1986, archival material of the State Security Service of Ukraine, f. 16, op. 11-A [ф. 16, оп. 11-А], [www.archives.gov.ua/Sections/Chornobyl\\_30/GDA\\_SBU/index.php?2](http://www.archives.gov.ua/Sections/Chornobyl_30/GDA_SBU/index.php?2).

173 *Nothing more than a slogan*: Kotkin, *Armageddon Averted*, 67.

173 “*We can’t procrastinate*”: Politburo meeting minutes (April 28, 1986), in Pikhoya, *Soviet Union*, 431.

173 *Gorbachev’s grip on power remained tenuous*: Committed reformers in the Politburo at the time were in a minority of four: Yeltsin, Yakovlev, Shevardnadze, and Gorbachev himself. Ligachev was a hardliner and Ryzhkov a moderate conservative. Remnick, *Lenin’s Tomb*, 48.

173 *The official record of the meeting*: The working record quotes Ligachev (who, by most other accounts, opposed information sharing) as saying, “The people have

been accommodated well. We should make a statement about the incident without delay.” Politburo meeting minutes (April 28, 1986), in Pikhoya, *Soviet Union*, 431.

173 *The second most powerful man in the Kremlin*: Jonathan Harris, “Ligachev, Egor Kuzmich,” in Joseph Wieczynski, ed., *The Gorbachev Encyclopedia* (Salt Lake City: Schlacks, 1993), 246.

173 “Come off it!”: Heydar Aliyev, testimony in the documentary *The Second Russian Revolution* (1991), “Episode Two: The Battle for Glasnost,” online at [www.youtube.com/watch?v=5PafRkPMFWI](http://www.youtube.com/watch?v=5PafRkPMFWI); Aliyev, interview transcripts, 2RR, archive file no. 3/1/6 and 1/4/2.

173 *Others at the table*: Yakovlev, interview transcript, 2RR, 6.

173 “The statement should be formulated”: Politburo meeting minutes (April 28, 1986), in Pikhoya, *Soviet Union*, 431.

174 *Ligachev had apparently prevailed*: Aliyev, interview transcript 1/4/2, 2RR, 9. Leonid Dobrokhотов, Central Committee spokesman, says during an interview in the second episode of *The Second Russian Revolution*: “The instructions were traditional—that is to say, we had to play down the catastrophe, to prevent panic among the people, and to fight against what was then called bourgeois falsification, bourgeois propaganda, and inventions.”

174 *By 2:00 p.m. in Stockholm, Swedish state authorities*: Stern, *Crisis Decisionmaking*, 136.

174 *Back in the town of Chernobyl*: Sklyarov, *Chernobyl Was . . . Tomorrow*, 70.

174 *That afternoon in Moscow*: Stern, *Crisis Decisionmaking*, 137–38.

175 *The official told Örn*: Hawkes et al., *Worst Accident in the World*, 117.

175 “One of the atomic reactors has been damaged”: Text of the announcement is from the official summary of the April 28 Politburo meeting available in RGANI, Opis 53, Reel 1.1007, File 1: “Excerpts from the protocol of meeting no. 8 of the CPSU Politburo” [Выписка из протокола № 8 заседания Политбюро ЦК КПСС от 28 апреля 1986 года]. The time of the broadcast is specified in Alexander Amerisov, “A Chronology of Soviet Media Coverage,” *Bulletin of the Atomic Scientists* 42, no. 7 (August/September 1986): 38. For Western coverage of the announcement, see William J. Eaton, “Soviets Report Nuclear Accident: Radiation Cloud Sweeps Northern Europe; Terming Not Threatening,” *Los Angeles Times*, April 29, 1986; and Serge Schmemann, “Soviet Announces Nuclear Accident at Electric Plant,” *New York Times*, April 29, 1986.

175 *At 9:25 p.m. Moscow time, Vremya*: BBC Summary of World Broadcasts, “Accident at Chernobyl Nuclear Power Station,” SU/8246/I, April 30, 1986 (Wednesday). The video of the *Vremya* news segment is available at “The announcement of the *Vremya* program about Chernobyl of 04.28.1986” [Сообщение программы Время о Чернобыле от 28-04-1986], published April 2011 and accessed May 2018: [www.youtube.com/watch?v=VG6eIuAfLoM](http://www.youtube.com/watch?v=VG6eIuAfLoM).

175 *Their editors did their best to keep it quiet*: Marples, *Chernobyl and Nuclear Power in the USSR*, 3.

175 *The second extraordinary meeting of the Politburo in two days*: V. I. Vorotnikov, *This Is*

*How It Went . . . From the Diary of a Member of the Politburo of the Central Committee of the Communist Party of the Soviet Union* [А было это так . . . Из дневника члена Политбюро ЦК КПСС] (Moscow: Soyuz Veteranov Knigoizdaniya SI-MAR, 1995), 96–97.

176 *Vladimir Dolgikh gave his colleagues the latest news*: Politburo meeting minutes (April 29, 1986), from Russian Government Archives Fond 3, Opis 120, Document 65, reproduced in Maleyev, *Chernobyl. Days and Years*, 245. A different version of events is proposed by Pikhoya, whose summary of meeting proceedings suggests that Dolgikh described deteriorating conditions at the plant: Pikhoya, *Soviet Union*, 432.

176 *They were facing disaster*: Politburo meeting minutes (April 29, 1986), in Maleyev, *Chernobyl. Days and Years*, 246. Vorotnikov maintains that it was only at this second meeting that the reports made the emerging scale of the accident clear (*This Is How It Went*, 96–97).

176 “*The more honest we are, the better*”: Politburo meeting minutes (April 29, 1986), reproduced in Maleyev, *Chernobyl. Days and Years*, 247 and 249.

176 *They agreed to cable statements*: “Resolution of the CPSU Central Committee: On Additional Measures Related to the Liquidation of the Accident at the Chernobyl Nuclear Power Plant” [О дополнительных мерах, связанных с ликвидацией аварии на Чернобыльской АЭС], top secret, April 29, 1986, in RGANI, Opis 53, Reel 1.1007, File 2.

177 “*Should we give information to our people?*”: Politburo meeting minutes (April 29, 1986), in Maleyev, *Chernobyl. Days and Years*, 248.

177 *Vremya broadcast a new statement*: Amerisov, “A Chronology of Soviet Media Coverage,” 38; Marples, *Chernobyl and Nuclear Power in the USSR*, 4; Mickiewicz, *Split Signals*, 61–62.

177 *Luther Whittington of the wire service*: Nicholas Daniloff, *Of Spies and Spokesmen: My Life as a Cold War Correspondent* (Columbia: University of Missouri Press, 2008), 343. In their book on the history of UPI, Gregory Gordon and Ronald Cohen suggested that Whittington was the victim of a deliberate attempt to discredit Western reporting, orchestrated by the KGB. Gregory Gordon and Ronald E. Cohen, *Down to the Wire: UPI's Fight for Survival* (New York: McGraw-Hill, 1990), 340–41.

177 “‘*2,000 DIE’ IN NUKEMARE*’”: Luther Whittington, “‘*2,000 Die*’ in Nukemare; Soviets Appeal for Help as N-plant Burns out of Control,” *New York Post*, April 29, 1986; “‘*2000 Dead*’ in Atom Horror: Reports in Russia Danger Zone Tell of Hospitals Packed with Radiation Accident Victims,” *Daily Mail*, April 29, 1986.

178 *That night, the lurid death toll*: Hawkes et al., *Worst Accident in the World*, 126.

178 *A secret intelligence assessment*: “Estimate of Fatalities at Chernobyl Reactor Accident,” cable from Morton I. Abramovitz to George Shultz, Secret, May 2, 1986, CREST record CIA-RDP88G01117R000401020003-1, approved for release December 29, 2011.

178 *Meanwhile, the radioactive cloud*: ApSimon and Wilson, “Tracking the Cloud from Chernobyl,” 44.

178 *The West German and Swedish governments lodged furious complaints*: William J. Eaton and Willion Tuohy, “Soviets Seek Advice on A-Plant Fire ‘Disaster’: Bonn, Stockholm Help Sought, but Moscow Says Only 2 Died,” *Los Angeles Times*, April 30, 1986; Karen DeYoung, “Stockholm, Bonn Ask for Details of Chernobyl Mis-  
hap: Soviets Seek West’s Help to Cope With Nuclear Disaster,” *Washington Post*, April 30, 1986; Stern, *Crisis Decisionmaking*, 230.

178 *In Denmark, pharmacies*: Stern, *Crisis Decisionmaking*, 147; DeYoung, “Stockholm, Bonn Ask for Details.”

178 *In Communist Poland*: Murray Campbell, “Soviet A-leak ‘world’s worst’: 10,000 lung cancer deaths, harm to food cycle feared,” *Globe and Mail*, April 30, 1986.

178 “*The world has no idea of the catastrophe*”: Hawkes et al., *Worst Accident in the World*, 127.

178 *Soviet spokesmen dismissed these stories*: Marples, *Chernobyl and Nuclear Power in the USSR*, 6–7.

179 *Chebrikov notified his superiors*: V. Chebrikov, “On the reaction of foreign diplomats and correspondents to the announcement of an accident at Chernobyl NPP” [О реакции иностранных дипломатов икорреспондентов на сообщение об аварии на Чернобыльской АЭС], KGB memo to Central Committee of the CPSU, April 20, 1986, in RGANI, Opis 53, Reel 1.1007, File 3.

179 *Apparently attempting to sever his remaining communications*: Daniloff, *Of Spies and Spokesmen*, 344; Daniloff, author interview, 2017.

179 *Fifteen thousand people had been killed*: Guy Hawtin, “Report: 15,000 Buried in Nuke Disposal Site,” *New York Post*, May 2, 1986.

179 *Using just three helicopters*: Antoshkin, *Regarding Chernobyl*, 2.

180 “*Like hitting an elephant with a BB gun!*”: Antoshkin, author interview, 2017. In his unpublished memoir, *Regarding Chernobyl*, Antoshkin recalls slightly different figures: fifty-five tonnes of sand, and ten of boron. Piers Paul Read reports that Scherbina at first told the chemical warfare generals, Ivanov and Pikalov, that Antoshkin was simply incompetent (*Ablaze*, 123–24).

180 *Heavy-lift helicopters*: Nesterov, *Heaven and Earth*, 245. For a description of Mi-26, see “Russia’s airborne ‘cow,’” BBC News Online, August 20, 2002.

180 *But it proved almost impossible*: Nesterov, *Heaven and Earth*, 247.

180 *Most crews flew a total of ten to fifteen sorties*: Antoshkin, author interview, 2015, and 11–13 in his unpublished memoir *The Role of Aviation in Localizing the Consequences of the Catastrophe at Chernobyl* [Роль авиации в локализации последствий катастрофы на Чернобыльской АЭС].

180 *The temperature dropped from more than 1,000 degrees*: Dolgikh, testimony to the Politburo on April 29, 1986, in meeting minutes reproduced in Maleyev, *Chernobyl. Days and Years*, 245. See also 258 for Legasov’s testimony to the Politburo on May 5, 1986.

180 *The government commission was forced to withdraw*: Shasharin, “The Chernobyl Tragedy,” 96.

181 *The territory immediately surrounding the plant*: Areas around the plant would

soon be classified as three concentric circles, the innermost of which measured about 1.5 kilometers across: Mary Mycio, *Wormwood Forest: A Natural History of Chernobyl* (Washington, DC: Joseph Henry Press, 2005), 23. The term *osobaya zona* can be found, for example, in a KGB memo from December 1986, although there it denotes a larger area, about nine kilometers in diameter: Danilyuk, ed., “Chernobyl Tragedy,” *Z arkhiviv*, document no. 73: “Special report of the UkrSSR KGB to the USSR KGB 6th Department concerning the radioactive situation and the progress in works on the cleaning up operation after the accident at the Chernobyl’ NPS,” December 31, 1986.

181 *The first meeting of the Politburo Operations Group*: Baranovska, ed., *The Chernobyl Tragedy*, document no. 60: “Protocol of the first meeting of the Politburo Task Force on liquidating the consequences of the Chernobyl NPP accident,” April 29, 1986, 80–81.

181 *Legasov was afraid to ask*: Legasov Tapes, cassette One, 14; Nikolai Ryzhkov, *Ten Years of Great Shocks* [Десять лет великих потрясений] (Moscow: Kniga-Prosveshchenie-Miloserdie, 1995), 167.

181 *The first 2,500 tonnes arrived*: Lyashko, *Weight of Memory*, 362.

181 *By the time the light failed*: Antoshkin, *Regarding Chernobyl*, 3.

181 *A scientific report*: Baranovska, ed., *The Chernobyl Tragedy*, document no. 59: “Memorandum of the Department of Science and Education of the Central Committee of the Communist Party of Ukraine on immediate measures connected to the accident at the Chernobyl NPP,” April 29, 1986.

181 *The regional civil defense leaders had made preparations*: Ivanov, “Chernobyl, Part 3: Evacuation,” 39. The number 10,000 is specified by Lyashko, *Weight of Memory*, 355.

181 *A shipment of parachutes was delivered*: Mimka, author interview, 2016; Antoshkin, author interview, 2017; Nikolai Antoshkin, “Helicopters over Chernobyl” [Вертолеты над Чернобылем], interview by Sergei Lelekov, *Nezavisimaya Gazeta*, April 28, 2006, [http://nvo.ng.ru/history/2006-04-28/1\\_chernobil.html](http://nvo.ng.ru/history/2006-04-28/1_chernobil.html).

181 *Each chute could carry as much as 1.5 tonnes*: Antoshkin, author interview, 2017.

181 *When the general delivered his report that night*: Nikolai Antoshkin, handwritten testimony, archive of the Chernobyl Museum.

182 *This time it turned almost due south*: Zhores Medvedev, *Legacy of Chernobyl*, 158–59.

182 *At exactly one o’clock that afternoon*: Y. Izrael, ed., *Chernobyl: Radioactive Contamination of the Environment* [Чернобыль: Радиоактивное загрязнение природных сред] (Leningrad: Gidrometeoizdat, 1990), 56. The accepted measure in the USSR for normal background radiation was between 4 and 20 microroentgen per hour. *Radiation Safety Norms–76* [Нормы радиационной безопасности–76], Moscow: Atomizdat, 1978, cited in “For Reference” [Справочно], undated, archive of the Chernobyl Museum. In his memoir, Kiev district radiation reconnaissance officer Alexander Logachev states that he regarded the normal background in Ukraine as 11 microroentgen per hour (*The Truth*).

182 *The progress of the radioactive cloud had been tracked*: Alla Yaroshinskaya, *Chernobyl: Crime Without Punishment*, 73–75.

182 *Inside the Ukrainian Ministry of Health*: Iurii Shcherbak, account in Zhores Medvedev, *Legacy of Chernobyl*, 160; Shcherbak, interview transcript (June 12, 1990), 2RR archive file no. 3/8/5, 2.

182 *Familiar with the dangers of radiation*: Zgursky had previously led the S. P. Korolev Manufacturing Company (later renamed Meridian), which produced specialized electronics, including gamma measurement devices. See “More than 60 years in the market of detection equipment and appliances” [Более 60 лет на рынке измерительной и бытовой техники], Meridian, <http://www.merydian.kiev.ua/>.

182 *He tried to convince Scherbitsky*: Alexander Kitral, “Gorbachev to Scherbitsky: ‘Fail to hold the parade, and I’ll leave you to rot!’” [Горбачев—Щербицкому: «Не проведешь парад—стгною!»], *Komsomolskaya Pravda v Ukraine*, April 26, 2011, <https://kp.ua/life/277409-horbachev-scherbytskому-ne-provedesh-parad-shnoui>.

183 *With only ten minutes to go, he was nowhere to be seen*: Lyashko confirms that Scherbitsky arrived late and that he spent some time conferring “in an undertone” with E. V. Kachalovsky, who headed the Ukrainian government’s task force on responding to the Chernobyl accident: Lyashko, *Weight of Memory*, 356. See also the interview with Vitali Korotich, then a prominent magazine editor in Moscow, in *The Second Russian Revolution*, “Episode Two: The Battle For Glasnost” (BBC, 1991).

183 “*I told him*”: Kitral, “Gorbachev to Scherbitsky”; Serhii Plokhy, *The Gates of Europe: A History of Ukraine* (New York: Basic Books, 2015), 310. Scherbitsky’s wife, Rada, confirmed the story about the Party card in an interview in 2006: Rada Scherbitskaya, interview by Yelena Sheremeta, “After Chernobyl, Gorbachev told Vladimir Vasiliyevich, ‘If you don’t hold the parade, say goodbye to the Party’” [Рада Щербицкая: «После Чернобыля Горбачев сказал Владимиру Васильевичу: «Если не проведешь первомайскую демонстрацию, то можешь распрощаться с партией»], *Fakty i kommentarii*, February 17, 2006: <http://fakty.ua/43896-rada-cscherbickaya-quot-posle-chernobyllya-gorbachev-skazal-vladimiru-vasilevichu-quot-esli-ne-provedesh-pervomajskuyu-demonstraciyu-to-mozhesh-rasprocshatsya-s-partiej-quot>.

183 “*To hell with it*”: Kitral, “Gorbachev to Scherbitsky”; Plokhy, *Gates of Europe*, 310–11. In 1991, as the Soviet Union was finally collapsing, author and member of the Supreme Soviet Iurii Shcherbak would say it had already become impossible to establish who truly issued the order for the parade to go ahead, because everything was discussed on the telephone and no written instructions were issued by anyone involved. Afterward, Scherbitsky’s people insisted it was Moscow’s directive; in the Kremlin, they blamed the Ukrainians (Shcherbak, interview transcript no. 3/8/5, 2RR, 7). For example, Nikolai Ryzhkov contests the Ukrainian account, insisting that authority over the parade resided with Scherbitsky alone. (See Ryzhkov, interview by Interfax, April 23, 2016: [www.interfax.ru/world/505124](http://www.interfax.ru/world/505124).) Ryzhkov declined to be interviewed for this book.

183 *There were seas of red banners*: Video footage of the parade is featured in *The Second Russian Revolution*, Episode 2: The Battle for Glasnost: [www.youtube.com/watch?v=tyW6wbHft2M](http://www.youtube.com/watch?v=tyW6wbHft2M).

184 *Some concessions to the perils of the fallout*: Kitral, “Gorbachev to Scherbitsky.”

184 *Some on the rostrum that morning*: Sklyarov, *Chernobyl Was . . . Tomorrow*, 146.

184 *Later, when the wind changed direction again*: Alan Flowers, author interview by telephone, February 2016; Justin Sparks, “Russia Diverted Chernobyl Rain, Says Scientist,” *Sunday Times*, August 8, 2004; Richard Gray, “How We Made Chernobyl Rain,” *Sunday Telegraph*, April 22, 2007. Moscow has repeatedly denied that cloud seeding took place after the accident, but two of the pilots involved in the operation—one of whom was later awarded a medal for involvement in the operation—described their efforts in the 2007 BBC documentary *The Science of Superstorms*.

184 *The May Day procession swept through Red Square*: UPI, “Tens of Thousands in March: Nuclear Disaster Ignored at Soviet May Day Parade,” *Los Angeles Times*, May 1, 1986. During the celebrations, two cosmonauts orbiting Earth on the Soviet space station *Mir* contributed a live message from space.

184 *But afterward, Prime Minister Ryzhkov convened*: Velikhov, *Strawberries from Chernobyl*, 245. Velikhov, interview transcript (June 12, 1990), 2RR archive file no. 1/1/14, 1.

184 *The group confronted the emergencies*: “Protocol no. 3 of the meeting of the Politburo Operations Group of the CPSU Central Committee on problems related to the aftermath of the Chernobyl NPP accident” [Протокол № 3 заседания Оперативной группы Политбюро ЦК КПСС по вопросам связанным с ликвидацией последствий аварии на Чернобыльской АЭС], May 1, 1986, in RGANI, Opis 51, Reel 1.1006, File 19.

185 *This new team would be led by Ivan Silayev*: Ibid. In November 1985 Silayev had been appointed deputy chairman of the USSR Council of Ministers, deputy prime minister and chairman of the council’s Bureau for Machine-Building.

185 *Ryzhkov went to see Gorbachev in his office*: Ryzhkov, *Ten Years of Great Shocks*, 170–71.

185 *Flew to Kiev without him*: Nikolai Ryzhkov, interview by Elena Novoselova, “The Chronicle of Silence” [Хроника молчания], *Rossiiskaya Gazeta*, April 25, 2016, <https://rg.ru/2016/04/25/tridcat-let-nazad-proizoshla-avariia-na-chernobyl-skoy-aes.html>.

185 *Accompanied by Scherbitsky, the Ukrainian first secretary*: Ryzhkov, *Ten Years of Great Shocks*, 170–72. Ryzhkov describes the map he was using in the interview by Novoselova, *Rossiiskaya Gazeta*, 2016.

186 *At 2:00 p.m.*: Ivanov, “Chernobyl, Part 3: Evacuation,” 39.

186 *All top secret*: Sklyarov, *Chernobyl Was . . . Tomorrow*, 89.

## 11. THE CHINA SYNDROME

187 *From high up on the roof of the Hotel Polesia*: Mimka, author interview, 2016; author visit to the Hotel Polesia, Pripyat, April 25, 2016.

188 *Taking off in a continuous carousel*: Footage of the helicopters lifting and transporting these loads can be seen at around 1:06 in *Chernobyl: A Warning* [Чернобыль: Предупреждение], a 1987 Russian state television documentary, available online at [www.youtube.com/watch?v=mwxbS\\_ChNNk](http://www.youtube.com/watch?v=mwxbS_ChNNk) (accessed May 2018).

188 *Although many routinely underreported it*: Antoshkin, handwritten testimony, Chernobyl Museum.

188 *Bitter potassium iodide tablets*: Mimka, author interview, 2016.

188 *If you want to be a dad*: A. N. Semenov, “For the 10th Anniversary of the Chernobyl Catastrophe,” in Semenov, ed., *Chernobyl: Ten Years On*, 22.

189 *Physicists were hauled into their offices*: Alexander Borovoi (head of the neutrino laboratory at Kurchatov Institute at the time of the accident), account in Alexander Kupny, *Memories of Lives Given: Memories of Liquidators* [Жизнь, пока нас помнят: Воспоминания ликвидаторов] (Kharkiv: Zoloty Storynki, 2011), 6–7.

189 *Five or six times every day*: E. P. Ryazantsev, “It Was in May 1986,” in Viktor A. Sidorenko, ed., *The Contribution of Kurchatov Institute Staff to the Liquidation of the Accident at the Chernobyl NPP* [Вклад Курчатовцев в ликвидацию последствий аварии на чернобыльской АЭС] (Moscow: Kurchatov Institute, 2012), 85.

189 *They watched as the pilots' payloads*: V. M. Fedulenko, “Some Things Have Not Been Forgotten,” in Sidorenko, ed., *The Contribution of Kurchatov Institute Staff*, 79.

189 *A beautiful crimson halo*: Ryazantsev, “It Was in May 1986,” 86.

189 *The volcanoes of Kamchatka*: Mimka, author interview, 2016.

189 *At the very start, one member of the Kurchatov group*: Fedulenko, “Some Things Have Not Been Forgotten,” 82; Read, *Ablaze*, 132–33.

190 *Day after day, the volume of material*: These statistics, which differ from those recalled by Antoshkin, are drawn from data in helicopter pilot logs recorded at the time, provided by Alexander Borovoi to Alexander Sich (“The Chornobyl Accident Revisited,” 241).

190 *They began dropping lead*: Shasharin, “Chernobyl Tragedy,” 107.

190 *A hastily created new formation*: Vladimir Gudov, *Special Battalion no. 731* [731 спецбатальон] (Kiev: Kyivskyi Universitet Publishing Center, 2010), trans. Tamara Abramenkova as *731 Special Battalion: Documentary Story* (Kiev: N. Veselicka, 2012). See 54 in the original Russian edition or 80 in the English translation.

190 *The hot weather and the rotor wash*: Piotr Zborovsky, interview by Sergei Babakov, “I’m still there today, in the Chernobyl zone” [Я и сегодня там, в Чернобыльской зоне], *Zerkalo nedeli Ukraina*, September 18, 1998: [http://gazeta.zn.ua/SOCIETY/ya\\_i\\_segodnya\\_tam,\\_v\\_chernobylskoy\\_zone.html](http://gazeta.zn.ua/SOCIETY/ya_i_segodnya_tam,_v_chernobylskoy_zone.html), translated in Gudov, *731 Special Battalion*, 101. Also see pp. 124–25 for N. Bosy, “Open Letter of a Commander of a Radiological Protection Battalion 731 [...] to Battalion Staff.”

190 *1,200 tonnes of lead, sand, and other materials*: Antoshkin, handwritten testimony, Chernobyl Museum. Antoshkin states that he deliberately underreported these volumes so that Scherbina did not set an even higher target for the next day. The actual total dropped on May 1 attributed to the pilot logs cited by Sich is 1,900 tonnes (“Chornobyl Accident Revisited,” 241).

190 *Some members of the government commission got to their feet*: Antoshkin, handwritten testimony, Chernobyl Museum.

191 *Instead of continuing to fall*: International Atomic Energy Agency, International Nuclear Safety Advisory Group, “Summary Report on the Post-Accident Review Meeting on the Chernobyl Accident,” Safety series no. 75-INSAG-1, 1986, 35; Sich, “Chornobyl Accident Revisited,” 241–42, fig. 4.1 and fig. 4.4.

191 *Approaching 1,700 degrees centigrade*: Legasov’s report to the Politburo, in minutes of the May 5, 1986, meeting reproduced in Maleyev, *Chernobyl. Days and Years*, 258. The transcript cites “20 degrees,” but this seems likely to be an erroneous transcription of 2,000 degrees Centigrade, since Legasov adds that the temperature has been rising by about 135 degrees per day since Saturday, April 26, when it measured 1,100 degrees. Based on these calculations, by the evening of Thursday, May 4, the reactor would be at around 1,595 degrees. In *Legasov Tapes* (cassette One, 20), he similarly mentions 2,000 degrees Centigrade as “approximately the highest temperature we have observed.” In reality, all of these figures could be little more than educated guesses, since the scientists did not yet have any way of taking accurate readings from inside the reactor space.

191 *The academicians now feared*: Sich, “Chornobyl Accident Revisited,” 241 and 257–58.

191 *If the temperature of the molten fuel*: Ryzhkov, statement to Politburo on May 5: minutes reproduced in Maleyev, *Chernobyl. Days and Years*, 252. Sich (“Chornobyl Accident Revisited,” 242) specifies the temperature necessary for liquefaction as between 2,300 and 2,900 degrees centigrade.

191 *A whole range of toxic radionuclides*: P. A. Polad-Zade (deputy minister of water of the USSR), “Too Bad It Took a Tragedy” [Жаль, что для этого нужна трагедия], in Semenov, ed., *Chernobyl: Ten Years On*, 195.

191 *But the second threat*: Karpan, *Chernobyl to Fukushima*, 68; Vitali Masol (head of the Ukraine State Planning Committee and deputy chairman of the Ukraine Council of Ministers at the time of the accident), interview by Elena Sheremeta, “We were quietly preparing to evacuate Kiev” [Виталий Масол: «Мы тихонечко готовились к эвакуации Киева»], *Fakty i kommentarii*, April 26, 2006: <http://fakty.ua/45679-vitalij-masol-quot-my-tihonechko-gotovilis-k-evakuacii-kieva-quot>.

192 *On Friday, May 2, the new team*: The resolution to send in a duplicate team was reached by the Kremlin’s task force on Chernobyl on May 1, 1986: “Protocol no. 3 of the meeting of the Politburo Operations Group,” in RGANI.

192 *Thoroughly irradiated*: Drach, author interview, 2017; Kopchinsky, recollections in Kopchinsky and Steinberg, *Chernobyl*, 53.

192 *The commission members had not been given iodine tablets*: Sklyarov, *Chernobyl Was . . . Tomorrow*, 52; Shasharin writes that there were no dosimeters available to the commission members at first and that “a subsequent analysis showed that the exposure dose ranged from 60 to 100 rem (without the internal radiation)” (“Chernobyl Tragedy,” 99).

192 Now their eyes and throats were red and raw: Evgeny P. Velikhov, *My Journey: I Shall Travel Back to 1935 in Felt Boots* [Мой путь. Я на валенках поеду в 35-й год] (Moscow: AST, 2016), translated by Andrei Chakhovskoi as *Strawberries from Chernobyl: My Seventy-Five Years in the Heart of a Turbulent Russia*, 253. Also see Abagayn, account in Voznyak and Troitsky, *Chernobyl: It Was Like This*, 216.

192 Others felt sick: Sklyarov, *Chernobyl Was . . . Tomorrow*, 141.

192 They surrendered their clothes and expensive foreign-made watches: Sklyarov, *Chernobyl Was . . . Tomorrow*, 83; Drach, author interview, 2017.

193 Legasov chose to stay behind: Vladimir Gubarev, testimony in Margarita Legasova, *Academician Valery A. Legasov*, 343.

193 Velikhov had no direct experience: Velikhov, *Strawberries from Chernobyl*, 245–46.

193 His manner didn't impress the generals: Read, *Ablaze*, 138–39.

193 But Velikhov: Bolshov, author interview, 2017; Vladimir Gubarev (science editor at *Pravda*), memorandum to the USSR Central Committee, summarized by Nicholas Daniloff, “Chernobyl and Its Political Fallout: A Reassessment,” *Demokratizatsiya: The Journal of Post-Soviet Democratization* 12, no. 1 (Winter 2004): 123. Alexander Borovoi describes Gorbachev’s personal animosity toward Legasov in Alla Astakhova, interview with Alexander Borovoi, “The Liquidator” [Ликвидатор], *Itogi* 828, no. 17 (April 23, 2012), [www.itogi.ru/obsh-spetzproekt/2012/17/177051.html](http://www.itogi.ru/obsh-spetzproekt/2012/17/177051.html).

193 Now, in addition to their different personalities: Rafael V. Arutyunyan, “The China Syndrome” [Китайский синдром], *Priroda*, no. 11 (November 1990): 77–83. In his taped recollections of the events, Legasov mentions that Velikhov had seen the film recently: Legasov Tapes, cassette One, 19.

193 The chances of a full meltdown: Shasharin, “Chernobyl Tragedy,” 100; Legasov Tapes, cassette One, 20.

193 A 50 percent margin of error: International Atomic Energy Agency, INSAG-1, 35.

193 They knew nothing: A. A. Borovoi and E. P. Velikhov, *The Chernobyl Experience: Part 1, Work on the “Shelter” Structure* [Опыт Чернобыля: Часть 1, работы на объекте «Укрытие»] (Moscow: Kurchatov Institute, 2012), 28.

193 An enclosed body of water: Shasharin, “Chernobyl Tragedy,” 100.

193 In the West, scientists had been simulating: Arutyunyan, “China Syndrome,” 77–83.

194 Velikhov contacted the head of his research lab: Bolshov, author interview, 2017.

194 The temperature inside Reactor Number Four continued to rise: Legasov, statement at the Politburo meeting on May 5, 1986, in Maleyev, *Chernobyl. Days and Years*, 259.

194 Velikhov called Gorbachev: Velikhov, *My Journey*, 274.

194 Less volatile than Boris Scherbina: Velikhov, *Strawberries from Chernobyl*, 251.

194 But he faced an even more dire situation: Velikhov, interview transcript, 2RR, 1; *Chernobyl: A Warning* (Soviet documentary, 1986); Read, *Ablaze*, 137–38.

195 Many slept for only: BBC Summary of World Broadcasts, “Velikhov and Silayev: ‘Situation No Longer Poses Major Threat’” (text of a *Vesti* video report from Chernobyl on May 11, 1986), translated May 13, 1986.

195 *He summoned subway construction engineers*: The head of the Kiev Metro construction company (Kievmetrostroi) arrived on site May 3, according to the account of Nikolai Belous, a senior surveyor, in Shcherbak, *Chernobyl*, 172.

195 *Five thousand cubic meters*: Ryzhkov, statement at the Politburo meeting on May 5, 1986, in Maleyev, *Chernobyl. Days and Years*, 252.

195 *In the meantime*: Mimka, author interview, 2016. A Ukrainian KGB memo of May 5, 1986, records plans to drop another thousand tonnes of loads on the reactor the following day (Danilyuk, ed., “Chernobyl Tragedy,” *Z arkhiviv*, document no. 28: *Report of the UkrSSR KGB 6th Department to the USSR KGB Concerning the Radioactive Situation and Progress in Investigating the Accident at the Chernobyl NPS*).

195 *At 1:00 a.m. on May 3*: Zborovsky, interview by Babakov, *Zerkalo nedeli*, 1998. Zborovsky recalls that this incident took place at one o'clock on the night of May 1-2, but Silayev was not scheduled to fly into Chernobyl until the morning of May 2 at the earliest. (His appointment and impending travel to Chernobyl were discussed during the Politburo meeting on the afternoon of May 1: “Protocol no. 3 of the meeting of the Politburo Operations Group,” in RGANI. Velikhov’s presence was also recorded at that meeting.) So it seems likely that Zborovsky meant instead the night of May 2-3.

196 *The steam suppression pools*: Shasharin, “Chernobyl Tragedy,” 100; Sich, “Chernobyl Accident Revisited,” 254 and 257. See photographs of the pools in Borovoi and Velikhov, *The Chernobyl Experience: Part 1*, 123 and 142.

196 *But on April 26 the condensation system*: Karpan, *Chernobyl to Fukushima*, 68-69; Alexey Ananenko, a senior engineer at Unit Two reactor shop, recollections [Воспоминания старшего инженера-механика реакторного цеха №2 Алексея Ананенка], *Soyuz Chernobyl*, undated (before September 2013), [www.souzchernobyl.org/?id=2440](http://www.souzchernobyl.org/?id=2440).

197 *It was still the small hours*: Zborovsky, interview by Babakov, *Zerkalo nedeli*, 1998.

198 *Gradually, the water level rose*: Zborovsky, testimony in Gudov, *731 Special Battalion*, 112. Karpan explains that the intake point was located in the stairway compartment 05/1 of the Auxiliary Reactor Equipment block, beneath Unit Three (*Chernobyl to Fukushima*, 69).

198 *Back in Moscow, Evgeny Velikhov’s team*: Bolshov, author interview, 2017.

198 *They sent samples to Kiev*: Borovoi and Velikhov, *Chernobyl Experience Part 1*, 29-30.

198 *They quickly confirmed*: Arutyunyan, “China Syndrome,” 78-81.

198 *But they also found*: Bolshov, author interview, 2017.

198 *In Chernobyl, the commission remained*: Zborovsky, testimony in Gudov, *731 Special Battalion*, 103-9.

199 *The plant physicists, consumed with fear*: Prianichnikov, author interview, 2006.

199 *By 6:00 p.m. on Sunday, Legasov’s readings*: Legasov, statement at the Politburo meeting on May 5, 1986, in Maleyev, *Chernobyl. Days and Years*, 258.

## 12. THE BATTLE OF CHERNOBYL

200 *Shortly after 8:00 p.m.:* The White House, “Presidential Movements” and “The Daily Diary of President Ronald Reagan,” April and May 1986, Ronald Reagan Presidential Library and Museum, online at [www.reaganlibrary.gov/sites/default/files/digitallibrary/dailydiary/1986-05.pdf](http://www.reaganlibrary.gov/sites/default/files/digitallibrary/dailydiary/1986-05.pdf); Paul Lewis, “Seven Nations Seeking Stable Currency,” *New York Times*, May 6, 1986.

200 *The first reports of the radiation:* Ronald Reagan, diary entry, Wednesday, April 30, 1986, in Douglas Brinkley, ed., *Reagan Diaries*, vol. 2: *November 1985–January 1989* (New York: HarperCollins, 2009), 408; George P. Shultz, *Turmoil and Triumph: My Years as Secretary of State* (New York: Charles Scribner’s Sons, 1993), 714.

200 *From high-resolution spy satellite photographs:* Laurin Dodd (RBMK reactor expert in Nuclear Systems and Concepts Department, Pacific Northwest National Laboratory, March 1986 to May 1994), author interview by telephone, May 2018.

200 *And officials at the US Nuclear Regulatory Commission:* Stephen Engelberg, “2D Soviet Reactor Worries U.S. Aides,” *New York Times*, May 5, 1986.

200 *American nuclear experts could only speculate:* Dodd, author interview, 2018.

200 *In a classified report:* Eduard Shevardnadze, “Memorandum, CPSU Central Committee, no. 623/GS” [ЦК КПСС № 623/ГС], classified, May 3, 1986, in RGANI, opis 53, reel 1.1007, file 3.

201 *President Reagan broadcast:* Ronald Reagan, “Radio Address to the Nation on the President’s Trip to Indonesia and Japan,” May 4, 1986, *The American Presidency Project* (collaboration of Gerhard Peters and John T. Woolley), [www.presidency.ucsb.edu/ws/?pid=37208](http://www.presidency.ucsb.edu/ws/?pid=37208).

201 *Radioactive rain fell on Japan:* P. Klages, “Atom Rain over U.S.,” *Telegraph*, May 6, 1986; D. Moore, “UN Nuclear Experts Go to USSR,” *Telegraph*, May 6, 1986.

201 *The following afternoon:* Moore, “UN Nuclear Experts Go to USSR.”

201 *In the hours before their arrival:* “Draft minutes, the meeting of the Politburo of the CPSU Central Committee on May 5, 1986” [Рабочая запись, Заседание Политбюро ЦК КПСС 5 мая 1986 г.] (Russian Government Archives collection 3, opis 120, document 65, 1–18), reproduced in Maleyev, *Chernobyl. Days and Years*, 249–64.

202 *“I can only imagine”:* Politburo meeting minutes (May 5, 1986), in Maleyev, *Chernobyl. Days and Years*, 253.

203 *“a nuclear explosion”:* Ibid., 252.

204 *The republican authorities had begun:* Masol, “We were quietly preparing to evacuate Kiev”; Vitali Masol, author interview, Kiev, June 2017.

204 *“We’ve got to pick up our pace”:* “Minutes from the Politburo meeting (May 5, 1986), in Maleyev, *Chernobyl. Days and Years*, 249–64.

204 *Zborovsky had set out:* Zborovsky, testimony in Gudov, *731 Special Battalion*, 108.

204 *When they arrived on the scene:* Vladimir Trinos, interview by Irina Rybinskaya, “Fireman Vladimir Trinos, one of the first to arrive at Chernobyl after the explosion: ‘It was inconvenient to wear gloves, so the guys worked with their bare hands, crawling on their knees through radioactive water’” [Пожарный Владимир

Тринос, одним из первых попавший на ЧАЭС после взрыва: «в рукавицах было неудобно, поэтому ребята работали голыми руками, ползая на коленях по радиоактивной воде»], *Fakty i kommentarii*, April 26, 2001: <http://fakty.ua/95948-pozharnyj-vladimir-trinos-odnim-iz-pervyh-popavshij-na-chaes-posle-vzryva-quot-v-rukavicah-bylo-neudobno-poetomu-rebyata-rabotali-golymi-rukami-polzaya-na-kolenyah-po-radioaktivnoj-vode-quot>. Abandoned fire trucks are also mentioned by Nikolai Steinberg in his recollections from arriving on the scene on May 7: Kopchinsky and Steinberg, *Chernobyl*, 56.

204 *They drilled again and again*: Read, *Ablaze*, 135.

204 *At first, Captain Zborovsky wasn't afraid*: Zborovsky, testimony in Gudov, 731 Special Battalion, 111.

205 *The specialists and management from the plant*: Kopchinsky and Steinberg, *Chernobyl*, 57–59.

205 *Since the final evacuation of Pripyat*: Glukhov, author interview, 2015.

205 *Decorated with whimsical sculptures*: Photographs of the camp can be found at [https://www.facebook.com/pg/skazochny/photos/?tab=album&album\\_id=1631999203712325](https://www.facebook.com/pg/skazochny/photos/?tab=album&album_id=1631999203712325) and <http://chornobyl.in.ua/chernobyl-pamiatnik.html>.

205 *Now the woods and the fields nearby*: Kopchinsky and Steinberg, *Chernobyl*, 55–56.

205 *First, the subway engineers*: V. Kiselev, deputy chief engineer of the Ministry of Transport department for special projects (known as Department 157 and responsible for building the Moscow Metro), account in Dyachenko, ed., *Chernobyl: Duty and Courage*, vol. 1, 38–40; Belous, account in Shcherbak, *Chernobyl*, 172.

206 *At the same time, technicians*: Steinberg, author interview, 2015; Kopchinsky and Steinberg, *Chernobyl*, 67.

206 *Silayev's government commission sent out instructions*: Read, *Ablaze*, 139–40; Steinberg, author interview, 2015; Kopchinsky and Steinberg, *Chernobyl*, 67.

206 *Carried by a pair of Antoshkin's*: Mimka, author interview, 2016.

206 *“Find the nitrogen”*: Read, *Ablaze*, 140.

207 *It was eight in the evening on Tuesday*: Zborovsky, testimony in Gudov, 731 Special Battalion, 107–9.

207 *The men stopped the trucks*: Karpan, *Chernobyl to Fukushima*, 69.

207 *They ran out the hoses*: Trinos, interview by Rybinskaya, *Fakty i kommentarii*, 2001.

207 *Leaving the engines running*: Zborovsky, testimony in Gudov, 731 Special Battalion, 109–10.

207 *At last, the water*: Read, *Ablaze*, 136.

207 *Every few hours, three men*: Trinos, interview by Rybinskaya, *Fakty i kommentarii*, 2001; Zborovsky, interview by Babakov, *Zerkalo nedeli*, 1998.

207 *At three in the morning*: Trinos, interview by Rybinskaya, *Fakty i kommentarii*, 2001; Read, *Ablaze*, 136–37.

207 *One truck's engine coughed*: Trinos, interview by Rybinskaya, *Fakty i kommentarii*, 2001.

207 *The men were all frightened*: Read, *Ablaze*, 136.

208 *Another began ranting*: Trinos, interview by Rybinskaya, *Fakty i kommentarii*, 2001.

208 “*Don’t bring out the beast in me*”: Zborovsky, interview by Babakov, *Zerkalo nedeli*, 1998.

208 *Details of what had happened at the plant began seeping*: Yuri Shcherbak, author interview, Kiev, February 2016. News spread by word of mouth as many of the 47,000 former residents of Pripyat were distributed across Ukraine, and rumors filled the information vacuum left by the state. Kopchinsky and Steinberg, *Chernobyl*, 39–40.

208 *The surveillance department of the Ministry of Internal Affairs*: The Seventh Directorate of the Ministry of Internal Affairs (MVD) of the Ukrainian SSR, *Report on Results of Public Opinion Monitoring with Regard to the Accident at Chernobyl NPP* [Докладная записка о результатах изучения общественного мнения в связи с аварией на Чернобыльской АЭС], classified, addressed to the Minister of Internal Affairs of Ukraine I. Gladush, April 30, 1986, archive of the Chernobyl Museum.

208 *But the streets of Kiev*: Zhores Medvedev, *The Legacy of Chernobyl*, 161.

208 *Radiation dose rates in the city had increased*: Department of Science of the Central Committee of the Communist Party of Ukraine, “On several urgent measures to prevent health harm to Kiev’s population from the accident at Chernobyl NPP” [О некоторых неотложных мерах по предотвращению ущерба здоровью населения г. Киева вследствие аварии на Чернобыльской АЭС], May 4, 1986, archive of the Chernobyl Museum.

208 *The head of the Ukrainian KGB warned*: Stepan Mukha, statement at the Ukrainian Politburo meeting, in Baranovska, ed., *The Chernobyl Tragedy*, Document no. 73: “Transcript of the meeting of the Operational Group of the Politburo of the Communist Party of Ukraine,” May 3, 1986.

209 *By then, word had gone around*: When this news reached the Politburo, Gorbachev and Ligachev discussed taking steps to remove Scherbitsky from his position at the head of the Republic. Kopchinsky and Steinberg, *Chernobyl*, 45–46.

209 *Days earlier, at a central Kiev pharmacy*: Shcherbak, interview transcript, 2RR, p. 4; Shcherbak, author interview, 2016.

209 *Worse still, rumors had also*: Shcherbak, author interview, 2016; Shcherbak, *Chernobyl*, 157–59; Boris Kachura (member of the Ukrainian Politburo, 1980–90), transcript of interview conducted by Tatyana Saenko on July 19, 1996, *The Collapse of the Soviet Union: The Oral History of Independent Ukraine, 1988–1991*, <http://oralhistory.org.ua/interview-ua/360>.

209 *That evening, crowds gathered*: Read, *Ablaze*, 185–86; Gary Lee, “More Evacuated in USSR: Indications Seen of Fuel Melting Through Chernobyl Reactor Four,” *Washington Post*, May 9, 1986.

209 *The Soviet internal passport system*: Read, *Ablaze*, 185–86.

209 *Fleets of orange street-cleaning trucks*: Zhores Medvedev writes that water trucks did not begin regular washing in Kiev until May 6 or 7 (*Legacy of Chernobyl*, 161).

Orange trucks are also mentioned in Serge Schmemann, "The Talk of Kiev," *New York Times*, May 31, 1986.

209 "There is no truth to the rumor": Interview with Deputy Minister of Health of the Ukrainian SSR A. M. Kasianenko, *Pravda Ukrayny*, May 11, 1986, cited in Marples, *Chernobyl and Nuclear Power in the USSR*, 149.

209 *Crowds of frantic passengers*: Shcherbak, *Chernobyl*, 152; Grigori Medvedev, "Chernobyl Notebook," trans. JPRS, 61.

209 *At the railway station*: Yuri Kozyrev, author interview, Kiev, 2017.

210 *Twenty thousand people left by car or bus*: Plokhy, *Chernobyl*, 212.

210 *Western reporters witnessed*: Felicity Barringer, "On Moscow Trains, Children of Kiev," *New York Times*, May 9, 1986.

210 *Fearing mass panic*: Lyashko, *Weight of Memory*, 372–73.

210 "Tell him that our outhouse"? Velikhov, *My Journey*, 277–78.

210 *It wasn't until around four in the morning*: Trinos, interview by Rybinskaya, *Fakty i kommentarii*, 2001.

210 *Deputy Minister Silayev insisted*: Shasharin, "Chernobyl Tragedy," 102; Ananenko, recollections on *Soyuz Chernobyl*.

211 *Three men from the plant staff*: Shasharin, "The Chernobyl Tragedy," 102.

211 *Clutching wrenches and flashlights*: Ananenko, recollections on *Soyuz Chernobyl*.

211 *Baranov kept watch*: Ibid.

212 *Inside he found 1,000 rubles*: Zborovsky, testimony in Gudov, *731 Special Battalion*, 113–14.

212 *The academicians' relief*: Kopchinsky and Steinberg, *Chernobyl*, 68.

212 *Some estimates now suggested*: E. Ignatenko, *Two Years of Liquidating the Consequences of the Chernobyl Disaster* [Два года ликвидации последствий Чернобыльской катастрофы] (Moscow, Energoatomizdat, 1997), 62, cited in Karpan, *Chernobyl to Fukushima*, 72.

212 *They were repeatedly stopped*: Belous, account in Shcherbak, *Chernobyl*, 175–76.

212 *At the same time*: Bolshov, author interview, 2017; "Protocol No. 8 of the Meeting of the Politburo CPSU Operations Group on Problems Related to the Aftermath of the Chernobyl Nuclear Accident" [Протокол № 8 заседания Оперативной группы Политбюро ЦК КПСС по вопросам, связанным с ликвидацией последствий аварии на Чернобыльской АЭС], May 7, 1986, in RGANI, opis 51, reel 1.1006, file 20.

212 *The most desperate measures yet*: William J. Eaton, "Soviets Tunneling Beneath Reactor; Official Hints at Meltdown into Earth; Number of Evacuees Reaches 84,000," *Los Angeles Times*, May 9, 1986.

212 *In their lab outside Moscow*: Arutyunyan, "The China Syndrome," 79; Bolshov, author interview, 2017.

213 *They were aghast*: Bolshov, author interview, 2017; Arutyunyan, "China Syndrome," 81.

213 *The scientists no longer saw themselves*: Bolshov, author interview, 2017.

214 *They were met at the airport*: Velikhov, *My Journey*, 278–79.

214 *Their green overalls*: TV footage of their landing is in *Two Colors of Time*, Pt. 1, mark 3.55, <https://www.youtube.com/watch?v=ax54gzlzDpg>.

214 *What the academician did not share*: Velikhov, *Strawberries from Chernobyl*, 251.

214 *The graphite fire*: International Atomic Energy Agency, INSAG-1; Borovoi and Velikhov, *The Chernobyl Experience: Part 1*, 3.

214 *The temperature on the surface*: “Protocol no. 9 of the meeting of the Politburo CPSU Operations Group on problems related to the aftermath of the Chernobyl nuclear accident” [Протокол № 9 заседания Оперативной группы Политбюро ЦК КПСС по вопросам, связанным с ликвидацией последствий аварии на Чернобыльской АЭС], May 8, 1986, RGANI, opis 51, reel 1.1006, file 21. A KGB report of May 11, 1986, attributes the fall in the temperature to the injection of gaseous nitrogen on May 7 and 8, but this conclusion remains questionable at best. Danilyuk, ed., “Chernobyl Tragedy,” *Z archiviv*, document no. 31: “Special Report of the UkrSSR OG KGB chief in the town of Chernobyl to the UkrSSR KGB Chairman.”

215 “*I can see perfectly*”: Velikhov, *My Journey*, 279.

215 *At a press conference*: BBC Summary of World Broadcasts, “IAEA Delegation Gives Press Conference in Moscow” (report published by TASS in English and broadcast by Moscow World Service on May 9, 1986), translated May 12, 1986.

215 *That Sunday, May 11*: BBC Summary of World Broadcasts, “Velikhov and Silayev: ‘Situation No Longer Poses Major Threat,’” May 11, 1986; and Serge Schmemann, “Kremlin Asserts ‘Danger Is Over,’” *New York Times*, May 12, 1986. Some video footage from this report is contained in the 1987 Soviet documentary *Chernobyl: A Warning* at 35:30.

215 *Back in Moscow*: Bolshov, author interview, 2017.

216 *Five meters high and thirty meters square*: Kozlova, *The Battle with Uncertainty*, 77.

216 “*Build it*”: Bolshov, author interview, 2017.

### 13. INSIDE HOSPITAL NUMBER SIX

217 “*Two steps back!*”: Esaulov, *The City That Doesn’t Exist*, 39–41; Svetlana Kirichenko, author interview, Kiev, April 2016.

217 *By the time night fell*: Baranovska, ed., *The Chernobyl Tragedy*, document no. 58: “Update from the Ukrainian SSR Interior Ministry to the Central Committee of the Communist Party of Ukraine on the Evacuation From the Accident Zone,” April 28, 1986. Undated handwritten list on p. 28 in Pripyat *militsia* File on Special Measures in the Pripyat Zone (archive of the Chernobyl Museum).

218 “*Clean . . . Contaminated*”: Esaulov, *City That Doesn’t Exist*, 40.

218 *Valentina, a trained engineer*: Viktor and Valentina Brukhanov, author interview, 2015; Andrey V. Illesh, *Chernobyl: A Russian Journalist’s Eyewitness Account* (New York: Richardson & Steirman, 1987), 62–63.

218 *But Valentina had been separated*: Viktor and Valentina Brukhanov, author interview, 2015.

218 *Thirty kilometers away, Natalia Yuvchenko*: Natalia Yuvchenko, author interviews, 2015 and 2016.

218 *By Wednesday, the official news blackout:* Nikolai Steinberg writes that on April 30 he and the other senior staff of the Balakovo nuclear power station knew only that there had been an accident of some kind. They judged its severity by taking dosimetry readings from the sandals of a woman who had been visiting Pripyat and had left on the evening of April 26 without learning the true scale of what had happened. Kopchinsky and Steinberg, *Chernobyl*, 10–12.

219 *Nine stories of austere brown brick:* Description of building and its surroundings from Gale and Hauser, *Final Warning*, 51, and author visit to the Institute of Biophysics, Moscow, October 15, 2016.

220 *The first patients from the plant:* Anzhelika Barabanova (burns specialist in the radiation medicine department at Hospital Number Six), author interview, Moscow, October 2016; Angelina Guskova and Igor Gusev, “Medical Aspects of the Accident at Chernobyl,” in Gusev et al., eds., *Medical Management of Radiation Accidents*, 199, table 12.1.

220 *They had been met:* Smagin, account in Chernousenko, *Insight from the Inside*, 66–67. Smagin left Kiev at noon on Sunday on a second special flight to Moscow, and said they were driven around the airport for an hour before being released from the plane.

220 *A six-hundred-bed facility:* Barabanova, author interview, 2016.

220 *Some were still:* Ibid., 2016; H. Jack Geiger, MD, “The Accident at Chernobyl and the Medical Response,” *Journal of the American Medical Association (JAMA)* 256, no. 5 (August 1, 1986): 610.

220 *The aircraft that delivered:* Barabanova, author interview, 2016; Alexander Boro-voi, author interview, October 2016.

220 *By evening on Sunday:* Angelina Guskova, *The Country’s Nuclear Industry Through the Eyes of a Doctor* [Атомная отрасль страны глазами врача] (Moscow: Real Time, 2004), 141–42. Other sources note slightly different figures for the number of Chernobyl victims admitted to Hospital Number Six. The figure of 202 is cited in Alexander Baranov, Robert Peter Gale, Angelina Guskova et al., “Bone Marrow Transplantation After the Chernobyl Nuclear Accident,” *New England Journal of Medicine* 321, no. 4 (July 27, 1989), 207. Dr. Anzhelika Barabanova (author interview, 2016) puts the number at slightly more than 200.

220 *Ten had received:* Barabanova, author interview, 2016.

220 *The head of the Clinical Department:* L. A. Ilyin and A. V. Barabanova, “Obituary: Angelina Konstantinova Guskova,” *Journal of Radiological Protection* 35 (2015): 733.

221 *When Guskova failed to return:* Guskova’s younger sister ensured that the letters were never sent: Guskova, interview by Gubarev, *Nauka i zhizn*, 2007.

221 *In Mayak:* Vladislav Larin, “Mayak” *Kombinat: A Problem for the Ages* [Комбинат “Маяк”—проблема на века], 2nd edition (Moscow: Ecopresscenter, 2001), 199–200; Brown, *Plutopia*, 172.

221 *Later, the young women:* Brown, *Plutopia*, 173–75.

221 *That same year, at the age of thirty-three:* Date of birth (March 29, 1924): “Angelina

Konstantinovna Guskova: Biography” [Гуськова Ангелина Константиновна: биография], Rosatom; Guskova, interview by Gubarev, *Nauka i zhizn*, 2007.

222 *The price of progress*: This was true, for example, of the survivors of the K-19 submarine accident in 1961. Six of the worst-affected patients were sent to Hospital Number Six, according to Barabanova, and afterward told to lie to their doctors about the cause of their complaints. Matt Bivens, “Horror of Soviet Nuclear Sub’s ’61 Tragedy Told,” *Los Angeles Times*, January 3, 1994; Barabanova, author interview, 2016.

222 *Alarmed by the refusal*: Guskova, *The Country’s Nuclear Industry Through the Eyes of a Doctor*, 141.

222 *The following year*: A. K. Guskova and G. D. Baysogolov, *Radiation Sickness in Man* [Лучевая болезнь человека] (Moscow: Meditsina, 1971); Ilyin and Barabanova, “Obituary: Angelina K. Guskova,” 733.

222 *By 1986, Guskova*: Ilyin and Barabanova, “Obituary: Angelina K. Guskova.”

222 *She had treated more than a thousand*: Mould, *Chernobyl Record*, 92.

222 *It took only a few moments*: Natalia Yuvchenko, author interview, 2015.

223 *The hospital was dim*: Robert Gale, author interview by telephone, June 2016; Richard Champlin, author interview by telephone, September 2016.

223 *When the elevator*: Barabanova, author interview, 2016.

223 *By the time they awoke*: Gunnar Bergdahl, *The Voice of Ludmilla*, trans. Alexander Keiller (Goteborg: Goteborg Film Festival, 2002), 43–45.

223 *Some felt so well*: Barabanova, author interview, 2016; Alexander Nazarkovsky, author interview, Kiev, February 2006; Uskov, account in Shcherbak, *Chernobyl*, 129–30.

224 *Others noticed a reddening*: Read, *Ablaze*, 144. The nature of radiation skin injuries is detailed in Fred A. Mettler Jr., “Assessment and Management of Local Radiation Injury,” in Fred A. Mettler Jr., Charles A. Kelsey, Robert C. Ricks, eds., *Medical Management of Radiation Accidents*, 1st ed. (Boca Raton, FL : CRC Press, 1990), 127–49.

224 *Yuvchenko’s head had been shaved*: Barabanova, author interview, 2016.

224 *The radioactivity*: Uskov, account in Shcherbak, *Chernobyl*, 130.

224 *“Let’s go and have a smoke”*: Natalia Yuvchenko, author interview, 2015.

224 *As befits a disease*: Barabanova, author interview, 2016.

225 *A few meters here or there*: Dr. Richard Champlin, “With the Chernobyl Victims: An American Doctor’s Inside Report From Moscow’s Hospital No. 6,” *Los Angeles Times*, July 6, 1986.

226 *In the chaos that followed*: Leonid Khamyanov, account in Kopchinsky and Steinberg, *Chernobyl*, 80–81.

226 *But Guskova’s decades of work*: Barabanova, author interview, 2016.

226 *It was a laborious process*: Champlin, “With the Chernobyl Victims.”

227 *“Within the first three weeks”*: Natalia Yuvchenko, author interview, 2016.

227 *When a doctor came*: Piotr Khmel, author interview, 2015. Despite clear public statements to the contrary made at the time by Soviet health officials, includ-

ing Dr. Guskova herself, the belief that alcohol could cleanse the human body of radioactive poisons persisted in the USSR long after the accident. In fact, in the laboratory, ethanol has been demonstrated to have a mild radioprotective effect at the cellular level, although it's unlikely a human being could drink enough alcohol to combat the effects of a lethal dose of radiation. However, at least one study demonstrates that mosquitoes are protected from the effects of radiation by drinking beer: S. D. Rodriguez, R. K. Brar, L. L. Drake et al. "The effect of the radio-protective agents ethanol, trimethylglycine, and beer on survival of X-ray-sterilized male *Aedes aegypti*," *Parasites & Vectors* 6, no. 1 (July 2013): 211, doi:10.1186/1756-3305-6-211.

227 *By now, the relatives*: Bergdahl, *The Voice of Ludmilla*, 46.

227 *From his bed, Pravik sent*: Letter quoted in Voznyak and Troitsky, *Chernobyl*, 196.

228 *On Tuesday they received a telegram*: Telegram from Leonid Toptunov to Vera Toptunova, April 29, 1986, archive of the Chernobyl Museum.

228 *When they arrived*: Date of arrival given as April 30 in letter from Toptunov's parents Vera and Fyodor, reproduced in Shcherbak, *Chernobyl*, 362.

228 "Everything is fine!": Vera Toptunova, author interview, 2015.

228 *Dr. Robert Gale was a man of regular habits*: Details drawn from Gale and Hauser, *Final Warning*, 33–36; Robert Gale, "Witness to Disaster: An American Doctor at Chernobyl," *Life*, August 1986; Gale, author interview by telephone, 2016; Sabine Jacobs (assistant to Robert Gale), author interview, Los Angeles, September 2016.

229 *Gale knew*: Gale and Hauser, *Final Warning*, 36–37.

229 *In Moscow, he met Lenin*: Hammer would recast his first trip to Moscow as part of a voluntary humanitarian mission to help save the lives of Soviet children from typhus; in reality he had traveled to the USSR after his father had been imprisoned for carrying out an illegal abortion that had killed both mother and child—an operation that had actually been conducted by Armand, who would never fully qualify as a doctor. Once in the USSR, Hammer was set up by the Communist government as the owner of a useless asbestos mine and a pencil factory, which functioned as fronts through which the Cheka—the forerunner of the KGB—could finance a network of spies in the United States. The details of Hammer's double life, which would only be fully revealed after his death in 1990 and the fall of the Soviet Union, are described in Edward Jay Epstein, *Dossier: The Secret History of Armand Hammer* (New York: Random House, 1996).

229 "An almost unique bridge": Gale and Hauser, *Final Warning*, 38.

230 *By Thursday afternoon*: "Top U.S. Doc Races Death," *New York Post*, May 2, 1986.

230 *On the landings of Hospital Number Six*: Natalia Yuvchenko, author interview, 2016.

230 *Those trained in nuclear engineering*: Read, *Ablaze*, 156.

230 *At their son's bedside*: Vera Toptunova, author interview, 2015.

230 *On the morning of Thursday*: Bergdahl, *Voice of Ludmilla*, 48–50.

231 *Identifying marrow donors*: Gale and Hauser, *Final Warning*, 57.

231 *For those relatives shown by the tests*: Details of procedure from Gale and Hauser, *Final Warning*, 34 and 56; and Champlin, “With the Chernobyl Victims.”

231 *When Vasily Ignatenko heard*: Bergdahl, *Voice of Ludmilla*, 48–49.

232 *By the end of the first week*: According to Barabanova’s records, Toptunov received transplants on the second and seventh days after the accident (April 27 and May 2) and Akimov on the fourth day after the accident (April 29).

232 *But three more patients*: Gale and Hauser, *Final Warning*, 54–55.

232 *This treatment stood even less chance*: Champlin, “With the Chernobyl Victims”; Barabanova, author interview, 2016.

232 *By then, the limitations*: Champlin, “With the Chernobyl Victims.”

232 *Yet this analysis*: Guskova and Gusev, “Medical Aspects of the Accident at Chernobyl,” 200; Barabanova, author interview, 2016.

232 *And as the visible signs*: Barabanova recalled that beta burns began to manifest on day six or seven; author interview, 2016.

232 *On May 2 Dr. Baranov estimated*: Read, *Ablaze*, 145.

232 *Their families had high hopes*: Elvira Sitnikova, testimony in Shcherbak, *Chernobyl*, 281.

232 *After checking in*: Gale and Hauser, *Final Warning*, 47–50 and 161; Barabanova, author interview, 2016; Read, *Ablaze*, 143–44.

233 *The two men were driven*: Read, *Ablaze*, 152.

233 *On the eighth floor*: Gale writes in *Final Warning* that the sterile unit was on the fifth floor, but in subsequent testimonies, several witnesses—including Arkady Uskov and Ludmilla Ignatenko—agree that it was on the eighth.

233 *Up here was the hospital’s sterile*: Herbert L. Abrams, “How Radiation Victims Suffer,” *Bulletin of Atomic Scientists* 42, no. 7 (1986): 16; Barabanova, author interview, 2016.

233 *In the sterile unit*: Gale and Hauser, *Final Warning*, 52–53; Barabanova, author interview, 2016.

233 *Young soldiers now came*: By May 2, a detachment of soldiers with special chemical protection uniforms and equipment had arrived in Hospital Number Six and pitched tents outside on the lawn. Bergdahl, *Voice of Ludmilla*, 51; and Yuri Goriev, interview by Alina Kharaz, “It was like being at the front” [Там было как на фронте], *Vzgliad*, April 26, 2010, [www.vz.ru/society/2010/4/26/396742.html](http://www.vz.ru/society/2010/4/26/396742.html).

233 *Some of the staff, especially*: Sitnikova, testimony in Shcherbak, *Chernobyl*, 281.

234 *The dozens of pills*: In his hospital diary, Arkady Uskov noted having to take “some 30 pills a day” on his second week of treatment. Uskov, account in Shcherbak, *Chernobyl*, 131.

234 *His hair began to fall out*: Bergdahl, *Voice of Ludmilla*, 49–53.

234 *The worst-affected patients*: Mould, *Chernobyl Record*, 81–82; Gale and Hauser, *Final Warning*, 62–63.

234 *Unlike thermal burns*: Barabanova, author interview, 2016.

235 *Within the first twelve days*: Read, *Ablaze*, 152–53; Gale and Hauser, *Final Warning*, 79; Adriana Petryna, *Life Exposed: Biological Citizens after Chernobyl* (Princeton,

NJ: Princeton University Press, 2013), 45; Champlin, “With the Chernobyl Victims.”

235 *But the doctors knew*: Geiger, “The Accident at Chernobyl and the Medical Response,” 610.

235 *His contaminated overalls alone*: Barabanova, author interview, 2016.

235 “*Don’t worry*”: Read, *Ablaze*, 157.

235 *He told a friend*: Davletbayev, “The Final Shift,” 382.

235 “*I’ll never go back*”: Read, *Ablaze*, 156.

235 *By the time Sergei Yankovsky*: Sergei Yankovsky, author interview, Kiev, February 7, 2016; Barabanova, author interview, 2016.

236 *On May 6*: Davletbayev, “The Last Shift,” 382.

236 *The patients watched from the windows*: Uskov, diary entry, quoted in Shcherbak, *Chernobyl*, 131.

236 *Had begun to shed his skin*: Bergdahl, *Voice of Ludmilla*, 52.

236 *Lying alone in his room*: Khmel, author interview, 2016.

236 *The deaths began*: Dates of all deaths are provided in “List of Fatalities in the Accident at Chernobyl Nuclear Power Plant,” Chernobyl and Pripyat electronic archive.

236 *Grotesque rumors*: Zakharov, interview by Taras Shumeyko, 2006.

236 *His eyes open, his skin black*: Luba Akimov, testimony in Grigori Medvedev, *Truth About Chernobyl*, 253–54.

236 *Dr. Guskova now forbade*: Uskov, account in Shcherbak, *Chernobyl*, 131–34.

237 *While the first of his comrades*: Parry, “How I Survived Chernobyl.”

237 *Yuvchenko moved into intensive care*: Ibid.; Natalia Yuvchenko, author interview, 2015; and Barabanova, author interview, 2016. Although Natalia Yuvchenko is firm on this point, Barabanova, her husband’s doctor, insists that she never considered the need to amputate.

237 *On Tuesday, May 13*: Bergdahl, *Voice of Ludmilla*, 56–58.

238 *With 90 percent of his skin covered*: Barabanova, author interview, 2016; Vera Topunova, author interview, 2015; Toptunov’s medical records, in Barabanova’s personal archive.

238 *Viktor Proskuryakov*: Uskov, diary entry, quoted in Shcherbak, *Chernobyl*, 131–33.

238 *By the end of the third week in May*: Natalia Yuvchenko, author interview, 2016; Alexander Yuvchenko, interview by Bond, *New Scientist*, 2004.

238 *Alone in their rooms*: Ibid., 133.

#### 14. THE LIQUIDATORS

239 *On Wednesday, May 14, 1986*: Marples, *Chernobyl and Nuclear Power in the USSR*, 32. For full text of the speech, see “M. S. Gorbachev’s address on Soviet television (Chernobyl)” [Выступление М. С. Горбачева посоветскому телевидению (Чернобыль)], May 14, 1986, Gorbachev Foundation, [www.gorby.ru/userfiles/file/chernobyl\\_pril\\_6.pdf](http://www.gorby.ru/userfiles/file/chernobyl_pril_6.pdf).

239 *Reading from a prepared statement*: Don Kirk, “Gorbachev Tries Public Approach,” *USA Today*, May 15, 1986.

239 *The accident at Chernobyl*: Celestine Bohlen, “Gorbachev Says 9 Died from Nuclear Accident; Extends Soviet Test Ban,” *Washington Post*, May 15, 1986.

239 *Gorbachev railed against the “mountain of lies”*: BBC Summary of World Broadcasts, “Television Address by Gorbachev,” text of broadcast, Soviet television 1700 GMT, May 14, 1986, translated May 16, 1986.

239 *Forty-eight hours earlier*: Maleyev, *Chernobyl: Days and Years*, 51.

240 *A military task force*: Mikhail Revchuk, account in Gudov, *731 Special Battalion*, 92; Marples, *Social Impact*, 184; Danilyuk, ed., “Chernobyl Tragedy,” *Z arkhiviv*, document no. 51: “Report of the UkSSR OG KGBM and the USSR KGB on the town of Chernobyl to the USSR KGB concerning the radioactive situation and the progress in works on the cleaning up operation after the accident at the Chernobyl NPS,” July 4, 1986.

240 *Now Marshal Sokolov*: Maleyev, *Chernobyl: Days and Years*, 54.

240 *From every republic of the USSR*: Kozlova, *The Battle with Uncertainty*, 67 and 378; V. Lukyanenko and S. Ryabov, “USSR Cities Rush to Send Critical Cargo,” *Pravda Ukrainskaya*, May 17, 1986, translated in JPRS, *Chernobyl Nuclear Accident Documents*.

240 *The spirit of patriotic mass mobilization*: Andrey Illesh, “Survivors Write about Night of April 26,” *Izvestia*, May 19, 1986; and V. Gubarev and M. Odintsov, “Communists in the Front Ranks: The Chernobyl AES—Days of Heroism,” *Pravda*, May 16, 1986, both translated in JPRS, *Chernobyl Nuclear Accident Documents*.

241 *“Had temporarily got out of control”*: Eduard Pershin, “They Were the First to Enter the Fire,” *Literaturna Ukraina*, May 22, 1986, translated in JPRS, *Chernobyl Nuclear Accident Documents*.

241 *The residents of the evacuated territory*: V. Prokopchuk, “We Report the Details: Above and Around No. 4,” *Trud*, May 22, 1986, translated in JPRS, *Chernobyl Nuclear Accident Documents*.

241 *The first cleanup efforts*: Discussions on isolating the radiation and decontaminating the zone were already taking place on May 3, according to a KGB memo filed the next day. Danilyuk, ed., “Chernobyl Tragedy,” *Z arkhiviv*, document no. 26: “Report of the UkSSR KGB 6th Department to the USSR KGB concerning the radioactive situation and progress in investigating the accident at the Chernobyl NPS,” May 4, 1986.

241 *No formal plans*: Positions of Pikalov and the Health Ministry are outlined in Dyachenko, ed., *Chernobyl: Duty and Courage*, vol. 1, 89–91. Maleyev, *Chernobyl: Days and Years*, 61, gives the date of this decree as May 24. Kopchinsky and Steinberg mention that the 25 rem limit was imposed by Ministry of Energy Order No. 254, dated May 12, 1986 (*Chernobyl*, 59).

241 *Horried by the lack of preparation*: Nikolai Istomin, head of the occupational health and safety department at Chernobyl, account in Kopchinsky and Steinberg, *Chernobyl*, 83–85. See also Evgeny Akimov, testimony in Chernousenko, *Chernobyl: Insight from the Inside*, 120–21.

242 *No comprehensive survey*: M. A. Klochkov, testimony in Dyachenko, ed., *Chernobyl: Duty and Courage*, vol. 1, 70.

242 *There was a chronic shortage*: Kopchinsky and Steinberg, *Chernobyl*, 88; Valery Koldin, author interview, Moscow, April 2017; Kiselev, testimony in Dyachenko, ed., *Chernobyl: Duty and Courage*, vol. 1, 39.

242 *The task of clearing*: Klochkov, testimony in Dyachenko, ed., *Chernobyl: Duty and Courage*, vol. 1, 71.

242 *By May 4, the first two colossal*: Ibid., 70–71. Interrogated by a lieutenant general and a Soviet minister on the reasons for the failure, the composure of the officer in charge of the operation eventually snapped: “Why?” he shouted. “Why? I don’t know! Go and see for yourself!” At this, the bosses’ technical curiosity abruptly evaporated.

243 *Abandoned in a nearby field*: Zhores Medvedev, *Legacy of Chernobyl*, 101.

243 *While the Ministry of Energy urgently*: “Protocol no. 8 of the meeting of the Politburo Operations Group,” May 7, 1986, in RGANI. Concrete covering: Danilyuk, ed., “Chernobyl Tragedy,” *Zarkhiviv*, document no. 33: “Report of the UkSSR KGB 6th Department concerning the radioactive situation and progress in investigating the accident,” May 13, 1986. See also document no. 31, which mentions readiness to begin on May 11: “Special report of the UkSSR OG KGB chief in Chernobyl to the UkSSR KGB Chairman,” May 11, 1986.

243 *Construction teams fed the gray slurry*: Kopchinsky and Steinberg, *Chernobyl*, 93.

243 *Special Battalion 731 began work*: Gudov, *731 Special Battalion*, 126, Kopchinsky and Steinberg, *Chernobyl*, 93.

243 *Their shifts lasted as little*: Revchuk, account in Gudov, *731 Special Battalion*, 92–93.

243 *Called to help clear chunks of reactor graphite*: Kiselev, testimony in Dyachenko, ed., *Chernobyl: Duty and Courage*, vol. 1, 40; Yuri Kolyada, testimony in Shcherbak, *Chernobyl*, 199.

243 *Such tasks exposed*: Petryna, *Life Exposed*, xix.

244 *Meanwhile, underground, the battle*: Prianichnikov, author interview, 2006.

244 *600 degrees centigrade*: Danilyuk, ed., “Chernobyl Tragedy,” *Zarkhiviv*, document no. 34: “Report of the UkSSR OG KGBM and the USSR KGB in the town of Chernobyl to the USSR KGB concerning the radioactive situation and progress in investigating the accident,” May 15, 1986.

244 *Using a plasma torch*: Vladimir Demchenko, account in Gudov, *731 Special Battalion*, 90.

245 *Four hundred miners*: These workers included 234 miners from the Donbas region in Ukraine and 154 from the Moscow Coal Basin: Borovoi and Velikhov, *Chernobyl Experience: Part 1*, 32.

245 *Once again, the deadline*: Orders came down for the miners to begin work on May 16 and complete all digging work by June 22. By July 2, the cooling pipe network was planned to be ready. Dmitriyev, account in Kozlova, *Battle with Uncertainty*, 64–66.

245 *The miners began tunneling*: Reikhtman, author interview, 2015.

245 *Digging with hand tools*: Yuri Tamoykin, account in Kozlova, *Battle with Uncertainty*, 71.

245 *When the chamber was complete*: Ibid., 68–72.

246 *The forty-kilogram graphite blocks*: Dmitriyev (66) and Tamoykin (72–73), accounts in Kozlova, *Battle with Uncertainty*, 66.

246 *Final assembly began*: Tamoykin, account in Kozlova, *Battle with Uncertainty*, 72.

246 *But long before the project was completed*: Prianichnikov, author interview, 2006; Kozlova, *Battle with Uncertainty*, 75–77.

246 *General of the Army Valentin Varennikov*: Steinberg, recollections in Kopchinsky and Steinberg, *Chernobyl*, 101. For Varennikov's biography, see “Gen. Valentin Varennikov Dies at 85; Director of the Soviet War in Afghanistan,” Associated Press, May 6, 2009.

246 *When the general arrived*: Dyachenko, ed., *Chernobyl, Duty and Courage*, vol. 1, 43. Minenergo construction workers: “Protocol no. 8 of the meeting of the Politburo Operations Group,” May 7, 1986, in RGANI.

246 *The Politburo now recognized*: Vladimir Maleyev, author interview, Moscow, April 2017. Details of alcoholism and drug use in the Soviet Armed Forces in Murray Feshbach and Alfred Friendly Jr., *Ecocide in the USSR: Health and Nature under Siege* (New York: Basic Books, 1992), 165–66.

246 *A decree unprecedented in peacetime*: See relevant parts of the decree (no. 634-188) in Vladimir Maleyev, “Chernobyl: The Symbol of Courage” [Чернобыль: символ мужества], *Krasnaya Zvezda*, April 25, 2017, [archive.redstar.ru/index.php/2011-07-25-15-55-35/item/33010-chernobyl-simvol-muzhestva](http://archive.redstar.ru/index.php/2011-07-25-15-55-35/item/33010-chernobyl-simvol-muzhestva).

247 *They were told they were required*: Colonel Valery Koldin, author interview, Moscow, April 2017.

247 *By the beginning of July*: Danilyuk, ed., “Chernobyl Tragedy,” *Z archiviv*, document no. 51: “Report of the UkSSR OG KGBM and the USSR KGB,” July 4, 1986.

247 *The journey was long and hot*: V. Filatov, “Chernobyl AES—Test of Courage,” *Krasnaya Zvezda*, May 24, 1986, translated in JPRS, *Chernobyl Nuclear Accident Documents*.

247 *Whether rising from*: Yuri Kozyrev (senior physicist at the Ukrainian Institute of Physics), author interview, Kiev, April 2016.

247 *Those who understood the threat*: In one interview he gave after his release from prison, former deputy chief engineer Dyatlov, for example, demonstrated this habit. See Michael Dobbs, “Chernobyl’s ‘Shameless Lies,’” *Washington Post*, April 27, 1992.

247 *But others remained unaware*: Kozyrev, author interview, 2016.

248 *Only the fate of the crows*: Klochkov, testimony in Dyachenko, ed., *Chernobyl: Duty and Courage*, vol. 1, 73.

248 *Daily radiation surveys*: Zhores Medvedev, *Legacy of Chernobyl*, 77–78.

248 *The threat to the population*: International Atomic Energy Agency, “Cleanup of Large Areas Contaminated as a Result of a Nuclear Accident,” IAEA Technical Reports Series No. 330 (IAEA, Vienna, 1989), Annex A: The Cleanup After the Accident at the Chernobyl Power Plant, 104–8.

248 *Wind and weather*: Legasov, “My duty is to tell about this,” in Mould, *Chernobyl Record*, 294n9.

248 *The work of decontaminating*: IAEA, “Cleanup of Large Areas,” 109.

248 *The word “liquidation”*: Brown, *Plutopia*, 234.

249 *No one in the USSR—or, indeed, anywhere else*: International Atomic Energy Agency, INSAG-1, 40.

249 *When General Pikalov*: Read, *Ablaze*, 102 and 130–31. During the May 5 Politburo meeting (minutes reproduced in Maleyev, *Chernobyl. Days and Years*, 255), Ryzhkov likewise described a longer cleanup time than estimated by Pikalov, although in Ryzhkov’s report, this estimate was between one and two years. “This is unacceptable,” Ryzhkov concluded.

249 *On their return to Moscow*: “Protocol no. 10 of the meeting of the Politburo Operations Group of the CPSU Central Committee on problems related to the aftermath of the Chernobyl NPP accident” [Протокол № 10 заседания Оперативной группы Политбюро ЦК КПСС по вопросам, связанным с ликвидацией последствий аварии на Чернобыльской АЭС], May 10, 1986, in RGANI, opis 51, reel 1.1006, file 22.

249 *Its construction teams were overwhelmed*: Igor Belyaev, author interview, Moscow, April 2017.

250 *The USSR had been the first*: Gorbachev to the Politburo, May 15, 1986, quoted by Volkogonov and Shukman, *Autopsy for an Empire*, 480.

250 *Sredmash chief Efim Slavsky arrived the next day*: Belyaev, author interview, April 2017; I. Belyaev, *Chernobyl: Death Watch* [Чернобыль: Вахта смерти], 2nd ed. (IPK Pareto-Print, 2009), 7. The date of Slavsky’s arrival, May 21, fell a day after the formation of Construction Supervisory Agency no. 605 (Kozlova, *Battle with Uncertainty*, 217).

250 *“Lads, you’ll have to take the risk”*: Belyaev, author interview, 2017.

250 *The following afternoon*: Ibid.; Read, *Ablaze*, 208; BBC Summary of World Broadcasts, “Other Reports; Work at Reactor and in Chernobyl: Interviews with Silayev and Ministers,” select Soviet TV and radio programming on May 18 and 19, translated May 20, 1986.

250 *In public, the Soviet government*: On May 8, *Izvestia* acknowledged that there was some surface contamination beyond the zone but emphasized that it posed no threat to human health: Zhores Medvedev, *Legacy of Chernobyl*, 158.

250 *But in its secret sessions*: “Protocol no. 10 of the Politburo Operations Group meeting,” May 10, 1986, in RGANI.

251 *Civil defense troops threw*: Nikolai Tarakanov, author interview, Moscow, October 2016; Tarakanov, *The Bitter Truth of Chernobyl* [Горькая правда Чернобыля] (Moscow: Center for Social Support of Chernobyl’s Invalids, 2011), 5–6.

251 *On May 12 it banned*: “Resolution of a selective meeting of the executive committee, the Soviet of People’s Deputies of the Kiev region” [Решение суженного заседания исполкома Киевского областного Совета народных депутатов], May 12, 1986, archive of the Chernobyl Museum.

251 *On every approach to Kiev*: Lyashko, *Weight of Memory*, 372.

251 *The Kremlin's chief scientists*: Read, *Ablaze*, 187–88; Lyashko, *Weight of Memory*, 373–75.

252 *Romanenko, appeared once more on TV*: A. Y. Romanenko, “Ukrainian Minister of Health: School Year to End by 15th May,” transcript of TV appearance on May 8, 1986, translated by BBC Summary of World Broadcasts on May 12, 1986; Read, *Ablaze*, 189.

252 *The evacuation began five days later*: Lyashko, *Weight of Memory*, 376–78; Alexander Sirota, author interview, Ivankov, 2017.

253 *On May 22 Scherbitsky put his signature*: “On the activities of local Soviets of people’s deputies of the Kiev region in relation to the accident at Chernobyl” [О работе местных Советов народных депутатов Киевской области в связи с аварией на Чернобыльской АЭС], May 21, 1986, archive of the Chernobyl Museum; V.Scherbitsky, “Information on ongoing work pertaining to the accident at Chernobyl NPP” [Информация о проводимой работе в связи с аварией на Чернобыльской АЭС], report no. I/50 to Central Committee of the CPSU, May 22, 1986, archive of the Chernobyl Museum.

253 *But for all this apparent care*: Oleg Schepin (deputy minister of health of the USSR), “VCh-gram from Moscow” [ВЧ-грамма из Москвы], May 21, 1986, archive of the Chernobyl Museum; Petryna, *Life Exposed*, 43 and 226n18).

254 *Back inside the zone*: Baranovska, ed., *Chernobyl Tragedy*, document no. 91: “Materials of the Ukrainian SSR State Agroindustrial Committee on the state of the industry in the wake of the accident at Chernobyl NPP,” May 6, 1986; and document no. 135: “Proposal from the Ministry of Internal Affairs of the Ukrainian SSR on the organization of hunting squads for clearing the 30-kilometer zone of dead and stray animals,” May 23, 1986.

254 *Twenty thousand agricultural and domestic animals*: IAEA, “Environmental Consequences of the Chernobyl Accident and Their Remediation: Twenty Years of Experience,” Report of the Chernobyl Forum Expert Group “Environment” no. STI/PUB/1239, April 2006, 75.

254 *Doza or Rentgen*: Dyachenko, ed., *Chernobyl: Duty and Courage*, vol. 1, 78.

254 *Soviet contingency plans*: Zhores Medvedev cites Leonid Ilyin, then the vice president of the USSR Academy of Medical Sciences, as saying that the Soviet response strategy involved a onetime ejection of radionuclides into the atmosphere: *Legacy of Chernobyl*, 76 and 326n6. See also Anatoly Dyachenko, “The Experience of Employing Security Agencies in the Liquidation of the Catastrophe at the Chernobyl Nuclear Power Plant” [Опыт применения силовых структур при ликвидации последствий катастрофы на Чернобыльской АЭС], *Voyennaya mysl*, no. 4 (2003): 77–79.

255 *Radiation experts were summoned*: Natalia Manzurova and Cathy Sullivan, *Hard Duty: A Woman’s Experience at Chernobyl* (Tucson, NM: Natalia Manzurova and Cathy Sullivan, 2006), 19.

255 *At first, the chemical troops*: IAEA, “Cleanup of Large Areas,” 116.

255 *Some materials proved more recalcitrant*: Wolfgang Spyra and Michael Katzsch, eds., *Environmental Security and Public Safety: Problems and Needs in Conversion Policy and Research after 15 Years of Conversion in Central and Eastern Europe*, NATO Security through Science Series (New York: Springer, 2007): 181.

255 *In yards and gardens*: IAEA, “Cleanup of Large Areas,” 124.

255 *Soviet technicians tried*: Klochkov, testimony in Dyachenko, ed., *Chernobyl: Duty and Courage*, vol. 1, 74.

255 *They sprayed the shoulders*: Irina Simanovskaya, account in Kupny, *Memories of Lives Given*, 39.

255 *Specialists from NIKIMT*: Elena Kozlova, author interview, Moscow, April 2017.

256 *Meanwhile, the threat posed*: Polad-Zade, “Too Bad It Took a Tragedy,” 198–99; L. I. Malyshev and M. N. Rozin (both senior water engineers with the Ministry of Energy at time of accident), “In the Fight for Clean Water,” in Semenov, ed., *Chernobyl: Ten Years On*, 238.

256 *Close to Pripyat*: IAEA, “Present and Future Environmental Impact of the Chernobyl Accident,” report no. IAEA-TECDOC-1240, August 2001, 65.

256 *Within ten days, the dense stands of pine*: Nikolai Steinberg writes that the trees were already an unusual color, but not yet red, on May 7: Kopchinsky and Steinberg, *Chernobyl*, 56.

256 *The soldiers and scientists*: Dyachenko, ed., *Chernobyl: Duty and Courage*, vol. 1, 79.

256 *In the fields of the collective farms*: Zhores Medvedev, *The Legacy of Chernobyl*, 90–91; Manzurova and Sullivan, *Hard Duty*, 31.

257 *The specialists’ optimistic forecast*: IAEA, “Cleanup of Large Areas,” 114.

257 *But in a place*: The total amount of soil removed in the process of decontamination was about 500,000 cubic meters. Zhores Medvedev, *Legacy of Chernobyl*, 102.

257 *Encircled by a besieging army*: By the end of 1986, more than 70,000 men and 111 military units would have served in the zone, according to Boris Scherbina’s memo to the Central Committee on October 15, 1987: “Memorandum, CPSU Central Committee, no. Shch-2882s” [ЦК КПСС № Ш-2882с], classified, in RGANI, opis 53, reel 1.1007, file 74.

257 *The detritus of combat*: See *Chernobyl: Chronicle of Difficult Weeks*, shot by the first documentary film crew permitted access to the zone, for footage of the plant and its surroundings during this period.

257 *The banished citizens*: Esaulov, *City That Doesn’t Exist*, 53–55.

257 *On June 6 alone*: Baranovska, ed., *Chernobyl Tragedy*, document no. 177: “Report of the Ukrainian MVD on maintaining public order within the 30-kilometer zone and in locations housing the evacuated population,” June 7, 1986.

258 *Attempts to make Pripyat habitable*: Esaulov, *City That Doesn’t Exist*, 51.

258 *The members of the Pripyat city council*: Protsenko, author interview, 2016.

258 *On June 10, engineering troops*: “The creation of the protective barrier in the Chernobyl NPP zone during efforts to liquidate the 1986 accident’s consequences” [Создание рубежа охраны в зоне Чернобыльской АЭС при ликвидации последствий катастрофы в 1986 году], Interregional Non-Governmental Move-

ment of Nuclear Power and Industry Veterans, Soyuz Chernobyl, May 6, 2013, [www.veteranrosatom.ru/articles/articles\\_173.html](http://www.veteranrosatom.ru/articles/articles_173.html).

258 *A centralized electronic alarm system*: “Evgeny Trofimovich Mishin” [Мишин Евгений Трофимович], Interregional Non-Governmental Movement of Nuclear Power and Industry Veterans, undated, [www.veteranrosatom.ru/heroes/heroes\\_86.html](http://www.veteranrosatom.ru/heroes/heroes_86.html).

258 *Around the edge of the 30-kilometer zone*: Dmitry Bisin, account in Kozlova, *Battle with Uncertainty*, 202.

259 *By June 24, they had completed*: Maleyev, *Chernobyl. Days and Years*, 68–69.

259 *A twelve-person committee met*: Esaulov, *City That Doesn’t Exist*, 53–54.

259 *A five-month campaign*: Decontamination efforts in Pripyat continued until October 2, 1986. Belyaev, *Chernobyl: Death Watch*, 158.

260 *A dedicated force of 160,000 men*: Kozyrev, author interview, 2016.

260 “*Forget it*”: Protsenko, author interview, 2015.

## 15. THE INVESTIGATION

261 *When Sergei Yankovsky arrived*: Sergei Yankovsky, author interviews, Kiev, February 2016 and May 2017.

261 *A strictly capitalist problem*: For crime statistics during the later years of the Soviet Union, see Wieczynski, ed., *Gorbachev Encyclopedia*, 90–92.

261 *It had been two in the morning*: Ibid.

263 *The investigation into the causes*: Yankovsky, author interview, 2017. The deputy prosecutor general was Oleg Soroka, and the head of the Second Department was Nikolai Voskovtsev.

263 *That same evening*: Karpan, *Chernobyl to Fukushima*, 113; Kopchinsky and Steinberg, *Chernobyl*, 47.

263 *A pair of experts on RBMK reactors*: The scientists were Alexander Kalugin and Konstantin Fedulenko. See Read, *Ablaze*, 123; Fedulenko, “*Some Things Have Not Been Forgotten*,” 74–75.

264 “*Cause of accident unruly and uncontrollable*”: Read, *Ablaze*, 126.

264 *By the end of the first week in May*: Valentin Zhiltsov (laboratory director at VNI-IAES, the Soviet atomic plants research institute), account in Shcherbak, *Chernobyl*, 182–83 and 186.

265 *Back at the station*: Steinberg, recollections in Kopchinsky and Steinberg, *Chernobyl*, 56–57; Viktor and Valentina Brukhanov, author interview, 2015; Steinberg, author interview, 2017; Read, *Ablaze*, 201.

265 “*Damn it*”: Yankovsky, author interview, 2017.

265 “*You don’t look well*”: Grigori Medvedev, *Truth About Chernobyl*, 225–26, and “*Chernobyl Notebook*” [Чернобыльская тетрадь], *Novy Mir*, no. 6 (June 1989), available online at <http://lib.ru/MEMUARY/CHERNOBYL/medvedev.txt>.

265 *Two weeks later*: Read, *Ablaze*, 201.

266 “*The cause lies*”: “*A Top Soviet Aide Details Situation at Stricken Plant*,” Associated Press, May 3, 1986. In a June 1990 interview for the British documentary series *The*

*Second Russian Revolution*, Vladimir Dolgikh, the Central Committee secretary who oversaw the energy industry, stated that Yeltsin called this press conference on his own initiative. Dolgikh, interview transcript, 2RR, 5.

266 “*The accident was caused*”: Andranik Petrosyants, “‘Highly Improbable Factors’ Caused Chemical Explosion,” *Los Angeles Times*, May 9, 1986.

266 *Hardliners inside the Ministry*: Read, *Ablaze*, 198.

266 *The academician had returned home*: Margarita Legasova, “Defenceless Victor: From the Recollections of Academician V. Legasov’s Widow” [Беззащитный победитель: Из воспоминаний вдовы акад. В. Легасова], *Trud*, June 1996, translated in Mould, *Chernobyl Record*, 304–5; Margarita Legasova, *Academician Valery A. Legasov*, 381.

267 *Nevertheless, Legasov threw himself*: Inga Legasov, author interview, 2017.

267 *Meanwhile, behind closed doors*: The document was also known as the “Act on the investigation of the causes of the accident at Unit no. 4 of Chernobyl NPP” [Акт расследования причин аварии на энергоблоке №. 4 Чернобыльской АЭС]. Karpan, *Chernobyl to Fukushima*, 113 and 146–47.

268 *In response, Aleksandrov convened*: Kopchinsky and Steinberg, *Chernobyl*, 48.

268 *The meetings went on for hours*: Karpan, *Chernobyl to Fukushima*, 113–15; Shasharin, “*Chernobyl Tragedy*,” 105; Gennadi Shasharin, “Letter to Gorbachev (draft)” [Письмо М. С. Горбачеву (черновик)], May 1986, available online at <http://accidont.ru/letter.html> and in translation in Karpan, *Chernobyl to Fukushima*, 214–17.

268 *But Gennadi Shasharin*: Shasharin, “Letter to Gorbachev,” in Karpan, *Chernobyl to Fukushima*, 215–16.

269 *Viktor Brukhanov returned*: The new director was Erik Pozdishev. Viktor Brukhanov, interview by Sergei Babakov, *Zerkalo nedeli*, 1999. The date of Pozdishev’s arrival was May 27, 1986, according to Steinberg (recollections in Kopchinsky and Steinberg, *Chernobyl*, 61). Also see Read, *Ablaze*, 202.

269 “*What are we going to do*”: The new chief engineer was Nikolai Steinberg. Steinberg, author interview, 2017; Viktor and Valentina Brukhanov, author interview, 2016.

269 *Inside the headquarters of the Second Department*: Yankovsky, author interviews, 2016 and 2017. The other two Ukrainian nuclear power plants, at Rovno and at Khmelnitsky, used VVER reactors.

270 *On Wednesday, July 2*: Read, *Ablaze*, 201. (Read gives the date as June 2, but this is incorrect: the Politburo meeting held the next day was July 3.)

270 *By now, the deposed director*: Viktor Brukhanov, interview by Maria Vasyl, *Fakty i kommentarii*, 2000.

270 *At precisely eleven o’clock*: Michael Dobbs, *Down with Big Brother: The Fall of the Soviet Empire* (New York: Vintage Books, 1998), 163.

270 “*The accident was the result*”: Politburo meeting minutes (top secret, single copy), July 3, 1986, reproduced in Yaroshinskaya, *Chernobyl: Crime Without Punishment*, 272–73. In his recorded summary of the meeting, Vorotnikov confirms Scherbi-

na's discussion of the shortfalls of the RBMK and its designers' failure to understand and eliminate them: Vorotnikov, *This Is How It Went*, 104.

271 *By the time Scherbina had finished*: Dobbs, *Down with Big Brother*, 163–64. See also meeting minutes excerpted from Gorbachev Foundation archives in Mikhail S. Gorbachev, *Collected Works* [Собрание сочинений] (Moscow: Ves Mir, 2008), vol. 4, 276–77.

271 *The meeting blazed on*: Read, *Ablaze*, 202; Yaroshinskaya, *Chernobyl: Crime Without Punishment*, 274.

271 *Slavsky continued to blame*: Politburo meeting minutes, July 3, 1986, reproduced in Anatoly Chernyaev, A. Veber, and Vadim Medvedev, eds., *In the Politburo of the Central Committee of the Communist Party of the Soviet Union . . . From the notes of Anatoly Chernyaev, Vadim Medvedev, Georgi Shakhnazarov (1985–1991)* [В Политбюро ЦК КПСС . . . По записям Анатолия Черняева, Вадима Медведева, Георгия Шахназарова (1985–1991)], 2nd ed. (Moscow: Alpina Business Books, 2008), 57–62. Also see “The meeting of the Politburo of the CPSU Central Committee on July 3, 1986: On Chernobyl” [Заседание Политбюро ЦК КПСС 3 июля 1986 года: О Чернобыле], Gorbachev Foundation, [http://www.gorby.ru/userfiles/file/chernobyl\\_pril\\_5.pdf](http://www.gorby.ru/userfiles/file/chernobyl_pril_5.pdf).

271 *The representatives of the Ministry of Energy*: Vorotnikov, *This Is How It Went*, 104; “On Chernobyl” [О Чернобыле], excerpt from the July 3, 1986, Politburo meeting in a compilation of Politburo protocols published by the Gorbachev Foundation, [www.gorby.ru/userfiles/protokoly\\_politbyuro.pdf](http://www.gorby.ru/userfiles/protokoly_politbyuro.pdf).

271 *Meshkov unwisely insisted*: Chernyaev, Veber, and Medvedev, eds., *In the Politburo*, 58. Also see “On Chernobyl,” Gorbachev Foundation.

272 “*It is our fault*”: Yaroshinskaya, *Chernobyl: Crime Without Punishment*, 279.

272 “*The accident was inevitable*”: Dobbs, *Down with Big Brother*, 164–65; Chernyaev, Veber, and Medvedev, eds., *In the Politburo*, 59–60.

272 *These were drafted into a resolution*: “Resolution of the Central Committee of the CPSU: On the results of investigation of the mistakes that caused the Chernobyl nuclear accident, on measures to address its aftermath, and on the safety of the atomic power industry” [Постановление ЦК КПСС: О результатах расследования причин аварии на Чернобыльской АЭС и мерах по ликвидации ее последствий, обеспечению безопасности атомной энергетики], top secret, July 7, 1986, in RGANI, opis 53, reel 1.1007, file 12. The document was ratified by a unanimous vote of the Politburo on July 14, 1986, according to a signed voting sheet.

273 “*Openness is of huge benefit*”: Gorbachev, *Collected Works*, vol. 4, 279.

273 *Not everyone agreed*: “Catalogue of information pertaining to the accident at block no. 4 of the Chernobyl NPP that is subject to classification” [Перечень сведений, подлежащих засекречиванию по вопросам, связанным с аварией на блоке № 4 Чернобыльской АЭС (ЧАЭС)], July 8, 1986, archive of the State Security Service of Ukraine fond 11, file 992, online at the Ukrainian Liberation Movement electronic archive: <http://avr.org.ua/index.php/viewDoc/24475>.

273 *On his arrival in Kiev*: Read, *Ablaze*, 202; Brukhanov, interview by Sergei Babakov, *Zerkalo nedeli*, 1999.

274 *On the evening of Saturday*: Associated Press, “Text of the Politburo Statement About Chernobyl,” *New York Times*, July 21, 1986; Lawrence Martin, “Negligence Cited in Chernobyl Report,” *Globe and Mail* (Canada), July 21, 1986.

274 *At home in Tashkent*: Viktor and Valentina Brukhanov, author interview, 2015.

274 *Handed down its own verdicts*: “Punishment for Chernobyl Officials,” *Radynska Ukraina*, July 27, 1986, translated in the BBC Summary of World Broadcasts, August 2, 1986.

274 *Eleven river cruise ships*: Lyashko, *Weight of Memory*, 369.

274 *On August 12 the deputy chief engineer*: Brukhanov, interview by Sergei Babakov, *Zerkalo nedeli*, 1999; Viktor and Valentina Brukhanov, author interview, 2015.

275 *Two weeks later, on August 25*: Walter C. Patterson, “Chernobyl—The Official Story,” *Bulletin of the Atomic Scientists* 42, no. 9 (November 1986): 34–36. For archival footage of Legasov’s IAEA appearance, see the documentary film *The Mystery of Academician Legasov’s Death* [Тайна смерти академика Легасова], directed by Yuliya Shamal and Sergei Marmeladov (Moscow: Afis-TV for Channel Rossiya, 2004).

275 *Legasov had spent much of the summer*: Read, *Ablaze*, 196.

275 *And yet, glasnost or not*: Alexander Kalugin, interview in *The Mystery of Academician Legasov’s Death*. Kalugin provides a similar summary of this note in his 1990 article “Today’s understanding of the accident” [Сегодняшнее понимание аварии], *Priroda*, available online at [https://scepsis.net/library/id\\_698.html](https://scepsis.net/library/id_698.html).

276 *While his notions*: Read, *Ablaze*, 196–97.

276 *Legasov’s delivery*: Steinberg, account in Kopchinsky and Steinberg, *Chernobyl*, 148–49; *The Mystery of Academician Legasov’s Death*. For specific parsing of Legasov’s language—and particularly the use of the word “drawbacks” rather than “defects”—see Walt Patterson, “Futures: Why a kind of hush fell over the Chernobyl conference / Western atomic agencies’ attitude to the Soviet nuclear accident,” *The Guardian*, October 4, 1986.

276 “*About half*”: “*Soviets: Half of Chernobyl-Type Reactors Shut*,” *Chicago Tribune*, August 26, 1986. Fourteen RBMK units remained in operation at the time, according to Dodd, *Industrial Decision-Making*, Appendix D.

276 *By the time they departed*: Patterson, “Chernobyl—The Official Story,” 36. Alexander Borovoi, author interview, Moscow, October 2015. Interview with Alexander Borovoi, “The Liquidator.”

277 *In the middle of the conference*: Richard Wilson, author interview, Cambridge, MA, August 2016; Alexander Shlyakhter and Richard Wilson, “Chernobyl: The Inevitable Results of Secrecy,” *Public Understanding of Science* 1, no. 3 (July 1992): 255; Zhores Medvedev, *Legacy of Chernobyl*, 99.

277 “*I did not lie in Vienna*”: As recalled by Andrei Sakharov, according to Shlyakhter and Wilson, “Chernobyl: The Inevitable Results of Secrecy,” 254.

## 16. THE SARCOPHAGUS

278 *In the darkened room*: Tarakanov, author interview, 2016; Nikolai Tarakanov, *The Bitter Truth of Chernobyl* [Горькая правда Чернобыля] (Moscow: Center for Social Support of Chernobyl's Invalids, 2011). For documentary footage, see "Chernobyl. Cleaning the Roofs. Soldiers (Reservists)," a segment of the documentary series *Chernobyl 1986.04.26 P. S.* [Чернобыль. 1986.04.26 P. S.], narrated by Valery Starodumov (Kiev: Telecon, 2016), online at [www.youtube.com/watch?v=ti-WdTf2Q](http://www.youtube.com/watch?v=ti-WdTf2Q). Also see *Chernobyl 3828* [Чернобыль 3828], directed by Sergei Zabolotny (Kiev: Telecon, 2011).

278 *According to their height*: Tarakanov, *Bitter Truth of Chernobyl*, 142.

278 *He named each area*: Tarakanov, author interview, 2016. Radiation levels: Starodumov, commentary in *Chernobyl 3828*. Starodumov worked as a radiation scout at the time of this operation.

279 *As much as 10,000 roentgen*: Yuri Samoilenco, interview by Igor Osipchuk, "When it became obvious that clearing the NPP roofs of radioactive debris would have to be done by hand by thousands of people, the Government Commission sent soldiers there" [Когда стало ясно, что очищать крыши ЧАЭС от радиоактивных завалов придется вручную силами тысяч человек, правительственная комиссия послала туда солдат], *Fakty i Kommentarii*, April 25, 2003, <http://fakty.ua/75759-kogda-stalo-yasno-chto-ochicshat-kryshi-chaes-ot-radioaktivnyh-zavalov-pridetsya-vruchnuyu-silami-tysyach-chelovek-pravitelstvennaya-komissiya-poslala-tuda-soldat>.

280 *The final concept*: Lev Bocharov (chief engineer, US-605 team three), author interview, Moscow, April 2017; V. Kurnosov et al., report no. IAEA-CN-48/253: "Experience of Entombing the Damaged Fourth Power Unit of the Chernobyl Nuclear Power Plant" [Опыт захоронения аварийного четвертого энергоблока Чернобыльской АЭС], in IAEA, *Nuclear Power Performance and Safety*, proceedings of the IAEA conference in Vienna (September 28 to October 2, 1987), vol. 5, 1988, 170. Other tallies of design proposals on the short list have also been reported. Y. Yurchenko notes twenty-eight blueprints (Kozlova, *Battle with Uncertainty*, 205). Nikolai Steinberg cites more than a hundred (author interview, 2006).

280 *Hollow lead balls*: Kopchinsky and Steinberg, *Chernobyl*, 128; Kozlova, *Battle with Uncertainty*, 209.

280 *Others had proposed*: Kozlova, *Battle with Uncertainty*, 209; Steinberg, author interview, 2006.

280 *During the first meetings*: Kopchinsky and Steinberg, *Chernobyl*, 128.

281 *Among the proposed architectural solutions*: Blueprints in the archive of Lev Bocharov (author interview, 2017).

281 *But the technical challenges*: Belyaev, author interview, 2017.

281 *So the engineers planned*: Kozlova, *Battle with Uncertainty*, 206–7.

281 *And time was short*: Baranovska, ed., *The Chernobyl Tragedy*, document no. 172: "Resolution of the Central Committee of the CPSU and the USSR Council of Ministers 'On Measures to Conserve Chernobyl NPP Objects Pertaining to the Acci-

dent at Energy Block No. 4, and to Prevent Water Runoff from Plant Territory,'" June 5, 1986.

282 *To limit their overall*: Viktor Sheyanov (chief engineer, US-605 team one), account in Kozlova, *Battle with Uncertainty*, 217.

282 *Create the infrastructure necessary*: General Y. Savinov, testimony in I. A. Belyaev, *Sredmash Brand Concrete* [Бетон марки "Средмаш"] (Moscow: Izdat, 1996), 39.

282 *But the often middle-aged*: Savinov explains that the reservists were forty-five to fifty years old and that he regarded them as amateur soldiers who approached their tasks in the same improvised way as the partisans of World War II. Belyaev, *Sredmash Brand Concrete*, 39.

282 *The first shift's most important task*: Sheyanov, account in Kozlova, *Battle with Uncertainty*, 218.

282 *Before building work began*: Bocharov, author interview, 2017; Belyaev, author interview, 2017.

282 *Began to lay siege to the reactor*: Kozlova, *Battle with Uncertainty*, 260.

283 *More than 6 meters high*: Ibid., 220 and 229; Belyaev, author interview, 2017.

283 *The surface of the ground around them*: Kozlova, *Battle with Uncertainty*, 226.

283 *The work was relentless*: Lev Bocharov, account in Kozlova, *Battle with Uncertainty*, 290. Construction supervisor Valentin Mozhnov recalls that the maximum daily volume of concrete reached 5,600 cubic meters (261).

283 *It was rushed to the remains*: Bocharov and Nikifor Strashevsky (senior engineer), accounts in Kozlova, *Battle with Uncertainty*, 290 and 326.

283 *In July and August*: L. Krivoshein, account in Kozlova, *Battle with Uncertainty*, 96; Tarakanov, *Bitter Truth*, 142.

283 *Capable of lifting*: Kozlova, *Battle with Uncertainty*, 243.

284 *If brought too close*: Yurchenko, account in Kozlova, *Battle with Uncertainty*, 245 and 252.

284 *The steel forms of the Cascade Wall*: A. V. Shevchenko (senior construction engineer, US-605 team two), account in Kozlova, *Battle with Uncertainty*, 251.

284 *While the Sredmash engineers were at work*: Borovoi, author interview, 2015; Alexander Borovoi, *My Chernobyl* [Мой Чернобыль] (Moscow: Izdat, 1996), 54.

285 *His rival, Velikhov*: Semenov, "For the 10th Anniversary of the Catastrophe at Chernobyl NPP," 41.

285 *Yet their initial efforts*: K. P. Checherov, "The Unpeaceful Atom of Chernobyl" [Немирный атом Чернобыля], nos. 6–7 (2006–2007), online at <http://vivovoco.astronet.ru/VV/PAPERS/MEN/CHERNOBYL.HTM>. For the location of this compartment, see 3D diagrams in Sich, "Chornobyl Accident Revisited," 288 and 296–98.

285 *Alexander Borovoi, a thickset forty-nine-year-old*: Borovoi, author interview, 2015; Borovoi, *My Chernobyl*, 39–40.

286 *The Politburo had publicly promised*: In a TV interview from Chernobyl on June 1, Vladimir Voronin, deputy chairman of the Council of Ministers and the third chief of the government commission, said he was "fully confident" that Units One

and Two would be restarted by winter “in accordance with the timescale planned by the government.” BBC Summary of World Broadcasts, “1st June TV Report of Work at AES: Statement by Voronin,” summary of television programming on June 1, 1986 (translated June 3, 1986).

286 *But now that the truth:* Kopchinsky and Steinberg, *Chernobyl*, 98 and 108–12. The plastic coverings remain on floors and staircases throughout the plant today.

286 *The entire ventilation system:* *Ibid.*, 102–7.

287 *A five-tonne concrete panel:* Tarakanov, author interview, 2016.

287 *The government commission turned once again:* Elena Kozlova, author interview, Moscow, April 2017; Kozlova, *Battle with Uncertainty*, 190–92.

287 *Technicians planned to clear the debris using robots:* For more details on this effort, see Y. Yurchenko, report no. IAEA-CN-48/256: “Assessment of the Effectiveness of Mechanical Decontamination Technologies and Technical Devices Used at the Damaged Unit of the Chernobyl Nuclear Power Plant” [Оценка эффективности технологий и технических средств механической дезактивации аварийного блока Чернобыльской АЭС], in IAEA, *Nuclear Power Performance and Safety*, 1988, 164–65.

288 *On September 16 General Tarakanov received:* Tarakanov, author interview, 2016; recollections of Nikolai Tarakanov (*Bitter Truth of Chernobyl*, 144–45), translated in Chernousenko, *Insight from the Inside*, 151. Description of Samoilenko’s appearance at the time is drawn from documentary footage in *Chernobyl* 3828.

288 *Using a sketch plan:* The sketch map is described by Tarakanov in *Bitter Truth of Chernobyl*, 141, and reproduced in Karpan, *Chernobyl to Fukushima*, 14.

288 *Tarakanov’s soldiers launched:* Tarakanov, author interview, 2016; Tarakanov, *Bitter Truth of Chernobyl*, 151.

289 “*I’m asking any one of you*”: Tarakanov, *Bitter Truth of Chernobyl*, 170.

289 *Many were young:* Alexander Fedotov (former liquidator), interviewed in *The Battle of Chernobyl*, dir. Thomas Johnson (France: Play Film, 2006). Although the majority of the men were *partizans*, the platforms of the vent stack were cleared by cadets from the firefighting school in Kharkov who had volunteered for the task, young men barely out of their teens. The cadets proved especially dedicated and, in some cases, stayed out longer than their allowed time to do extra work.

289 *Years afterward, the general would insist:* Tarakanov, interview in *The Battle of Chernobyl*.

290 *Their eyes hurt:* Igor Kostin and Alexander Fedotov, interviews in *The Battle of Chernobyl*. Kostin’s biography and photographs taken on the plant’s roof are included in Igor Kostin, *Chernobyl: Confessions of a Reporter* (New York: Umbrage Editions, 2006), 76–81 and 225–37.

290 *Recorded in a ledger:* Tarakanov, author interview, 2016; “List of personnel of army units and subdivisions of the USSR Ministry of Defense that took part in the operation to remove nuclear fuel, highly radioactive graphite and other products of the explosion from the roof of energy block no. 3, machine hall and vent supports of the Chernobyl NPP in the period from September 19 to October 1, 1986” [Список

личного состава воинских частей и подразделений МО СССР, принимавших участие в операции по удалению ядерного топлива, высокорадиоактивного зараженного графита и других продуктов взрыва с крыши 3го энергоблока, машзала и трубных площадок ЧАЭС в период с 19 сентября по 1 октября 1986 года], personal archive of Nikolai Tarakanov.

290 *For twelve days*: Starodumov, narration in *Chernobyl 3828*; Tarakanov, author interview, 2016.

290 *At a quarter to five that afternoon*: Kopchinsky and Steinberg, *Chernobyl*, 115.

290 *On the roof of Unit Three*: See documentary footage in *Chernobyl 3828*, narrated by Starodumov, who was one of the scouts raising the flag. Kostin's photograph is reproduced in his book *Chernobyl: Confessions of a Reporter*, 95.

291 *Tarakanov was climbing into his car*: Tarakanov, author interview, 2016.

291 *Splashed on the front page*: An image of the article titled "The Taming of the Reactor" [Укрощение реактора], is reproduced in Kozlova, *Battle with Uncertainty*, 284.

291 *The chief engineer of the shift*: Bocharov, author interview, 2017; Josephson, *Red Atom*, 69; IAEA, *Nuclear Applications for Steam and Hot Water Supply*, report no. TECDOC-615, July 1991, 73; Stefan Guth, "Picturing Atomic-Powered Communism," paper given at the international conference Picturing Power. Photography in Socialist Societies, University of Bremen, December 9–12, 2015.

291 *Had already fallen behind schedule*: An October 5 KGB memo specified that the Sarcophagus had missed the original Sredmash deadline but that the roofing operation was expected to commence on October 11, and Unit Two was scheduled to come online on October 20 (Danilyuk, ed., "Chernobyl Tragedy," *Z arkhiviv*, document no. 65, *Report of the USSR OG KGB and UkSSR KGB to the USSR KGB Concerning the Radioactive Situation and the Progress in Works on the Cleaning Up Operation After the Accident at the Chernobyl NPS*, October 5, 1986).

292 *A massive steel house of cards*: Kozlova, *Battle with Uncertainty*, 324.

292 *Colossal and ungainly*: Ibid., 358–59; Belyaev, *Chernobyl: Death Watch*, 145.

292 *Bocharov and his engineers set up*: Bocharov, author interview, 2017; Kozlova, *Battle with Uncertainty*, 270.

293 *The batiskaf*: The NIKIMT technicians made several versions of the bathyscaphe, each slightly different. Pictures and a description are provided in Alexander Khodeyev's account in Kozlova, *Battle with Uncertainty*, 161–62, and by Pavel Safronov, account, 380.

293 *The chief designer's plan*: Bocharov, author interview, 2017.

294 *They would have to start the Sarcophagus again*: Bocharov, account in Kozlova, *Battle with Uncertainty*, 382.

294 *Before leaving, some were presented with awards*: Koldin, author interview, 2017.

294 *Regardless of the triumphant*: Raab, *All Shook Up*, 172–73.

294 *Some bribed the draft officer*: Marples, *The Social Impact of the Chernobyl Disaster*, 191.

294 *One group of two hundred*: James M. Markham, “Estonians Resist Chernobyl Duty, Paper Says,” *New York Times*, August 27, 1986.

294 *Military police patrols in Kiev*: Logachev, Taras Shumeyko interview, 2017.

294 *High wages*: Wages paid in the zone were calculated at a multiple of individual salaries, according to Maria Protsenko (author interview, 2016). Additionally, at the end of May, the Politburo approved a schedule of special one-off payments for those who distinguished themselves during the liquidation. See Baranovska, ed., *The Chernobyl Tragedy*, document no. 154: “Resolution of the Central Committee of the CPSU and the USSR Council of Ministers ‘On conducting decontamination work in Ukrainian SSR and Belarussian SSR regions affected by radioactive pollution after the accident at Chernobyl NPP,’” May 29, 1986.

294 *Vladimir Usatenko was thirty-six years old*: Vladimir Usatenko, author interview, Kiev, December 2016.

296 *Twenty-eight missions*: Ibid. For his work, Usatenko earned five times his usual salary as an electrical engineer, plus a 100-ruble bonus as a noncommissioned officer, earning 1,400 rubles in total.

296 *Led by a physicist*: Bocharov, author interview, 2017; Bocharov, account in Kozlova, *Battle with Uncertainty*, 361–78; Belyaev, *Chernobyl: Death Watch*, 144–45.

296 *At ten in the evening*: Belyaev, *Chernobyl: Death Watch*, 146 and 149.

297 *There was still no sign*: Borovoi, author interview, 2015; Astakhova, “The Liquidator.”

297 *The roof and windows*: Kozlova, *Battle with Uncertainty*, 515.

297 *The engineers boasted*: Belyaev, *Chernobyl: Death Watch*, 165. These figures, cited frequently in Soviet reports, do not survive close scrutiny. In his thesis, Alexander Sich shows that cramming this volume of concrete into a building the size of the Sarcophagus is a geometric impossibility (Sich, “Chornobyl Accident Revisited,” 26n12).

297 *The costs had risen*: Kozlova, *Battle with Uncertainty*, 518.

297 *As he gazed up*: Belyaev, *Chernobyl: Death Watch*, 162.

297 *It would be Slavsky’s final achievement*: Belyaev, author interview, 2017.

298 “*Kandahar?*”: Bocharov, author interview, 2017.

## 17. THE FORBIDDEN ZONE

299 *By the beginning of August 1986*: Gary Lee, “Chernobyl’s Victims Lie Under Stark Marble, Far From Ukraine,” *Washington Post*, July 2, 1986; Carol J. Williams, “Chernobyl Victims Buried at Memorial Site,” Associated Press, June 24, 1986; Thom Shanker, “2 Graves Lift Chernobyl Toll to 30,” *Chicago Tribune*, August 3, 1986. Description of cemetery layout: Grigori Medvedev, *Truth About Chernobyl*, 262.

299 *In September, Dr. Angelina Guskova*: “‘No Significant Increase in Cancer Sufferers Foreseen’ After Accident,” excerpts from interviews with Guskova and L. A. Ilyin (vice president of the Soviet Academy of Medical Sciences and director of the

USSR Ministry of Health Institute of Biophysics), published in *Izvestia* on September 19, 1987, and translated by BBC Summary of World Broadcasts on September 27, 1986; Reuters, "Chernobyl Costs Reach \$3.9 Billion," *Globe and Mail* (Canada), September 20, 1986.

299 *The body of pump operator*: Shcherbak, *Chernobyl*, 340.

299 *Since then, twenty-nine more*: International Atomic Energy Agency, INSAG-1, 64. One death, of a woman, was attributed to a brain hemorrhage also apparently a consequence of ARS: Gusev et al., eds., *Medical Management of Radiation Accidents*, 201.

299 *Of the thirteen patients who had been treated*: International Atomic Energy Agency, INSAG-1, 64–65; Zholes Medvedev, *Legacy of Chernobyl*, 140.

300 *Deputy Chief Engineer Anatoly Dyatlov*: Dyatlov, *Chernobyl: How It Was*, 54 and 109.

300 *Major Leonid Telyatnikov*: Felicity Barringer, "One Year After Chernobyl, a Tense Tale of Survival," *New York Times*, April 6, 1987.

300 *The doctors regarded the survival*: Barabanova, author interview, 2016. Also see Davletbayev, "Last Shift," 373.

300 *Alexander Yuvchenko*: Natalia Yuvchenko, author interview, 2016. Despite her flinty attitude to her staff, Angelina Guskova apparently displayed a special warmth for her favorite patients. According to Natalia, the veteran radiation specialist appeared at Yuvchenko's bedside, twittering with pet names and reassurances, like a devoted grandmother. "Sashenka!" she said. "Everything is going to be fine! Why are you worried?"

301 *It was June*: Ibid.

301 *Just outside the Exclusion Zone, in the town of Polesskoye*: Esaulov, *City That Doesn't Exist*, 50.

302 *In May the Soviet Red Cross Society*: Ibid., 69.

302 *On July 25 they received an answer*: Ibid., 14 and 55; Natalia Yuvchenko, author interview, 2016.

302 *The refugees were allowed*: Esaulov, *City That Doesn't Exist*, 55–56.

303 *Some found it hard*: A diary entry of a checkpoint worker tasked with accompanying former residents on their apartment visits, published in *Komsomolskaya Pravda* in October 1986 and reproduced in David R. Marples, *The Social Impact of the Chernobyl Disaster* (New York: St. Martin's Press, 1988), 173.

303 *It was September*: Natalia Yuvchenko, author interview, 2016.

303 *Other residents retrieved*: Valery Slutsky, author interview, Pripyat, 2006.

303 *Valentina Brukhanov*: Viktor and Valentina Brukhanov, author interview, 2016. Svetlana Samodelova in "The private catastrophe of Chernobyl's director" [Личная катастрофа директора Чернобыля], *Moskovsky komsomolets*, April 22, 2011, [www.mk.ru/politics/russia/2011/04/21/583211-lichnaya-katastrofa-direktora-chernobilya.html](http://www.mk.ru/politics/russia/2011/04/21/583211-lichnaya-katastrofa-direktora-chernobilya.html).

303 *It was often late at night*: Esaulov, *City That Doesn't Exist*, 56.

303 *They manned the barriers*: Diary entries of MEPhI checkpoint workers, *Komsomolskaya pravda*, October 1986, reproduced in Marples, *Social Impact of the Chernobyl Disaster*, 172–77.

304 *The visits to the deserted city*: Esaulov, *City That Doesn't Exist*, 56.

304 *The town council planned*: Ibid., 67–68.

304 *A charity rock concert*: BBC Summary of World Broadcasts, “‘Highlights’ of Rock Concert for Chernobyl Victims Shown on TV,” summary of Soviet television programming on July 11, 1986 (translated July 15).

305 *Account No. 904 had already received*: BBC Summary of World Broadcasts, “Contributions to Chernobyl aid fund,” summary of TASS news report on August 11, 1986 (translated August 15, 1986).

305 *In June the Politburo passed a resolution*: Baranovska, ed., *The Chernobyl Tragedy*, document no. 173: “Resolution of the Central Committee of the CPSU and the USSR Council of Ministers ‘On providing homes and social amenities to the population evacuated from the Chernobyl zone,’” June 5, 1986.

305 *Fifty thousand men*: “New Homes for Evacuees: AES Workers’ Township,” *Pravda*, July 23, 1986, translated by BBC Summary of World Broadcasts on July 28, 1986.

305 *The first settlement*: Marples, *Social Impact of the Chernobyl Disaster*, 197.

305 *Each home was reportedly*: Ibid., 198.

305 *11,500 new single-family houses*: Lyashko, *Weight of Memory*, 370.

305 *But the Politburo task force*: Ibid., 371–72; Valentin Kupny, author interview, Slavutych, Ukraine, February 2016; Natalia Khodemchuk, author interview, Kiev, May 2017.

305 *Mysteriously came to a halt*: Esaulov, *City That Doesn't Exist*, 58–59.

306 *They were shunned*: Natalia Khodemchuk, author interview, 2017.

306 *At school*: Samodelova, “The private catastrophe of Chernobyl’s director.”

306 *The radiation readings in the stairwells*: G. K. Zlobin and V. Y. Pinchuk, eds., *Chernobyl: Post-Accident Construction Program* [Чорнобиль: Післяаварійна програма будівництва], Kiev Construction Academy (Kiev: Fedorov, 1998), 311.

306 *With the first reactor*: E. N. Pozdishev, interview by *Pravda* correspondents, “Chernobyl AES: Chronicle of Events—In Test Mode,” *Pravda*, October 10, 1986, translated in “Aftermath of Chernobyl Nuclear Power Plant Accident—Part II,” Foreign Broadcast Information Service, USSR Report: Political and Sociological Affairs, January 22, 1987.

306 *Unit Three remained*: Kopchinsky and Steinberg, *Chernobyl*, 125; Danilyuk, ed., “Chernobyl Tragedy,” *Z arkhiviv*, document no. 73: “Special report of the USSR KGB and UkrSSR KGB 6th Department concerning the radioactive situation and the progress in works on the cleaning up operation after the accident at the Chernobyl NPS,” December 31, 1986.

306 *The commission even issued orders*: Kopchinsky and Steinberg, *Chernobyl*, 117.

306 *In the meantime, Pravda reported*: O. Ignatyev and M. Odinets, “House Warming at Zelenyy Mys,” *Pravda*, October 20, 1986, translated in “Aftermath of Chernobyl—

Part II,” Foreign Broadcast Information Service; Marples, *Social Impact of the Chernobyl Disaster*, 225–26.

307 “*Tens upon tens of millions*”: BBC Summary of World Broadcasts, “Gromyko’s Presentation of Awards to ‘Heroes’ of Chernobyl,” summary of TASS news report on January 14, 1987 (translated January 16, 1987).

307 *The few awards*: Grigori Medvedev, *Truth About Chernobyl*, 264.

307 *At one point*: Natalia Yuvchenko, author interview, 2015.

307 *Instead of recognition*: Yankovsky, author interview, 2017. The date of this notification is given as November 28, 1986, by Samodelova in “The private catastrophe of Chernobyl’s director.”

308 *He was permitted*: Viktor and Valentina Brukhanov, author interview, 2016.

308 *Occasionally Brukhanov had*: Brukhanov, interview by Maria Vasyl, *Fakty i kommentarii*, 2000.

308 *For a while*: Viktor and Valentina Brukhanov, author interview, 2015.

308 *At first, Brukhanov refused*: Brukhanov, interview by Maria Vasyl, *Fakty i kommentarii*, 2000.

308 *But his wife*: Yuri Sorokin (Viktor Brukhanov’s attorney in court), author interview, Moscow, October 2016.

308 *That same month*: Yankovsky, author interview, 2017.

308 *The director found a letter*: The expert, once more, was Vladimir Volkov (see chapter 4), who this time wrote a letter of protest to Gorbachev himself.

309 *They sent a total of forty-eight*: Sorokin, author interview, 2016. The investigator Yankovsky recalls that there were 57 volumes of material, including KGB surveillance recordings of telephone conversations and data from the plant (Yankovsky, author interview, 2017).

309 *Four other senior members of the plant staff*: The sixth man on trial, Yuri Laushkin, the inspector of the state nuclear industry regulator (Gosatomenergonadzor) based at the plant, was the only one not accused of a crime under Article 220 regarding an “explosion-prone facility.” He was tried under Article 167, for negligence. Schmid, *Producing Power*, 4–5 and 206n29 and 206n30; and A. Rekunkov, Prosecutor General of the USSR, “On the completion of the criminal investigation into the accident at Chernobyl NPP” [О завершении расследования по уголовному делу об аварии на Чернобыльской АЭС], memo to the Central Committee of the CPSU, in RGANI, opis 53, reel 1.1007, file 56.

309 *An inventive legal gambit*: Karpan, *Chernobyl to Fukushima*, 125; Schmid, *Producing Power*, 4. The legal category of “explosion-prone” facilities was normally reserved for plants and storage spaces housing large volumes of hot oil, fertilizer, acid, and other chemicals. See A. G. Smirnov and L. B. Godgelf, *The classification of explosive areas in national and international standards and regulations* [Классификация взрывоопасных зон в национальных и международных стандартах, правилах] (Moscow: Tiazhpromelectroproyekt, 1992), online at <http://aquagroup.ru/normdocs/1232>.

309 *To bolster the case*: Voznyak and Troitsky, *Chernobyl*, 249; Karpan, *Chernobyl to Fukushima*, 126.

309 *Too mentally unstable*: A. Smagin, testimony in Grigori Medvedev, *Truth About Chernobyl*, 256–57.

309 *While the wretched technician*: Voznyak and Troitsky, *Chernobyl*, 246. For details of the original trial date, see “On the criminal trial related to the accident at Chernobyl NPP” [О судебном разбирательстве уголовного дела, связанного с аварией на Чернобыльской АЭС], February 27, 1987, memo to the Central Committee of the CPSU, RGANI, opis 53, reel 1.1007, file 58. A follow-up memo from two months later suggests an alternative reason for the postponement was to avoid the trial coinciding with the first anniversary of the disaster: “On the criminal trial related to the accident at Chernobyl NPP” [О судебном разбирательстве уголовного дела, связанного с аварией на Чернобыльской АЭС], April 10, 1987, memo to the Central Committee of the CPSU, RGANI, opis 4, reel 1.989, file 22.

309 *Maria Protsenko returned*: Protsenko, author interview, 2015.

310 *On April 18*: Protsenko, author interview, 2016. The precise language of the standard diagnosis is reported in Chernousenko, *Insight from the Inside*, 163.

310 *Back in Pripyat*: L. Kaybysheva, “News panorama” from Chernobyl, *Izvestia*, March 13, 1987, translated by BBC Summary of World Broadcasts on March 26, 1987; Alexander Sich, “Truth Was an Early Casualty,” *Bulletin of Atomic Scientists* 52, no. 3 (1996): 41.

310 *Now sole masters*: Felicity Barringer, “A Reporter’s Notebook: A Haunted Chernobyl,” *New York Times*, June 24, 1987.

310 *Tens of thousands of liquidators*: During the course of 1987, approximately 120,000 military personnel were rotated through the Exclusion Zone as part of the liquidation effort. Yuriy Skaletsky and Oleg Nasvit (National Security and Defense Council of Ukraine), “Military liquidators in liquidation of the consequences of Chornobyl NPP accident: myths and realities,” in T. Imanaka, ed., *Multi-side Approach to the Realities of the Chernobyl NPP Accident* (Kyoto University Press, 2008), 92.

310 *Dust from highly contaminated areas*: Danilyuk, ed., “Chernobyl Tragedy,” *Z arkhiviv*, document no. 82: “Special report of the UkrSSR KGBM on Kiev and Kiev region to the UkrSSR KGB 6th Department concerning the radioactive situation and the progress in works on the cleaning up operation after the accident at the Chernobyl NPS,” May 19, 1987.

311 *The Kombinat leaders*: V. Gubarev and M. Odinets, “Chernobyl: Two years on, the echo of the ‘zone,’” and commentary by V. A. Masol (chairman of Ukraine’s Council of Ministers) in *Pravda*, April 24, 1988, translated by the BBC Summary of World Broadcasts on April 29, 1988.

311 *In the meantime, looting*: Ivan Gladush (interior minister of Ukraine at time of accident), interview by Dmitry Kiyansky, “Let our museum be the only and the last” [Пусть наш музей будет единственным и последним], *Zerkalo nedeli Ukraina*,

April 28, 2000, [https://zn.ua/society/pust\\_nash\\_muzey\\_budet\\_edinstvennym\\_i\\_poslednim.html](https://zn.ua/society/pust_nash_muzey_budet_edinstvennym_i_poslednim.html).

311 *Logachev watched in amazement*: Alexander Logachev, interview by Taras Shumeiko, 2017.

311 *The cars and motorcycles left behind*: Esaulov, *City That Doesn't Exist*, 65; Maria Protsenko, author interview, 2016.

311 *As the first anniversary of the disaster approached*: L. Kravchenko, list of proposed print, TV, and radio stories, in “Plan of essential propaganda measures to commemorate the first anniversary of the Chernobyl nuclear accident, approved by the Central Committee” [План основных пропагандистских мероприятий в связи с годовщиной аварии на Чернобыльской АЭС], April 10, 1987, in RGANI, opis 53, reel 1.1007, file 27.

311 *The official Soviet report*: “Annex 7: Medical-Biological Problems,” in “USSR State Committee Report on Chernobyl,” Vienna, August 1986.

312 *Western specialists*: David R. Marples, “Phobia or not, people are ill at Chernobyl,” *Globe and Mail* (Canada), September 15, 1987; Felicity Barringer, “Fear of Chernobyl Radiation Lingers for the People of Kiev,” *New York Times*, May 23, 1988.

312 *Robert Gale told the press*: Stuart Diamond, “Chernobyl's Toll in Future at Issue,” *New York Times*, August 29, 1986.

312 *Here, more than a year after the accident*: Valeri Slutsky, author interview, 2006; Felicity Barringer, “Pripyat Journal: Crows and Sensors Watch Over Dead City,” *New York Times*, June 22, 1987; Sue Fox, “Young Guardian: Memories of Chernobyl—Some of the things Dr. Robert Gale remembers from the aftermath of the world's worst nuclear disaster,” *The Guardian*, May 18, 1988; Celestine Bohlen, “Chernobyl's Slow Recovery; Plant Open, but Pripyat Still a Ghost Town,” *Washington Post*, June 21, 1987; Thom Shanker, “As Reactors Hum, 'Life Goes On' at Mammoth Tomb,” *Chicago Tribune*, June 15, 1987.

313 *And one morning would be awoken*: Viktor Haynes and Marco Bojcn, *The Chernobyl Disaster* (London: Hogarth, 1988), 98. When that day might come, no one was any longer prepared to say. “I can't predict the future,” a spokesman for Kombinat explained. “Maybe in ten or fifteen years.”

## 18. THE TRIAL

314 *The trial of Viktor Brukhanov*: Voznyak and Troitsky, *Chernobyl*, 244–50.

314 *A handful of representatives*: Martin Walker, “Three Go on Trial After World's Worst Atomic Disaster,” *Guardian*, July 7, 1987, cited by Schmid, *Producing Power*, 205, fn.13

315 *“I think I'm not guilty”*: Voznyak and Troitsky, *Chernobyl*, 253.

315 *Wearing a suit jacket*: For photos from the trial, see “Chernobyl trial” [Чернобыльский суд], Chernobyl and Pripyat electronic archive, December 18, 2010, <http://pripyat-city.ru/main/36-chernobylskiy-sud.html>.

315 *He gave an account*: Voznyak and Troitsky, *Chernobyl*, 254–55.

315 *And yet he told the court*: Brukhanov, court testimony in Karpan, *Chernobyl to Fukushima*, 130–33.

316 “*The answer to this question*”: Ibid., 137.

316 “*Who do you think is guilty?*”: Ibid., 173.

316 *Chief engineer Nikolai Fomin*: Voznyak and Troitsky, *Chernobyl*, 252.

316 *His face pale and glistening*: See video footage of court proceedings at “*The Chernobyl Trial*” [Чернобыльский суд], online at [www.youtube.com/watch?v=BrH2lmP5Wao](http://www.youtube.com/watch?v=BrH2lmP5Wao) (accessed May 2018).

316 *He explained how he had been incapacitated*: Voznyak and Troitsky, *Chernobyl*, 259; Karpan, *Chernobyl to Fukushima*, 144.

317 *Unaware of the scale*: Fomin, court testimony in Karpan, *Chernobyl to Fukushima*, 151.

317 “*Dyatlov and Akimov*”: Fomin, court testimony in *ibid.*, 143.

317 *Of all the defendants*: Voznyak and Troitsky, *Chernobyl*, 252; Karpan, *Chernobyl to Fukushima*, 162.

317 *He said responsibility*: Voznyak and Troitsky, *Chernobyl*, 259.

317 *Despite being contradicted*: Dyatlov, court testimony in Karpan, *Chernobyl to Fukushima*, 155 and 164. He would later admit to giving the mission to the trainees, in his memoir *How It Was*, 49.

317 *Although none of the accused*: Read, *Ablaze*, 231.

317 *Reporters were told*: Voznyak and Troitsky, *Chernobyl*, 270.

318 *Yet many of the expert witnesses*: Karpan, *Chernobyl to Fukushima*, 205–6; Voznyak and Troitsky, *Chernobyl*, 261.

318 *The court stifled*: Read, *Ablaze*, 231–32.

318 *On July 23*: Ibid., 231; Voznyak and Troitsky, *Chernobyl*, 262–63.

318 “*There is no reason to believe*”: *Ibid.*

319 *They both recognized that*: Sorokin, author interview, 2016.

319 *Fomin accepted his guilt*: Voznyak and Troitsky, *Chernobyl*, 264–68.

319 *Sarcophagus: A Tragedy*: William J. Eaton, “Candor Stressed in Stage Account; Soviet Drama Spotlights Chernobyl Incompetence,” *Los Angeles Times*, September 17, 1986; Martin Walker, “Moscow Play Pans Nuclear Farce: Piece on Chernobyl Accident to Tour Soviet Cities,” *Guardian*, September 18, 1986.

319 “*Of course, they should be punished*”: Thom Shanker, “Life Resumes at Chernobyl as Trials Begin,” *Chicago Tribune*, June 16, 1987.

319 *During an adjournment*: Read, *Ablaze*, 233.

319 *Judge Brize delivered his verdict*: Voznyak and Troitsky, *Chernobyl*, 271.

320 *Valentina Brukhanov fainted*: Viktor and Valentina Brukhanov, author interview, 2016; Samodelova, “The private catastrophe of Chernobyl’s director.”

320 *Driven from the Palace*: Viktor and Valentina Brukhanov, author interview, 2015; Voznyak and Troitsky, *Chernobyl*, 271. “*Stolypin cars*” was a common name for the railroad cattle wagons used to transport convicts, and pickled herring was given to prisoners to discourage hunger.

320 *When he finally arrived*: Samodelova, “Private catastrophe of Chernobyl’s direc-

tor”; Viktor Brukhanov, interview, “The Incomprehensible Atom” [Непонятый атом], *Profil*, April 24, 2006, [www.profile.ru/obshchestvo/item/50192-items\\_18814](http://www.profile.ru/obshchestvo/item/50192-items_18814); Viktor and Valentina Brukhanov, author interview, 2016.

320 *As the end of 1987 approached*: Marples, *Social Impact of the Chernobyl Disaster*, 226–27 and 235; Baranovska, ed., *Chernobyl Tragedy*, document no. 372: “Information from the Central Committee of the Communist Party of Ukraine to the Central Committee of the CPSU on the status of construction of the city of Slavutych,” August 5, 1987; and document no. 373: “The letter of V. Scherbitsky to the USSR Council of Ministers about construction shortfalls in the city of Slavutych,” September 21, 1987. The city would eventually welcome its first five hundred residents in April 1988 (Reuters, “New Town Opens to Workers from Chernobyl Power Plant,” *New York Times*, April 19, 1988).

320 *A radiation survey of Slavutych*: Baranovska, ed., *Chernobyl Tragedy*, document no. 374: “Report of the Joint Commission of USSR ministries and agencies on the radioactive situation in the city of Slavutych,” September 21, 1987.

321 *The last of the three surviving reactors*: BBC Summary of World Broadcasts, “Chernobyl Nuclear Station Third Set Restart,” summary of Soviet television programming, December 4, 1987 (translated December 11, 1987).

321 *Unit Three, although now separated*: Kopchinsky and Steinberg, *Chernobyl*, 119–20. Even in 1990, there were still fuel pills scattered on the roof of Unit Three (Karpan, *Chernobyl to Fukushima*, 13). Attempts to rectify the problem in the autumn of 1987 are detailed in Borovoi and Velikhov, *The Chernobyl Experience, Part 1*, 114–16.

321 *A tacit admission*: Schmidt, *Producing Power*, 153 and 271n86.

321 *The authorities revised*: Ibid., 152. In an interview with a West German environmental magazine at the end of the year, Legasov said that the safety modifications would cost the equivalent of between \$3 million and \$5 million at each station. BBC Summary of World Broadcasts, “Better safeguards for nuclear stations,” West German Press Agency, November 22, 1987 (translated on December 4, 1987).

321 *Little had really changed*: The report noted that 320 equipment failures occurred at Soviet nuclear power plants since the accident at Chernobyl, and that 160 of them led to emergency reactor shutdowns: Memorandum to the CPSU Central Committee by I. Yastrebov (head of the Department of Heavy Industry and Power Engineering) and O. Belyakov (head of the Department of Defense Industry), “On the work of the USSR Ministry of Atomic Energy and the Ministry of Medium Machine Building on securing operational safety of nuclear power plants as a result of implementing the CPSU Central Committee resolution of July 14, 1986” [О работе Министерства атомной энергетики СССР и Министерства среднего машиностроения СССР по обеспечению безопасности эксплуатации атомных электростанций в свете постановления ЦК КПСС от 14 июля 1986 года о результатах расследования причин аварии на Чернобыльской АЭС], May 29, 1987, in RGANI, opis 53, reel 1.1007, file 61.

321 *Demoralized by the way*: Danilyuk, ed., *Z arkhiviv*, document no. 82: “Special report of the UkSSR KGBM,” May 19, 1987.

322 *In public*, Valery Legasov: Legasov, writing in *Pravda* in June 1986, cited in Mould, *Chernobyl Record*, 299n12.

322 *But privately*: Legasov Tapes, cassette Three, 11–14.

322 *He made repeated visits*: Margarita Legasova, “Defenceless Victor,” in Mould, *Chernobyl Record*, 304.

322 *He proposed that*: Read, *Ablaze*, 254.

323 *Even his role at Chernobyl*: Vladimir S. Gubarev, “On the Death of V. Legasov,” excerpts from *The Agony of Sredmash* [Агония Средмаша] (Moscow: Adademkniga, 2006), reproduced in Margarita Legasova, *Academician Valery A. Legasov*, 343.

323 *A perestroika of its own*: Ibid., 340.

323 *Legasov, citing his poor health*: Read, *Ablaze*, 256.

324 *He began reading the Bible*: Legasova, “Defenceless Victor,” in Mould, *Chernobyl Record*, 305.

324 *Using a new Japanese Dictaphone*: Margarita Legasova, *Academician Valery A. Legasov*, 382; Read, *Ablaze*, 257.

324 *Afterward, Gubarev attempted*: Read, *Ablaze*, 257–58; Gubarev, “On the Death of V. Legasov,” 346.

324 *In a separate interview with Yunost*: Shcherbak, “Report on First Anniversary of Chernobyl,” trans. JPRS, pt. 2, 20–21.

325 *By the beginning of 1988*: Read, *Ablaze*, 259–60.

325 *That afternoon, Legasov’s daughter*: Inga Legasov, author interview, 2017.

325 *At lunchtime*: Ibid.; the time of the discovery is given in *The Mystery of Academician Legasov’s Death*.

325 *When a colleague*: Borovoi, author interview, 2015.

326 *“Why did he abandon me?”*: Read, *Ablaze*, 261.

326 *The opening address*: E. I. Chazov, USSR Minister of Health, “Opening speech,” in the proceedings of the event published by the IAEA: “Medical Aspects of the Chernobyl Accident: Proceedings of An All-Union Conference Organized by the USSR Ministry of Health and the All-Union Scientific Centre of Radiation Medicine, USSR Academy of Medical Sciences, and Held in Kiev, 11–13 May 1988,” report no. IAEA-TECDOC-516, 1989, 9–10. The number of adults and children living in affected areas is given in G. M. Avetisov et al., “Protective Measures to Reduce Population Exposure Doses and Effectiveness of These Measures,” 151.

326 *In Kiev, even two years*: Felicity Barringer, “Fear of Chernobyl Radiation Lingers for the People of Kiev,” *New York Times*, May 23, 1988.

326 *But the mandarins*: Kopchinsky and Steinberg, *Chernobyl*, 41.

326 *“They inflict great damages”*: Leonid Ilyn, quoted in Barringer, “Fear of Chernobyl Radiation Lingers for the People of Kiev.”

327 *And the general secretary’s own realization*: Taubman, *Gorbachev*, 235–43.

327 *What began with more open reporting*: Kotkin, *Armageddon Averted*, 68.

327 *An edited extract*: “My Duty Is to Tell about This”: From Academician V. Legasov’s Notes” [«Мой долг рассказать об этом» Из записок академика В. Легасова], *Pravda*, May 20, 1988, translated in Mould, *Chernobyl Record*, 300.

328 *Two new nuclear plants*: The Minsk station was hastily converted to a natural-gas-powered plant. The other construction project, near Krasnodar, was abandoned. Quentin Peel, "Work Abandoned on Soviet Reactor," *Financial Post* (Toronto), September 9, 1988; Sich, "Chornobyl Accident Revisited," 165.

328 *In spite of glasnost*: Grigori Medvedev, interview transcript, June 1990, 2RR. The full story, published in June 1989, was preceded by extracts published in March by the *Kommunist* magazine.

328 *A letter he personally addressed*: Sakharov's message (dated November 1988) is enclosed in the Central Committee memorandum "On Academician A. D. Sakharov's letter" [О письмі академіка А. Д. Сахарова], signed by the head of the committee's ideology department, January 23, 1989, in RGANI, opis 53, reel 1.1007, file 81.

328 "Everything that pertains": Grigori Medvedev, "Chernobyl Notebook," trans. JPRS, 1.

328 *Even larger than that within*: See maps of contamination disclosed in March 1989 in Zhores Medvedev, *Legacy of Chernobyl*, 86–88.

328 "'Glasnost wins after all'": Charles Mitchell, "New Chernobyl Contamination Charges," UPI, February 2, 1989.

329 *The land was so poisoned*: Francis X. Clines, "Soviet Villages Voice Fears on Chernobyl," *New York Times*, July 31, 1989.

329 *Traveled to the scene*: Gerald Nadler, "Gorbachev Visits Chernobyl," UPI, February 24, 1989; Bill Keller, "Gorbachev, at Chernobyl, Urges Environment Plan," *New York Times*, February 24, 1989.

329 Zelenyi Svit: "Ukrainian Ecological Association 'Green World': About UEA" [Українська екологічна асоціація «Зелений світ»: Про YEA], [www.zelenysvit.org.ua/?page=about](http://www.zelenysvit.org.ua/?page=about).

329 *The crowd veered off script*: John F. Burns, "A Rude Dose of Reality for Gorbachev," *New York Times*, February 21, 1989.

329 *As the third anniversary*: Nadler, "Gorbachev Visits Chernobyl"; Remnick, *Lenin's Tomb*, 245; Zhores Medvedev, *Legacy of Chernobyl*, 87.

329 *One member of a team*: BBC Summary of World Broadcasts, "'Sanctuary' Designated Around Chernobyl Plant and Animal Mutations Appearing," summary of TASS news reports on May 19, 1989 (in English) and July 31, 1989 (in Russian), translated August 26, 1989.

330 *Secretly mixed into sausages*: David Remnick, "Chernobyl's Coffin Bonus," *Washington Post*, November 24, 1989; Josephson, *Red Atom*, 165–66. The Politburo report cited a controversy in Yaroslavl, a city whose meat processing plant was revealed to be supplied with contaminated meat. Local officials insisted they had been acting with the approval of the Soviet Sanitation Service despite their own earlier denials that any Chernobyl meat was shipped to the area. "On the Radio Report from Yaroslavl Region" [О радиосообщении из Ярославской области], memo by the head of the agrarian department of the CPSU Central Committee, December 29, 1989, in RGANI, opis 53, reel 1.1007, file 87.

330 *Strange new phenomena*: BBC Summary of World Broadcasts, "'Sanctuary' Desig-

nated Around Chernobyl Plant" and "An international research centre is to be set up at the Chernobyl AES," summary of a TASS news report on September 15, 1989 (translated September 16, 1989).

330 *The price for the construction*: V. Kholosha and V. Poyarkov, "Economy: Chernobyl Accident Losses," in Vargo, ed., *Chornobyl Accident*, 215.

330 *One estimate put the eventual bill*: Kholosha and Poyarkov estimate that \$128 billion was the sum of all direct and indirect costs borne by Ukraine alone between 1986 and 1997, noting that Ukraine has assumed most of the ongoing expenses in the post-Soviet period. The official report of the USSR Finance Ministry in 1990 put the direct cost attributed to the accident at \$12.6 billion for the USSR as a whole, and Ukraine's share was about 30 percent (Kholosha and Poyarkov, "Economy: Chernobyl Accident Losses," 220). The Soviet defense budget was disclosed by Gorbachev in 1989, revising the lower official figure of about \$32 billion per year ("Soviet Military Budget: \$128 Billion Bombshell," *New York Times*, May 31, 1989).

331 *In Lithuania, six thousand*: Bill Keller, "Public Mistrust Curbs Soviet Nuclear Efforts," *New York Times*, October 13, 1988.

331 *In Minsk, a reported*: Reports by AFP (October 1, 1989) and *Sovetskaya Kultura* (October 6, 1989), summarized in BBC Summary of World Broadcasts, "The Chernobyl Situation: Other reports, Nuclear Power and Test Sites," October 30, 1989.

331 *The disaster unleashed*: Ben A. Franklin, "Report Calls Mistrust a Threat to Atom Power," *New York Times*, March 8, 1987.

331 *The United States faced*: Serge Schmemann, "Chernobyl and the Europeans: Radiation and Doubts Linger," *New York Times*, June 12, 1988.

332 *A focal point of regional opposition*: Dodd, *Industrial Decision Making and High-Risk Technology*, 129–30.

332 *Eight hundred waste disposal sites*: V. Kukhar', V. Poyarkov, and V. Kholosha, "Radioactive Waste: Storage and Disposal Sites," in Vargo, ed., *Chornobyl Accident*, 85.

332 *Even offered twice the average*: Yuri Risovanny, interview by David R. Maples, "Revelations of a Chernobyl Insider," *Bulletin of the Atomic Scientists* 46, no. 10 (1990): 18; Antoshkin, *The Role of Aviation*, 1.

332 *As many as six hundred thousand*: Burton Bennett, Michael Repacholi, and Zhanat Carr, eds., "Health Effects of the Chernobyl Accident and Special Care Programmes," Report of the UN Chernobyl Forum Expert Group "Health," World Health Organization, 2006, 2.

333 *A dedicated clinic*: Chernousenko, *Chernobyl: Insight from the Inside*, 160.

333 *Reluctant to connect their symptoms*: Ibid., 163. According to an instruction sent by the Soviet Ministry of Defense to recruiting centers throughout the USSR, military doctors were forbidden from mentioning Chernobyl work on medical certificates they issued to liquidators. Radiation doses below the level that caused Acute Radiation Syndrome were also to be omitted ("Explanation by the Central

Military Medical Commission of the USSR Ministry of Defense," no. 205 [July 8, 1987], cited in Yaroshinskaya, *Chernobyl: Crime Without Punishment*, 47).

334 *Captain Sergei Volodin*: Volodin, author interview, 2006.

334 *Some died of heart disease*: Gusev, Guskova, and Mettler, eds., *Medical Management of Radiation Accidents*, 204–512.4.

334 *Major Telyatnikov*: "Late Chernobyl Fireman's Blood Tests to Be Disclosed," *Japan Times*, April 19, 2006; Anna Korolevska, author interview, 2015.

334 *For others, the psychological burden*: Guskova, *The Country's Nuclear Industry Through the Eyes of a Doctor*, 156; Barabanova, author interview, 2016.

334 *In a desolate cafe*: Prianichnikov, author interview, 2006.

334 "The invisible enemy": Antoshkin, interview in *Battle of Chernobyl*, 2006.

335 *When I visited*: Alexander Yuvchenko, author interview, 2006; Natalia Yuvchenko, author interview, 2015.

335 *Yet when he began*: Natalia Yuvchenko, author interview, 2016.

## 19. THE ELEPHANT'S FOOT

336 *The afternoon of Monday, April 25*: Author visit to Pripyat, April 25, 2016; Mycio, *Wormwood Forest*, 5.

336 *Open to the elements*: Mycio, *Wormwood Forest*, 5–6 and 239.

338 *One arm outstretched in alarm*: The handprints of the figure in bronze were cast from those of Khodemchuk's widow, Natalia (Natalia Khodemchuk, author interview, 2017).

337 *When I first visited the Chernobyl station*: Author visit, February 10, 2016.

338 *From the very start*: Borovoi, "My Chernobyl," 45–48.

339 *Although fully aware*: Borovoi, author interview, 2015.

339 *In the autumn of 1986*: Ibid.; Borovoi, "My Chernobyl," 86–87.

340 *Unable to find*: Borovoi, "My Chernobyl," 90–92.

340 *Sixteen thousand tonnes*: Sich, "Chornobyl Accident Revisited," 241.

340 *The sample revealed*: Borovoi and Velikhov, *Chernobyl Experience: Part 1*, 118–19.

340 *But it contained no trace*: Borovoi, author interview, 2015; Sich, "Chornobyl Accident Revisited," 326n.

340 *By measuring*: Borovoi, "My Chernobyl," 52 and 99–100.

340 *At the beginning of 1988*: Borovoi and Velikhov, *Chernobyl Experience: Part 1*, 66–71.

340 *By the late spring*: Borovoi, "My Chernobyl," 104–9; Borovoi, author interview, 2015. See also documentary footage in *Inside Chernobyl's Sarcophagus*, directed by Edward Briffa (United Kingdom: BBC Horizon, 1991) (subsequently rereleased in 1996).

341 *The smallest trace*: Only 0.01 percent of the lead dropped from the helicopters was found in the corium (Sich, "Chornobyl Accident Revisited," 331).

341 *Mounds up to fifteen meters high*: Spartak T. Belyayev, Alexandr A. Borovoy, and I. P. Bouzouloukov, "Technical Management on the Chernobyl Site: Status and Future of the 'Sarcophagus,'" in European Nuclear Society (ENS), *Nuclear Accidents and the Future of Energy: Lessons Learned from Chernobyl*, Proceedings of the

ENS International Conference in Paris, France, April 15–17, 1991, 27, cited in Sich, “Chornobyl Accident Revisited,” 248n34.

341 *Some lead ingots*: Checherov, “Unpeaceful Atom of Chernobyl.”

341 *Simply burned itself out*: Sich, “Chornobyl Accident Revisited,” 331.

341 *Almost entirely pointless*: This issue is explored in detail in *ibid.*, 243–50.

341 *But the Complex Expedition also revealed*: Borovoi and Velikhov, *Chernobyl Experience: Part 1*, 118; Borovoi, author interview, 2015; Sich, “Chornobyl Accident Revisited,” 332.

342 *The zirconium cladding*: Alexander Sich estimates that 71 percent of the 190.3 tonnes of uranium fuel flowed downward from the reactor shaft (“Chornobyl Accident Revisited,” 288). The weight of the lower biological shield is noted on 195 and 409.

342 *It burned clean through*: *Ibid.*, 293n; Borovoi and Velikhov, *Chernobyl Experience, Part 1*, 30–31.

342 *Spreading out to the south and east*: Sich provides a map of the four flow routes: “Chornobyl Accident Revisited,” 322.

342 *It had burned and seethed*: Borovoi, author interview, 2015; Sich, “Chornobyl Accident Revisited,” 322.

342 *Puddles fifteen centimeters deep*: Sich, “Chornobyl Accident Revisited,” 308.

342 *When the lava dropped*: *Ibid.*, 323. Elsewhere, according to Sich, the heat of radioactive decay ensured that the solidified corium remained hot even in 1991, five years after the accident had taken place. Also see p. 245, which diagrams a cross section of the damaged Unit Four.

343 “*For the time being*”: Conclusions of the expert group: S. T. Belyaev, A. A. Borovoi, V. G. Volkov et al., “Technical Validation of the Nuclear Safety of the Shelter” [Техническое обоснование ядерной безопасности объекта Укрытие], report on the scientific research work conducted by the Complex Expedition, 1990, cited in Borovoi and Velikhov, *Chernobyl Experience: Part 1*, 147–48. The monitoring system (named “Finish”): *Ibid.*, 148–49.

343 *Increasingly forgotten*: Borovoi, author interview, 2015.

343 *Eventually the men ran short*: Documentary footage in *Inside Chernobyl’s Sarcophagus*, 1991; Borovoi, “My Chernobyl,” 110.

343 *So fascinating and important*: Borovoi, “My Chernobyl,” 30 and 34.

344 *They granted individual nicknames*: Borovoi and Velikhov, *Chernobyl Experience: Part 1*, 119, 134, and 141.

344 *Chernobylite*: Borovoi, author interview, 2015; Sich, author interview, 2018; Valery Soyfer, “Chernobylite: Technogenic Mineral,” *Khimiya i zhizn*, November 1990, translated in JPRS report JPRS-UCH-91-004: “Science and Technology: USSR Chemistry,” March 27, 1991.

344 *Could soon collapse*: Borovoi, “My Chernobyl,” 37.

344 *Former plant director*: “Information on the criminal case against V. P. Brukhanov” [Справка по уголовному делу в отношении Брюханова В. П.], personal archive of Yuri Sorokin.

344 *The good Czech overcoat*: Viktor and Valentina Brukhanov, author interview, 2016.

345 *A two-line letter*: S. B. Romazin (president of the Collegium on Criminal Cases of the USSR Supreme Court), Letter no. 02DC-36-87, addressed to Y. G. Sorokin, December 26, 1991, personal archive of Yuri Sorokin.

345 *Longed to return to Pripyat*: Viktor and Valentina Brukhanov, author interview, 2016. A 2011 newspaper profile of Brukhanov reports that he returned to work at Chernobyl after his release as head of the technical department and was greeted warmly by the staff (Samodelova, “The private catastrophe of Chernobyl’s director”). But his wife, Valentina, stated in an interview with the author that Brukhanov’s first job after prison was in Kiev and involved administrative assistance for a former colleague.

345 *Eventually Vitali Sklyarov*: Viktor and Valentina Brukhanov, author interview, 2016; Vitali Sklyarov, author interview, 2016; Viktor Brukhanov, interview by Babakov, *Zerkalo nedeli*, 1999.

345 *The fallen director*: Read, *Ablaze*, 336.

345 *The former nuclear safety inspector*: Samodelova, “The private catastrophe of Chernobyl’s director.”

345 *Granted early release*: Read, *Ablaze*, 336. Date of Fomin’s release (September 26, 1988): “Information on the criminal case against V. P. Brukhanov,” personal archive of Yuri Sorokin.

345 *Had spent his years of incarceration*: Anatoly Dyatlov, “Why INSAG Has Still Got It Wrong,” *Nuclear Engineering International* 40, no. 494 (September 1995): 17; Anatoly Dyatlov, letter to Leonid Toptunov’s parents, Vera and Fyodor, June 1, 1989, personal archive of Vera Toptunova.

346 *Also granted early release*: Date of Dyatlov’s release (October 1, 1990): “Information on the criminal case against V. P. Brukhanov,” personal archive of Yuri Sorokin.

346 *In the face of opposition from NIKIET*: Steinberg, recollections in Kopchinsky and Steinberg, *Chernobyl*, 149–51.

346 *One senior member*: Armen Abagyan, interviews by *Asahi Shimbun*, July 17 and August 31, 1990, cited in Kopchinsky and Steinberg, *Chernobyl*, 151.

347 *In May 1991*: Kopchinsky and Steinberg, *Chernobyl*, 152; Read, *Ablaze*, 324.

347 “*scientific, technological*”: Steinberg, quoted in Read, *Ablaze*, 324.

347 “*Under those circumstances*”: Ibid.

347 “*Thus the Chernobyl accident*”: Ibid., 324–25.

348 “*Those who hang a rifle*”: Read, *Ablaze*, 325.

348 *But the barons*: Kopchinsky and Steinberg, *Chernobyl*, 152.

348 “*New information*”: International Atomic Energy Agency, INSAG-7, 16.

349 “*In many respects*”: Ibid., 22.

349 *Attracted little attention*: Alexander Sich, author interview, Steubenville, OH, April 2018.

349 *Until his own death*: “Brief biography of A. S. Dyatlov” [Краткая биография Дятлова А. С.], preface to Dyatlov, *How It Was*, 3.

349 *Ukrainian Orders for Courage*: Karpan, *Chernobyl to Fukushima*, 24–25; Decree of the President of Ukraine No.1156/2008 at the official website of the President of Ukraine: <https://www.president.gov.ua/documents/11562008-8322>.

## 20. A TOMB FOR VALERY KHODEMCHUK

350 *It wasn't until the end of that year*: Natalia Yuvchenko, author interviews, 2015 and 2016.

352 *Almost twenty-five years after the explosion*: Author visit to Red Forest, February 5, 2011.

353 *The territory of the Exclusion Zone had expanded repeatedly*: Mycio, *Wormwood Forest*, 68–69; Sergiy Paskevych and Denis Vishnevsky, *Chernobyl: Real World* [Чернобыль. Реальный мир] (Moscow: Eksmo, 2011). Also see Mikhail D. Bondarkov et al., “Environmental Radiation Monitoring in the Chernobyl Exclusion Zone—History and Results 25 Years After,” *Health Physics* 101, no. 4 (October 2011): 442–85.

354 *In Britain, restrictions on the sale of sheep*: Liam O’Brien, “After 26 Years, Farms Emerge from the Cloud of Chernobyl,” *Independent*, June 1, 2012.

354 *Subsequent studies found*: “Wild Boars Roam Czech Forests—and Some of Them Are Radioactive,” *Reuters*, February 22, 2017.

354 *The first evidence for the phenomenon*: Sergei Gaschak, deputy director for science, Chernobyl International Radioecology Laboratory, author interview, Chernobyl exclusion zone, February 2011.

354 *After the breakup of the USSR*: Adam Higginbotham, “Is Chernobyl a Wild Kingdom or a Radioactive Den of Decay?,” *Wired*, April 2011; Gaschak, author interview, 2011.

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