

# Annotation to *Germ Gambits: The Bioweapons Dilemma, Iraq and Beyond*

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NOTE: The following are extended annotations for many of the endnotes in the book.

## Introduction

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1. Popular conception holds that possessors of nuclear weapons have an enviable military advantage and elevated political influence. For a synopsis of the scholarly discussion on the advantages and drawbacks of acquiring nuclear arms, Michael I. Handel, *Weak States in the International System* (Abingdon: Routledge, 1990): 195–208. An opposing school of thought argues that the sheer destructive power of modern nuclear weapons renders them unusable. Positing that deterrence is less effective during the post–Cold War era and proposing steps leading to the abolition of nuclear weapons, George P. Shultz, William J. Perry, Henry A. Kissinger, and Sam Nunn, “Toward a Nuclear-Free World,” *Wall Street Journal*, January 15, 2008, A13.

3. The Biological and Toxin Weapons Convention opened for signature on April 10, 1972. According to Article XIV of the Convention, the Convention entered into force on March 26, 1975 after twenty-two nations, including the United States, the United Kingdom, and the U.S.S.R., deposited their instruments of ratification. For more information about the Convention, go to: <[www.opbw.org](http://www.opbw.org)>. On the Convention’s negotiating history, Marie Isabelle Chevrier, “The Politics of Biological Disarmament,” in Mark Wheelis, Lajos Rozsa, and Malcolm Dando, eds., *Deadly Cultures: Biological Weapons Since 1945* (Cambridge, MA: Harvard University Press, 2004), 304–28.

4. Iraq signed the Biological and Toxin Weapons Convention on May 11, 1972, but acceded to this accord on June 19, 1991, as part of the Security Council’s ceasefire conditions for the 1991 Gulf War. The Security Council also invited Iraq to “reconfirm unconditionally its obligations” to the 1925 Geneva Protocol, which bans the use of chemical and biological

weapons. See Resolution 687 (1991), adopted by the Security Council on April 3, 1991, Doc. S/RES/687 (New York: United Nations, April 8, 1991), para. C (7).

5. On June 7, 1981, Israeli fighter jets bombed the French-built Osiraq reactor located at the Al Tuwaitha Nuclear Research Institute southeast of Baghdad before the reactor was loaded with nuclear fuel, in order to prevent the Iraqis from using the reactor to produce plutonium for weapons. See Rodger Claire, *Raid on the Sun: Inside Israel's Secret Campaign that Denied Saddam the Bomb* (New York: Broadway Publishing, 2004); and Uri Bar-Joseph, *Two Minutes Over Baghdad* (Oxford: Routledge, 2003). More details about Al Hakam, which Iraq began to build in the desert southwest of Baghdad in 1988, are contained in Chapters 2, 3, 4, and 6 of this book.

6. International experts met four times in 1992 and 1993 to evaluate twenty-one potential on-site and off-site measures that might be used to monitor the Biological and Toxin Weapons Convention, which lacks a verification protocol. Experts concluded that a combination of monitoring procedures would be most effective. See United Nations, *Special Conference of the States Parties to the Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction: Final Report*, Doc. BWC/SPCONF/1, Geneva: September 19–30, 1994.

7. "It has been argued that history is a description of what happened by the winners or the descendants of the winners. Most winners tend not to boast about the massacres or disasters they caused. If required to explain some unfortunate incident, humans have an ability to rationalize beyond all rational thought." Martin Shubik, "Terrorism, Technology, and Socioeconomics of Death," *Comparative Strategy* 16, no. 4 (October 1997): 406. Several scholars have noted the susceptibility of history to manipulation, including Margaret MacMillan, *Dangerous Games: The Uses and Abuses of History* (New York: Modern Library, 2009). To illustrate the point, an authoritative history of the holocaust of World War II can be juxtaposed to a revisionist one. For the former, see Raul Hilberg, *The Destruction of European Jews* (Teaneck, NJ: Holmes & Meier, 1985). For the latter, see Arthur R. Butz, *The Hoax of the Twentieth Century: The Case Against the Presumed Extermination of European Jewry* (New York: Theses & Dissertations Press, 2003).

11. Coalition forces initiated a massive bombing campaign on January 16, 1991, the day after Saddam refused to heed the UN's deadline to withdraw his forces from Kuwait. The ground offensive of Operation Desert storm began on February 23, and President George H. W. Bush issued terms for a ceasefire and suspended the offensive on the 27th of February. For more in-depth accounts, Richard Lowry, *The Gulf War Chronicles: A Military History of the First War with Iraq* (New York: Universe, 2008); and Michael R. Gordon, *The Generals' War: The Inside Story of the Conflict in the Gulf* (Boston: Back Bay Books, 1995). With an overview of the personnel, equipment, and money given to support UNSCOM's biological and chemical inspections, Graham S. Pearson, *The UNSCOM Saga: Chemical and Biological Weapons Non-Proliferation* (New York: St. Martin's Press, 1999), 176–187.

12. The UN imposed sanctions on Iraq's sale of oil in 1990, then established the Oil for Food program so that funds from the limited sale of Iraqi oil could be used to purchase medicine and food and to maintain the infrastructure in Iraq to distribute this aid. These funds were also used to repay war reparations to Kuwait and to support UN disarmament inspections in Iraq. Awash in controversy and corruption, the program transferred billions in escrow funds and essential humanitarian supplies to Iraq's Coalition Provisional Authority, shutting down its operations in November 2003. An independent probe of the program detailed the waste, kickbacks, and the methods Iraq and its collaborators used to undermine it, enabling Iraq to accrue an estimated

\$10.99 billion in oil revenues through smuggling and sales surcharges. Other estimates hold that Iraq managed to earn between \$10.1 billion and \$21 billion in illicit trade from 1991 to 2003. For more on the history of the Oil for Food program and its investigation, go to <http://www.oilforfoodfacts.org/default.aspx>. See also United States General Accounting Office, *United Nations: Observations on the Management and Oversight of the Oil for Food Program*, GAO-04-730T (Washington, DC: April 28, 2004).

15. Equipment in space includes military command, control, and communications systems; offensive ballistic missiles; anti-satellite systems; commercial communications satellites; and anti-ballistic missile intercepting missiles. From a verification standpoint, the grey areas involve the similarities in the technical characteristics, the trajectories, and the speed and height of the orbits of this equipment. See David Webb, "On the Definition of a Space Weapon (When Is a Space Weapon Not a Space Weapon?)" (Leeds, United Kingdom: Leeds Metropolitan University, Praxis Center, n.d.), [http://praxis.leedsmet.ac.uk/praxis/documents/space\\_weapons.pdf](http://praxis.leedsmet.ac.uk/praxis/documents/space_weapons.pdf). On very small nuclear tests as a grey area in nuclear testing verification capabilities, Lynn R. Sykes, "False and Misleading Claims About Verification During the Debate on the Nuclear Comprehensive Test Ban Treaty," F.A.S. Public Interest Report 53, no. 3, (May–June 2000). Addressing the grey areas under the Chemical Weapons Convention involving nonlethal or incapacitating agents and their development, production, stockpiling, and use for domestic law enforcement and riot control, Walter Krutzsch, "Law Enforcement including Domestic Riot Control: The Intent of the CWC Negotiators" (paper presented at the 52nd CBW Pugwash Meeting, Noordwijk, The Netherlands, March 17–18, 2007); Jonathan B. Tucker, "The Body's Own Bioweapons," *Bulletin of the Atomic Scientists* 64, no. 1 (March–April 2008): 16–22.

16. Article I, paragraph 1 of the Convention justifies retaining agents and toxins for "prophylactic, protective or other peaceful purposes." According to one scholar, "There is a range of quantities of nearly any biological agent or toxin that would be consistent with both peaceful and nonpeaceful purposes. That range of quantities would always constitute a gray area where a judgment of the intent of the possessor is inescapable." Marie Isabelle Chevrier, "From Verification to Strengthening Compliance: Prospects and Challenges of the Biological Weapons Convention," *Politics and the Life Sciences* 14, no. 2 (August 1995): 212. "The more that there are materials, equipment, human resources and other elements common to both legitimate and prohibited activities, the easier it is for a treaty violation to be hidden under the cover of legitimate activities. That is precisely what makes violations of the BWC so difficult to detect." Describing how routine and challenge inspections with no right of refusal together form an integral structure for treaty verification, former deputy director of intelligence at the Central Intelligence Agency Douglas J. MacEachin, "Routine and Challenge: The Pillars of Verification," *The CBW Conventions Bulletin* 39 (March 1998): 1. The text of the Convention can be found at <http://www.opbw.org>.

17. Such political overtones, visible when U.S. experts and policymakers have debated the merits of various treaties, are also present in the writing of international experts. For more, see Mark M. Lowenthal, "The Politics of Verification: What's New, What's Not," and Maria R. Alongi, "Verification and Congress: What Role for Politics," in *Verification: The Key to Arms Control in the 1990s*, ed. John G. Tower, James Brown, and William K. Cheek (New York: Brassey's, 1992), 13–34; Michael Krepon and Dan Caldwell, eds., *The Politics of Arms Control Treaty Ratification* (New York: St. Martin's Press, 1991); Michael Krepon, "The Politics of Treaty Verification and Compliance," in *Arms Control Verification: The Technologies That Make It Possible*, ed. Kosta Tsipis, David W. Hafemeister, and Penny Janeway (New York: Pergamon-Brassey's, 1986), 20–32; Rudolf Avenhaus, Nikolas Kyriakopoulos, Michael Richard, Gotthard Stern, eds., *Verifying*

*Treaty Compliance: Limiting Weapons of Mass Destruction and Monitoring Kyoto Protocol Provisions* (New York: Springer, 2006).

18. The Strategic Arms Limitation Talks I and II accords both called for Moscow and Washington not to interfere with each other's satellite coverage to enable compliance monitoring from afar. For a firsthand account of the strategic arms talks, Gerard Smith, *Doubletalk* (Lanham, MD: University Press of America, 1985). The safeguards inspections of the International Atomic Energy Agency (IAEA) to monitor peaceful uses of the atom in conjunction with the 1968 Nuclear Nonproliferation Treaty were the exception to relying on satellite verification. Article III of the treaty requires non-nuclear weapons states to conclude safeguards agreements with the IAEA. An account of the IAEA's early decades, Hans Grumm, "IAEA Safeguards: Milestones in Development and Implementation," *IAEA Bulletin*, no. 3 (Vienna: International Atomic Energy Agency, 1987): 29–34. On remote monitoring, Bhupendra Jasani and Toshibomi Sakata, *Satellites for Arms Control and Crisis Monitoring* (Stockholm: Stockholm International Peace Research Institute, 1987); Tsipis, Hafemeister, and Janeway, *Arms Control Verification*, Chapters 7 to 20.

19. Trust but verify was apparently Reagan's mantra with Soviet General Secretary Mikhail Gorbachev, and Reagan uttered the phrase twice at the December 8, 1987, signing of the Intermediate-Range Nuclear Forces Treaty. Gorbachev rejoined, teasing Reagan about his fondness for the proverb with the observation, "You repeat it at every meeting." Ronald Reagan, remarks on signing the Intermediate-Range Nuclear Forces Treaty, Washington, DC, The White House, December 8, 1987.

20. The START Treaty actually provides for twelve types of inspections, including baseline inspections of declared facilities and inspections at newly declared sites, to confirm the elimination and conversion of strategic arms, at facilities that have been closed, of reentry vehicles, and of suspect sites. Briefly, see Article XI of the 1992 Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Reduction and Limitation of Offensive Strategic Arms. At length, see the treaty's inspection protocol and associated annexes. For the addition of challenge or special inspections to the toolkit of the IAEA to monitor compliance with the Nuclear Nonproliferation Treaty, see Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards, Doc. INFCIRC/540, International Atomic Energy Agency, Vienna, September 1997. The inspection procedures for the chemical weapons ban, which was activated in 1997, are elaborated in the 1993 Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction, Annex on Implementation and Verification.

21. Ostensibly to avoid confusion with other arms control regimes, at talks to draft a verification protocol for the Convention, in place of routine inspections negotiators used the term of art *non-challenge visits*, with several variants considered for inclusion in the protocol. Instead of challenge inspections, negotiators used the word *investigations*. The routine or non-challenge inspection approaches discussed at the protocol negotiations were transparency or randomly selected visits, voluntary assistance visits, and clarification visits. For more, see Graham Pearson and Malcolm Dando, "On-Site Inspections in the Emerging BTWC Protocol," in *On-Site Inspections: Common Problems, Different Solutions*, ed. Kerstin Hoffman, *Disarmament Forum*, no. 3 (Geneva: United Nations Institute for Disarmament Research, 1999): 78–82; Jez Littlewood, *The Biological Weapons Convention: A Revolution Failed* (Aldershot, U.K.: Ashgate Publishing, 2005), 89–138. For the text as it stood when the negotiations disintegrated, Protocol to the Convention on the Prohibition of the Development, Production and Stockpiling of

Bacteriological (Biological) and Toxin Weapons and on their Destruction, BWC/ADHOCGROUP/CRP.8, Ad Hoc Group, Geneva, April 3, 2001. An evaluation of the 2001 draft text can be found in Graham S. Pearson, Malcolm R. Dando, and Nicholas A. Sims, "The Composite Protocol Text: An Effective Strengthening of the Biological and Toxin Weapons Convention," paper no. 20 (Bradford, U.K.: University of Bradford, Department of Peace Studies, April 2001). See also Marie Chevrier, "The Biological Weapons Convention: The Protocol That Almost Was," in *Verification Yearbook 2001*, ed. Trevor Findlay and Oliver Meier (London: Verification, Inspection, and Training Centre, 2001), 79–97. Note that the Convention is not the only regime to use tailored language for these inspection concepts. In the Model Additional Protocol to the Nuclear Nonproliferation Treaty, challenge inspections are called special inspections. See Model Protocol Additional to the Agreement(s), Doc. INFCIRC/540.

22. The U.S. government rejected the draft protocol on the basis that it would not improve the ability to verify the Convention, adding that inspections would endanger national security secrets and compromise proprietary trade information. See U.S. Ambassador Donald Mahley, Statement by the United States to the Ad Hoc Group of Biological Weapons Convention States Parties, Geneva, July 25, 2001. Also, Mike Allen, "US Seeks to Stiffen Pact on Germ War; Pact's Enforcement Mechanism Faulted," *Washington Post*, October 17, 2001, A21; Mike Allen and Steve Mufson, "U.S. Scuttles Germ War Conference; Move Stuns European Allies," *Washington Post*, December 8, 2001, A1. For an account of the protocol negotiations and the preceding meeting of verification experts, Littlewood, *The Biological Weapons Convention: A Revolution Failed*. In 2002, treaty members agreed to replace the negotiations with a yearly technical and policy discussions on related issues. Fifth Review Conference of the States Parties to the Convention on the Prohibition of Bacteriological (Biological) and Toxin Weapons and on their Destruction: Final Report, Doc. BWC/CONF.V/17, Geneva, 2002, para. 18.

23. U.S. Arms Control and Disarmament Director Ronald Lehman delivered the first Bush administration's verdict on September 10, 1991, at the Convention's Third Review Conference: "The convention is not effectively verifiable and we do not know any way to make it so," Lehman said. Later in his remarks, Lehman reiterated the point: "It is our view that the BW Convention is not effectively verifiable. In this context, this means that the United States acknowledges the inherent difficulty of detecting and verifying illegal activities under this convention." Ronald Lehman, "Conference Can Strengthen Biological Weapons Regime," Geneva, September 10, 1991. On November 15, 2002, Assistant Secretary of State for Arms Control Stephen Rademaker travelled to Geneva to give the second Bush administration's assessment, declaring the Convention "inherently unverifiable" and proposed alternate ways to strengthen the treaty and confront the biological weapons threat. Wendy Lubetkin, "U.S. Welcomes Biological Work Plan," Office of International Information Programs, US Department of State, November 15, 2002, <http://www.america.gov/st/washfile-english/2002/November/20021115141419mkellerh@pd.state.gov0.4453089.html>.

24. According to some UNSCOM inspectors, such frequent use of challenge inspections and the actual use of military force to compel compliance are very unlikely in a standard arms control regime. David Huxsoll, DVM (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, June 21, 2005; Ake Sellstrom, PhD (former UNSCOM chief inspector), interview with author, Stockholm, August 24, 2005. For an elaborated concept of coercive disarmament, Jessica Tuckman Mathews, *Iraq: A New Approach* (Washington, DC: Carnegie Endowment of International Peace, September 2002).

25. The Executive Council of the Organization for the Prohibition of Chemical Weapons and the Board of Governors handle more routine governance matters for the Chemical Weapons Convention and the Nuclear Nonproliferation Treaty, respectively.

27. This projection springs from historian Alan D. Beyerchen's exposition on Carl von Clausewitz's *On War*, in which he argues that Clausewitz viewed war as nonlinear, interactive, and shaped by amplifying factors that can alter the character of a conflict and disproportionately influence its outcome. Alan Beyerchen, "Clausewitz, Nonlinearity, and the Unpredictability of War," *International Security* 17, no. 3 (Winter 1992): 55–90. For this extrapolation of Beyerchen, punctuated with "World War III easily could be the biologist's war," Martin Shubik, "Terrorism, Technology, and Socioeconomics of Death," *Comparative Strategy* 16, no. 4 (October 1997): 404.

31. Note that a comprehensive history of Iraq's program is no longer possible because some key documents have vanished, central figures in Iraq's bioweapons activities have died, others have disappeared, and still others are reluctant to speak about these matters.

## Chapter 1

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1. Iraq's invasion of Kuwait on August 2, 1990, triggered the Gulf War, which was launched under the auspices of United Nations Security Council Resolutions 660 (1990) and 678 (1990) demanding Iraq's withdrawal from Kuwait and authorizing "all necessary means" to restore the status quo ante after January 15, 1991. The air war, known as Operation Desert Storm, began on January 17, 1991, while the ground assault began on February 24, 1991. The United States led a coalition of thirty-four countries, with non-U.S. forces making up approximately 24 percent of the 660,000 coalition combatants facing 530,000 Iraqi troops in the ground war. Hostilities stopped on February 28, 1991, and a formal cease-fire ended the war after forty-two days. The U.S. casualty toll was 148 deaths in combat and 145 non-combat deaths. In June 1991, an estimated four hundred thousand Iraqi soldiers were killed or wounded, while Baghdad claimed there were over thirty-five thousand civilian casualties. A reliable Iraqi casualty figure is not available, but scholars have concluded that significantly fewer Iraqi soldiers died than originally reported. Juan J. Walte, "Next Comes Ground War: An Allied Blitzkrieg Is Likely," *USA Today*, January 18, 1991; "The Operation Desert Shield/Desert Storm Timeline," *DefenseLink*, August 8, 2000, <http://www.defenselink.mil/news/newsarticle.aspx?id=45404>; "Fog of War," The Washington Post Company, 1998, <http://www.washingtonpost.com/wp-srv/inatl/longterm/fogofwar/fogofwar.htm>; "The Unfinished War: The Legacy of Desert Storm," *CNN Presents*, CNN, January 5, 2001, <http://transcripts.cnn.com/TRANSCRIPTS/0101/05/cp.00.html>; Guy Gugliotta and Caryle Murphy, "Jets Roar Off in Darkness at Start of 'Desert Storm,'" *Washington Post*, January 17, 1991, A1; "War In the Gulf: War Summary," *New York Times Late Edition*, February 24, 1991, section 1, part 1, p. 17; Rick Atkinson and Steve Coll, "Bush Orders Cease-Fire," *Washington Post*, February 28, 1991, A1.

2. Not wishing to offend Arab states with overly harsh ceasefire terms for Iraq or to create a regional imbalance with a devastated Iraq neighboring a resurgent Iran, the drafters of Resolution 687 searched for terms to weaken Iraq but not leave it in ruins. Philip Towle, *Enforced Disarmament: From the Napoleonic Campaigns to the Gulf* (Oxford: New Oxford University Press, 1997), 186–187. To implement the ceasefire agreement, an approach similar to the Allied Control Commission created after World War I was among the models raised. Foreign ministry official, interview with author, London, August 17, 2005.

3. To underscore the difficulty of such an endeavor, despite the fairly extensive allied inspections following World War I designed to eliminate Germany's military capacity and thwart its rearmament, Germany managed to rebuild its military strength and annex neighboring countries, setting the stage for World War II. For a comparative history of disarmament attempts, see Towle, *Enforced Disarmament*. Of the circumstances, "UNSCOM was what Iraq got instead of an invasion and occupation in 1991." Charles Duelfer, *Hide and Seek: The Search for Truth in Iraq* (New York: Public Affairs, 2009), 170.

5. Gallucci was pulled from his post at the National Defense University to help write Resolution 687. Robert Gallucci, PhD (former deputy executive chairman of UNSCOM), interview with author, Washington, DC, March 13, 2006.

6. Resolution 687 (1991), paras. 9(b)(i) and (ii), which authorized UNSCOM to designate for inspection "other locations" aside from those declared by Iraq. The French and some U.S. officials argued that the International Atomic Energy Agency (IAEA) not be shunted aside totally in favor of UNSCOM lest the agency be weakened further in advance of the 1993 negotiations to extend indefinitely the Nuclear Non-Proliferation Treaty, which the IAEA was charged with policing. Tim Trevan, *Saddam's Secrets: The Hunt for Iraq's Hidden Weapons* (London: HarperCollins, 1999), 46–49. See also William M. Arkin, "Origins of the Iraq Mistake," *Washington Post*, October 19, 2005.

7. "To begin with, that early reporting deadline was totally unrealistic," and the other Resolution 687 deadlines were "totally ridiculous. Only politicians could come up with something like that." Ronald Manley, PhD (former UNSCOM chief chemical weapons inspector), interview with author, London, August 19, 2005. "It now seems remarkable, but at the time the Security Council honestly believed that the entire disarmament job would be completed within a year—hence the demand for declarations within fifteen days." Richard Butler, *The Greatest Threat: Iraq, Weapons of Mass Destruction, and the Crisis of Global Security* (New York: Public Affairs, 2000), 41–42. "There was no way they were going to do it in forty-five days, not in practical terms, especially not the chemical destruction." Foreign ministry official, interview.

9. "The U.S. was working with the Russians and lots of the relationships and guidelines that used to govern in the international arena were no longer in play. All of these nations were cooperating. The Security Council was creating an entity and was going into a nation and kicking butt. Since when does that happen?" Gallucci, interview.

11. Agreeing on the air of optimism, "We initially anticipated UNSCOM would be there for six months and the whole thing would stop." David Kelly, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, December 17, 2002. Similarly, Doug Englund (former UNSCOM chief inspector), interview with author, Washington, DC, December 5, 2005; Robert Kadlec, MD (former UNSCOM inspector), interview with author, Washington, DC, February 23, 2006.

12. "I said something to the effect of 'this is what the United States of America wishes to be the outcome.'" Gallucci, interview. Also on the United Nations bureaucracy's press for equitable geographic balance, Terence Taylor (former UNSCOM Commissioner and chief inspector), interview with author, Washington, DC, May 12, 2005.

13. Iraq did not accept the ceasefire conditions until April 6, 1991. In a lengthy letter, Foreign Minister Ahmed Hussein railed against the terms imposed. Trevan, *Saddam's Secrets*, 46.

14. Iraq could pump three million barrels of oil daily, which equated to \$25 million in lost oil sales per day. Also on Ekeus's cognizance of the fiscal and time pressures, Trevan, *Saddam's Secrets*, 52.

15. “As soon as UNSCOM got the declarations, I thought we would line up the teams and verify the declarations one by one,” said Ekeus. “I knew there were some chemical weapons to destroy, but before the declarations this was also thought to be a manageable issue.” He sincerely wanted to return to his “fascinating and well paid” post in Vienna. Earlier, Ekeus was Sweden’s representative to the Conference on Disarmament in Geneva. Ambassador Rolf Ekeus (former UNSCOM executive chairman), interview with author, Stockholm, August 24, 2005. Remembering Ekeus’s view that the job could hopefully be done rapidly, Ake Sellstrom, PhD (former UNSCOM chief inspector), interview with author, Stockholm, August 24, 2005; Gabriele Kraatz-Wadsack, DVM (former UNSCOM chief biological weapons inspector), interview with author, Berlin, August 15, 2005.

17. “I handled the political problems so that the scientists had space to do their work,” said Ekeus, who claimed a fondness for the scientists’ “bizarre sense of humor.” Ekeus, interview. Ekeus trusted his senior staff to fulfill their stated intentions: “Ekeus delegated almost everything to his chiefs.” Hamish Killip (former UNSCOM chief biological weapons inspector), interview with author, Isle of Man, August 22, 2005. “His style was that everybody does the best they can, and he let them do it.” Kraatz-Wadsack, interview. Ekeus gave his senior staff and inspection chiefs direct access to him, often having individual meetings to make decisions instead of assembling the entire senior staff to deliberate an issue. UNSCOM personnel from places with formal organizational charts could find Ekeus’s approach a bit unsettling, but also recognized that it empowered his subordinates. Doug Englund (former UNSCOM chief inspector), interview with author, December 5, 2005; Taylor, interview; former senior UNSCOM official, interview with author, August 30, 2005.

18. Bestowing perhaps the biggest compliment a boss can have, “I would work for Ekeus any time.” Richard Spertzel, PhD (former UNSCOM chief biological inspector), interview with author, July 1, 2005. Also singing Ekeus’s praises, Kelly, interview; Killip, interview; Sellstrom, interview; Englund, interview; Taylor, interview; Debra Krikorian, PhD (former UNSCOM inspector), interview with author, June 21, 2005; former UNSCOM chief inspector, interview with author, January 31, 2006; former UNSCOM chief inspector, interview with author, London, August 18, 2005; former senior UNSCOM official, interview with author, September 1, 2005; former senior UNSCOM official, interview with author, August 30, 2005.

20. “I recall one instance where he told me that he was going to DC to make the rounds, to brief the intelligence community, the Pentagon, State. When I asked him how things went, he observed that Americans were very good at keeping to their talking points, but he thought he learned some tidbits from them.” Continued Gallucci, “I asked him what he told them and he said, not much, that he spoke Swinglish and had a very nice day. Of course, I called DC to see what the U.S. government had gotten out of Rolf and he hadn’t told them jack [expletive]. They couldn’t understand what he was saying.” Gallucci, interview. Another UNSCOM insider who observed Ekeus at close quarters agreed that “he could easily filibuster any issue or leave you with the impression that you had received an answer to your question but that somehow it was your fault that you did not understand it.” Trevan, *Saddam’s Secrets*, 52.

21. Gallucci hoped that diplomats with pertinent technical expertise would be recruited as commissioners, who were to gather in New York on a quarterly basis for consultations and oversight of UNSCOM’s work. Gallucci, interview.

22. Also recalling that diplomats were jockeying fiercely to serve as commissioners, UNSCOM CBW commissioner, interview with author via telephone, January 23, 2006.

23. Member states paid the salaries of the experts they seconded to UNSCOM. Though the IAEA inspected Iraq’s nuclear facilities, UNSCOM had a few nuclear experts who, among other



activities, evaluated whether undeclared sites in Iraq should be inspected. UN Security Council, *Report of the Secretary-General on Setting up a Special Commission (UNSCOM) to Carry Out On-Site Inspection of Iraq's Biological, Chemical and Missile Capabilities*, Doc. S/22508, April 18, 1991, paras. 5, 7, and 9.

26. With this declaration letter to Secretary-General de Cuellar, Iraq also transmitted its ratification for the Biological and Toxin Weapons Convention and confirmed its adherence to the Geneva Protocol, which bans the use of biological and chemical weapons. Iraq also declared 280 tons of the blister agent mustard, 75 tons of the nerve agent sarin, 30 sarin-filled SCUD warheads, just over 10,300 chemical munitions, and precursor chemicals to make the nerve agent tabun and other chemical warfare agents. Iraq made no statement about VX or phosgene, its work on super guns, or its nuclear fuel enrichment program. Iraq identified far fewer sites than Western intelligence agencies believed were involved in Iraq's nuclear program. Western intelligence estimates held that some 350 SCUDs remained in Iraq, but Iraq declared just 52 SCUDs and six launchers. On biological weapons issues, Letter from Ahmed Hussein, Iraqi Minister of Foreign Affairs, to Secretary-General Javier Perez de Cuellar, conveyed by Permanent Mission of Iraq to the UN, Ambassador Abdul Amir A. Al-Anbari, Permanent Representative to the UN (dated April 18, 1991), paras. 1–3. Iraq sent the UN supplemental data on April 18 and 28, 1991, and also on May 4, 1991. UN Security Council, Plan for the Implementation of Relevant Parts of Section C of Security Council Resolution 687 (1991), Report of the Secretary-General Pursuant to Paragraph 9(b) of Resolution 687, Doc. S/22614, May 17, 1991, para. 7.

27. Summarizing what was known via open sources, Iraq used chemical weapons against Iran and its Kurdish citizens, had a chemical weapons program centered at Al Muthanna, was thought to have engaged in some bioweapons research and development activity at Salman Pak, and perhaps conducted questionable nuclear work at Al Tuwaitha, though IAEA safeguards inspectors gave Iraq's nuclear facilities a clean bill of health. Stephen Black (former UNSCOM historian), interview with author, Washington, DC, November 16, 2007.

30. Also, at the Conference on Disarmament, European military officers influenced Ekeus's opinion about the seriousness of biological weapons. These officers intensely disliked germ weapons because of their deadliness and difficulty to control, which increased the likelihood of civilian harm. Ekeus, interview.

32. Specifically, Ekeus called on Iraq to submit the data listed in section II of the April 21, 1987, report of the Ad Hoc Meeting of Scientific and Technical Experts from States Parties to the Biological Weapons Convention, referring them to document BWC/CONF.II/EX/2. See UN Doc. S/22614, paras. 20–21.

34. "Remember, there was no concern about the U.S.S.R. until Pasechnik defected, and even then it was not so big in some circles." Former senior UNSCOM official, interview with author, August 30, 2005. Dr. Vladimir Pasechnik was the first high-level insider to reveal the extent of the Soviet bioweapons program. British experts, including Dr. David Kelly, debriefed Pasechnik after his 1989 defection to the United Kingdom. Kelly, who later led inspections to the Soviet Union and Iraq, speaks of his experiences in *Deadly Enemies*, directed by Susan Lambert (New York: First Run Icarus Films, 2004), DVD. Significant concern about the U.S.S.R.'s bioweapons program did not mount until a second high-level defector, Ken Alibek, confirmed much of what Pasechnik had already told the British. Ken Alibek, with Stephen Handelman, *Biohazard* (New York: Random House, 1999).

35. "We have no information which we might provide [underlined words stricken in the original, the word "to" inserted in handwriting] under paragraph III, because Iraq possesses no biological weapons, as we stated in our previous letter." Letter from Abdul Amir A. Al-Anbari,

Permanent Representative of Iraq to the UN, to Rolf Ekeus, Executive Chairman of the Security Council Special Commission (New York, Permanent Mission of Iraq to the UN, dated May 16, 1991).

36. UNSCOM experts later found Al Daura to be a biosafety level 3 facility. Iraq's P4 and P3 terminology equates roughly to biosafety levels 4 and 3, respectively. Both letters were transferred to UNSCOM on May 22, 1991. Item (iv), page 10 of one transmittal contains the biological declaration. Letter from Abdul Amir A. Al-Anbari to Rolf Ekeus, letter no. 117 (New York, Permanent Mission of Iraq to the UN, dated May 22, 1991, stamped received, UN Office of the Special Commission, May 24, 1991).

37. UNSCOM personnel interviewed remembered the ten-site declaration as occurring in mid-May, not mid-July 1991, but the document, as indicated in endnote 38, was dated July 18, 1991.

38. From Al Taji, Iraq listed a 450-liter fermenter as involved in a petroleum protein project and an unspecified number of 1,400-liter imported Olsa fermenters and 1,200 mixing tanks as transferred from Al Kindi. The other Al Hakam fermenter listed had a 150-liter capacity, and on the first biological inspection the Iraqis stated they had moved this fermenter to Al Hakam. Iraq described Salman Pak as destroyed, and at the discontinued Al Fudhaliyah facility the mostly inoperative equipment included a 300-liter fermenter and a 75-liter fermenter. Iraq listed Al Daura as Iraq's only high-level containment facility, and the Iraqis declared no capability to encapsulate live microorganisms. The bakeries were at Nineveh, Misan, and Suq al-Shuyukh, all with fermenters of over 10,000-liter capacity. The transmittal letter stated, "[W]e reiterate our absolute readiness to respond to any further queries . . . to [ensure] that you form a complete picture of the subject." Letter from Abdul Amir A. Al-Anbari to Rolf Ekeus, letter no. 1/7/230 (New York, Permanent Mission of Iraq to the UN, dated July 18, 1991), Annex B, pages 9–11, and transmittal letter.

39. "It is worth noting that the site of Al-Salman was among the sites declared prior to the arrival of the first biological inspection team. . . . This is evidence that proves Iraq's broadmindedness, cooperation and credibility and its keen desire not to conceal anything." Letter from the Charge d'Affaires A.I. of the Permanent Mission of Iraq to the UN addressed to the President of the Security Council (New York, Permanent Mission of Iraq to the UN, dated January 23, 1992), UN Doc. S/23472, 28.

41. An unidentified Israeli official stated that "they have developed a military biological capacity. They have completed the research and development phase for this type of warfare." The agents reported to be in Iraq's program were anthrax, cholera, and typhoid. CBS and ABC News also ran this story. "Israel Vows Action Against Iraqi Germ Research," *Washington Times*, January 19, 1989, A8; Stephen Engelberg, "Iraq Said to Study Biological Arms," *New York Times*, January 18, 1989, A7; Michael Binyon, "Iraq 'Developing Typhoid, Cholera and Anthrax Weapons,'" *The London Times*, January 19, 1989, 6.

42. Senator Robert Dole led the U.S. delegation, and, according to the Iraqi transcript of the meeting, Saddam stated, "We have no biological weapons, but we do have chemical weapons." Michael Gordon, "Confrontation in the Gulf; C.I.A. Fears Iraq Could Deploy Biological Arms by Early 1991," *New York Times*, September 29, 1990, section 1, p. 4.

44. Iraq was also working on tularemia, cholera, and typhus and a likely dispersal system using canisters dropped from helicopters. James Gerstenzang, "Iraqi Pillaging Prompts U.S. War Warning," *Los Angeles Times*, September 29, 1990. Iraq was thought to have produced 1,000 liters of anthrax, botulinum toxin, and possibly other agents. CIA, *Iraq's Biological Warfare Program: Saddam's Ace in the Hole*, Doc. SW-90-1152CX (Washington, DC, August 1990). See

also Eric Nadler and Robert Windrem, "Deadly Contagion: How We Helped Iraq Get Germ Weapons," *New Republic*, February 4, 1991, 18–20.

45. Explaining that a few dozen munitions would be militarily significant because of the large area of coverage of biological weapons, the March 1991 CIA report also stated that Iraq already had a chemical-capable SCUD warhead and would soon have the ability to make a biological warhead indigenously. CIA, Directorate of Intelligence, *Prewar Status of Iraq's Weapons of Mass Destruction*, Top Secret Report, DocID 934037 (Washington, DC, March 20, 1991), quote from page 27. See also pages 4, 8–9, and 28. Available at <http://www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB80>. Other U.S. pre-war intelligence assessments that include discussions of possible warfare agents developed and produced, suspect biowarfare facilities, and possible delivery systems include Armed Forces Medical Intelligence Center, *Iraq Biological Warfare Threat* (Washington, DC, October 22, 1990); DIA, *Interim Report on Iraq Biological Warfare (BW)* (Washington, DC, December 17, 1990); CIA, *Bugs and Things* (Washington, DC: Central Intelligence Agency, CA-SIO, 3 December 1990). These and other pre-1991 war assessments can be found at <http://www.gulflink.osd.mil/declassdocs/cia>.

47. This report listed several possible targets that Iraq might consider and possible delivery means (such as spray tanks) but said, "There is no evidence of any weaponization of a biological warfare (BW) payload" for Iraq's SCUD missiles. DIA, *Iraqi Biological Weapons (BW) Capabilities*, Background Paper for the Director, J-5 (Washington, DC, September 14, 1990). The U.S. intelligence community did not assess Iraq's capabilities to test biological weapons because it lacked the requisite data. *Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction: Report to the President of the United States* (Washington, DC: U.S. Government Printing Office, March 31, 2005), 81.

48. Following precedent from Iraq's chemical weapons use in the Iran-Iraq War, Saddam would make all initial judgments about bioweapons use then gradually delegate decisions to field commanders. CIA, *Iraq's Potential for Chemical and Biological Warfare*, Document 62758, marked "Not Finally Evaluated Intelligence" (Washington, DC, September 1990), [http://www.fas.org/irp/gulf/cia/960618/62758\\_01.htm](http://www.fas.org/irp/gulf/cia/960618/62758_01.htm). A raw intelligence report described Saddam's order before the 1991 Gulf War to devise an Iraqi attack plan for the airborne delivery of biological agents involving the use of a decoy flight of three MIG-21s, followed a few days later by another trio of MIG-21s, trailed by an SU-22 dispersing a biowarfare agent at low altitude. Shortly after the 1991 War began, a three-MIG flight from Talil Airbase was shot down and plans for the actual attack flight were reportedly aborted. The report noted, "No efforts made to find another method to deliver the [biological] agent." CIA, *Iraq's BW Mission Planning*, marked "Not Finally Evaluated Intelligence" (Washington, DC, 1992), <http://www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB80/>.

49. The "many years kind" probably refers to anthrax spores, which can persist for decades. Saddam agreed with a recommendation to spread germ agents from airplanes and instructed use of bioweapons against Israel, U.S. forces, and Saudi Arabia. For a transcript of this conversation, as well as the U.S. intelligence community's assessment after the 2003 Gulf War of Iraq's biological weapons capabilities and use doctrine, including Saddam Hussein's, CIA, "Regime Strategic Intent," in *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD*, vol. 1 (Washington, DC, September 30, 2004), 1–2, 8–11, 20–41, 45–48.

51. U.S. intelligence analysts were also concerned about possible Soviet-Iraqi collaboration on biological weapons, particularly whether the Soviets shared antibiotic-resistant strains or know-how about the engineering of biowarfare agents. Former UNSCOM biological weapons inspector, interview with author, Washington, DC, February 21, 2006.

54. To protect troops going into the Gulf War theater, the Pentagon stretched its supply of anthrax and botulinum toxin vaccine very thin, which was indicative of the lack of a solid pre-war assessment of Iraq's biological weapons program. Robert Kadlec, MD (former UNSCOM biological weapons inspector), interview with author, Washington, DC, February 23, 2006. For treatment of anthrax exposures, ciprofloxacin had just come onto the market and was recommended in case the Iraqis had an anthrax strain resistant to penicillin and other early generation antibiotics. Former UNSCOM biological weapons inspector, interview with author, February 21, 2006. On U.S. troop vaccination activities, Office of the Special Assistant to the Deputy Secretary of Defense for Gulf War Illnesses, "Vaccine Use During the Gulf War," Interim Report (Washington, DC: U.S. Department of Defense, December 7, 2000), Chapter IV, B, <http://www.gulflink.osd.mil/va/>.

55. Australia's anthrax vaccination program was voluntary and offered to 150,000 troops. In addition, Australia inoculated military personnel expected to go to sensitive sites for smallpox and plague. Senate Foreign Affairs, Defence, and Trade Legislation Committee, Official Committee Hansard, Consideration of Budget Estimates (Canberra, Commonwealth of Australia, July 4, 2003), 27–29. See also Rod Barton, *The Weapons Detective: The Inside Story of Australia's Top Weapons Inspector* (Melbourne: Black Inc. Agenda, 2006), 54.

56. At Salman Pak, U.S. fighters were to concentrate on a suspect bioweapons laboratory, production facility, and bunkers believed to store biowarfare agent, dropping munitions designed to keep people away from the bunkers (for example, gator mines). Kadlec, interview. On U.S. targeting of suspect bioweapons facilities prior to the Gulf War, Armed Forces Medical Intelligence, *Information on Iraq's Biological Warfare Program*, Memorandum to John Deutch, Under Secretary of Defense for Acquisitions (Washington, DC, November 12, 1993).

58. Configured similar to those at Salman Pak, the twelve-frame storage bunkers were targeted because they were thought to be air-conditioned and therefore suited to store biological agents and munitions. Bombers destroyed the four most likely storage bunkers for biowarfare agents, located at Salman Pak, Qabitiyan, and Kai-bala, soon after the onset of war. Armed Forces Medical Intelligence, *Information on Iraq's Biological Warfare Program*; DIA, *Collateral Risk Due to Allied Air Strikes on Iraqi Biological Warfare (BW) Facilities*, Memorandum to U.S. Army Lt. Gen. Eichelberger (Washington, DC, n.d.). Also, *Identification of BW Related Facility at Latifiya*, Memorandum to CENTCOM FWD/CCJ2-T (Washington, DC, February 26, 1991). Chemap took orders to send fermenters to Latifiya, but did not deliver the equipment. Spertzel, interview.

59. Engineers from Salman Pak and Al Tuwaitha, facilities at the heart of Iraq's nuclear and bioweapons programs, were sent to the Infant Formula Plant for several months in 1989 to "do maintenance work" and "get it operational." Iraq might have planned to fill small munitions there or to make growth media to produce biowarfare agents at Al Hakam. After the 1991 war, a full-sized sterilizer, certainly not needed to make infant formula, was found on a pile of equipment just outside the plant. Iraq never clarified the facility's role, if any, in the bioweapons program. Kadlec, interview; Spertzel, interview. On the intelligence assessment, see CIA, *Biological Weapons Production Capabilities of a Nutritional Plant Located Three Miles from the Abu-Ghraib Military Complex*, marked "Not Finally Evaluated Intelligence" (Washington, DC, November 1990); CIA, *Iraq Backup BW Production Plant, Iraq-Kuwait: Situation Report*, marked "Not Finally Evaluated Intelligence" (Washington, DC, January 1991); CIA, *Report on the Iraqi Biological Warfare Facilities at the Aqaba Establishment, and Projects 600 and 400*, marked "Not Finally Evaluated Intelligence" (Washington, DC, April 1992); Al Kamen, "Iraqi Factory's Product: Germ Warfare or Milk?" *Washington Post*, February 8, 1991, A1; Gregory Koblenz, "Countering

Dual-Use Facilities: Lessons from Iraq and Sudan," *Jane's Intelligence Review* 11, no. 3 (March 1999): 50–52.

60. Arnett's report was filed amidst bomb damage, and bags of Nestle infant formula were seen at the site. Shortly afterward, Nestle stated that it never manufactured formula in Iraq. Furthermore, U.S. reconnaissance observed large trucks leaving the site the day after the bombing, perhaps salvaging equipment. Ekeus said that UNSCOM had documentation of two engineers being sent to the factory in 1989 and that the plant never made "anything financially viable because the raw material for the production cost more than the product they produced from it." Koblenz, "Countering Dual-Use Facilities," 50–52. On the loaning of Al Tuwaitha engineers to the Infant Formula Plant to prepare it to produce growth media for the bioweapons program, Kadlec, interview; Spertzel, interview.

65. "The agency's estimate was that they had a robust chemical program, but their estimate on bio was mostly deductive, and they underestimated the progress Iraq had made on nuclear weapons." Gallucci, interview. Seconding this view, Charles Duelfer (former UNSCOM deputy executive chairman), interview with author, Washington, DC, November 15, 2007. The CIA managed the pre-war assessment of Iraq's bioweapons program, but a lot of intelligence about Iraq's biological weapons program was "buried in the bowels of the intelligence community." Kadlec, interview.

66. The importance of UNSCOM's mission rated offices on the thirtieth and thirty-first floors of the UN headquarters building, including a secure, windowless meeting room on the thirtieth floor that the inspectors nicknamed "the bunker," but not too much else in the way of UN resources or administrative support. UNSCOM personnel relied on typewriters and communal secretaries until computers arrived in 1993. In addition to the reliance on typewriters, anyone who wanted to copy a document faced the frustration of a line at the copying machine. Filing was practically nonexistent as harried inspectors stuck photographs in cardboard boxes, sometimes annotated, sometimes not, and jammed thick inspection reports and other data into cabinets. In the 1993–1994 time frame, UNSCOM established a more formalized data-management system. Staffers also migrated almost on a weekly basis, poaching the empty desk of a colleague out on inspection. After a while, each discipline (chemical, missile) had a work room to allow frequent, informal consultation among the staff. This arrangement had its advantages and drawbacks. Concentration could be difficult, but the consultation could be a big bonus. Ekeus injected some normalcy into this otherwise chaotic work environment by holding an executive staff meeting once a week and a 9:00 A.M. meeting open to all UNSCOM staff, nicknamed the "morning prayers." For example, Ekeus would give a detailed account of various governments' positions when he briefed the Security Council or of a meeting with a senior Iraqi official. Spertzel, interview; Krikorian, interview; former senior UNSCOM official, interview with author, August 30, 2005; former UNSCOM staff member, interview with author, New York City, September 1, 2005; former UNSCOM staff member, interview with author, New York City, September 2, 2005; former UNSCOM CBW Commissioner, interview with author, January 23, 2006.

68. "After a while, UNSCOM had a stable of technical experts that really couldn't be beat by anything that governments alone had." Kadlec, interview. Also, Kraatz-Wadsack, interview.

70. Even when the reason was discerned, "[a] common observation Nikita would make about many issues after a long discussion or analysis was, 'It doesn't really matter.'" Duelfer, *Hide and Seek*, 40–41.

71. During the trilateral inspections, Smidovich helped to "orchestrate the theatrical moments, the delays, the language incomprehensions, the lies and deceptions." Tom Mangold

and Jeff Goldberg, *Plague Wars* (New York: St. Martin's Press, 1999), 305. The Biopreparat facilities inspected were the Institute of Immunology at Chekhov, the Institute of Microbiology at Obolensk; the Institute of Molecular Biology at Koltsova, and the Institute of Ultrapure Preparations in Leningrad, now St. Petersburg. David C. Kelly, "The Trilateral Agreement: Lessons for Biological Weapons Verification," in *Verification Yearbook 2002*, ed. Trevor Findlay and Oliver Meier (London: Verification, Inspection, and Training Centre, 2002), 93–109. Also, David E. Hoffman, *The Dead Hand: The Untold Story of the Cold War Arms Race and Its Dangerous Legacy* (New York: Doubleday, 2009), 353–357.

72. Smidovich "thinks ahead, understands their mentality, and is unbluffable." Mangold and Goldberg, *Plague Wars*, 306.

74. Governments donated millions in cash, all types of equipment (such as gas chromatographs and vehicles), a medical support team, and helicopters and U-2 surveillance aircraft and aircrews. Listing early donations, UN Security Council, *First Report of the Executive Chairman of UNSCOM Under Resolution 687*, Doc. S/23165, October 25, 1991, Appendix VI.

76. The IAEA formed the Iraq Nuclear Verification Office to manage inspections in Iraq after the 1991 Gulf War. IAEA reports can be found at <http://www.iaea.org/OurWork/SV/Invo/statements.html>.

77. For the original terms, go to <http://www.un.org/Depts/unscom/General/basicfacts.html> - ESTABLISH. The inspectors' rights were established in an exchange of letters between Secretary General Peres de Cuellar and Iraq's Deputy Prime Minister, Tariq Aziz, dated May 6 and 18, 1991. In his letter, Aziz noted that Iraq accepted the terms because it had no choice. Trevan, *Saddam's Secrets*, 60–62. After the joint first inspection in May 1991, the Security Council began a multiyear parade of statements and resolutions to reinforce the inspectors' authority, passing Resolution 669 on June 17, 1991, to confirm the mandate to destroy, render harmless, or remove capabilities related to Iraq's prohibited weapons programs. On June 28, the Security Council President admonished Iraq for failing to cooperate with inspectors. For more, go to <http://www.un.org/Depts/unscom/unscomdoc.htm>.

78. The team of four scientists collected samples from munitions found on a battlefield near the Iran-Iraq border, which laboratory analysis revealed to contain mustard and the nerve agent tabun, saw Iranians hospitalized for likely exposure to chemical warfare agents, and concluded that the evidence was consistent with the use of chemical weapons. Eliot Marshall, "Iraq's Chemical Warfare: Case Proved: A U.N. Team Found Mustard and Nerve Gas Bombs on the Battlefield; Now the Challenge Is to Prevent the War from Spreading," *Science* 224, no. 4645 (April 13, 1984): 130–132.

81. "Hamish would have been a great poker player. He took us all by surprise" in the midst of an interview when he nonchalantly reached into a bag beneath the table and plunked a component of one of Iraq's bioweapons delivery systems onto the table, pressing the Iraqis for more detail about it. William Leberherz (former UNSCOM industrial biotechnology expert), interview with author, Washington, DC, February 13, 2006.

86. With the exception of two early no-notice nuclear inspections, the initial two dozen UNSCOM inspections involved mostly checklist counting to confirm Iraq's declarations. Thereafter, the inspectors had to begin using more assertive and innovative inspection tactics. Black, interview.

88. "Later we passed what was clearly a vehicle repair shop: we had felt certain, based on its exterior design, that it was a mustard-gas production plant." Rod Barton (former UNSCOM biological inspector), interview with author via telephone, May 20, 2005. Also, Barton, *The Weapons Detective*, 62–70.

89. Killip's subteam was elsewhere on the site, but the black-striped R-400s were photographed. Some munitions also had green stripes, Arabic letters, and other markings. Killip, interview; Barton, interview; Ekeus, interview.

91. UN diplomatic representatives accompanied the first few UNSCOM teams, weighing in on the inspectors' comportsment with the Iraqis. The discussion with Dunn involved various colored markings on the munitions. Killip thought that the Iraqis might have halted the inspection if forced to explain the markings at that juncture. Killip, interview.

99. Neither the safeguards inspections of the IAEA, the verification provisions of the 1987 Intermediate-Range Nuclear Forces Treaty, nor the draft text of the Chemical Weapons Convention, which had the most stringent verification measures ever negotiated, asked for information about past weapons development activities. Former senior UNSCOM official, interview with author, August 20, 2005.

101. Iraq's nuclear weapons program involved a small army of scientists, an estimated investment of a billion dollars, and several programs to develop the capability to produce fissile material for nuclear weapons. IAEA inspectors conducted safeguards at declared facilities but did not find the program prior to the 1991 Gulf War, which led to a strengthening of IAEA inspection procedures to authority to inspect undeclared sites. Lawrence Scheinman, *Cooperative Oversight of Dangerous Technologies: Lessons from the International Atomic Energy Safeguards System* (College Park, MD: Center for International and Security Studies at Maryland, January 2005); Joseph F. Pilat, "Iraq and the Future of Nonproliferation: The Roles of Inspections and Treaties," *Science* 255, no. 5049 (March 6, 1992): 1224–1229; *Report of the Mission Dispatched by the Secretary-General to Investigate Allegations of the Use of Chemical Weapons in the Conflict Between the Islamic Republic of Iran and Iraq*, UN Docs. S/19823 (April 25, 1988), S/20060 (July 20, 1988), S/20063 (July 25, 1988), and S/20134 (August 19, 1988); Trevan, *Saddam's Secrets*, 121. On Iraq's points of references for Iraq's estimation of how UNSCOM would perform inspections, Black, interview.

102. Baghdad never wavered in this policy even as international inspectors showed repeatedly that Iraq did not fully relinquish its prohibited weapons capabilities. Stephen Black, "UNSCOM and the Iraqi Biological Weapons Program: Technical Success, Political Failure," in *Biological Warfare and Disarmament: New Problems, New Perspectives*, ed. Susan Wright (New York: Rowman & Littlefield, 2002), 303. "The United States had made it clear that sanctions would stay in place as long as Saddam did, no matter what happened with UNSCOM. So he had little to lose. He decided on a tactic of not complying but appearing to comply." Khidir Hamza with Jeff Stein, *Saddam's Bombmaker: The Terrifying Inside Story of the Iraqi Nuclear and Biological Weapons Agenda* (New York: Scribner, 2000), 261.

104. UNSCOM attributed the decision to hide key weapons capabilities to a high-level committee chaired by Deputy Prime Minister Tariq Aziz, which also decided to conceal Iraq's domestic capabilities to make long-range missiles and the maturity of the chemical weapons program, particularly the manufacture and weaponization of the nerve agent VX. Aziz later admitted that it was his decision to conceal the bioweapons program from the outset and to reveal it to UNSCOM in July 1995. United Nations Security Council, *Fourth Report of the Executive Chairman of the Special Commission Following the Adoption of Security Council Resolution 1051 (1996)*, Doc. S/1997/774, October 6, 1997, Annex, para. 107. "It was very clear that Saddam complied with the UN disarmament restrictions only as a tactic. His strategy was to reconstitute his weapons programs." Duelfer, *Hide and Seek*, 381. Also, 377–380, 406–408. On Iraq's policy to cheat on the terms of the ceasefire agreement to retain nuclear, biological, and missile capabilities, former senior UNSCOM official, interview with author, New York City,



August 30, 2005. Also on these matters, see “Biological Warfare,” in Central Intelligence Agency, *Comprehensive Report of the Special Advisor to the DCI on Iraq’s WMD*, vol. 1 (Washington, DC, September 30, 2004), 1, 49–59. According to UNSCOM, Abed Hamid Mahmoud, presidential secretary, chaired a second high-level committee overseeing concealment activities. Analyst Ibrahim Al-Marashi, however, places Hussein’s son, Qusay, as the chair. Both could have at one time served in that capacity at one time or another. These two sources call this group the Concealment Operations Committee and state that it first met in May 1991. The Iraq Survey Group, however, lists a Committee of Special Duties, under the direction of Qusay or Hussein Kamal Hassan, as being established in the summer of 1991. United Nations Security Council, *Letter Dated 25 January 1999 from the Executive Chairman of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Security Council Resolution 687 (1991) Addressed to the President of the Security Council*, Doc. S/1999/94, January 29, 1999, Annex D, paras. 2 and 32; Al-Marashi, “How Iraq Conceals and Obtains Its Weapons of Mass Destruction,” 52; “Regime Strategy and WMD Timeline Events,” in *Comprehensive Report of the Special Advisor to the DCI on Iraq’s WMD*, vol. 1, 4.

105. Saddam’s statement, excerpted from a transcript of videotapes found in Iraq after the 2003 war, was apparently filmed after the 1991 Gulf War. Lisa Myers, “Saddam Talked of WMD Attack in U.S.: Tapes Show Him ‘Almost Obsessed’ with Weapons, Don’t Prove He Had Them,” NBC News, February 15, 2006, <http://www.msnbc.msn.com/id/11373537/>.

106. Operational control for concealment activities rested with both the presidential secretary and the Special Security Organization, or SSO, which also helped clear sites of important weapons equipment and materials. UNSCOM discovered that a secret entity called the Apparatus of Special Security, which oversaw Saddam’s internal security agencies—the Special Republican Guard, the Special Presidential Guard Units, the SSO—also had a role in steering these entities to obscure Iraq’s prohibited weapons programs. Al-Marashi, “How Iraq Conceals and Obtains Its Weapons of Mass Destruction,” 52, 55–57. Placing overall operational control with the SSO, UN Doc. S/1999/94, Annex D, para. 19. Also on the overall structure of Iraq’s security apparatus, see Sean Boyne, “Inside Iraq’s Security Network: Part I,” *Jane’s Intelligence Review* 9, no. 1 (July 1, 1997): 312–317. On the role of the SSO and Iraqi intelligence, “Regime Strategic Intent,” *Comprehensive Report of the Special Advisor to the DCI on Iraq’s WMD*, vol. 1, 57–58, Annexes B, C, D. Saddam’s son Qusay had the reins of this agency. In 1994, Israel passed UNSCOM information about the existence of this secret entity. Barton Gellman, “A Futile Game of Hide and Seek,” *Washington Post*, October 11, 1998, A1. See also Sean Boyne, “Saddam’s Shield: The Role of the Special Republican Guard,” *Jane’s Intelligence Review* 11, no. 1 (January 1999): 29–32. UNSCOM also found that the Military Industrial Commission was heavily involved in activities to hide prohibited weapons capabilities. UN Doc. S/1999/94, Annex D, para. 19. The Emergency Forces, which was the military unit of General Security and of the Special Republican Guard, provided security for weapons facilities. The Guard, formed in 1991 after a pair of assassination attempts on Saddam, was also responsible for securing Iraq’s chemical and biological missile warheads and for transporting and concealing key equipment and materials. Al-Marashi, “How Iraq Conceals and Obtains Its Weapons of Mass Destruction,” 56, 58, 60. On transportation of equipment, see UN Doc. S/1999/94, Annex D, paras. 13, 18. The General Military Intelligence Directorate also protected military installations and military industrial facilities. Al-Marashi, “How Iraq Conceals and Obtains Its Weapons of Mass Destruction,” 57. Also on Iraq’s internal security apparatus, Sean Boyne, “Inside Iraq’s Security Network: Part II,” *Jane’s Intelligence Review* 9, no. 8 (August 1997): 365–367. Saddam’s internal security apparatus began laying the groundwork for what UNSCOM would encounter after



Israel's 1981 air strike to disable Iraq's Osiraq nuclear reactor, approaching the U.S.S.R. for help. From 1982 to 1985, the KGB tutored Iraq in concealment methods. For instance, the KGB taught the Iraqis how to disguise activities to foil aerial and satellite reconnaissance and building decoy facilities. Iraq also gained considerable insight into the sources and methods of U.S. satellite and signals intelligence gathering capabilities when Washington shared intelligence with Iraq during the Iran-Iraq War. Al-Marashi, "How Iraq Conceals and Obtains Its Weapons of Mass Destruction," 57–58. Considering all of this, an UNSCOM chief inspector rated Iraqi intelligence as "really top notch, second to none except maybe Mossad." Former UNSCOM chief inspector, interview with author, August 18, 2005.

107. The Special Security Organization (SSO) often used refrigerated trucks for this task, moving items to secondary hide sites, presidential palaces, the basements of government buildings, or the homes of trusted individuals or personnel in the SSO and Special Republican Guard, which also had responsibility for these relocations. Al-Marashi, "How Iraq Conceals and Obtains Its Weapons of Mass Destruction," 53, 56–58.

108. Facilities laid and periodically updated their plans to move equipment, materials, and essential documents to a secondary site that the U.S. military would not target (such as mosques, hospitals, or schools) in advance of an inspection or air strike. One of the Russians working with UNSCOM once told Krikorian that the Iraqis learned their concealment strategy and skills from the Soviets. Krikorian, interview.

109. Some forgeries were rush jobs, but others were pretty sophisticated. Some inspectors jokingly referred to the fakes as "new instant antiques." Analysis of Iraqi documents revealed such forgery tip-offs as use of a paper different from the type typically employed by the organizations in question and ink that was too recent for the date on the documents. Barton, interview; Taylor, interview; Kraatz-Wadsack, interview.

110. The Iraqis gave very deliberate thought to what to forfeit in the beginning, realizing that some clues would give them away if they did not volunteer them to the inspectors. For their cover stories, the Iraqis also had to decide how much, if any, information to reveal to the inspectors initially; the individuals they would position as the leaders of their biological facilities; how to clean facilities and present their activities; and where key substitutes of personnel might enhance a cover story's credibility. For example, the Iraqis anticipated that UNSCOM would at least track down Iraq's orders for pathogens to the American Type Culture Collection. When Iraq gave the inspectors a collection of pathogens during the first biological inspection, a few of the seed culture vials were open, and the Iraqis geared their declaration to that. Chief Iraqi bioweaponeer Rihab Taha later told the inspectors that she rewrote by hand the research papers given to the first inspection team, trying to use words that could walk the line between defensive and offensive work. The complete version of nine of these documents was recovered at the Haidar chicken farm in 1995. "What this showed, aside from the offensive purposes of the research program, was that the Iraqis had thought about what they would declare from the very start." Kelly, interview. On the handover of the vials, UN Security Council, *Twenty-Second Quarterly Report on the Activities of the United Nations Monitoring, Verification and Inspection Commission in Accordance with Paragraph 12 of Security Council Resolution 1284 (1999)*, Doc. S/2005/545, August 30, 2005, Annex, para. 15. Iraq established two committees to make these critical calls and run operations to deceive the inspectors about the breadth, depth, and sophistication of its weapons programs. Four senior scientists from Iraq's weapons of mass destruction programs sat on the Administrative Security Committee, which counseled Saddam about what data to release. Out of Saddam's Presidential Office, the Higher Security Committee, possibly headed by Saddam himself or by his younger son, Qusay, ran the operational aspects of

the deception program Iraq eventually provided information about the structure and nature of its deception activities to UNSCOM. *Iraq's Weapons of Mass Destruction: The Assessment of the British Government* (London, September 2002), 36. Also, CIA, "Regime Strategic Intent," 47–48, 54, 56; CIA, "Biological Warfare," vol. 3, 13.

113. Iraq "sanitized" Salman Pak, for instance, just days before inspectors first examined the site. Trevan, *Saddam's Secrets*, 9. In August 1995, UNSCOM found a report titled "The al-Atheer Center for Development of Materials Production: Report of Achievements Accomplished from June 1, 1990 to June 7, 1991," detailing what was done to sanitize a nuclear facility before inspections. UN Doc. S/1999/94, Annex D, para. 15.

115. UNSCOM attributed the destruction decision to the high-level Concealment Operations Committee. Already forfeited to UNSCOM for destruction, the decision to destroy weapons unilaterally did not pertain to the bulk of Iraq's chemical arsenal. UN Doc. S/1999/94, Annex D, para. 4. See also paras. 5–6. An August 1995 letter from Hossam Amin to Saddam's son Qusay gives the summer of 1991 as the time frame for the destruction of Iraq's biological weapons. "Biological Warfare," in *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD*, vol. 3, 53. Police normally escorted the team, and at sites being inspected facility guards did so as well. Kelly, interview; Kraatz-Wadsack, interview; Spertzel, interview; Killip, interview.

116. Seasoned inspectors came to understand that when the Mukhabarat, Iraq's internal intelligence, escorted the team they would probably be obstructed, because these minders knew the history of the past bioweapons program and could more effectively fence with the inspectors. A team would normally have a police escort, but the inspectors came to understand that if the Iraqis assigned other minders and particularly senior counterintelligence personnel, the day was likely to be eventful. Kelly, interview; Kraatz-Wadsack, interview; Spertzel, interview; Killip, interview; Duelfer, *Hide and Seek*, 92–93. UNSCOM inspectors expected the Iraqis to tamper with or bug their vehicles and hotel rooms. If eavesdropping devices were not planted before their arrival, recalled bioweapons inspector Debra Krikorian, UNSCOM personnel often found an inoperable lamp or television, and the hotel sent a "repairman" who would plant a bug. At breakfast, inspectors found a microphone jammed inside a cereal box at their table. Perhaps due to ineptness or deliberate tradecraft intended to burden the inspectors psychologically, Iraqi surveillance was sometimes so obvious it was as if they wanted the inspectors to know their every move was monitored. Krikorian, interview. Also on the bugging, Duelfer, *Hide and Seek*, 94; Barton, *The Weapons Detective*, 72, 81. The Iraqis assembled dossiers on many inspectors and literally graded them from A to C on the basis of an inspector's leniency or harshness and level of sympathy to Iraq. These dossiers often included inspectors' technical background, personal data, and which sites individual inspectors went to most frequently, which the Iraqis used to help them project where inspection teams might go once they were notified of the identities of incoming UNSCOM personnel. In 1993, Amin matter-of-factly told a senior UNSCOM official that the NMD oversaw this systematic evaluation of inspectors. Some UNSCOM personnel believed the Iraqis were simply being professional by watching the inspectors carefully and assessing them. Former senior UNSCOM official, interview with author, August 30, 2005. An inspector graded "A" was sympathetic to Iraq; "B" indicated the inspector was tough but fair; and "C" meant the inspector was implacably anti-Iraq. After the 2003 Gulf War, the Iraq Survey Group found several grading lists, and although the inspectors' grades changed somewhat from list to list, inspectors from some countries were always graded A, while Americans were predominately graded C. Killip usually received a B or C. Some inspectors considered it a badge of honor when the Iraqis tagged them as unfair or too

harsh. Killip, interview; Sellstrom, interview; former senior UNSCOM official, interview with author, August 30, 2005.

117. In the category of juvenile harrassment, for example, the Iraqis trapped inspectors trying to reach UNSCOM's seventeenth floor operations office in the Sheraton Hotel in an elevator as they ran it up and down the building over a dozen times. Spertzel, interview; Kraatz-Wadsack, interview; Killip, interview. The minders cornered certain male inspectors to taunt them with crude remarks or try to tempt them to go to brothels. One burly minder frequently cornered an inspector with such remarks as, "You were just in that plant where there were a lot of pretty women. You like sex?" Former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, Washington, DC, February 21, 2006. On the offers about brothels, Spertzel, interview. In the Sheraton lobby, a hotel frequented by the inspectors, one of Saddam's omnipresent portraits was conveniently juxtaposed to a large image of a crucified dove, dripping blood and labeled "UN." Towle, *Enforced Disarmament*, 191. The minders arranged for inspectors lodged on the fourth floor to be spit on from the balconies overhead. In the wee hours of the night, female inspectors received multiple phone calls filled with English-language obscenities, while the men were treated to repeated calls with no one on the line, a tirade of expletives, or sounds of gunfire. The minders rifled through the inspectors' personal belongings, sometimes decorated their rooms with posters of Saddam, and trashed the rooms and the inspectors' vehicles. Spertzel, interview; Manley, interview; former UNSCOM chief inspector, interview with author, August 18, 2005; Kraatz-Wadsack, interview with author; former UNSCOM chief inspector, interview with author, January 31, 2006; former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, February 21, 2006. See also, Barton, *The Weapons Detective*, 72, 81. To illustrate the more intense psychological intimidation that the Iraqis practiced, team chief David Franz recounted that during his first biological mission in mid-March 1993, Amin, arguing that Iraqi universities were sacred, delayed him for three hours in a parking lot near the veterinary school at Baghdad University. Once the inspectors packed to leave, Hazim Ali, dean of the veterinary school and also the director of the Al Razi Institute, genially received the team. Franz was somewhat taken aback, however, when Ali calmly recited the publications off of his curriculum vitae. The minders made veiled threats against the families of some inspectors and placed bullying phone calls to their family members. David Franz (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, June 29, 2005. Also, Krikorian, interview; Spertzel, interview; former UNSCOM biological weapons inspector, interview with author, September 17, 2005. Comparing Iraq's stall tactics to those used against the allied inspectors disarming Germany after World War I, "The Germans invented ludicrous civilian uses for their flame-throwers and other weapons; the Iraqis suddenly discovered a high regard for academic freedom and protested that inspection of universities would infringe academic independence and upset the students." Towle, *Enforced Disarmament*, 190. See also 75–77, 191.

118. After UNSCOM 16, which resulted in the capture of Iraq's nuclear bomb blueprints, Deputy Prime Minister Tariq Aziz and other senior Iraqis screamed at Ekeus that his inspectors, held hostage for four days in a parking lot in the heat of summer, offended all Iraqi women by removing their shirts. Gallucci, interview. In another incident involving Ekeus, during a mid-February 1992 trip to Baghdad to ask for full, final, and complete declarations and Iraq's acceptance of the ongoing monitoring and verification terms, the Iraqis pushed a scheduled 3:00 P.M. meeting with Ekeus to noon the next day. Trevan, *Saddam's Secrets*, 13–15.

119. The minders assembled citizens, a “rent-a-crowd” as the UNSCOM inspectors called it, to surround, shout at, and physically jostle the inspectors near their hotels and at some inspection sites. Sometimes, these rent-a-crowds threw bottles and other objects. Even senior Iraqi officials got down and dirty with UNSCOM. Former UNSCOM chief inspector, interview with author, January 31, 2006; Manley, interview; Barton, *The Weapons Detective*, 72, 81. On demonstrations, harassment, and physical attacks, see also UN Security Council, *Fourth Report of the Executive Chairman of Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b)(i) of Security Council Resolution 687 (1991)*, Doc. S/24984, December 17, 1992, Appendix II. When UNSCOM Deputy Executive Chairman Robert Gallucci gave notice that a nuclear team would inspect a site the next day, a Friday, the deputy foreign minister reminded Gallucci that Fridays were religious holidays and made a veiled threat that “he would hate to have something happen to the inspectors that day.” Gallucci responded that UN Resolution 687 said nothing about foregoing inspections on religious holidays. The inspection proceeded, and the team ran into resistance. Gallucci, interview. Intelligence reports indicated attempts to poison Ekeus’s food during his trips to Iraq, and U.S. officials once notified that Iraq had dispatched assassins to New York to kill him. Notification of the inbound assassination team occurred on a Sunday evening in the 1995 to 1996 time frame. Ekeus informed UN security about the threat the next day, after which UN security installed a reinforced door at his home and assigned him a temporary security detail. Ekeus, interview. The Iraqis once told Ekeus they had arrested people in Iraq who tried to poison him. Apparently, the anti-coagulant drug warfarin was detected in food, but no one became ill. Sellstrom, interview; Spertzel, interview.

120. On UNSCOM’s first inspection of Salman Pak, the team’s explosive ordinance specialists encountered booby traps clearly set to slow, injure, or kill the inspectors. One bunker at the site contained a radioactive source, deliberately placed to pose a health hazard to the inspectors. The furious inspectors demanded an explanation but received only flaky answers, including from a special forces colonel who was clearly angry at having the blame pinned on him. Killip, interview. Also on the deliberate placement of these munitions and the radiation source, Spertzel, interview; Kelly, interview; former UNSCOM biological weapons inspector, interview with author, September 17, 2005. During a 1994 inspection of the Al Kindi Veterinary Vaccine Plant, Franz’s team wanted to inspect underground rooms where the technology being employed could also be used to make botulinum toxin, but as they approached these rooms, women situated just inside began mopping the floors with formalin, blocking access. The warm temperature and other artificial conditions in these rooms facilitated the growth of anaerobes, and the Iraqis said they were growing *Clostridium* species to make toxoid vaccines for goats and sheep. On their next visit to Al Kindi, the inspectors carried masks so they could safely enter even if the Iraqis staged another formalin mop job. Franz recalls worrying about the health of these women since the formalin vapors would have easily penetrated the cloth masks they were wearing. Franz, interview. The initial live fire incident occurred on June 28, 1991, when the Iraqis had blocked an IAEA/UNSCOM inspection team at Al Fallujah’s front gate. Team chief David Kay sent an inspector up a fifty-foot water tower, who subsequently spotted the departing transports. The Iraqis fired shots as the inspectors chased the transports with video cameras. Paul Lewis, “Iraqis Fire to Bar U.N. Inspectors; ‘We Can’t Allow This,’ Bush Says,” *New York Times*, June 29, 1991, A1; Gellman, “A Futile Game of Hide and Seek,” A1.

121. One of the early “lost key incidents” was at the Mosul Sugar Factory in November 1991, where the Iraqis insisted the keys to building 73, a large warehouse, were nowhere to be found. Inside, the inspectors discovered practically an entire chemical bomb factory labeled as “general purpose machinery.” The equipment was to make bomb casings and

carried the identification numbers of an equipment series from Al Muthanna. Barton, *The Weapons Detective*, 89–90.

122. “The Iraqis played games with us all of the time. Part of their concealment games was to bait-and-switch us, to lead us away from what they didn’t want us to see, but sometimes they were just screwing with us.” Kadlec, interview. The Iraqis directed their misbehavior mostly at the nuclear inspectors in 1991 and 1992 and their biological counterparts from 1995 onward, whereas the chemical and missile teams fared better. Kraatz-Wadsack, interview; former UNSCOM chief inspector, interview with author, January 31, 2006.

123. The job of spying on UNSCOM fell to the Mukhabarat and the General Intelligence Agency, and the SSO. The Technical Research Center of the Ministry of Industry and Military Industrialization also had signals intelligence collection capabilities. The Fourth Directorate of General Intelligence interpreted the data from Al Hadi, which had five collection stations on Iraqi soil and operated on an around-the-clock basis. Al-Marashi, “How Iraq Conceals and Obtains Its Weapons of Mass Destruction,” 58, 60; Duelfer, *Hide and Seek*, 92–93; UN Doc. S/1999/94, Annex D, para. 32. UNSCOM learned in 1996 that a former Iraqi policeman was in charge of the cleaning crew for the UN’s thirtieth floor, which housed Ekeus and his inspectors. Plus, an Iraqi national worked in the American Express office that processed all UN travel arrangements, including for UNSCOM inspections. Plus, Iraqi defector Hassan Kamal asserted that Iraq had paid the salary of Ekeus’s personal interpreter. The Iraqi embassy invited the cleaning crew chief to receptions celebrating Iraqi National Day, an indicator that he may have maintained ties to Saddam’s regime. Confirmation of the infiltration came during a 1996 inspection in Iraq when Al Sa’adi repeated a specific phrase used to brief Ekeus and others in UNSCOM’s thirtieth floor conference room a couple of days earlier. Former UNSCOM staff member, interview with author, September 2, 2005; Spertzel, interview. Also on the Iraqi cleaner in headquarters, former UNSCOM chief biological weapons inspector, interview with author, August 28, 2005; Gellman, “A Futile Game of Hide and Seek,” A1. On Kamal’s assertion that Iraq had paid the salary of Ekeus’s personal interpreter, Duelfer, *Hide and Seek*, 113, 119. UNSCOM inspectors assumed that Iraq tapped the telephones in their offices in Baghdad. UNSCOM confirmed Iraq’s eavesdropping on its Baghdad Monitoring and Verification Center when inspectors found an Iraqi listening post a dozen feet away from the Canal Hotel. One Iraqi cleaned UNSCOM’s Baghdad office, and another served as a driver, though not during inspections. Iraq also tried to infiltrate UNSCOM’s operational staging in Bahrain. Former UNSCOM staff member, interview with author, September 2, 2005; Spertzel, interview; former UNSCOM chief biological weapons inspector, interview with author, August 28, 2005.

124. To begin with, UNSCOM restricted the number of people who knew sensitive data in the first place and stored sensitive data in safes. UNSCOM was required to give Iraq advance notice of seven days of an incoming inspection team, but only named the chief inspector and otherwise gave the number of inspectors. This notice did not include inspection target(s), and, in later years, did not identify the type of inspection. Spertzel, interview; former senior UNSCOM official, interview with author, August 30, 2005; former UNSCOM chief biological weapons inspector, interview with author, August 28, 2005. Having caught personnel from nations considered “friendly” to Iraq passing sensitive operational data to their home governments, UNSCOM took extra safeguards with its most sensitive data. Inspection team chiefs had leeway about how much they told their teams and when. UNSCOM’s Capable Sites/Concealment Investigation unit compartmentalized its data and generated requests for missions they never intended to launch. The real mission requests were kept in a separate file marked “No French” due to the fact that French personnel working with UNSCOM had openly

copied internal documents and divulged information about UNSCOM operations to the French government. This type of problem was not restricted to France. One part of UNSCOM, the Capable Sites/Concealment Investigation unit, compartmentalized its data and generated requests for missions they never intended to launch. The real mission requests were kept in a separate file marked “No French,” due to the fact that French personnel working with UNSCOM had openly copied internal documents and divulged information about UNSCOM operations to the French government. This type of problem was not restricted to France. Gellman, “A Futile Game of Hide and Seek,” A1. In Bahrain, some of the team chiefs had inspectors practice necessary procedures without telling them the inspection targets. In Baghdad, team chiefs and operations officers withheld the identification of inspection targets until the last possible moment and also carefully plotted their routes to keep Iraqi minders guessing as long as possible. Some chief inspectors took such precautions out of concern that their teams had inspectors from nations friendly to Iraq, others so that inspectors would not inadvertently slip and reveal sensitive data to nearby minders or in conversations with other inspectors susceptible to electronic eavesdropping. Taylor, interview; Kelly, interview; Jeff Mohr, PhD (former UNSCOM chief biological weapons inspector), interview with author via telephone, June 27, 2005; former UNSCOM chief biological weapons inspector, interview with author, August 28, 2005. Confirming that some inspectors were not informed of inspection targets until the last moment, Ekeus, interview. UNSCOM instructed inspectors not to discuss any sensitive data or mission plans in the office, unless they were inside the conference rooms in New York and Baghdad that were periodically swept for bugs. Former UNSCOM chief biological weapons inspector, interview with author, August 28, 2005; former senior UNSCOM official, interview with author, August 30, 2005; Spertzel, interview. Some inspectors made deliberately inaccurate statements over phone lines they knew to be bugged to attempt to mislead the Iraqis. Duelfer, *Hide and Seek*, 94. <sup>In the conference rooms</sup>, staffers often wrote sensitive data on paper or an eraser board as extra precautions. To discuss extra sensitive matters, they walked the streets of Manhattan, met in restaurants, or chatted quietly in the UN’s cavernous General Assembly hall, cafeteria, or other meeting areas where the din of general conversation covered their words. A 1997 mission to find scientists at Iraqi universities with possible ties to the bioweapons program was planned on the back of a napkin during lunch at a Thai restaurant in Manhattan, with the napkin destroyed afterwards. This inspection, described in Chapter 7, took place in 1997. Kraatz-Wadsack, interview. Also on these precautions, former senior UNSCOM official, interview with author, August 30, 2005; Spertzel, interview; Taylor, interview. UNSCOM’s Baghdad office observed similar practices, and in Bahrain, inspectors went to Gateway, a secure facility inside the U.S. compound, for sensitive discussions. Ekeus, interview; Spertzel, interview; Taylor, interview. The handful of key UNSCOM staffers involved in mission planning used code (such as numbers or letters) to designate sites in Iraq. For long-distance communications UNSCOM used secure phones and faxes and changed the encryption keys weekly. Situation reports from the field contained the facts and little analysis. Chiefs sent truly sensitive material by an encrypted laptop computer in Iraq that linked to another encrypted laptop kept in a safe in Ekeus’s UN office. Kraatz-Wadsack, interview. Also on these precautions, former senior UNSCOM official, interview with author, August 30, 2005; Spertzel, interview; Taylor, interview.

125. One UNSCOM senior official compared the UNSCOM-Iraq situation to the American-Soviet spy games in which spies passed some information from side to side but it all evened out and did not significantly influence the overall Cold War.

If UNSCOM was going to Al Hakam to investigate growth media, well, the growth media was still there. The Iraqis knew they had two

dozen facilities that were really important to them that we were trying to learn more about. They would protect those facilities regardless of when and what UNSCOM was doing. Penetration was a matter of fact, not a matter of judgment. In the big picture, so what? Penetration did not prevent UNSCOM from discovering their weapons.

This individual compared the UNSCOM situation to the spy games that the United States and the USSR used to play, as follows. America caught a mole or a Soviet spy, and to signal its outrage declared some Soviet officials *persona non grata*, which resulted in the retaliatory booting of American personnel from Moscow. A couple of years later, the situation reversed. Former senior UNSCOM official, interview with author, August 30, 2005. Moreover, the aims of Iraq's spying might have been misunderstood. One UNSCOM staffer deduced that the purpose of Iraq's monitoring "was not about whether we were conducting an inspection tomorrow but about whether UNSCOM was spying on Saddam. That is why they were listening to us. . . . Think about it, did it really matter to them whether UNSCOM went to Fudhaliyah 1 or Fudhaliyah 2 or wherever the next day?" Former UNSCOM staff member, interview with author, September 2, 2005.

128. The Iraqis privately told UNSCOM inspectors and later declared that Baghdad had serious concerns that Iran, Israel, or even the United States would attack Iraq in its weakened conventional military state and therefore mistakenly thought it was necessary to maintain unconventional weapons. Killip, interview; Spertzel, interview; Huxsoll, interview; Kraatz-Wadsack, interview. On Deputy Prime Minister Tariq Aziz stating this viewpoint to Ekeus, Trevan, *Saddam's Secrets*, 36–37. On Saddam's role in Iraq's unconventional weapons programs, "Regime Strategic Intent," *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD*, vol. 1, 11–12; 4–44; 52–62, Annex D; CIA, *Addendum to the Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD* (Washington, DC, March 2005), Annex C, 27–42.

129. "It was very important for him to project that because that was what kept him, in his mind, in power," said the FBI agent who saw Saddam daily from his capture until his execution. "That capability kept the Iranians away, it kept them from reinvading Iraq." George Piro, interviewed by Scott Pelley, "Iraq War: Saddam's View," 60 Minutes, CBS News Division, March 18, 2008. For the inside story of Piro's interrogation of Saddam and the insights gleaned about the Iraqi leader, Duelfer, *Hide and Seek*, 392–412.

130. "One can debate the military difference poison gas made in the Iran-Iraq War, but politically it created tremendous pressure on the Iranians," said Ekeus. "The lesson the Iraqis learned during the Iran-Iraq War was to use chemicals." Ekeus, interview. Also on these points, Mark Phythian, "UNSCOM in the Time of Cholera: The Continuing Lessons and Arms Control Implications of the UNSCOM Experience," *World Affairs* 163, no. 2 (Fall 2000): 62–64.

131. "Saddam made explicit . . . that he was at times deliberately ambiguous about his WMD capabilities. . . . Many of Saddam's own senior military and civilian leaders were uncertain about whether Iraq secretly possessed WMD before the [2003] war." Duelfer, *Hide and Seek*, 405. Also, pages 167, 400–401. The inspectors having already fished the missile gyroscopes from the Tigris River and uncovered calutrons buried in the desert, the Iraqis fretted that they would find Saddam's bioweapons stash. So, to hedge their bets and avoid being blamed if their suspicions turned out to be true, the Iraqis stacked up falsehoods about what happened to the biological weaponry. Kraatz-Wadsack, interview; former senior UNSCOM official, interview with author, August 30, 2005. Also, Vladimir Orlov and William C. Potter, "The

Mystery of the Sunken Gyros," *Bulletin of the Atomic Scientists* 54, no. 6 (November-December 1998): 34–36.

132. For more on Saddam, Shiva Bhalagi, *Saddam Hussein: A Biography* (Westport, CT: Greenwood Press, 2005); Said K. Aburish, *Saddam Hussein: The Politics of Revenge* (New York: Bloomsbury, 1999).

133. Iraq provided many documents to the inspectors voluntarily, inadvertently, and under duress, in the latter instance most notably the huge cache of records at the Haidar farm in mid-August 1995. However, Iraq never turned over the essential compilation of documents necessary to restart its various weapons programs. In June 1997, Ekeus stated that Saddam kept the weapons because they gave him "this sweet, wonderful, fantastic power, and that is why Iraq won't give them up." Barton Gellman, "A Futile Game of Hide and Seek," A1. See also, Duelfer, *Hide and Seek*, 22, 386, 394, 400–408.

134. Agreeing on this point and noting that if doors had to be broken down, the inspectors had the Iraqis, who were obligated to provide immediate and unconditional access, do it: "Some UNSCOM chiefs gave access rights away, taking the Iraqis' word for what was behind a locked door when they claimed they couldn't find the key. A chief should insist the door be opened. Nothing should be taken at face value; an inspector's job is to confirm." Kraatz-Wadsack, interview.

137. By 1924 Inter-Allied Military Control Commission inspectors had eliminated 40,000 tons of German powder, 50,000 field guns, 4.5 million rifles, and 80 of 7,000 factories assessed for their potential to make weapons. Under the auspices of the Allied Control Council, from 1945 to 1947 the United Kingdom reported destroying 1,866 German tanks, France 250, the U.S.S.R. 5,730, and the United States 2,016. By 1947, Allies had also destroyed a combined 10,361 German aircraft, 331 warships, and 389 submarines. Details of these activities were available, for example, in the monthly Disarmament Progress Reports of the British Army of the Rhine and in cables to the Foreign Office. According to accepted practice at the time, German chemical weapons were mostly loaded onto ships and dumped into the sea. The occupying forces also destroyed military infrastructure (for example, airfields) and ancillary military equipment. The British, French, Soviet, and Americans employed somewhat different disarmament practices, and their decisions about whether to reduce certain industrial plants to rubble or allow them to be converted to civilian production to avert further economic hardship show that the implementers of the Versailles Treaty and the Potsdam agreement struggled with some of the same humanitarian and political pressures that UNSCOM would later face. Towle, *Enforced Disarmament*, 66–93, 152–168.

138. The 1986 Stockholm Agreement on Confidence- and Security-Building Measures and Disarmament in Europe provided for advance notification of Warsaw Pact and North Atlantic Treaty Organization military exercises and for their observation. See, U.S. Arms Control and Disarmament Agency, *Arms Control and Disarmament Agreements: Texts and Histories of the Negotiations* (Washington, DC, 1996), 234–247; Don O. Stovall, "The Stockholm Accord: On-Site Inspections in Eastern and Western Europe," in *Arms Control Verification and the New Role of On-Site Inspection*, ed. Lewis A. Dunn and Amy E. Gordon (Lexington, MA: Lexington Books, 1990), 15–38. In addition, Joseph P. Harahan, *On-Site Inspections Under the INF Treaty, A History of the On-Site Inspection Agency and Treaty Implementation, 1988–1991* (Washington, DC: U.S. Government Printing Office, 1993); Joseph P. Harahan and John C. Kuhn, III, *On-Site Inspections Under the CFE Treaty, A History of the On-Site Inspection Agency and CFE Treaty Implementation, 1990–1996* (Washington, DC: U.S. Department of Defense, 1996).



139. British and U.S. inspectors went to four former Soviet biological institutes in the early 1990s as part of a trilateral Washington-London-Moscow process to ascertain the closure of the former Soviet bioweapons program, with the first such visits taking place in January 1991. Though Soviet authorities limited access to certain parts of the sites visited, U.S. and British inspectors observed strong indications that the Soviets were using purportedly civilian sites for military purposes. Additional visits to Russian sites took place in 1993 and 1994. Kelly, "The Trilateral Agreement: Lessons for Biological Weapons Verification," 93–109; Hoffman, *The Dead Hand*, 345–357, 431–437, 460; Jonathan B. Tucker, "Verification of the Chemical Weapons Convention and Their Relevance to the Biological Weapons Convention," in *Biological Weapons Proliferation: Reasons for Concern, Courses of Action*, ed. Amy E. Smithson, report no. 24 (Washington, DC: Stimson Center, January 1998), 77–105; Jez Littlewood, *The Biological Weapons Convention: A Revolution Failed* (Aldershot, U.K.: Ashgate Publishing, 2005). Also, guest articles and news summaries in *The CBW Conventions Bulletin* at <http://www.sussex.ac.uk/Units/spru/hsp/pdfbulletin.html>.

140. A challenge inspection is based on a suspicion of noncompliance and carried out at any location on a state's territory, at any time, with no right of refusal. In addition to no-notice inspections and extensive interviewing of individuals connected with activities of concern, UNSCOM innovations included the use of aerial surveillance in coordination with on-site inspection activities, document reviews, on-site sampling and forensic analysis at laboratories abroad, and the employment of equipment such as ground-penetrating radars. Black, "UNSCOM and the Iraqi Biological Weapons Program: Technical Success, Political Failure," 304. Also, Gabriele Kraatz-Wadsack, "The Role of Scientists in Verification," in *Assessing the Threat of Weapons of Mass Destruction: The Role of Independent Scientists*, vol. 61, ed. John L. Finney and Ivo Slaus, (NATO Science for Peace and Security Series E: Human and Societal Dynamics) (Amsterdam: IOS Press, 2010), 43–54.

141. Then Vice-President George H. W. Bush introduced the concept of challenge inspections in 1984, but this novel approach was not widely accepted until 1991. See United Nations, *Conference on Disarmament, Draft Text of the Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on Their Destruction*, Document CD/500, Geneva: 1984): 7–8, 10; Amy E. Smithson, "Chemical Inspectors: On the Outside Looking In?" *Bulletin of the Atomic Scientists* 47, no. 8 (October 1991): 22–25.

142. "This evaluation process was particularly important for the biological program, which did not hinge on vast quantities of hardware but rather the effort of the program and its infrastructure." Killip, interview.

143. The inspectors asked for such data as the import records for the R-400 bomb casings and the test statistics and usage documentation for the R-400s. Killip placed the decision to initiate mass balance accounting during UNSCOM 17/CW5 (October 6 to November 9, 1991) or UNSCOM 20/CW6 (October 22 to November 2, 1991). Killip, interview. Also, Black, interview; former senior UNSCOM official, interview with author, August 30, 2005.

144. A common definition for the standard of verification is "Adequate and effective verification arrangement must be capable of providing, in a timely fashion, clear and convincing evidence of compliance or non-compliance. . . . Verification of arms control and disarmament agreements is the process of gathering, compiling and interpreting information to permit a judgment to be made about whether each party is fulfilling its undertakings." Kraatz-Wadsack, "The Role of Scientists in Verification," 43–44.

## Chapter 2

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2. Seconding this due diligence factor: “The rationale for BW1 was to go to the places that were on the Western intelligence suspect sites list, like Salman Pak. I recall intelligence saying that they had these mysterious pits at Salman Pak, and it was possible that munitions could have been buried there.” Doug Englund (former UNSCOM chief inspector), interview with author, Washington, DC, December 5, 2005.

3. The purpose of the trilateral inspections between the Soviet Union, the United Kingdom, and the United States was to ascertain if the U.S.S.R.’s biological facilities were engaged in weapons work. David C. Kelly, “The Trilateral Agreement: Lessons for Biological Weapons Verification,” in *Verification Yearbook 2002*, ed. Trevor Findlay and Oliver Meier (London: Verification, Inspection, and Training Centre, 2002), 93–109; David E. Hoffman, *The Dead Hand: The Untold Story of the Cold War Arms Race and Its Dangerous Legacy* (New York: Doubleday, 2009), 431–438.

6. Kelly described his interview technique as “to go in hard, but to be courteous. I remind my interviewees of the seriousness of the UN mission, I explain my role, I treat people with respect and dignity, a little bit of humour, and no threat. I’ve done six-hour interviews, with very short coffee breaks, where I thought people were holding back; [I do] nothing nasty, but they tell me I am rather persistent.” Tom Mangold and Jeff Goldberg, *Plague Wars* (New York: St. Martin’s Press, 1999), 309.

7. The questionnaire, sent to Iraq before the BW1 mission, posed simple questions, such as about the size and location of the fermenters in Iraq. David Kelly, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, December 17, 2002. Tim Trevan, *Saddam’s Secrets: The Hunt for Saddam’s Hidden Weapons* (London: HarperCollins Publishers, 1999), 27, 29.

8. UNSCOM’s operations director, Derek Boothby, was serving simultaneously as its press officer and sent out a press announcement a week before Kelly’s team arrived, as he had done for preceding UNSCOM teams. Trevan, *Saddam’s Secrets*, 24–25. The element of surprise gone, Kelly gave a press interview as the team arrived in Baghdad, stating that he had “an open mind” and UNSCOM had “no indication that they possess such weapons.” Walter Putnam, “Biological Weapons Inspection Team Begins Work in Iraq,” Associated Press, August 3, 1991.

9. Mr. Hossam Mohammad Amin, Dr. Hazem Mohammad Ali, Mr. Jazzen Ahmad Hassam, and Dr. Imad Yassin were also at the airport to welcome the team. UNSCOM, *Draft Report on the First Biological Warfare Inspection in Iraq* (New York, n.d.), 12.

12. Amin was Iraq’s chief interlocutor with UNSCOM and the International Atomic Energy Agency. At this juncture, he headed the National Monitoring Section, which tapped other Iraqi bureaucracies for escorts and logistical assistance for the early inspection teams. After Iraq finally accepted UNSCOM’s plan for ongoing monitoring and verification in November 1993, Iraq established the National Monitoring Directorate (NMD), which eventually had ten departments, one for each category of prohibited weaponry (ballistic missile, nuclear, chemical, biological) as well as for imports and exports, operations, sensors and photography, documentation and information, studies, and follow-up activities. The NMD established an import-export department in 1996, by which point the NMD had its own shadow bureaucracy. To increase his control and create uncertainty, Saddam Hussein gave duplicate assignments to many Iraqi organizations. Watching over the NMD, the Special Security Committee of the National Security Council had a staff of two thousand to monitor inspectors, to coordinate the illicit movement of equipment, materials, and documents important to revive Iraq’s weapons programs, and to

procure additional equipment toward that end. Ibrahim al-Marashi, "How Iraq Conceals and Obtains Its Weapons of Mass Destruction," *Middle East Review of International Affairs* 7, no. 1 (March 2003): 55; GlobalSecurity.org, "National Monitoring Directorate," <http://www.globalsecurity.org/wmd/world/iraq/nmd.htm>.

15. Iraq stated that it used mice, guinea pigs, and rabbits as test animals, but "categorically denied" testing with primates. Inhalational tests were conducted with botulinum toxin. The route of exposure in an LD<sub>50</sub> test of a liquid agent is through the skin. The Iraqis had to have an aerosolization chamber to generate test data to back up their LD<sub>50</sub> numbers, and Taha's team would have had to run various tests to see how far they could dilute the agents and still kill their test animals. David Huxsoll, DVM (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, June 21, 2005. An LD<sub>50</sub> test is conducted within a fixed period of time. The lower the LD<sub>50</sub>, the more toxic the agent being tested.

18. On the first night of the inspection, Amin intelligently and deliberately tried to take shelter in the research that the bioweapons treaty allows. Huxsoll, interview.

19. "From that point on, I knew—there was no question in my mind—that they had admitted that Iraq had an offensive program." Huxsoll noted that a fair number of the inspectors had never worked in a defensive biological facility, much less had real concepts of an offensive bioweapons program, and this played a role in the team's split about whether the Iraqis admitted an offensive program that first night. Huxsoll, interview.

22. For almost everyone on the team, this questionnaire response was the first they had heard of Al Hakam. Actually, the "Al Hukm" plant was first mentioned in Iraq's declaration of May 22 and again in its declaration of July 18. In both instances, Iraq described Al Hakam as a fermenter repair facility. See Letter from Abdul Amir A. Al-Anbari, Permanent Representative of Iraq to the UN, to Rolf Ekeus, Executive Chairman of the Security Council Special Commission, letter no. 117 (New York, Permanent Mission of Iraq to the UN, dated May 22, 1991, stamped received, UN Office of the Special Commission, May 24, 1991); Letter from Abdul Amir A. Al-Anbari to Rolf Ekeus, letter no. 1/7/230 (New York, Permanent Mission of Iraq to the UN, dated July 18, 1991).

26. For example, the forensic science building and the chemical laboratory had guard posts, and the latter had fixed defensive positions (for example, foxholes). Kelly, interview; Huxsoll, interview. Dr. David Kelly was a principal author of the British paper on the lessons from the first UNSCOM inspections in Iraq, Government of the United Kingdom, "UN Special Commission BW Inspections in Iraq: Lessons for the Ad Hoc Experts' Group on Verification," BWC/CONF-III/VEREX-WP5 (White Paper presented during Third Review Conference of the Parties to the BWC, Geneva, UN, March 30–April 10, 1992). Foreign ministry official, interview with author, London, August 17, 2005.

28. Military planners wanted to use anti-personnel munitions (such as gator mines) to keep the Iraqis away from the bunkers. Robert Kadlec, MD (former UNSCOM biological weapons inspector), interview with author, Washington, DC, February 23, 2006. Situated in a loop of the Tigris River, the other Iraqi military installations at Salman Pak included army bunkers at the end of the peninsula and what the Iraqis termed an anti-terrorist training camp, complete with a double-deck bus, a train, the fuselage of a commercial airliner, a village, and a fairly high-technology obstacle course to train Baghdad's police, firefighters, and special forces to handle riots, hijackings, and other terrorist activities. The Forensic Department of the Center for Technical Research had major electronics research facilities among its thirty or so buildings. Also, a lavish safe house for senior Iraqi officials with a separate entrance road and beautiful view of the river was located mid-way down the peninsula with a beautiful river view. The Al

Rasheed Hotel ran this safe house. Huxsoll, interview; Hamish Killip (former UNSCOM chief biological weapons inspector), interview with author, Isle of Man, August 22, 2005; Kelly, interview; William Lebherz (former UNSCOM industrial biotechnology expert), interview with author, Washington, DC, February 13, 2006; UNSCOM, *Draft Report on the First Biological Warfare Inspection in Iraq*, 17.

29. The extra security measures would help restrict the number of Iraqi personnel who knew about the biological work. Jeff Mohr, PhD (former UNSCOM chief biological weapons inspector), telephone interview with author, June 27, 2005; Killip, interview.

30. The inspectors found no evidence to indicate that the drones were a biological delivery system. UNSCOM, *Draft Report on the First Biological Warfare Inspection in Iraq*, 18–19.

31. The research institute's full name was the Al Hazen Ibn-al Haytham Institute. Killip, interview; Charles Duelfer (former UNSCOM deputy executive chairman), interview with author, Washington, DC, November 15, 2007; "Draft Report on the First Biological Warfare Inspection in Iraq," 18. For more on the linkage of the Iraqi intelligence services to biological weapons activities, Central Intelligence Agency (CIA), *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD* (Washington, DC, September 30, 2004): "Regime Strategic Intent," vol. 1, Annex B, 6, 9 and "Biological Warfare," vol. 3, pp. 5–8, 16–17, 57.

32. Clean and dirty corridors exist primarily to safeguard the integrity of the test animals, with food and bedding brought in via the clean corridor and waste materials taken out through the dirty corridor. Huxsoll, interview.

33. The term *turnkey* indicated a facility built with the intention of turning it over to someone else to operate. Thyssen Rheinstahl Technology employees said they set up equipment in 1980–81 to make ordinary chemicals and that they saw nothing unusual. They attempted to win a contract from the Iraqis to install a ventilation system in the animal house. The Germans noticed indicators that the Iraqis wanted to restrict access to their work in this facility: (1) the entrance to the chemical laboratory was controlled by magnetic security; (2) the German workers were constantly watched while they were on site, sometimes not allowed to enter the laboratory; and (3) the laboratory had guards, a double electric fence, watch towers, and missile and gun positions. Rudolf Lambrecht and Gudrun Pott, "'Diyala' Secret Project," *Stern* (Hamburg), February 7, 1991 (translated in Doc. FBIS-WEU-91-032-A, Washington, DC, Federal Broadcast Information Service, February 15, 1991), 8–9.

34. The storeroom could maintain a temperature of 39.2 degrees Fahrenheit. The Iraqis said this facility was to store chemicals, but the inspectors concluded it lacked "essential features" for chemical storage. UNSCOM, Chief Inspector D. C. Kelly, *Report on the First Biological Warfare Inspection in Iraq: UNSCOM 7* (New York, August 16, 1991), para. 18.

35. The main biological forensics building also included an "ink analysis laboratory, which the Iraqis said worked with falsified manuscripts. The other outlying structures included a storage building for animal cages and an animal holding room. The Iraqis provided two drawings of this building that were incorrect. They tried to insist it was a one-story structure, but it appears to have consisted of two stories. The animal rooms had 100 percent fresh air, and the exhaust ducts had ultraviolet germicidal lamps. UNSCOM, *Draft Report on the First Biological Warfare Inspection in Iraq*, 22–26. Sampling quote from page 24. On the demolition of the buildings and the presence of the bulldozers, former UNSCOM biological weapons inspector, interview with author, September 17, 2005.

37. The public name for the biological branch of the Al Hazen Ibn-al Haythem Institute was the Center for Medical Agriculture, not the Ibn-Sina Center. The containment level for this laboratory, which included a change and shower area, would have been roughly biosafety level

3. The Iraqis had parked all of the equipment outdoors, which complicated the inspectors' efforts to determine the laboratory's past activities. The Iraqis also insisted that the program dated to the mid-1980s and their only work was done in the Forensic Biology Buildings. Kelly, interview; Richard Spertzel, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, July 1, 2005. On the Iraqi policy of removing important equipment from key weapons facilities to protect assets prior to the war, Kadlec, interview. Dr. Amir Al Sa'adi, unsatisfied with the progress toward weaponization of biological agents that the Ibn-Sina Center's researchers made, ordered the center's closure in mid-January 1979. For more on Al Hazen and its biological weapons work, CIA, *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD*, vol. 3, 6 and Annex C of the March 2005 *Addendum to the Comprehensive Report*, 28; Graham S. Pearson, "The Iraqi Biological Weapons Program," in *Deadly Cultures: Biological Weapons Since 1945*, ed. Mark Wheelis, Lajos Rozsa, and Malcolm Dando (Cambridge, MA: Harvard University Press, 2004), 171–172.

38. "Bull," said an inspector who noted that a colleague later saw this same doctor administering emergency medical aid to an Iraqi at Al Muthanna who was seizing from exposure to the contents of a leaking chemical munition. Former UNSCOM biological weapons inspector, interview with author, September 17, 2005.

39. This approach differed distinctly from what UNSCOM inspectors did on their first inspection at Al Muthanna, where conservative operational protocol discouraged interviews or much discussion with Iraqi officials. On the line-up for these interviews, Kelly, interview; Killip, interview. Kelly spoke with representatives from the Ministry of Health and the Ministry of Agriculture about microbiological research activities, specifically research involving pathogens. Iraqi Foreign Ministry spokesman remarks (translated in Doc. FBIS-NES-1991, Washington, DC, Federal Broadcast Information Service, August 4, 1991), 35–36; United Nations, "UN Inspection Team on Iraq's Biological Weapons Capacity, Finds No Evidence of Current Stocks," Press Release, Doc. IK/46, August 14, 1991. These ministries were responsible for the laboratories needed to identify and address public health concerns and possible problems for Iraq's agricultural sector. Therefore, it would be appropriate for them to be working with microorganisms that posed an endemic threat to the health and well-being of people, livestock, and crops.

40. Kelly felt somewhat sorry for Taha, as she was asked so many questions over the course of five days. Kelly, interview.

41. Two other simulants were among the seed cultures that Taha later gave Kelly, *Bacillus cereus* and *Bacillus megaterium*. UN Security Council, *First Report of the Executive Chairman of UNSCOM Under Resolution 687*, Doc. S/23165, October 25, 1991, Appendix IV, para. 26.

44. These reports, marked classified and published at Salman Pak, were (1) "Growth and production of Botulinal toxin by *Cl. botulinum*, and its effects on lab animals"; (2) "Lab scale production of Botulinal toxin"; (3) "Effects of ecological condition on the activity (toxicity) of Botulinal toxin in Iraq"; (4) "Effects of preservation under different condition on toxicity of Botulinal toxin in Iraq"; (5) "Morphological and biochemical studies of four strains of *B. anthracis*"; (6) "Growth and sporulation in genus *Bacillus*"; (7) "Studies on pathogenicity of *B. anthracis* in lab animals"; (9) "Biochemical and physiological properties of *Cl. Perfringens* isolates"; (10) "Growth and sporulation and pathogenicity of *Cl. Perfringens* isolates." [Misspelling of report titles in the original.] "List of Biological Research and Reports Handed Over to the First Biological Inspection (sic) Team," in Republic of Iraq, *A Full, Final and Comprehensive Report on {Biological Activity}*, May 1992, 15.

45. For instance, in a scientific, academic, business, or military organization “the proper way of communicating that information” to the authorities responsible for a promotion would be to have clear designation of the recipient(s), the sender, a subject line indicating the purpose of the paper, and a date of transmittal. Kelly, interview. Also on the provision of these documents to the inspectors, Killip, interview; former UNSCOM biological weapons inspector, interview with author, September 17, 2005; Huxsoll, interview; foreign ministry official, interview with author, London, August 17, 2005. On the Ministry of Industry and Military Industrialization’s oversight of this research, *Report on the First Biological Warfare Inspection in Iraq: UNSCOM 7*, para. 6.

47. The Iraqis told the inspectors that they had little contact with foreign scientists or even with other Iraqi scientists. Huxsoll, interview; *Draft Report on the First Biological Warfare Inspection in Iraq*, 29.

50. “No scientific or technical objectives were ever stated for the research undertaken on Biological Warfare agents other than the fact that it was to familiarize and train staff (particularly in fermentation technology). It was stated that it was ‘more important to train than economise.’” *Report on the First Biological Warfare Inspection in Iraq: UNSCOM 7*, para. 11. Also, *Draft Report on the First Biological Warfare Inspection in Iraq*, 28–29.

52. Western intelligence also identified Al Kindi as a site that possibly produced botulinum toxin and bombed Al Kindi during the 1991 Gulf War. This connection should have also triggered suspicions about Al Hakam as being just a warehouse, but the inspectors recalled only discussing the apparent link between Salman Pak and Al Hakam. Killip, interview; Huxsoll, interview.

53. Although Iraq denied using primates as test animals, the Iraqis stated they purchased primate cages in 1982, leading the inspectors to conclude that “[s]ince the capability existed, such studies were presumably planned. *Report on the First Biological Warfare Inspection in Iraq: UNSCOM 7*, para. 16; *Draft Report on the First Biological Warfare Inspection in Iraq*, 32, 35. In 1995, UNSCOM obtained corroboration from the Swiss company Chemap that it sold a 150-liter fermenter to Al Muthanna in 1986 and that this piece of equipment appeared to be in pristine condition when Chemap’s technician commissioned it in 1988 at Salman Pak. Rod Barton, *The Weapons Detective: The Inside Story of Australia’s Top Weapons Inspector* (Melbourne: Black Inc. Agenda, 2006), 155.

54. At one point, the Iraqis did state that they were making one defensive product, a Romanian kit, under a license from Russia. Kelly, interview. In 1995, UNSCOM learned that Sinan, a military captain who worked at Al Hakam, filled munitions with biological agents. He also helped to deploy biological munitions to Al Azziziyah and to Air Field 37 and to dispose of biological agent and munitions at Al Azziziyah. National Monitoring Directorate, Republic of Iraq, *Draft Full, Final and Complete Declaration of the Iraq National Biological Program*, May 1996, 202–203. In 1991, Sinan joined the staff of Hossam Amin, who oversaw Iraq’s interactions with the inspectors. Spertzel, interview.

55. A photocopy of the receipt for the handover of the seed culture collection, signed by Taha and Kelly, is dated August 5, 1991. See “List of Bacteriological Isolates Handed Over to the First Biological Inspection Team,” in Republic of Iraq, *A Full, Final and Comprehensive Report on {Biological Activity}*, 12–14. On the August 5th date, also *Draft Report on the First Biological Warfare Inspection in Iraq*, 29–31. Note that a few inspectors recall this handover taking place on the last day of the inspection. Kelly, interview; Killip, interview; Rod Barton (former UNSCOM biological weapons inspector), interview with author via telephone, May 20, 2005; former senior UNSCOM official, interview with author, New York City, September 1, 2005; former UNSCOM biological weapons inspector, interview with author, September 17, 2005. See also UN Doc. IK/46.

56. Of the strains that Iraq ordered, Kelly asserted that someone thought long and hard about it because among the collection were some of the most virulent strains of anthrax used in the U.S. and British programs. Kelly, interview. To reporters, Kelly described Taha's handover of this culture collection as "a symbolic gesture." Walter Putnam, "Germ Warfare Team Ends Work; Nuclear Inspector Critical of Iraqis," Associated Press, August 7, 1991. Note that Kelly's characterization acknowledged that the Iraqis could easily have cultured microorganisms from the vials they opened, retaining seed stocks.

57. From 1985 to 1989, the American Type Culture Collection sent bacteria, fungi, viruses, and toxins to various purchasers in Iraq, including the Atomic Energy Commission. More than fifteen shipments of seed cultures valued over \$18,000 were made. The U.S. Centers for Disease Control and Prevention also sent West Nile Fever virus to Iraq three times, and the German Company Sigma Chemie GmbH sold mycotoxins to Iraq. "Supplier: American Type Culture Collection," Supplier Database (Washington, DC: Wisconsin Project), <http://www.iraqwatch.org/suppliers/index.html>; Eric Nadler and Robert Windrem, "Deadly Contagion: How We Helped Iraq Get Germ Weapons," *New Republic*, February 4, 1991, 18–20.

59. The microorganisms in the seed culture collection that other countries had developed as biowarfare agents were *Brucellus abortus*, *Brucella melitensis*, *Francisella tularensis*, and various strains of *Clostridium botulinum*. The agent simulants were *Bacillus subtilis*, *Bacillus cereus*, and *Bacillus megaterium*. UN Doc. S/23165, Appendix IV, para. 26.

60. The press release noted that Iraq previously described Salman Pak as conducting laboratory analysis to detect food contamination and briefly described the program as initiated in 1987, terminated in August 1990, and situated at Salman Pak. UNSCOM, "Aim of Biological Research Defensive, Iraq Tells UN Inspection Team," Press Release, Doc. IK/43, August 5, 1991.

61. The Iraqis said this work was done at a general research complex, which the team inspected, and that in 1990 the biological research was completely halted. The Iraqis also restated that Iraq did not have a "central laboratory for military biological purposes." Remarks of Iraqi Foreign Ministry spokesman on August 4, 1991, translated from Arabic in Foreign Broadcast Information Service, Doc. FBIS-NES-1991 (Washington, DC: Federal Broadcast Information Service, August 5, 1991), 35–36; R. Jeffrey Smith, "Iraq Admits to Germ Warfare Research," *Washington Post*, August 6, 1991, A11.

62. This early excavation attempt conveyed the lesson to ensure that future UNSCOM teams had enough vaccinated personnel to conduct such activities safely. Killip, interview. The team was briefed that the Iraqis might exhibit a different attitude about safety. The draft inspection report noted that the Iraqis "had no concept of proper safety" as demonstrated during the Al Muthanna inspection. UNSCOM, *Draft Report on the First Biological Warfare Inspection in Iraq*, 4, 40.

63. Near the bunkers, it looked as though the Iraqis had cleared the area and then deliberately placed debris to simulate bomb rubble. The larger bunkers were all of the same design, with interior corridors and mostly empty brick rooms. During the suspected salvage operation a fire truck and decontamination personnel were present. The inspectors also took samples from one of the laboratories, and all sample results came back negative for biowarfare agents, according to Killip and Kelly. Killip, interview; Kelly, interview. The bunkers were only partly accessible. One was used to store Kalashnikov automatic weapons. The Iraqis were given a duplicate set of the samples, which were analyzed at the Chemical and Biological Defense Establishment, Porton Down. UNSCOM, *Draft Report on the First Biological Warfare Inspection in Iraq*, 36–37. The commanding officer for the anti-terrorist camp, Lt. Col. Hussein Allawi, struggled for an explanation but eventually said that another department had imported the



cobalt-60 in 1980 and his group had acquired the sources in 1984 for radiography of munitions and other items. Lacking the proper equipment for such activity, the colonel said the anti-terrorist group abandoned the sources in the small bunker in 1984. A nuclear inspector assisted Kelly's team in determining that the cobalt-60 could not have been part of a nuclear weapons program so Kelly did not recommend further investigation. UNSCOM, *Draft Report on the First Biological Warfare Inspection in Iraq*, 38–39; UNSCOM, *Report on the First Biological Warfare Inspection in Iraq: UNSCOM 7*, para. 19.

65. Kamal classified the program as “private,” and Taha reported directly to the director general of the Defense Ministry. *Report on the First Biological Warfare Inspection in Iraq: UNSCOM 7*, paras. 2, 6, 7. Also on the admission of an offensive research program at this point in the inspection, Government of the United Kingdom, “UN Special Commission BW Inspections in Iraq: Lessons for the Ad Hoc Experts’ Group on Verification,” BWC/CONF-III/VEREX-WP5 (White Paper presented during Third Review Conference of the Parties to the BWC, Geneva, UN, March 30–April 10, 1992), 5. At another point in the inspection, the Iraqis explained that the organization that preceded the Technical Research Center was above cabinet level, reporting to the Office of Science in the Office of the President. Murtada said the research program was solely Taha’s idea but that he had recommended its approval to Hussein Kamal. *Draft Report on the First Biological Warfare Inspection in Iraq*, 28–29. On this discussion between Murtada and Kelly, Kelly, interview; Killip, interview. Also on this discussion, Spertzel, interview; Gabriele Kraatz-Wadsack, DVM (former UNSCOM chief biological weapons inspector), interview with author, Berlin, August 15, 2005. See as well Trevan, *Saddam’s Secrets*, 34–35. Note that the State Organization for Technical Industries, which grew out of the Military Industry Follow-up and Executive Committee, was renamed the Military Industrialization Commission in late 1987. For a history of Iraq’s military industry under the regime of Saddam Hussein, see CIA, “Iraq’s Military Industrial Capability—Evolution of the Military Industrialization Commission,” in *Addendum to the Comprehensive Report of the Special Advisor to the DCI on Iraq’s WMD* (Washington, DC, March 2005), 1–13.

66. Under Kelly’s questioning, Amin said, “The objective would be either defensive or offensive.” Murtada stated, “When we say for military purposes, what do we exactly mean by that? What we mean is the following. When the research work is over then it will be used for military purposes either defensive or, perhaps, offensive.” Murtada also stated that Kamal authorized the program in 1987 “on the basis of our recommendation,” to which Taha added, “I suggested the program.” See Amin’s statement on page 1, Murtada’s comments on pages 1, 3, and Taha’s remark on page 3, “Annex Q: Transcript of Iraqi Admission of Both Offensive and Defensive Research Excerpt in Verbatim from Proceedings of the Meeting with Iraqi Officials on August 5, 1991,” in *Report on the First Biological Warfare Inspection in Iraq: UNSCOM 7*. Note that after this exchange, UNSCOM’s official statements employed the “for defensive or offensive purposes” language. “UN Inspection Team on Iraq’s Biological Weapons Capacity, Finds No Evidence of Current Stocks,” Doc. IK/46.

68. “It was the unanimous opinion of the inspectors that the site had not been bombed.” UNSCOM, *Draft Report on the First Biological Warfare Inspection in Iraq*, 32. The Iraqis claimed that the inhalation chamber incurred about 90 percent damage. Republic of Iraq, *A Full, Final and Comprehensive Report on {Biological Activity}*, 4.

69. The aerosolization chamber was made by the German company Karl Kolb. Huxsoll, interview. In the 1980s, Karl Kolb sold Iraq millions of dollars worth of equipment, supplemented by materials, training, installation, and technical expertise, that was used at Al Muthanna to make chemical agents (for example, mustard gas and nerve agents). Germany



authorities investigated Karl Kolb for illegal exports to Iraq. For more on suppliers to Iraqi weapons programs, go to <http://www.iraqwatch.org/suppliers/index.html>.

70. The electrical supply was just 600 amps. *Draft Report on the First Biological Warfare Inspection in Iraq*, 33–34. Also on these matters, Killip, interview.

71. To reach the chamber, the Iraqis led the convoy through several turns amidst the dirt paths that separated the trash mounds. Huxsoll, interview. See also UN Security Council, *Letter Dated 25 January 1999 from the Executive Chairman of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Security Council Resolution 687 (1991) Addressed to the President of the Security Council*, Doc. S/1999/94, January 29, 1999, Appendix III, para. 161.

72. Huxsoll estimated that the chamber could hold monkeys but probably not cows. Later, the manufacturer, Karl Kolb, gave UNSCOM the chamber's specifications. Huxsoll, interview. Also on the crushed aerosol chamber, Killip, interview; former UNSCOM biological weapons inspector, interview with author, September 17, 2005.

73. The inspectors assumed that the chamber was decontaminated, which would have hindered sampling. Before long, UNSCOM would be able to impound such equipment and secure it at a location for thorough investigation, but time pressures and lack of logistical capability compelled the inspectors to leave the chamber by the roadside. Killip, interview. The Iraqis also provided a Karl Kolb catalogue that gave some of the chamber's specifications. The inspectors could see the remains of an animal cage rack inside, as well as sampling ports, the decontamination equipment, and a few other features of this stainless steel structure, roughly three to four square meters in volume. UNSCOM, *Draft Report on the First Biological Warfare Inspection in Iraq*, 33–34.

76. Much later, the inspectors learned that Iraq also conducted biological aerosolization tests in Al Muthanna's larger chamber. Killip, interview. Also on the biological testing at Al Muthanna, Spertzel, interview.

77. The inspectors thought the chamber could have been removed from the Chemical Analytical Laboratory at Salman Pak. *Draft Report on the First Biological Warfare Inspection in Iraq*, 33–35; Trevan, *Saddam's Secrets*, 33; William J. Broad and Judith Miller, "The Deal on Iraq: Secret Arsenal: The Hunt for the Germs of War," *New York Times*, February 26, 1998, A1.

80. Kelly termed the removal of buildings and the failure to give a full verbal and documented account for the activities at Salman Pak "negative evidence." Kelly, interview.

87. Kay also turned to UNSCOM's second biological team for their satellite telephone when his equipment was not functioning properly. In this instance, the loan of the satellite phone to Kay, who used it to communicate with UNSCOM headquarters in New York and the worldwide media when the Iraqis boxed his nuclear inspection team in a downtown parking lot in Baghdad, did not influence the length or activity of the second biological inspection. Huxsoll, interview.

90. After Iraq admitted weaponization in 1995, the Iraqis said they had filled 122mm shells and LD-250 bombs with agent in this room. Kelly, interview.

92. Kelly filed a stronger "minority" report about the inspection that expressed his concerns about a probable Iraqi offensive weapons program. Ron Manley, PhD (former UNSCOM chief chemical weapons inspector), interview with author, London, August 19, 2005. Also on the divergent views of the inspectors, Trevan, *Saddam's Secrets*, 37.

94. Other statements about the BW 1 inspection included "[T]he biological research programme in question was seemingly well on its way to an offensive capability based on the direct information obtained" and "[T]he range of microbiological agents possessed at this site together with toxin producing bacteria indicates an intent to develop the programme further to

provide versatility to the Biological armoury either at the present or in the future.” Government of the United Kingdom, “UN Special Commission BW Inspections in Iraq,” 6. The summary of the mission said that the UN gave the press was

[T]he team discovered a capability to research, test and store biological warfare agents. Fermentation, production, aerosol testing and storage existed at that site. However, no evidence of biological weapons per se was obtained and no facility for filling weapons was determined. The site had been extensively damaged by Coalition force bombardment, and by the recent physical removal by the Iraqis of key buildings.

“UN Inspection Team on Iraq’s Biological Weapons Capacity,” UN Doc. IK/46. Also, Government of the United Kingdom, “UN Special Commission BW Inspections in Iraq,” 5; Trevan, *Saddam’s Secrets*, 37; “United Nations: Possible Biological Warfare Sites Found in Iraq,” IPS-Inter Press Service, August 14, 1991. Publicly, Kelly emphasized that just because inspectors had not found conclusive evidence of weapons “does not mean . . . that weapons were not manufactured there,” characterized Salman Pak’s production capacity as “substantial,” and pegged their anthrax production capacity at “two hundred litres of anthrax a week.” John M. Goskho and Trevor Rowe, “U.N. Panel Describes Iraq’s Anthrax Threat: No Evidence Yet That Weapons Were Built,” *Washington Post*, August 15, 1991, A31.

96. “[R]esearch on biological warfare agents were undertaken and undoubtedly that capability could be extended to develop, produce and stockpile such agents.” UNSCOM, *Report on the First Biological Warfare Inspection in Iraq: UNSCOM 7*, para. 10. The agent made in Salman Pak’s 150-liter Chemap fermenter could have inoculated other fermenters for agent production at other sites in Iraq. UNSCOM, *Draft Report on the First Biological Warfare Inspection in Iraq*, 47–48.

102. Commercial enterprises situate buildings near each other in part to make frequent interaction among workers convenient. Huxsoll, interview; Kelly, interview; Killip, interview; Lebherz, interview; former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, Washington, DC, February 21, 2006. Also on the widely spaced buildings, Trevan, *Saddam’s Secrets*, 116–117. On the Hussein mural, Kelly, interview; Debra Krikorian, PhD (former UNSCOM biological weapons inspector), interview with author, Washington, DC, June 21, 2005.

103. On Al Hakam’s stealth building and initial operation, Kelly, interview; Spertzel, interview. The construction of a major new facility is something normally trumpeted in the press. No public announcement of Al Hakam’s construction was ever made, nor were foreign contractors or suppliers ever taken to the site. UN Security Council, *Report of the Secretary-General on the Status of the Implementation of the Special Commission’s Plan for the Ongoing Monitoring and Verification of Iraq’s Compliance with Relevant Parts of Section C of Security Council Resolution 687 (1991)*, Doc. S/1995/284, April 10, 1995, Annex, para. 76.

104. When asked, the Iraqis took inspectors to this refinery, which was under construction. Huxsoll, interview. Proximity to the refinery, the Iraqis later explained, let them switch their single-cell protein production from a yeast fermentation process in their experimental plant in the southern area of Al Hakam to a large-scale methanol or ethanol process in the northern area. Lebherz, interview.

106. With an eye more familiar with military equipment, Killip recognized that the artillery was also old and that sometimes the gun mounds lacked guns. Killip, interview. Seconding the tendency of Western inspectors to see the security at sites as excessive, Barton, interview.

110. His geniality aside, Kelly doubted Al-Hindawi was Al Hakam's true director, particularly when the Iraqis told the inspectors that the Al Hakam staff reported to the Technical Research Center at Salman Pak. Kelly, interview. See also Barton, *The Weapons Detective*, 117. Kelly was not the only inspector with such reservations. Hindawi's scientific credentials made him more credible than Taha as the front for Iraq's cover story that Al Hakam made single-cell protein production, so before BW2, Iraq installed Al-Hindawi as the figurehead at Al Hakam. Saddam Hussein's powerful son-in-law Lt. Gen. Hussein Kamal Hassan, formerly Iraq's minister of defense and until 1990 Iraq's minister of industry and military industrialization, booted Al-Hindawi from the program in 1992, after which Taha became the head of Al Hakam. Kelly, interview; Spertzel, interview; Barton, interview. Also, CIA, "Biological Warfare," in *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD*, vol. 3, 13. Al-Hindawi wrote a technical paper in 1983 about the military advantage that bioweapons could provide, and within a year at Al Muthanna Iraq started a germ weapons program, marked a "presidential priority." R. Jeffrey Smith, "Iraq's Drive for a Biological Arsenal; U.N. Pursing 25 Germ Warheads It Believes Are Still Loaded with Deadly Toxin," *Washington Post*, November 21, 1997, A1.

112. Al-Hindawi spent time at Jackson State University. Huxsoll, interview. Confirming the stash of biological equipment confiscated from Kuwait at Al Hakam, Kadlec, interview.

113. The inspectors lacked time to closely examine or inventory this media or assess whether it was appropriate for the manufacture of single-cell protein. Huxsoll, interview.

114. The BW2 inspection report did not mention this media cache, but a June 1994 inspection report stated that some of the shipment labels directed delivery of some media to the Medical Affairs Directorate of the Iraqi Ministry of Defense, while other containers were shipped to the Technical Scientific Materials Import Division. UNSCOM, *UNSCOM 84/BW6: Final Report*, June 20–July 12, 1994 (New York, n.d.), A19-1 to A19-3. The biological inspectors found out in November 1994 that the Technical Scientific Materials Import Division was part of the Ministry of Defense and was the sole procurement agency for the Technical Research Center. Spertzel, interview; Kraatz-Wadsack, interview.

116. In the heyday of its bioweapons program, the United States made anthrax in fermenters that leaked. Some inspectors readily understood that the Iraqis could have produced agents under these conditions. Readily agreeing with Kelly that the Iraqis could have produced agents under these conditions, Spertzel, interview; former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, February 21, 2006.

118. The paint job made these tanks look like they were mild steel. Barton, interview.

120. These tanks still bore Al Kindi identifying tags. Huxsoll, interview; Killip, interview.

123. The purpose of dummy items, bunkers or otherwise, is to increase the odds that attacking aircraft would hit the fake items, not the real ones. The hardening of the cooled bunkers at Al Hakam was nothing, the Iraqis said, in comparison to the ones at Al Muthanna. Huxsoll, interview. Also on the bunkers at Al Hakam, Government of the United Kingdom, "UN Special Commission BW Inspections in Iraq," 10.

124. Always with a ready explanation, the Iraqis told later inspectors that it was standard for all facilities in Iraq built toward the end of the 1980s to have bunkers because of the ongoing war with Iran. Former UNSCOM chief biological weapons inspector, interview with author, August 15, 2005; Lebherz, interview.

125. Porton Down, the United Kingdom's principal chemical and biological defense facility, again performed the sample analysis. Spertzel, interview; Huxsoll, interview; Killip, interview. On the samples and negative results, UN Security Council, *Twenty-Second Quarterly Report on the Activities of the United Nations Monitoring, Verification and Inspection Commission in Accordance with Paragraph 12 of Security Council Resolution 1284 (1999)*, Doc. S/2005/545, August 30, 2005, Annex, para. 17, p. 9.

129. Nine sites were identified for inspection before the mission and one was added during the inspection. Huxsoll, interview; *First Report of the Executive Chairman UNSCOM under UNSCR 687*, Appendix IV, para. 27.

131. A faint pink cloud hung in the air in parts of Samarra, coating the workers' white smocks with the residue of the antibiotics being processed. On leaving, Huxsoll felt that he had "inhaled enough antibiotics for a lifetime." Huxsoll, interview. Also on the antibiotic aerosols hanging in the air and the inspectors coming out coated in pink, Krikorian, interview; former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, February 21, 2006.

132. The Agricultural and Water Research Institute at Al Fudhaliyah made Coalition target lists because in the mid-1980s a European company reportedly sent fermenters to the site. Trevan, *Saddam's Secrets*, 118. For more on the Western intelligence that led to the bombing of Iraqi biological facilities during the 1991 Gulf War, see Chapter 1.

134. A slaughterhouse has cold storage capacity, and biowarfare agents require temperature controlled storage, so intelligence analysts inferred that the tanks might have contained bulk warfare agent. The location of the slaughterhouse was unknown. After Huxsoll's interpreter saw a sign posted in the plant advertising the availability of meat, Huxsoll began asking about problems Iraq might have with contaminated meat sales, and Al Kindi's director gave the plant's location while describing Iraq's meat inspection standards and capacity. The director was clear that all farmers had to take animals for slaughter to a facility at Al Daura and that smaller slaughterhouses did not exist. The Iraqi escorts were quite pleased when the inspectors went to the slaughterhouse because they left with bags loaded with meat imported from France. The inspectors went to four sites with no advance notice to the Iraqis, including a blood bank. Huxsoll, interview; *First Report of the Executive Chairman UNSCOM under UNSCR 687*, Appendix IV, para. 27.

136. The company that built the plant was Merial. Huxsoll, interview.

146. "Because of a potential link between [single-cell protein] research and a biological weapons programme, the team recommended that the UN carry out ongoing monitoring of activity at the site and prohibit the use of any human or animal pathogens there." UN, "Several Iraqi Sites Recommended for Future Monitoring by Second UN Biological Weapons Inspection Team," Press Release, Doc. IK/69, October 31, 1991.

148. Throughout this ordeal, David Kay used a satellite telephone borrowed from the UNSCOM BW2 team to maintain contact with UNSCOM headquarters and the worldwide media. Huxsoll, interview. For contemporary accounts of these events, John M. Goshko and Ann Devroy, "Iraq Holds U.N. Inspectors for 13 Hours, Seizes Data," *Washington Post*, September 24, 1991, A1; John Lancaster and John M. Goshko, "Iraq Said to Yield on Nuclear Inspection," *Washington Post*, September 25, 1991, A1; John Lancaster and John M. Goshko, "Iraq Seeks Deal to End U.N. Team Standoff," *Washington Post*, September 26, 1991, A1; Michael Z. Wise, "U.N. Team Finds New Evidence of Iraqi Coverup," *Washington Post*, October 1, 1991, A14. For a summary of the events, and the International Atomic Energy Agency's Hans Blix subsequently

telling Kay that was his last inspection, Jean E. Krasno and James S. Sutterlin, *The United Nations and Iraq: Defanging the Viper* (Westport, CT: Praeger, 2003), 57–59.

### Chapter 3

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2. Annex A identifies microorganisms and toxins, equipment, and facilities that could have offensive purposes, all of which were subject to declarations, limitations, and prohibitions. UNSCOM was to monitor related and permitted biological activities. Iraq was required to limit its research with pathogens to endemic diseases only and would be allowed to maintain only one high-level containment (Biosafety Level 4) facility. Furthermore, Iraq was to conduct its permitted research only in civilian facilities and to declare facilities working with microorganisms or toxins of high risk to humans and animals and sites with vessels larger than 10 liters or 40 aggregate liters. Iraq had to detail all work with the pathogens. UN Security Council, *Plan for Future Ongoing Monitoring and Verification of Iraq's Compliance with Relevant Parts of Section C of Security Council Resolution 687 (1991) Report of the Secretary-General*, Doc. S/22871/Rev.1 and S/22872/Rev.1, August 1, 1991. The corollary document for the IAEA was S/22872/Rev.1. Also, Revised Annex III, UN Security Council, *Plan for Future Ongoing Monitoring and Verification of Iraq's Compliance with Relevant Parts of Section C of Security Council Resolution 687 (1991) Report of the Secretary-General*, Doc. S/1995/208, March 17, 1995.

3. On November 19, 1991, Iraqi Foreign Minister Ahmed Hussein sent UN Secretary-General Peres de Cuellar a diatribe refusal of the plan. Tim Trevan, *Saddam's Secrets: The Hunt for Saddam's Hidden Weapons* (London: HarperCollins, 1999), 7.

5. Ekeus respected Santesson's scientific skills, his experience in other UN field investigations, and his skepticism about a possible Iraqi bioweapons program in Iraq. In early July 1992, Santesson was a member of a team that the UN Secretary-General sent to investigate the possible use of chemical weapons in Azerbaijan. For more on that inspection, see UN Security Council, *Report of the Mission Dispatched by the Secretary-General to Investigate Reports of the Use of Chemical Weapons in Azerbaijan*, Doc. S/24344, July 24, 1992; see Jez Littlewood, "Investigating Allegations of CBW Use: Reviving the UN Secretary-General's Mechanism," *Compliance Chronicles*, no. 3 (Ottawa: Canadian Centre for Treaty Compliance, December 2006): 1–36. By his own admission, Ekeus was so convinced that biosafety containment was a requirement for a bioweapons program that he instructed his teams to look for biosafety precautions (such as special ventilation systems) as an indicator. Ekeus said, "I told them that if they found the biosafety facilities they would have found the bio program." Paraphrasing Santesson, whom Sweden seconded to UNSCOM from the World Health Organization, Ekeus recalled, "He said the Iraqis don't know how to spell 'safety.' They were not bothered if workers were contaminated or even worse. Also, he was disappointed that the Iraqis were not really answering questions in an open fashion. He had expected them to be forthcoming and they were not." Ekeus noted, "that conversation was the first thing that led me to think that maybe all was not perfect in the biological area." Ambassador Rolf Ekeus (former UNSCOM executive chairman), interview with author, Stockholm, August 24, 2005. Seconding Ekeus's very high opinion of and reliance on Santesson, Robert Gallucci, PhD (former deputy executive chairman of UNSCOM), interview with author, Washington, DC, March 13, 2006; former UNSCOM CBW Commissioner, interview with author via telephone, January 23, 2006. In addition, over UNSCOM's first several months, Ekeus espoused the view that the Iraqis should be given one chance to recover if they lied. Former senior UNSCOM official, interview with author, New York City, August 30, 2005. Aside from senior aide Nikita Smidovich, during this

period of time Ekeus heeded the views of David Kelly, who led UNSCOM's first biological inspection, and two UNSCOM commissioners—Bryan Barras, who invented a widely used detector for chemical agents, and John Gee, an Australian chemical and biological weapons expert with impressive diplomatic experience. A subset of the UNSCOM commissioners, the chemical and biological working group, also advised Ekeus on biological matters. Gallucci, interview; Doug Englund (former UNSCOM chief inspector), interview with author, Washington, DC, December 5, 2005; former UNSCOM CBW commissioner, interview with author, January 23, 2006.

6. Iraq originally reported having 10,000 to 11,000 chemical munitions and 650 tons of precursor chemicals, but the inspectors found a vast number of additional weapons, mainly tear gas, bringing the tally to 46,000. In addition, they found 3,000 tons of precursor chemicals. UNSCOM had Iraq move the bomb-making equipment at the Mosul sugar factory back to Al Muthanna, where it was slated for destruction. This equipment might have also been used to make biological bombs. Frank J. Prial, "U.N. Team Finds Chemical Arms 4 Times Greater Than Iraq Claims," *New York Times*, July 31, 1991, A1. On the bomb-making equipment at the Mosul Sugar Factory, which UNSCOM had the Iraqis move back to Al Muthanna, UN Security Council, *Third Report of the Executive Chairman of Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b)(i) of Security Council Resolution 687 (1991)*, Doc. S/24108, June 16, 1992, Appendix II, paras. 1–2.

7. Ekeus's emissaries were Johan Santesson, senior aide Nikita Smidovich, and UNSCOM commissioner John Gee, PhD, who later became a senior official in the Technical Secretariat, the international inspection agency for the Chemical Weapons Convention. The team also conveyed Ekeus's message that UNSCOM would not back off its disarmament mandate. In addition to recommending that Ekeus deliver a message of determination to Iraq, the chemical and biological commissioners also stated that the ad hoc selection of inspection chiefs who occasionally went into Iraq would not be sufficient to sort out the problems. Former UNSCOM CBW commissioner, interview with author, January 23, 2006.

8. Former UNSCOM deputy executive chairman Charles Duelfer remembered Iraq's first assertion of this nature in Stephen Black, "The Death of UNSCOM: The CBW Colloquium" *ASA Newsletter*, no. 76 (January 2000).

10. Moreover, UNSCOM personnel appreciated the size of the chemical weapons destruction job at Al Muthanna, not to mention the implications of Iraq's hiding of its nuclear weapons program and the uncertainties about the remaining number of Iraqi missiles. Ron Manley, PhD (former UNSCOM chief chemical weapons inspector), interview with author, London, August 19, 2005; foreign ministry official, interview with author, London, August 17, 2005; former senior UNSCOM official, interview with author, New York City, August 30, 2005.

11. "The whole of 1992 the biological issue was on the back burner." Ekeus, interview. UNSCOM sent two joint chemical-biological inspections missions to Iraq in June and December 1992. Graham S. Pearson, *The UNSCOM Saga: Chemical and Biological Weapons Non-Proliferation* (New York: St. Martin's Press, 1999), 130.

12. Another UNSCOM insider agreed that Iraq got lucky: "They might not have felt too threatened for a while because there were no biological inspections." Former senior UNSCOM official, interview with author, August 30, 2005.

13. The two-inspections-per-month average in the early 1990s included twenty-one high-level missions to speak with the Iraqis about outstanding issues. The three combined chemical-biological missions that UNSCOM conducted in 1991 and 1992 produced no worrisome findings about Iraq's biological activities and facilities. Former senior UNSCOM official, interview with

author, August 30, 2005. Also, UN Security Council, *Fourth Report of the Executive Chairman of Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b)(i) of Security Council Resolution 687 (1991)*, Doc. S/24984, December 17, 1992, Appendix III, para. 4; UN Security Council, *Fifth Report of the Executive Chairman of Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b)(i) of Security Council Resolution 687 (1991)*, Doc. S/25977, June 21, 1993, Appendix II, para. 7. UNSCOM sent two joint chemical-biological inspections missions to Iraq in June and December 1992, but the UNSCOM 39/CBW2 and UNSCOM 47/CBW3 reports contained nothing of note. Graham S. Pearson, *The UNSCOM Saga: Chemical and Biological Weapons Non-Proliferation* (New York: St. Martin's Press, 1999), 130.

14. UNSCOM inspectors oversaw the crushing of 11,829 munitions. The chemical inspectors ultimately oversaw the destruction of over 690 tons of poison gas and the elimination of over thirty-eight thousand filled and unfilled chemical weapons. Rod Barton, "Eliminating Strategic Weapons in Iraq," *Pacific Research* 6, no. 3 (August 1993): 11–13. The nerve agents were destroyed with hydrolysis, the mustard with incineration. "U.N. Prepares to Destroy Iraqi Chemical Weapons," *Washington Post*, September 13, 1992, A34. On the amount of chemical agents and munitions destroyed under UNSCOM supervision, UN Security Council, *Letter Dated 25 January 1999 from the Executive Chairman of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Security Council Resolution 687 (1991) Addressed to the President of the Security Council*, Doc. S/1999/94, January 29, 1999, Appendix II, paras. 11,16.

15. "Between 1991 and 1994, I don't think there was anyone in the leadership in the U.K. or the U.S. who really believed that they had a biological weapons program. Instead, they were worried about the nuclear program and the missiles. There were just a few people, like David Kelly and Bryan Barras, who were pushing to get biological teams in from 1991 to 1994." Manley, interview. The Iraqi perspective on the hiatus was that UNSCOM did not investigate the bioweapons program to provide a reason to keep sanctions in place. Charles Duelfer, *Hide and Seek: The Search for Truth in Iraq* (New York: Public Affairs, 2009), 97. Ekeus's approach in these circumstances was characterized as "We need to do the obvious first." Former UNSCOM staff member, interview with author, New York City, September 2, 2005. Lamenting that from 1991 to 1993 "the mind-set was such that nuclear was so important they just couldn't take adequate interest" in more biological inspections, David Kelly, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, December 19, 2002.

16. "The notion that they would try to conceal an entire biological weapons program may have been in the minds of a few people, but it was not a major consideration in the early days, by any means." Stephen Black (former UNSCOM historian), interview with author, Washington, DC, November 16, 2007.

17. Agreeing with Ekeus, UNSCOM's deputy executive chairman noted that the sole U.S. intelligence briefer who specifically raised the biological portfolio during his nine-month tenure in 1992–1993 "mumbled" that the intelligence community believed Iraq had a more substantial program but had no actionable intelligence. "Bio had gone dry." Pierce Corden (former UNSCOM deputy executive chairman), interview with author, Washington, DC, August 4, 2008.

21. Before Jansen, this desk was intermittently in the hands of Australian Roger Hill and UNSCOM CBW Commissioner Bryan Barras. Former senior UNSCOM official, interview with author, August 30, 2005.

23. "While she was there, frankly, nothing got done." Hamish Killip (former UNSCOM chief biological inspector), interview with author, Isle of Man, August 22, 2005. "She told me that she

just couldn't conceive of them [the Iraqis] doing a biological program." Foreign ministry official, interview with author, August 17, 2005. In January 1992, Jansen pulled a chemical and biological commissioner aside to state there was nothing in the biological program on which UNSCOM would be able to pin down the Iraqis. Former UNSCOM CBW commissioner, interview with author, January 23, 2006. Of the UNSCOM biological inspections, Jansen wrote, "The inspections centered on the Iraqi biological-warfare program did not uncover the 'smoking gun' many had expected—that of weaponized biological agents. However, the facts in evidence and an assessment of the findings did provide a picture of where the Iraqis were in this effort, along with a reasonable determination of where they were headed." Karen M. Jansen, "Disarming Iraq—Lessons for the Chemical Weapons Convention," *Chemical Weapons Convention Bulletin*, no. 24 (June 1994): 6.

24. With regard to a biological weapons program, Jansen said, "[W]e'll never really know more than what they've declared." Peter Grier, "UN Inspectors in Iraq Get Chemical Surprise," *Christian Science Monitor*, June 23, 1992, 1. Jansen departed UNSCOM after leading a joint chemical and biological inspection that acted on an intelligence tip on where Iraq had hidden documents related to its prohibited weapons activities. UNSCOM 39/CBW2 went to the geographic coordinates of the building, which turned out to be the Ministry of Agriculture. When the Iraqis finally allowed the inspectors inside after a seventeen-day standoff, they found no incriminating documents. The Iraqis were mistakenly warned of the no-notice inspection when a July 2, 1992, UNSCOM clerical error gave them the coordinates of the inspection. R. Jeffrey Smith, "U.N. Team Comes Up Empty-Handed," *Washington Post*, July 30, 1992, A20; Peter Grier, "Iraq-UN Standoff: A Miscalculation?" *Christian Science Monitor*, August 3, 1992, 7.

25. Described as idealistic, pleasant, dedicated, and a fervent believer that Iraq could have an active bioweapons program, at first, Paul-Henriot helped to coordinate UNSCOM's chemical weapons destruction activities. Of Paul-Henriot's persistence in investigating Iraq's possible bioweapons program, Ekeus said, "Annick was insistent. She gave me no peace." Quoted in Christopher Dickey and Colin Soloway, "The Secrets of Dr. Germ: U.N. Inspectors Have Begun Searching Iraqi Weapons Sites. But What Happens When They Investigate the Scientists? The 'Human Factor' Could Be a Trigger to War," *Newsweek*, December 9, 2002, 2.

27. With legal advisor John Scott and top aide Nikita Smidovich, Ekeus negotiated these tougher inspection modalities. Aziz signed a formal statement accepting these terms. Ekeus, interview. Also, Corden, interview. UNSCOM gradually began to employ other tactics, such as flying toward several prominent facilities before heading to the real target of the inspection or pre-positioning two teams near a site where prohibited items were thought to be, ready to catch an attempt to move items. UNSCOM occasionally placed a missile specialist among several bioweapons inspectors examining a missile site, a tactic that apparently unsettled the Iraqis. Gabriele Kraatz-Wadsack, DVM (former UNSCOM chief biological weapons inspector), interview with author, Berlin, August 15, 2005; former UNSCOM chief inspector, interview with author, August 18, 2005.

28. Human Rights Watch sent Ekeus documents obtained from the Kurdistan Democratic Party that indicated an Iraqi military commander had requested a semi-annual inventory of biological weaponry in 1986. Letter from Kenneth Anderson, Human Rights Watch, and Andrew Whitley, Middle East Watch, to Rolf Ekeus, Chairman of UNSCOM (Human Rights Watch, New York, December 29, 1992). Unnamed CIA and Defense Intelligence Agency officials were confident the documents were authentic. "Document Says Iraq Has Biological Weapons," *New York Times*, December 30, 1992, A9. An unnamed Iraqi microbiologist also said that Iraq had worked with a trio of biological agents (anthrax, botulism, and salmonella) and conducted



animal and artillery tests. This defector said the Al-Hasan Al-Hawtham Foundation, which was run by intelligence services, ran this effort. Shyam Bhatia, "Iraqi Scientist Tells 10-Year Secret: Saddam Hides Germ Tests from UN Inspectors," *The Observer* (London), August 9, 1992 (in FBIS Doc. JPRS-TND-92-007-L, September 10, 1992), 6.

29. The general also said that presidential aides hid cookbooks for bioweapons production in their homes, that biological bombs were Saddam's weapon of last resort, that Iraq had buried over eighty Scud missiles, and that he had told the CIA of Iraq's program to conceal prohibited weapons systems by shuffling them between various governmental buildings. Mark Skipworth and Jonathan Calvert, "Saddam Hid Missiles and Anthrax Bombs from UN," *Sunday Times* (London) February 19, 1995, 1; "Saddam Is Hiding Weapons from UN," *Gulf Daily News*, February 20, 1995, 7; Duelfer, *Hide and Seek*, 100–103.

30. On the Security Council's guidance in early years to by-pass U.S. and British concerns about an Iraqi biological weapons program, John Barry, "Unearthing the Truth: How a Team of Underdog Inspectors Finally Found Evidence of Iraq's Arsenal of Death," *Newsweek* (March 2, 1998), 40.

31. The UNSCOM 53/BW3 team was in Iraq from March 11 through March 18, 1993, and went to seven sites, including Salman Pak, Al Tuwaitha, and Al Hakam. David Franz, DVM, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, June 29, 2005. UN Security Council, *Fifth Report of the Executive Chairman of Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b)(i) of Security Council Resolution 687 (1991)*, Doc. S/25977, June 21, 1993, Appendix II, para. 8.

32. The Iraqis said the women in this egg inoculation operation initially got pink-eye, which is indicative of infection with Newcastle virus. Also at Al Kindi, Franz believed the Iraqis deliberately hindered the team's access to the facility's sunken, half-underground warm rooms by placing women inside mopping the floors with formulin. The Iraqis said they were growing *Clostridium* species to make toxoid vaccines for goats and sheep inside these rooms, and these women did not have proper respiratory protection. Franz' inspectors later returned to the site and did access these rooms wearing protective masks. For these vaccines, the Iraqis were employing the same technology needed to grow botulinum toxin but the inspectors decided not to sample because it would have been difficult to know whether they were growing *Clostridium* species for vaccine or botulinum toxin. Franz, interview. With similar observations about the lack of safety precautions in Al Kindi's egg inoculation operations after an early 1995 mission, Jeff Mohr, PhD (former UNSCOM chief biological weapons inspector), interview with author via telephone, June 27, 2005. The Iraqis also painted the floor of the biopesticide production plant at Al Hakam just before the inspectors' arrival so that they could not enter. Robert Kadlec, MD (former UNSCOM biological weapons inspector), interview with author, Washington, DC, February 23, 2006.

33. In the northern part of Al Hakam, the Iraqis said they planned to ramp up production of single-cell protein with 50,000-liter Iraqi-made fermenters. Franz also recalled seeing the rather empty small animal house near the administrative building, with scant signs of any chickens or other animals there. The inspectors did not access the roof to investigate the ventilation capacity of any buildings on site. Franz, interview. See also, Barton, *The Weapons Detective*, 118.

34. Franz thought that the Iraqis were drying beer mash waste just for the purpose of doing something while the inspectors were there. The small plastic bags for bentonite were on the ground in the large bunker next to the pilot plant in the southern area of Al Hakam. UNSCOM inspectors later learned that the Iraqis conducted a dry study and simulations with dry *Bacillus thuringiensis*. One aspect of the Iraqi bioweapons program that UNSCOM was unable to confirm

was whether they ever moved past wet production and testing of simulants to dry production of *Bacillus anthracis*. At Al Tuwaitha, Franz also saw the same small plastic bags. Franz, interview.

35. Al Daura's production records showed that the plant operated much more efficiently when the French, who built the plant, were on site. The inspectors considered that the Iraqis might have used Al Daura to make foot and mouth disease as a weapon, but saw no reason to think the plant was being used at that time to make bioweapons agents. Nothing remarkable stood out about Al Daura's fermentation equipment or other features. In the plant pathology laboratory at Al Tuwaitha, the Iraqis accused the United States of dropping insects to spread disease into their date palm crops. They showed the inspectors little paper cartons, which they said contained infected moths that U.S. airplanes dropped during the Gulf War. Franz told them that this would not have happened because the United States had halted its bioweapons program in 1969. Otherwise, Franz found little unusual about Al Tuwaitha other than the siting of a greenhouse and a diagnostics laboratory inside of a bermed area. Franz, interview.

36. Despite its safety shortcomings, Franz did not believe the Iraqis were growing botulinum toxin at Al Kindi at that time, nor did he get a sense that Al Kindi was a core facility in a bioweapons program. Franz, interview; UN Doc. S/25977, Appendix II, para. 8.

38. "Why does Al Hakam have such heavy protection, especially so far away from a civilian population? If they were making chicken feed, yes maybe some people could steal some and the site would need some protection. Such heavy protection I felt was improper." Ekeus, interview.

40. Noting that UNSCOM's Tim Trevan also attended Taha's biological briefing and argued that Taha lied on that occasion and others, Corden, interview with author, August 4, 2008. Apparently during this trip a romance kindled between Rasheed and Taha, who later married and had a daughter, Huda. Dickey and Soloway, "The Secrets Of Dr. Germ."

41. Deputy Prime Minister Tariq Aziz came to New York to discuss UN Resolution 715. To break the stalemate over Resolution 715, Ekeus reportedly told Aziz that "a clean report card on disarmament" would be forthcoming, which would have been a major step toward the lifting of sanctions. Iraq agreed to Resolution 715 on November 26, 1993. Barton, *The Weapons Detective*, 118-119. See also Trevan, *Saddam's Secrets*, 18. On Iraq's quid pro quo strategy of trading cooperation with Resolution 715 for the lifting of sanctions, Barry, "Unearthing the Truth," 40.

42. The Iraqis were to provide data about facility ownership, location, purpose, financing, level of containment, activities, and imports and exports. UN Doc. S/22871/Rev.1, Annex A. Iraq gave UNSCOM some data on relevant imports (for example, complex growth media, microorganisms, inhalation chambers) in October 1993, along with information on sixteen sites. Republic of Iraq, "Status of Iraq's Implementation of Its Obligations in Accordance with Paragraph (C) of SRC-687 (1991) and in Accordance with the Ongoing Monitoring Plan Annexed to SCR 715 (1991) for the Period of Sep. 1994 to Jan. 1995," (Baghdad, January 1995), 14-15. Iraq provided data on twenty-three facilities on December 31, 1993. Barry, "Unearthing the Truth," 40.

44. Zilinskas, seconded from the U.S. Arms Control and Disarmament Agency, arrived in April 1994 and participated in two inspections before his departure in November 1994. Seconded to UNSCOM from the Department of Defense, Spertzel's first day on the job was March 31, 1994. Raymond Zilinskas, PhD (former UNSCOM biological weapons inspector), interview with author, Washington, DC, October 4, 2005; Richard Spertzel, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, July 1, 2005; former senior UNSCOM official, interview with author, New York City, September 1, 2005; former UNSCOM staff member, interview with author, New York City, September 2, 2005.

47. Paul-Henriot died of a heart attack. Dickey and Soloway, “The Secrets Of Dr. Germ”; Trevan, *Saddam’s Secrets*, page x.

48. Spertzel performed this assessment during his first five weeks at UNSCOM. Spertzel, interview; Zilinskas, interview.

49. According to a U.S. intelligence report, the technical specifications for the air-handling system were for dual air supply and dual air exhaust, with both input and output air directed through high efficiency particulate air filters. Spertzel, interview; Debra Krikorian, PhD (former UNSCOM biological weapons inspector) interview with author, Washington, DC, June 21, 2005. On the recognition in 1994 of discrepancies in Iraq’s stories, former UNSCOM senior official, interview with author, September 1, 2005. See also John Barry and Gregory L. Vistica, “The Hunt for His Secret Weapons,” *Newsweek*, December 1, 1997, 32.

53. “They could pick up the telephone and call into a vast network of colleagues for technical help or a question about a piece of equipment, to ask someone to take a look at something or whether they had ever seen a particular feature before.” Former UNSCOM staff member, interview with author, September 2, 2005.

54. “When they did, I felt much confidence, but it was a painful process to get there.” Duelfer, *Hide and Seek*, footnote 13, page 495–496.

55. “We were always in agreement on the substantive things, the stuff that had to do with the program and the weapons. The only time we got into tiffs was on the stupid administrative stuff.” Killip, interview.

58. For example, at Al Kindi, the inspectors recorded two undeclared mixing tanks and incorrect serial numbers on the autoclaves. At the Agricultural and Biological Research Center at Al Tuwaitha, the inspectors noted this facility’s cooperation with Al Hakam on research on single-cell protein, biopesticides, and biofertilizers. The inspectors observed a maintenance staff of roughly forty at Al Daura, although the Iraqis said lack of spare parts compelled the plant to cease operations in 1992. At Al Daura, the inspectors found one wrong serial number on a declared fermenter and a few other minor deviations, and they considered tagging the plant’s double-walled mixing vessels in the future. On April 18, the inspectors recorded minor declaration mistakes at the Plant Protection Division of the Ministry of Agriculture at Abu Ghraib, which provided agricultural pesticide spraying services for all of Iraq, sold sprayers to Iraqi farmers, and stored some equipment at an airfield at Khan Bani Sa’ad. The Iraqis had spraying equipment mounted onto some of their fleet of twenty-four Mi-2, two Mi-8, and one Hughes 500 helicopter, all but one of which the Iraqis said were grounded due to lack of spare parts. Situation Report #11, To UNSCOM Executive Chairman, From CI UNSCOM 72, signed Volker Beck (Baghdad, April 18, 1994), 2–3; Situation Report #6, To UNSCOM Executive Chairman, From CI UNSCOM 72, signed Volker Beck (Baghdad, April 13, 1994), 1; Situation Report #5, To UNSCOM Executive Chairman, From CI UNSCOM 72, signed Volker Beck (Baghdad, April 12, 1994), 1; Situation Report #13, To UNSCOM Executive Chairman, From CI UNSCOM 72, signed Volker Beck (Baghdad, April 20, 1994), 1.

59. UNSCOM BW4 inspected the Pasteur Institute in downtown Baghdad and a large hospital next to it. During an amiable discussion over tea with about thirty hospital staffers, Mohr noticed an armed guard down the hall, which was odd for a hospital. When he tried to investigate the situation, Patrice Binder told him to mind his own business. Overall, Beck and Binder blocked their inspectors from asking any probing questions. Mohr, interview.

61. The final BW4 inspection report also stipulated that dual-use equipment need not be tagged and monitored unless it was associated with a Biosafety Level 3 or 4 facility. From the field, Beck’s fourteenth situation report stated that including brewery fermenters in declarations

was “without any sense” and that other aspects of the biological ongoing monitoring and verification plan were absent “any practical experience.” Situation Report #14, To UNSCOM Executive Chairman, From CI UNSCOM 72, signed Volker Beck (Baghdad, April 21, 1994), 2.

62. UNSCOM was taking a similar approach with the ballistic missile and chemical sites. Former senior UNSCOM official, interview with author, August 30, 2005.

64. President Richard Nixon renounced germ warfare and ended the U.S. offensive biowarfare program on the advice of the Joint Chiefs of Staff. Richard M. Nixon, “Remarks Announcing Decisions on Chemical and Biological Defense Policies and Programs,” Washington, DC, The White House, November 25, 1969.

65. In the seed culture collection list Iraqi officials gave to UNSCOM on August 5, 1991, the Vollum strain, which is identified by its American Type Culture Collection number 14578, appeared along with several other *B. anthracis* strains that Iraq acquired. The hand-written inventory indicates Iraq received one ampoule of strain 14578, which researchers “used.” See Republic of Iraq, “List of Bacteriological Isolates Handed Over to the First Biological Inspection Team,” in Annex 2, *A Full, Final and Comprehensive Report on{Biological Activity}*, May 1992, 13. Also, Dominic Kennedy, “Saddam’s Germ War Plot Is Traced Back to One Oxford Cow,” *London Times*, August 9, 2005, 19. Prior to its arrival at the American Type Culture Collection, strain 14578 was kept by Dr. G. W. Dunkin, Prof. R. L. Vollum, Dr. P. Filkes, Dr. H. M. Darlow, and Prof. P.H.A. Sneath. During World War II, Vollum, Filkes, Darlow, and Sneath worked in the British bioweapons program, which bombarded sheep on Gruinard Island to test the effectiveness of the strain as a weapon. Geoffrey Holland, *United States Exports of Biological Materials to Iraq: Compromising the Credibility of International Law* (Montreal: Center for Research on Globalization, July 7, 2005).

66. Another spraying setup for single-cell protein had two cyclone collectors operating together. The use of Westfalia centrifuges, mostly in a mobile fashion, also drew this inspector’s attention. In an independent March 1995 report, this inspector listed numerous concerns about Al Hakam and also sent a separate letter to UNSCOM recommending a much closer examination of the spray nozzle assembly from the two driers, particularly the high-pressure, two-fluid nozzle. This inspector noted that the Iraqis were operating at Al Hakam and Al Kindi without minimal biosafety precautions but said that technicians could be protected with personal suits or head hoods. This inspector searched warehouses for personal protective gear but found none. Also absent in storage and laboratories were stabilizers (for example, lactose, silica, thiourea, raffinose, or phenol) that would indicate that the Iraqis were stabilizing their agents to improve storage or aerosol decay rates. Former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, Washington, DC, February 21, 2006. On the importance of the insights that this inspector provided, Franz, interview; Kadlec, interview. Also, David R. Franz, Cheryl D. Parrott, and Ernest Takafuji, “The US Biological Warfare and Biological Defense Programs,” in *Medical Aspects of Chemical and Biological Warfare*, ed. Frederick R. Sidell, Ernest T. Takafuji, and David R. Franz (Washington, DC: Office of the Surgeon General at Textbook of Military Medicine Publications, 1997), 425–436.

67. The Iraqis complained that they had to continue polishing their domestically made fermenters to get them sufficiently smooth to grow organisms cleanly. Glass site spots are important to monitor the pressure closely or the entire production line will bust. The Iraqis were quite open about the problems they were experiencing, such as their lack of neoprene, the water, and how they had to pack their valves with cotton and keep steam on them to continue operations. Former UNSCOM inspector and chief of product development in an offensive

biological weapons program, interview with author, February 21, 2006. In the summer of 1991 inspectors encountered Iraqi nuclear scientists who also had “theoretical” knowledge of the technical intricacies of nuclear weaponry. Paul Lewis, “Telltale Clues Found by U.N. Inspectors in Iraq: No Documents, but Weapons-Knowledgeable Scientists,” *New York Times*, September 29, 1991, A18.

68. The inspectors tagged seven Tifa foggers at Abu Ghraib, and eleven dispersal systems at Khan Bani Sa’ad. At Al Hakam, the UNSCOM 78/BW5 team tagged ninety-eight pieces of equipment and reported that new facilities for biopesticide and single-cell protein production, the latter line with a 50,000-liter fermenter, were near completion. At Al Kindi, they tagged sixteen pieces of equipment, and at Al Daura they tagged twenty-six items. The phrase “world standards” refers to the large former bioweapons programs of Japan, the United States, the United Kingdom, and the U.S.S.R. The cameras, the team stated, might not show actual biowarfare agent production but could show a change in pace of activities and deter illicit behavior. UNSCOM, *Draft Inspection Report of UNSCOM 78/BW5*, (New York, n.d.), 1–2, 11, 5–6, especially sub-section of the report titled, “Site-Related Recommendations Pertaining to OMV,” 1.

69. UNSCOM BW6 buttressed prior recommendations to monitor Al Kindi, Al Daura, and Al Hakam. On the conduct of BW6 and another mission, UNSCOM 86/BW7, that Johan Santesson led in early June to resolve problems with the Iraqi biological declarations, UN Security Council, *Addendum to the Eighth Report of the Executive Chairman of the Special Commission, Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Security Council Resolution 687 (1991)*, Doc. S/1994/1422/Add.1, December 15, 1994, Annex, paras. 50–53.

70. Passive protection included such features as dummy bunkers and the separation of buildings to minimize losses in the event of an attack. Al-Hindawi’s experience and skill set made him much better qualified than Taha to direct Al Hakam. She apprenticed with him for six weeks before his mandatory retirement at the age of sixty-five. Al-Hindawi, they emphasized, was not available for interview. Thamer’s trip to attempt to buy the spray dryers from the Danish company Niro was made under the cover of the Technical Services and Material Import Division, which Taha identified as part of the Ministry of Trade and the import office of the Scientific Research Center. At Salman Pak, Taha and Thamer stated that botulinum toxin was made in small fermenters. UNSCOM, *UNSCOM 84/BW6: Final Report, June 20–July 12, 1994* (New York, n.d.), A38-3 to A38-4, A38-6, A38-8.

71. The spray dryer on the single-cell protein line was connected in serial formation to two cyclone filters, which would operate in parallel with each other to increase the volume flow and produce very small particles. This serial formation was ideally suited for a weapons program. Spertzel, interview; Mohr, interview.

72. The media were located in a warehouse, building 25. The Oxoid barrels were labeled “URGENT Medical Supplies, TSMID, Ship via Istanbul, Letter of Credit 21788.” Several styrofoam boxes of media were marked “Directorate of Medical Affairs, Ministry of Defense, Directorate of Contracts and Purchases, PO Box 552, Baghdad, Serial # 111514, Stored Medical Department, 613/Med/1989.” The media were in 25-, 50-, and 100-kilogram-sized containers. The Iraqis stated that their annual capacity for making single-cell protein was ten thousand tons per year. Once again, the Al Hakam animal facility held just a few chickens and some rabbits. UNSCOM, *UNSCOM 84/BW6: Draft Final Report; Site Report: Al Hakam, June 20–July 12, 1994* (New York, n.d.), A19-1 to A-19-3; Spertzel, interview.

74. Taha, who was at Al Daura along with its director, Dr. Ismael Kanderian, was described as “agitated” by the short-notice inspection. The Iraqis also blamed the inspectors for starving

Iraqi children. At Al Ameriyah Serum and Vaccine Institute, the staff numbered 108, with 2 PhDs, 4 with master's degrees, and 27 working on vaccines or antigens and 18 in diagnostics, but they had published no scientific papers. An armed guard accompanied the inspectors everywhere at Al Ameriyah, which had a "modest" production capacity. This mission ran from June 24 to July 5, 1994. Situation Report #3, To UNSCOM Executive Chairman, From CI UNSCOM 84/BW6, signed Jeff Mohr (Baghdad, June 27, 1994), 1; *UNSCOM 84/BW6: Draft Final Report*, A16-2 to A-16-4, A-17.

75. Aerial photography showed trenches being dug from mid- to late March 1991 to early May 1991, when the Iraqis were apparently removing items from Salman Pak's bombed bunkers. They graded over the trenches and subsequently began to use the area for farming. *UNSCOM 84/BW6: Draft Final Report*, A39-1. So the Iraqis might have hidden equipment or containers of agent in the trenches, or remains from tests of biological warfare agents on humans or animals. Killip, interview; Spertzel, interview; Kelly, interview; Kraatz-Wadsack, interview; Kadlec, interview.

76. The Iraqis said the graves were unmarked, and they had no records for the twelve hundred unidentified prisoners of war purportedly buried there. Amin claimed he was told about the graves overnight. The minister of Islamic Trusts and Religious Affairs, Mohammed Saleh, and two priests put in an appearance. The dean of Islamic University of Saddam, Dr. Abdul Hakim Saad, arrived with stenographers and videographers to emphasize how a scandal could be created. Situation Report #4, To UNSCOM Executive Chairman, From CI UNSCOM 84/BW6, signed Jeff Mohr (Baghdad, June 28, 1994), 2, 10; Situation Report #5, To UNSCOM Executive Chairman, From CI UNSCOM 84/BW6, signed Jeff Mohr (Baghdad, June 29, 1994), 4-5; *UNSCOM 84/BW6: Draft Final Report*, A39-5, A39-10. Also, Alan J. Mohr, "Biological Sampling and Analysis Procedures for the United Nations Special Commission (UNSCOM) in Iraq," *Politics and the Life Sciences* 14, no. 2 (August 1995): 243; Kadlec, interview.

78. The trench dimensions were roughly three meters wide by eight meters long by two meters deep. The British Chemical and Biological Defence Establishment at Porton Down used direct culture, immunological assays, and polymerase chain reaction to analyze the samples. *UNSCOM 84/BW6: Draft Final Report*, A39-2, A39-11. Also, Mohr, interview; Spertzel, interview; Killip, interview; Kadlec, interview.

81. "We went past those tanks without identifying them as stainless steel vessels. We didn't notice they were anything other than tanks used to store whatever. Normally you advertise stainless steel. That's a valued capability." The four-hundred-page UNSCOM 87 report detailed practically everything an incoming inspector needed to know about a site. Killip, interview. Also on the black tanks, Krikorian, interview.

82. Kelly noted that the worrisome munitions, which could have been used to disperse biowarfare agents, were manufactured somewhere in Europe. Nabila Megalli, "Biological Experts Complete Survey, but Questions Remain," Associated Press, September 13, 1994.

83. Among the baseline inspections, Spertzel led the UNSCOM 88/BW9 team on a five-day mission to consider how many remote monitoring pieces of equipment would be needed and where cameras and other items should be placed at five sites. UNSCOM 92/BW10, led by David Huxsoll, went to seven sites and added two of them to the list of those requiring ongoing monitoring. Canadian Ken Johnson's team, UNSCOM 94/BW11, continued inventory and tagging activities at over thirty sites. Spertzel, interview; Kraatz-Wadsack, interview; UN Doc. S/1994/1422/Add.1, Annex, paras.58-61.

84. Multiple inspectors were involved in tagging and categorizing the equipment on UNSCOM's list, and some appeared confused about the typical equipment in a large-scale

fermentation operation. Leberherz had to re-categorize roughly 5 percent of what was on the Al Hakam list because predecessors were not clear about the difference between a fermenter, a holding tank that can be pressurized, and a storage tank. A fermenter can be pressurized and/or jacketed to support in situ sterilization and temperature control during fermentation. A fermenter also has an agitator, some type of mechanical sealing system, and a “probe belt” with ports for the various probes (for example, oxygen, pH, or thermometers) to monitor and maintain production conditions. A holding tank may be similar but usually is designed to allow more limited manipulation of material than a fermenter; it is jacketed, has an agitator, and can be heated or chilled. A storage tank may or may not be jacketed, usually does not contain an agitator and associated sealing system, often cannot be pressurized, and therefore is not capable of being sterilized in situ. If storage tank is not jacketed, the material in it will be ambient. Leberherz, interview.

85. The inspectors rated nine sites in category A, fifteen in category B, ten in category C, and forty-five in category D. UN Security Council, *Report of the Secretary-General on the Status of the Implementation of the Special Commission’s Plan for the Ongoing Monitoring and Verification of Iraq’s Compliance with Relevant Parts of Section of Security Council Resolution 687 (1991)*, Doc. S/1995/864, October 11, 1995, Annex, para. 65.

88. Recalling a specific U.S. intelligence briefing on October 28, 1994, that mentioned Iraq’s attempted purchase of ventilation equipment and Project 324, though the purpose and location of Project 324 were unknown, Barton, *The Weapons Detective*, 136.

90. “U.N. teams have been unable to find any trace of a biological weapons production capability, despite widespread reports that Iraq possesses such weapons.” Thomas W. Lippman, “Baghdad Remains Far from Full Compliance with U.N. Resolutions,” *Washington Post*, October 21, 1994, A28. Ekeus characterized Iraq’s biological activities as the “worst area of compliance,” where UNSCOM had “encountered a complete stonewalling.” R. Jeffrey Smith, “Secretive Iraq Parries U.N. Arms Inspectors: Technology, Patience Pry Open Weapons Data,” *Washington Post*, November 4, 1994, A1.

91. These two staffers told Ekeus that they were prepared to quit if UNSCOM did not increase the frequency and intensity of its bioweapons inspections. Spertzel, interview; former UNSCOM staff member, interview with author, September 2, 2005. Describing the in-house review that led to more assertive biological inspections, UN Security Council, *Second Report of the Executive Chairman of the Special Commission Following the Adoption of Security Council Resolution 1051 (1996)*, Doc. S/1996/848, October 11, 1996, Annex, para. 13.

92. Spertzel and Paul-Henriot made the case in this meeting. Barton, *The Weapons Detective*, 125. Ekeus attributed his decision to authorize the investigation to his trust in Spertzel and Corden, who also told him Iraq was hiding a bioweapons program. Ekeus, interview.

93. The Iraqis allowed the interview mission because Ekeus told them their next Security Council review on sanctions relief would go better if they cooperated, and Aziz had specifically promised to allow UNSCOM to interview the scientists in the biological program. Iraq rejected prior interview mission requests as “irrelevant, beyond UNSCOM’s mandate, or more usually, because ‘the scientists are all now driving taxis and cannot be found.’” Quote from Barton, *The Weapons Detective*, 127. On the mission’s objectives, UN Doc. S/1994/1422/Add.1, Annex, para. 46.

94. Seeing Kamal’s name on the interview list, Ekeus’s deputy, Duelfer, responded somewhat incredulously, “You want to interview who? No.” During the BW1 mission in August 1991, Iraq identified members of Taha’s research group. The inspectors plucked some names

from a CIA-provided roster of people believed to have some connection to a bioweapons program. To bring off the mission, UNSCOM had to agree to review Iraq's revised biological declaration during that trip. The six-person UNSCOM 104/BW15 team ended up running at least two interview sessions daily and marking up the Iraqi declarations well into the night. Amin insisted that the interviews be conducted at the Rashid Hotel, a Ba'ath Party facility. Spertzel, interview; Barton, *The Weapons Detective*, 128–130.

96. Amin first denied any knowledge about the Al Hazen Ibn-al Haythem Institute, but after conferring with others came back with a nothing-to-worry-about tact. Killip, interview. Unaware that all the inspectors had was a piece of paper with Al Hazen stamped on it and thinking perhaps that UNSCOM knew more about this institute's role in Iraq's early bioweapons research, in later interviews the Iraqis spoke cryptically about the origins of some work. On finding the clue about this institute's existence, see Chapter 2.

98. TSMID's director, Ahmed Khudayyer, gave the same account as the clerk, Adel Nafi Salman. The inspectors got the names of both individuals from a CIA list of people possibly involved in bioweapons activities. Barton, *The Weapons Detective*, 130–131. The clerk said TSMID imported items such as electronics and chemical equipment. Since 1991, Iraq made occasional mention of an entity called TSMID. A brief 1991 data declaration, for instance, noted that TSMID imported some of the equipment located at Al Hakam. This declaration included the fermenters transferred to Al Hakam from Al Kindi, Al Taji, and Salman Pak, and stated that other equipment came to Al Hakam through imports by TSMID and other organizations (such as the Ministry of Petroleum). This declaration listed some media (for example, peptone, glucose, yeast extract) at Al Hakam but stated there were no complex media there. In his letter protesting the unfairness of the ongoing monitoring and verification plan, Iraqi Minister of Foreign Affairs Ahmad Hussein argued erroneously that it "bars Iraq from undertaking any biological activity for civilian purposes." Iraq submitted this declaration along with a lengthy list of complaints about the requirements of ongoing monitoring. See *Letter from Abdul Amir Al-Anbari, Permanent Representative of Iraq to the UN, to Rolf Ekeus, Executive Chairman of the Security Council Special Commission*, letter no. 1/7/516 (New York, Permanent Mission of Iraq to the UN, dated November 19, 1991), 4, 5, 12.

99. Taha's breakdown persuaded Barton, who had been to Al Hakam and several other facilities but was neutral about whether Iraq had a full-fledged bioweapons program, that indeed Iraq was hiding something. Barton, interview. Also on Taha's breakdown, Kelly, interview; Spertzel, interview. See also Barton, *The Weapons Detective*, 131–132. Admiring the effectiveness of Kelly's interviewing technique, Franz, interview; Killip, interview; Kraatz-Wadsack, interview.

101. The BW16 inspection ran from December 2 to 10, BW13 from December 2 to 13, BW17 from December 9 to 18. BW16 began installing cameras at Al Hakam. UN Doc. S/1994/1422/Add.1, Annex, para. 66.

102. The research and development building had such typical equipment as a drying oven, lyophilizers, incubators, centrifuges, pH meters, 10- to 14-liter bench fermenters, and very few biosafety hoods, including some class B, laminar flow hoods that were not vented to the exterior. Both in this building and in the animal house much of the equipment was trashed, just thrown into a corner, not hooked up, or otherwise inoperable. However, in the rear of the animal house that the Iraqis said was to house and occasionally test their feed product on chickens, the inspectors saw cages big enough to hold primates. An incinerator was behind the animal house. In a large warehouse just inside of the main gate, Leberherz found a couple of sets of heavy duty rubber gloves of the type used in totally enclosed safety cabinets (Class III),



indicating perhaps higher level containment equipment had been on site at one point. Leberz, interview.

103. To make their single-cell protein product, the Iraqis hauled in the beer mash via tankers, transferred this yeast slurry into seven holding tanks, added sodium hydroxide to help precipitate the yeasts, chilled the mixture without agitation to allow the yeasts to settle, and then put the cell-rich slurry from the bottom of the holding tanks through centrifuges and driers, including a cyclonic air drier, for a final product that they estimated to be roughly 45 percent protein by weight. The production line used the Olsa fermenters from Al Kindi. The continuous flow process would substitute methanol and ethanol to provide the carbon to yeast cells during fermentation. The scale-up line consisted of fermenters, separation equipment, and a laboratory to experiment with continuous flow fermentation. In a larger building next door, the Iraqis planned to install seed fermenters and a 50,000-liter production fermenter, among other equipment. Beside this new facility, the Iraqis were setting up large pieces of air-handling equipment in a new utility building, already connected to power lines. The Iraqis started the *B. thuringiensis* process in a laboratory for sample analysis, then introduced inoculum into the Chemap fermenters, harvested the spores from the spent medium via continuous flow centrifuge, and dried the spore-bentonite slurry in a cyclonic air dryer. The Iraqis said this biopesticide went to farmers for use against corn borers. In the second process in this building, the Iraqis said they mixed peat moss with a nitrogen-fixing organism in batch fermenters and then harvested *Aspergillus niger* as a biofertilizer to facilitate nitrogen fixation, which helps grow certain crops. In a U-shape along the interior walls, the new process line would use between two and four seed fermenters then move the material to four Iraqi-made 50,000-liter production fermenters, transfer the spore-rich medium into two holding tanks and then into a continuous flow centrifuge to separate the spores from the medium. The cell slurry would next go to another holding tank, where bentonite would be added for mass to facilitate drying in a cyclonic air dryer. The Iraqi homemade fermentation tanks did not have mechanical seals or agitators installed in them, which they needed before taking this line operational. So the Iraqis said they needed to import the mechanical seals, which have to operate with very tight clearances to withstand internal pressures generated during fermentation and not allow any leakage into or from the tanks. They had stocks of imported seals to replace worn out or damaged seals in their imported fermenters. The clean-in-place facility was a quite sophisticated, expensive operation with automatic controls, and well-constructed tanks and piping. The Iraqis claimed to need this capacity because their planned media formulation for their *B. thuringiensis* product included casein, which crudded up the tanks. Leberz, interview.

104. Note that Leberz drew the process flow diagrams after a December 1994 inspection of Al Hakam. Leberz, interview. Concurring with Leberz's assessment, Kelly, interview; Spertzel, interview; former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, February 21, 2006.

105. In December 1994, five fermenters at Al Hakam were operational. The Iraqis noted they were trying to grow their own media so that they would not need to rely on outside suppliers. Construction had begun on a water purification facility, which would eliminate the need to truck in water for Al Hakam's fermentation, cleaning process equipment, and steam generation. The Iraqis were planning to use a de-ionization process to purify the water. Leberz recalled seeing growth media being in 30- to 50-gallon sizes. This road camouflage document was among those photocopied from Taha's files and various production process and plant records. The waste samples were taken the next to the last day of the inspection. UNSCOM at that point lacked a biological sampling protocol, so the night before this sampling, the

inspectors devised procedures to protect the sample integrity and assure chain of custody (for example, duplicate, split samples). Leberherz, interview.

106. The laboratories in question were at Dugway Proving Ground, Utah, and the Naval Medical Research Institute, Bethesda. The biopesticide line had two driers, one that just rotated and dried material without making particle sizes, and another spray drier that also created small particle sizes. The latter drier was sampled. Spertzel, interview; Kraatz-Wadsack, interview.

108. Salman Pak was still largely in disrepair and there were no personnel in most of the buildings. An alternate explanation for the excavation was that the Iraqis could have been removing several feet of topsoil to uncover water, a practice that earlier teams had noticed. Leberherz, interview; Kelly, interview.

111. UNSCOM also installed pressure sensors at facility gates to detect heavily loaded vehicles. Kraatz-Wadsack, interview.

113. The incident in question took place within the last ten days of the month. Some recall other Iraqis in the video, not wearing protective gear, but not necessarily in the room at the same time as the protected staffer. Kelly, interview; Spertzel, interview; Kadlec, interview; former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, February 21, 2006.

114. Essentially, Killip, Kelly, Barton, Spertzel, and a few others came to this conclusion thinking the Iraqis were not aware the cameras were operational. Spertzel, interview; former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, February 21, 2006; Kadlec, interview; Franz, interview. When the United States still had an offensive bioweapons program, U.S. personnel donned protective gear for worker biosafety. The wearing of protective gear may also indicate that the individual is not immunized against the agent being produced. Kadlec, interview; Franz, interview. The Al Hakam worker may have been scrubbing the area between manufacturing runs or to hide evidence of illicit biowarfare agent production and thus was wearing protection against formaldehyde or other potent cleansers. The inspectors dismissed this explanation because a substance as potent as formaldehyde would have penetrated the respirator and the activity observed did not appear to be consistent with cleaning. Kraatz-Wadsack, interview.

116. Inspectors first viewed the tape in mid-to late-January 1995. The U.S. government provided the cameras, the technician, and operators for all of UNSCOM's ongoing monitoring cameras. Before the system went real time, the tapes were taken to the U.S. Gateway facility in Bahrain for review. When UNSCOM requested it, copies were forwarded to UNSCOM headquarters. The original cameras were black and white, but UNSCOM later installed infrared cameras. Kraatz-Wadsack, interview. Also on the Iraqi practice of doing provocative things on camera to test the UNSCOM response, Kelly, interview. On the Iraqi awareness that the cameras became operational on December 19, 1994, Republic of Iraq, "Status of Iraq's Implementation Under Resolutions 687 and 715," 19.

## Chapter 4

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1. In late May or early June 1994, the Israelis told two UNSCOM staffers that Iraq had imported a large quantity of media, mentioning yeast extract as one type of media purchased. In January, the Israeli briefer spoke of other media types, including triptone, soya broth, and casein, and provided a bit of documentation about the growth media purchase of thirty-nine tons. Richard Spertzel, PhD (former UNSCOM chief biological weapons inspector), interview with

author, Washington, DC, July 1, 2005; David Kelly, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, December 17, 2002. The Israeli briefings occurred on January 5 and 6 at two different apartments in Manhattan. Also, the Central Intelligence Agency briefed UNSCOM on Iraq's possible bioweapons program on October 28, 1994, in UNSCOM's secure conference room on the thirtieth floor, known as the bunker. Also, Rod Barton, *The Weapons Detective: The Inside Story of Australia's Top Weapons Inspector* (Melbourne: Black Inc. Agenda, 2006), 136–138; Tom Mangold and Jeff Goldberg, *Plague Wars* (New York: St. Martin's Press, 1999), 307.

2. UNSCOM's interaction with Israeli intelligence grew out of a discussion between UNSCOM's Tim Trevan and David Ivri, the director of the Israeli Defense Ministry, which led to a meeting with UNSCOM Executive Chairman Rolf Ekeus. Israel began sharing data with UNSCOM in 1994, but the relationship was wrapped in secrecy out of concern that Iraq would exploit it for propaganda purposes. Iran and other Middle Eastern states also had incentive to share intelligence data with UNSCOM. Barton Gellman, "UN Arms Inspectors Relied on Israeli Leads," *International Herald Tribune*, September 30, 1998, 2.

5. Ekeus sent these letters to ambassadors from France, Germany, Switzerland, Italy, and the United Kingdom, naming companies in each country to make it difficult for governments to ignore his request. In early 1992, Ekeus used a more broadly worded letter to many countries asking for assistance with any information they could share about any prohibited weapons or activities in Iraq. The response in the biological area was very modest because most countries assumed that exports of growth media and fermenters were for legitimate purposes, whereas a gyroscope shipped to Iraq might be more questionable. UNSCOM also sent similar letters when the nuclear, missile, or chemical inspectors had a specific matter they wanted to explore. Spertzel, interview; former senior UNSCOM official, interview with author, New York City, August 30, 2005; Barton, interview; Barton, *The Weapons Detective*, 138–139.

7. At the manager's invitation, Barton visited Oxoid in the first week of April 1995. Oxoid gave him access to their sales file on Iraq. Barton, *The Weapons Detective*, 145, 150–151. Also, Spertzel, interview.

8. When Spertzel and Barton went to Fluka in early April, the company opened the files on its sales of growth media during 1988 and 1989 to Iraq. The technical representative from the Swiss company Chemap was very helpful, explaining that the fermenter Chemap sent to Al Muthanna in 1986 was probably not used right away because it looked untouched when Chemap's technician commissioned it in 1988. By that time, the Iraqis had moved the fermenter to Salman Pak. In 1988, Chemap began to supply spare fermenter parts to TSMID but the company declined to sell Iraq additional fermenters after they contacted the Swiss government and were advised not to do so. Chemap provided the inspectors with a report on the fermenters it refused to sell Iraq. Spertzel, interview; Terence Taylor (former UNSCOM CBW commissioner and chief inspector), interview with author, Washington, DC, May 12, 2005. Also, Barton, *The Weapons Detective*, 151, 154–157; William J. Broad and Judith Miller, "The Deal on Iraq: Secret Arsenal: The Hunt for the Germs of War," *New York Times*, February 26, 1998, A1.

9. In late June, Niro was very forthcoming when Spertzel and Barton visited. The company provided model and manufacturing numbers for the two spray driers that it sold Iraq. Company officials explained how Taha's deputy, Abdul Rahman Thamer, brought a *Bacillus thuringiensis* sample to Niro in 1989 so that the company could dry it in a contained dryer. Answering Thamer's questions, Niro's specialists told him the additive needed to improve the product's dispersability but did not tell Thamer where to obtain that additive. TSMID subsequently ordered four dryers, and the paperwork showed that Military Industrialization Commission

employees signed off on that order. The Danish government, however, discouraged the sale, so Niro refused to fill the order despite Iraq's letters of protest. Some governments set up the appointments with the companies, others allowed UNSCOM to make the contact. The German government sent an escort when Spertzel and Barton visited a company thought to have manufactured a piece of equipment for Iraq's efforts to craft a biological dispersal device. This company did not cooperate at all, even when shown a telex documenting Iraq's order. Spertzel, interview; Barton, interview. Also, Barton, *The Weapons Detective*, 151–152, 154–155.

10. The sales records of what Olsa supplied to Iraq listed two 1,850-liter fermenters and six storage tanks, but rather than redesign their fermenters and make the storage tanks that Iraq requested, it was more cost effective for Olsa to just send fermenters labeled as storage tanks. Spertzel, interview.

13. To illustrate the utility of the broken code, if the inspectors had a document from the ninety-sixth purchase in 1989, they knew that TSMID had made at least ninety-five other procurement actions in that year for the bioweapons program. Spertzel, interview.

14. Niro made the dryer that was sampled. This dryer was purchased in 1983 for the single-cell protein project at Al Taji. Iraq transferred this dryer into the bioweapons program in 1986, when the center of Iraq's research and development activity moved from Al Muthanna to Salman Pak. The laboratory verbally summarized its analysis for UNSCOM before sending a written report in January. Spertzel, interview; former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, Washington, DC, February 21, 2006; Robert Kadlec, MD (former UNSCOM inspector), interview with author, Washington, DC, February 23, 2006.

15. The Al Nasir biopesticide turned out to be inactive, the *B. thuringiensis* perhaps killed because the Iraqis dried it for too long. After scientists at Al Tuwaitha analyzed Al Hakam's biopesticide in 1997 and found it incapable of killing any pests, they started their own project to develop a biopesticide. Gabriele Kraatz-Wadsack, DVM (former UNSCOM chief biological weapons inspector), interview with author, Berlin, August 15, 2005; Kadlec, interview; former UNSCOM biological weapons inspector, interview with author, Washington, DC, February 21, 2006. The initial analyses of this sample confirmed the ultra small particle size, but it also showed that the material did not resemble *B. thuringiensis*. The sample was forwarded to Los Alamos National Laboratory for further analysis, which initially identified it as a nonpathogenic strain of *B. anthracis*. This result created a stir among UNSCOM inspectors, some of whom viewed it as confirmation that Iraq was definitely working toward drying of virulent anthrax. Two explanations for this result were posited: Iraq was using a nonpathogenic strain to train for their work with a virulent strain; or, worse, Iraq was working with a nonpathogenic strain with the goal of modifying the genome and insert other plasmids. Kraatz-Wadsack, interview. Additional investigation of this sample by U.S. specialists eventually revealed that the *B. thuringiensis* strain from the Al Hakam spray drier shared some characteristics with *B. anthracis*, but the final assessment was that the strain was indeed *B. thuringiensis*, suitable for pest control. Former UNSCOM biological weapons inspector, interview with author, Washington, DC, February 21, 2006.

18. One filter of the separated plenum can be sterilized while the other remains in place. British and U.S. designs for high-level containment facilities often included this distinct, bifurcated plenum. Hamish Killip (former UNSCOM chief biological weapons inspector), interview with author, Isle of Man, August 22, 2005; Kelly, interview; Spertzel, interview.

20. A dry powder, growth media absorbs water out of the air, which induces fungi to develop and grow and reduces the carbohydrate component of the media. Scientists in hospitals

or research laboratories would have had to open these barrel containers countless times to retrieve the small amount of media required for experiments or diagnostic tests, resulting in contamination of the media. For this reason, suppliers such as Oxoid and Fluka typically offer container sizes no larger than 5 or 10 kilograms, unless on special order. Two days later, Kraatz-Wadsack returned to inventory the Al Adile cache more precisely, noting the size, contents, and manufacturer of each container and photographing the label on each barrel before sealing the room. Media used for diagnostic tests is usually in 0.1 to 1 kilogram-sized packages. An Oxoid representative told Barton that if the media were stored in proper conditions, it had an indefinite lifetime. Kraatz-Wadsack, interview. Also, UNSCOM, "IBG 2 SitRep 12," from Gabriele Kraatz-Wadsack, CI IBG2, to Executive Chairman, UNSCOM (Baghdad, Baghdad Monitoring and Verification Center, March 15, 1995), 2; United Nations (UN) Security Council, *Report of the Secretary-General on the Status of the Implementation of the Special Commission's Plan for the Ongoing Monitoring and Verification of Iraq's Compliance with Relevant Parts of Section C of Security Council Resolution 687 (1991)*, Doc. S/1995/284, April 10, 1995, Annex, para. 65; Barton, *The Weapons Detective*, 151.

21. All containers were photographed, and the inventory sent to UNSCOM headquarters indexed the media by type, container size, manufacturer, and serial and lot numbers. Kraatz-Wadsack made subsequent visits to all of the sites involved to further ascertain the nature of the media. She identified whether each container had the original seal, if it had a double or single label, if it contained the right material, or if it had substitute media from Jordan. The suppliers normally packed media in clear plastic bags, but at Al Kindi, the Oxoid barrels, which were plastic, had blue plastic bags inside, indicating refill media. At Al Adile, she found one container labeled thioglycolate that was really peptone, but otherwise this detailed inventory was uneventful. Kraatz-Wadsack, interview. Also, "IBG 2 SitRep 12," March 15, 1995, 1–3. Two Iraqi institutes bore the name Al-Razi. Hazim Ali ran the virology department of the research center at Al Muthanna and shared the responsibility of directing the institute with Athir Al Duri, who headed the bacteriology department. The Iraq Survey Group found no evidence that this Al-Razi Center was actively engaged in bioweapons research and development. In 1992, Hussein Kamel installed Hazim Ali as the director of a second Al-Razi Center of Biology. For more, CIA, *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD, "Biological Warfare," Central Intelligence Agency (CIA), Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD* (Washington, DC, September 30, 2004): "Biological Warfare," vol. 3, Annex B: BW Research and Development Facilities.

22. For example, Jeff Mohr led the UNSCOM 110/BW19 team to the Al Kindi Veterinary Vaccine Production Plant, Al Ameriyah Serum and Vaccine Institute, and the Al Razi Research Institute. Mohr, in Iraq from January 20 to February 6, 1995, noted that his instructions were to operate more assertively, but the team did not find any records of consequence. "I was told to look in every nook and cranny, to get every document we could lay our hands on. We copied hundreds and hundreds of pages from notebooks, SOPs, everything." Jeff Mohr, PhD (former UNSCOM chief biological weapons inspector), interview with author via telephone, June 27, 2005. On UNSCOM 109/BW18, Diane Seaman led an all-female inspection team to the women's universities and colleges that Iraq declared as being engaged in biological research. Franz took in UNSCOM 111/BW20 from February 3 to 17, 1995, focusing the inspection on Samarra Drug Industries. David Franz, DVM, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, June 29, 2005. In a reprise of the type of conclusions reached by UNSCOM 72/BW4, Patrice Binder took UNSCOM 112/BW21 to eight declared and six undeclared sites in Iraq from February 5 to 16, 1995. Of Al Hakam, the UNSCOM BW21 report

stated, “The installation of the major components and vessels of the Biopesticide Production Plant indicates that the Iraqis have the capability to develop and integrate biotechnological equipment. However, any capability to operate such equipment and to produce biological agents was not evident.” The report concluded, “Regarding Iraq’s capability to produce pathogenic microorganisms and toxins with indigenous equipment at facilities such as Al Hakam, the complete lack of specialized containment systems and procedures for safe plant operations would pose a serious threat of contamination to skilled operators and the surrounding environment.” UNSCOM, *Final Report: UNSCOM 112/21, Executive Summary*, marked “UNSCOM Sensitive” (New York, UNSCOM, n.d.), 2, 10.

24. A University of Technology engineer also stated that the research building was known as Project 400 and the animal house as Project 500. These two figures added up to Project 900 for the architectural drawings for these two facilities, which were situated very closely in Al Hakam’s research complex. Spertzel, interview.

25. Prior to the decision to build Al Hakam, Lt. Gen. Amer Al Sa’adi, one of Hussein Kamel’s senior deputies, instructed his subordinates to survey other sites and also to consider the feasibility of mobile bioweapons production facilities. Late in 1995, the Iraqis explained that the code number 324 stood for March 24, the date Iraq settled on Al Hakam as the site for their dedicated biowarfare agent production facility. Spertzel, interview; Kraatz-Wadsack, interview.

26. The University of Technology was also known as the Baghdad Consultative Bureau. Spertzel, interview.

28. TSMID Director Ahmed Mohammed Khudayyer and an official from the State Company for Drugs and Medical Appliances, which normally procured materials and equipment for the Ministry of Health, also participated in this interview session. Barton, interview; Spertzel, interview; Barton, *The Weapons Detective*, 142–143.

32. At this juncture, UNSCOM had reference numbers for four additional letters of credit to buy smaller quantities of media and several of TSMID’s tenders for media orders. Iraq made no mention of these additional media procurement activities. Spertzel, interview. The Iraqis showed documents about the procurement of twelve more tons of media. Barton, *The Weapons Detective*, 143. See also Broad and Miller, “The Deal on Iraq: Secret Arsenal.”

33. Somewhat uncomfortably, the health minister repeated the claim that TSMID bought the media because his ministry lacked the foreign currency to buy supplies abroad. Kelly, interview; Killip, interview; Spertzel, interview.

36. The State Company for Marketing Drugs and Medical Appliances provided documents dating to 1989 that fell into three categories: (1) store receipts, (2) store inventories, and (3) the sales lists of media orders from the hospitals in these seven provinces. The store receipts specified the types and amounts of media received and carried the reference number for the letter of credit used for the purchase. In 1989, Iraq purportedly delivered a cumulative twenty tons of media to the hospitals in question. The store inventories gave the incoming and outgoing amounts for various types of media, with the incoming amounts neatly matching the figures on the store receipts. Further, the outgoing amounts for the store inventories were just the same as the figures on the sales lists. Taylor, interview; Kraatz-Wadsack, interview; Spertzel, interview. Also, UN Security Council, *Report of the Secretary General on the Activities of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b)(i) of Resolution 687 (1991)*, Doc. S/1999/401, April 9, 1999, Annex, para. 67.

37. Preliminary and detailed analyses both confirmed the forgery. The Iraqis had used paper unavailable at the time of the dates on the documents. The exact same ink was on all of the documents, but the FBI was unable to stipulate exactly when the documents were created

because it was not sufficiently familiar with Iraqi inks. The documents were dated months apart but had sequential serial numbers. Taylor, interview; Spertzel, interview; Barton, interview. Also, United States Special Commission, *Background Paper for the Biological Seminar* (seminar of international biological weapons experts, April 6–7, 1995), April 5, 1995, 4; Barton, *The Weapons Detective*, 145. Confirming that “[s]uperficial, incomplete, and even phony documents were served up to mislead the eager inspectors,” Khidir Hamza with Jeff Stein, *Saddam’s Bombmaker: The Terrifying Inside Story of the Iraqi Nuclear and Biological Weapons Agenda* (New York: Scribner, 2000), 260.

38. Kelly also let the Iraqis know exactly where they stood early in 1995. UNSCOM, he told them, believed that 95 percent of its investigation of biological matters lay ahead and that there were significant indicators that both Al Hakam and Al Muthanna were linked to a bioweapons program. Barton, *The Weapons Detective*, 138–139.

39. Iraq submitted the new declaration in March 1995. UN Security Council, *Report of the Secretary-General on the Status of the Implementation of the Special Commission’s Plan for the Ongoing Monitoring and Verification of Iraq’s Compliance with Relevant Parts of Section of Security Council Resolution 687 (1991)*, Doc. S/1995/864, October 11, 1995, Annex, para. 69.

40. Johan Santesson, who was seconded by the World Health Organization to UNSCOM’s earliest biological inspection teams, coined this phrase. Spertzel, interview. Kelly called the declarations “a mixture of fact and fiction.” Kelly, interview.

43. Iraq’s media imports could have made over three tons of bacterial biowarfare agents. “Biological Weapons Program in Iraq Larger Than Believed,” *Los Angeles Times*, February 28, 1995.

44. In retrospective, “Why didn’t we see that before? UNSCOM was too compartmented.” Taylor, interview. Also on the file video of the media at Al Adile, former senior UNSCOM official, interview with author, August 30, 2005; Kraatz-Wadsack, interview.

45. Staffers from Al Hakam were not included in these interviews. Kraatz-Wadsack, interview; Taylor, interview.

52. Iraq’s Ambassador to the United Nations, Nizar Hamdoon, made this claim. Lee Michael Katz, “Iraq: Inspections Will Be ‘Settled,’ Will Open Up on Biological Arms, Ambassador Says,” *USA Today*, March 7, 1995, 10.

54. Lebherz was at Al Hakam on two UNSCOM inspections. Without telling Lebherz the reason for the review, Smidovich asked Lebherz to evaluate the documents, making no distinction between those that UNSCOM inspectors acquired or those provided by intelligence services. Lebherz posited that full-scale fermentation would only become viable once Al Hakam had an operational steam generator. The records showed when Iraq ordered a steam generator and when it was delivered. Allowing for installation, the conservative date for the plant to be operational was March 1989. The documents included invoices for materials, bank drafts, and supply and equipment orders (for example, for Ph probes, fermentation seals, agitators, and dissolved oxygen probes) from various firms. Lebherz performed this evaluation over a three-day period in UNSCOM’s offices in New York City. William Lebherz (former UNSCOM industrial biotechnology expert), interview with author, Washington, DC, February 13, 2006; former UNSCOM staff member, interview with author, New York City, September 2, 2005.

55. Barton assumed that Al Qaysi was present to assess whether the cover story was holding or if UNSCOM had a solid case and Iraq should stop denying its bioweapons program. Barton, interview. Before Ekeus’s high-level meeting in Baghdad, Amin met with UNSCOM in New York on March 15 to 16, 1995, presenting a written statement from Iraq’s minister of health that the media imports through TSMID were for hospitals. In turn, the inspectors showed

Amin telexes about Iraq's attempts to procure strains of anthrax from Porton-Down, the United Kingdom's leading chemical and biological defense facility. Amin wrote off the Porton-Down telexes as fakes. Spertzel, interview. Chapter 3 contains additional information about Iraq's acquisition of the Vollum strain of anthrax. Taha and Rasheed met during this mid-March 1995 trip to New York to brief UNSCOM and later married. Christopher Dickey and Colin Soloway, "The Secrets of Dr. Germ: U.N. Inspectors Have Begun Searching Iraqi Weapons Sites. But What Happens When They Investigate the Scientists? The 'Human Factor' Could Be a Trigger to War," *Newsweek*, December 9, 2002, 2.

57. Rasheed said the original order of one ton for a year's supply to cover all hospitals got doubled to five tons for five years and then doubled again to be even safer before more senior officials finally made it forty tons. Barton, *The Weapons Detective*, 146–148. On Iraq describing this as a one-time only mistake, UN Doc. S/1999/401, Annex, paras. 63–64.

58. In addition to the minister of health's verbal statement to the inspectors of UNSCOM 113, he provided a written statement about the legitimacy of the media imports to UNSCOM in mid-March 1995. Spertzel, interview.

60. Also on the Iraqi calculation of Al Hakam production capabilities during the time frame in question, UNSCOM, *Background Paper for the Biological Seminar*, 4. According to Iraq's Ministry of Health, from 1987 to 1994, on an annual basis all of Iraq's hospitals collectively used less than 200 kilograms of media in diagnostic tests. UN Doc. S/1999/401, Annex, para. 64.

61. The filling machines that Iraq ordered were for liquid materials, and both their products were in dry form. Barton, *The Weapons Detective*, 148.

67. Ekeus was uncomfortable when the senior Iraqis in the room looked at him as though Taha had been treated in an ungentlemanly like manner, but since the inspectors knew her tears were mostly for show, he was not concerned about her emotional exit. Ambassador Rolf Ekeus (former UNSCOM executive chairman), interview with author, Stockholm, August 24, 2005.

68. Of the upcoming report, U.S. Secretary of State Warren Christopher said, "We now have strong evidence that Iraq is conducting a large program to develop biological weapons." Lee Michael Katz and Judy Keen, "U.S. Fears Iraq Is Working on Biological Arms Again," *USA Today*, April 5, 1995, A1.

71. The outside panel of experts from eight countries was a final precaution to sanity check UNSCOM's evidence. Ekeus "couldn't just say to the Security Council 'I think they had a past biological weapons program.' He would immediately be asked the basis for his assertion. Everything that Ekeus said to the Security Council had to stand up to scrutiny." Former UNSCOM staff member, interview with author, September 2, 2005.

70. For each container of media inventoried, Kraatz-Wadsack recorded the interior and exterior labels on the container, the actual content and weight, the size of the container, and the expiration date. Kraatz-Wadsack, interview; former senior UNSCOM official, interview with author, August 30, 2005; Spertzel, interview. The Iraqis said the filling machines were really intended for use in a biopesticide project at Salman Pak but had not previously spoken about this project, and they claimed that the company that sold them the spray drier made an error regarding the desired particle size. The Iraqis attempted to order an inhalation chamber in 1989 and 1990, but such equipment is not required to make single-cell protein or a biopesticide. Three fermenters were ordered, and Iraq falsified the end-user certificate for the first one to mask its placement at Al Hakam. Iraq also placed orders for spare parts for the equipment at Al Hakam with statements that the equipment was located at Al Taji. UNSCOM, *Background Paper for the Biological Seminar*, 4.



71. The layout of the roads and general structure was the same. In Al Hakam's case, the Iraqis erred in orienting the facility without regard to the prevailing winds. Had an accident occurred, the workers would have been unable to leave safely either of the production buildings or Al Hakam's front gate, making a trek across the desert their best escape route. Killip, interview.

72. During her exhaustive inventory of the media, Kraatz-Wadsack observed mice feces on the lids of the containers on the top of the Al Adile stacks. The Iraqis said that the media had not been moved since they arrived in country and were transported to Al Adile. The presence of feces on some containers in the middle of stacks proved they had at one point been on top of a stack and therefore the media had been moved. Carefully recording the number and location of the containers with feces on their lids, Kraatz-Wadsack disproved another facet of the Iraqi media cover story. In 1998, the Iraqis finally told UNSCOM that the media went first to Salman Pak, where the storage shed had a low ceiling and did not allow them to stack the containers very high. The collapse of this shed damaged some containers. Some of the media also were probably sent to Al Hakam, and what was not consumed in agent production, along with the media from Salman Pak, was eventually sent to Al Adile. Kraatz-Wadsack, interview.

80. For example, Tom Aspell filed his report for NBC Nightly News on April 4, 1995, from Al Hakam. Also, UNSCOM inspectors recall Asian television coverage of Al Hakam in the spring of 1995 showing Taha posed amidst a well-fed flock of chickens. Tom Aspell, "UN Monitoring of Plant in Iraq Shows Some Suspicious Activities," NBC News, April 4, 1995; Leon Barkho, "Iraq Shows Foreign Reporters Main Biological Site," Reuters (Al Hakam, Iraq), April 22, 1995; "Iraqis Open Pesticide Factory Doors to Refute Germ War Claims," Agence France Presse (Baghdad), April 22, 1995; Robert Windrem, "The World's Deadliest Woman?" NBC News, September 23, 2004, <http://www.msnbc.msn.com/id/3340765>; Taylor, interview; Kraatz-Wadsack, interview.

83. Taha showed the media how they tallied the daily egg production on a blackboard. The Iraqis also took this group of journalists to three other facilities associated with chemical and biological weapons manufacture. Dilip Ganguly, "Iraqis Try to Build a Better Chicken at Former Weapons Plant," Associated Press, April 22, 1995.

84. Saddam Hussein ordered Aziz to cut this deal. Duelfer, interview; Spertzel, interview; Charles Duelfer, *Hide and Seek: The Search for Truth in Iraq* (New York: Public Affairs, 2009), 103–104. On the high-level meeting and Iraq's refusal to cooperate with the biological team, UN Security Council, *Report of the Executive Chairman of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Security Council Resolution 687 (1991)*, Doc. S/1995/494, June 20, 1995, Annex, para. 5. Duelfer also recalled the Aziz-Ekeus deal in Stephen Black, "The Death of UNSCOM: The CBW Colloquium," *ASA Newsletter*, no. 76 (January 2000).

87. Leaving Baghdad, Ekeus indicated that a way had been found for Iraq to account for the missing media. "Arms Issues Unresolved, U.N. Inspector Says," *Washington Post*, June 2, 1995, A27.

94. Ekeus also told the press,

This is something that we cannot comprehend. . . . This could be because they have convinced themselves that there would be no value for them in cooperating with us in the biological field and thus opening the way to other problems that they could not foresee. As for the facts we have acquired about the biological weapons, they concentrate in the main in a series of import operations which could form an integrated production program covering a major armament operation. This is a serious matter. We do not know whether Iraq has used these capabilities for production or has stored and guarded

them, or whether it has manufactured elements and stored them away. But if they have really done so, what would be the aim of the biological program? Is it to be a substitute for the chemical program, or would it be parallel to the programs that began with the end of the Iraq-Iran war and continued after the end of that war? Perhaps their lack of cooperation could be due to their belief that it is the last negotiating card they have, and so they will not surrender it before the resolution of their political problems.

Khalil Matar, "Ekeus Sees No 'Total Guarantee' on Arms," interview with Rolf Ekeus (in New York, n.d.), *Al-Sharq Al-Awsat* (London), July 1, 1995 (translated by FBIS, Doc. FBIS-TAC-95-014-L, August 4, 1995, 72–74).

96. Taha also stated that the bioweapons program originated in 1985 at Al Muthanna and moved to Salman Pak in early 1986. Spertzel, interview; former senior UNSCOM official, interview with author; August 30, 2005; Kraatz-Wadsack, interview.

101. The Iraqis gave the inspectors a paper dated June 30. Spertzel, interview; former senior UNSCOM official, interview with author, August 30, 2005. On these events as well, Barton, *The Weapons Detective*, 158; UN Doc. S/1995/864, Annex, para. 71.

102. Chapter 5 of another manual details the effects that weather (such as wind, temperature, humidity clouds, or rain) and terrain (for example, soil, plants, or topography) have on the spray dispersal of a biological agent. Republic of Iraq, Ministry of Defence, *Manual: Meteorology*, vol. 10, section 1, first printing, *Behaviour of Chemical, Biological and Nuclear Agents in the Field* (Army General Staff, Training Department, Chemical Group Section, January 1988) (translated for the Armed Forces Medical Intelligence Center, Ft. Detrick, Maryland, Document AFMIC-HT-100-92).

104. According to UNSCOM's historian, "The July disclosure exposed many areas in which Iraq's statements were inconsistent with the Commission's information or where information was absent or vague, notably in the area of weaponization." Stephen Black, "UNSCOM and the Iraqi Biological Weapons Program: Technical Success, Political Failure," in *Biological Warfare and Disarmament: New Problems, New Perspectives*, ed. Susan Wright (New York: Rowman & Littlefield, 2002), 294.

105. Foreign Minister Muhammad Sa'id al-Sahhaf said, "There are no germ weapons. We explained to Mr. Ekeus there was research on producing germ elements. This was an intermediate stage in which the Iraqi program was terminated and these elements were destroyed. We said that our researches had produced the germ elements. It was an intermediate stage, which, if continued, would have been considered nondefensive. . . . We are no longer interested in that field. When we reached that stage (of the germ program), we discovered that it was of no importance to us, so we destroyed it because it was dangerous to keep or put (these materials) in depots."

Raghidah Dirgham, "Al-Sahhaf Says Iraq Destroyed Germ Program Because It Was Dangerous," *Al-Hayat* (London), July 7, 1995 (translated by FBIS, Doc. FBISTAC-95-014-L, August 4, 1995, 77–78).

107. "When cover stories were penetrated, Iraq would abandon them in a controlled fashion that tried to indicate that minimal disclosure was complete disclosure," said chief nuclear inspector David Kay. "Even a penetrated cover story served a useful purpose of allowing another opportunity for Iraq to claim that it had turned over a new leaf and was making a full and final disclosure of its secret activities." David A. Kay, "Denial and Deception Practices of

WMD Proliferators: Iraq and Beyond,” *Washington Quarterly* 17, no. 4 (Winter 1994): 96. Iraq’s actions were consistent with a policy of “calculated concessions.” Ibrahim al-Marashi, “How Iraq Conceals and Obtains Its Weapons of Mass Destruction,” *Middle East Review of International Affairs* 7, no. 1 (March 2003): 53. Saddam viewed UNSCOM inspections as an avenue to sanctions relief, “a step-by-step process whereby Iraq would give something to the UN and the UN would give something to Iraq.” Duelfer, *Hide and Seek*, 377. Also, page 405.

## Chapter 5

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1. This draft contained no new information beyond what the Iraqis had told Ekeus’s delegation on July 1, 1995. UNSCOM 121/BW26 ran from July 12 to July 23. Richard Spertzel, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, July 1, 2005. Also, UN Security Council, *Eighth Report of the Secretary-General on the Status of the Implementation of the Special Commission’s Plan for the Ongoing Monitoring and Verification of Iraq’s Compliance with Relevant Parts of Section of Security Council Resolution 687 (1991)*, Doc. S/1995/864, October 11, 1995, Annex, para. 72–73.

2. Al Taji was mentioned as a source of a 450-liter fermenter. The declared activities at Al Muthanna were research on biowarfare agents, a literature survey, equipment and material procurement, and service as a front company for Salman Pak. One “memory” account listed items imported via Al Muthanna. Republic of Iraq, *Draft Full, Final and Complete Disclosure of Iraq’s Past Biological Programme*, July 1995, 53–58.

3. The declaration described the cleanup of buildings 17, 23, 31, 33, and 35 using slightly different approaches depending on the building and its activity. In general, they removed some equipment to scrap heaps outside of Al Hakam, burned materials (such as filters), used steam sterilization and changed the filters of equipment that was to remain on site (such as fermenters), doused animal cages with phenol and put them outside in the sunlight, scrubbed buildings with 40 percent liquid formalin, burned the floors of the production buildings with alcohol, and washed the walls with antiseptic. To hide signs of decontamination, they painted equipment stands and washed the floors with sulfuric acid to eliminate the dark brown color indicative of potassium permanganate, which was used to deactivate the agent. The Iraqis decontaminated waste pits with formalin, drained them, burned them with alcohol, and then covered some waste pits with cement. They sampled to ensure that the inspectors could not detect agent. Republic of Iraq, *Draft Full, Final and Complete Disclosure of Iraq’s Past Biological Programme*, July 1995, Section 5.6, 156–159.

5. Spertzel and Barton both believed the company knew their product was destined to be used in a weapon. Iraqi engineers later claimed that they planned to use these cylinders, which spun at a thousand revolutions per minute, to filter oil, but the inspectors knew that oil filtration did not require such a high-performance device. Iraq approached this company to make the perforated cylinders, which had to be perfectly balanced, because Iraqi efforts to make them failed. The inspectors never really got the full story about the parallel Zubaidy device from the Iraqis or the German company. This company may have accepted a cash payment for two reasons: because the Iraqis told corporate officials information that made it clear they were trying to develop a weapons system, and a cash payment would have allowed the company to evade sales tax. Some of the same Iraqi personnel worked on the Zubaidy and the parallel Zubaidy device. Rod Barton (former UNSCOM biological weapons inspector), telephone interview with author, May 20, 2005; Spertzel, interview,; Rod Barton, *The Weapons Detective*:

*The Inside Story of Australia's Top Weapons Inspector* (Melbourne: Black Inc. Agenda, 2006), 158–159.

7. According to Hussein Kamal, Iraq's Revolutionary Command Council made the decision to give UNSCOM a no-cooperation ultimatum following Iraq's July 1, 1995, admission of a biological weapons program. "Notes of Nikita Smidovich on a Meeting Between Hussein Kamal and UNSCOM and IAEA," Note for the File, UNSCOM/IAEA Sensitive (Amman, Jordan, August 22, 1995), 2, available at <http://www.ummovic.org>. An Iraqi ambassador who also delivered the threat stated he was speaking on Kamal's behalf. William J. Broad and Judith Miller, "The Deal on Iraq: Secret Arsenal: The Hunt for the Germs of War," *New YorkTimes*, February 26, 1998, A1. On Saddam's initial July 17th statement and repetition of the threat by Amer Rasheed as late as August 9th, R. Jeffrey Smith, "Iraq Rushes to Preempt Defectors' Arms Disclosure," *Washington Post*, August 15, 1995, A13. On Saddam's July 17th statement, UN Doc. S/1995/864, Annex, para. 12. The threat was reiterated on July 20, 1995, in Cairo when Minister of Foreign Affairs Mohammed Saeed al-Sahaf said, "The [UN] Special Commission should end all its work by the end of August and should then report that to the Security Council, to lift the sanctions. If they don't give us our rights, we will stop cooperating with them." "Iraq Threatens Halt in U.N. Cooperation," *Washington Times*, July 21, 1995, A23.

8. Aziz used the phraseology of a "tendentious and hostile" circumstance if sanctions were not eased. James Bruce, "Saddam Hopes BW Confession Is Enough to Convince USA," *Jane's Defence Weekly*, September 2, 1995, 27. After Aziz's second threat, Ekeus briefed the Security Council on August 10, 1995. UN Doc. S/1995/864, Annex, para. 13.

11. According to Iraq's July 1995 draft declaration,

The state organizations in Iraq, like any other state in the third world, work sometimes, when implementing programs or research and production projects, without prior planning for specifying and allocating resources, like financial allocations, personnel and planning, in different criteria comparing to those followed by state organizations and companies in the industrial countries. In this regard, there are a lot of good examples concerning a number of projects implemented depending on step-by-step principle, without well organized planning.

Republic of Iraq, *Full, Final and Complete Disclosure of Iraq's Past Biological Programme*, August 1995, section 1.2, page 10. See also page 163 in Chapter VI and page 13 in section 1.2.

12. Kamal and his entourage drove to Jordan at night following a disagreement at a family dinner at which six bodyguards were shot. Nora Boustany, "Relatives, Top Aides of Saddam Defect to Jordan," *Washington Post*, August 11, 1995, A1; Broad and Miller, "The Deal on Iraq: Secret Arsenal." For Kamal's refusal of a meeting with Uday, Saddam's son and emissary, who went to Amman perhaps to mediate a reconciliation, Smith, "Iraq Rushes to Preempt Defectors' Arms Disclosure." On the role of Saddam's family in Iraq's government,, John Lancaster and David B. Ottaway, "Saddam Curbs Role of Kin in Iraq's Regime," *Washington Post*, October 22, 1995, A1. For a biography of Kamal and synopsis of his defection, Central Intelligence Agency (CIA), "Regime Strategic Intent," in *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD* (Washington, DC, September 30, 2004): vol. 1, pp. 49–51.

14. To illustrate, in September 1990 Kamal commandeered Al Daura, which was built to make foot-and-mouth vaccine for livestock, to produce anthrax and botulinum toxin. Quoted in Stephen J. Hedges, "Iraqi Arms Tests: Fears Strong, Proof Elusive," *The Gazette*, Montreal, January 31, 1999, A6.

15. Though Iraq persisted in this tactic, Aziz later admitted that it was his decision to conceal the bioweapons program from the outset and to reveal it to UNSCOM in July 1995. UN Security Council, *Fourth Report of the Executive Chairman of the Special Commission following the Adoption of Security Council Resolution 1051 (1996)*, Doc. S/1997/774, October 6, 1997, Annex, para. 107.

16. Saying that history would stone Kamal, Saddam stated, "Hussein Kamel has betrayed and was close to us, but his influence would be like that of Judas." Daniel Williams, "U.S. Questions Top-Level Iraqis; Saddam Calls Defectors 'Judas,'" *Washington Post*, August 12, 1995, A15.

18. Said Ekeus, "In the biological area we have serious concerns. Iraq has produced biological agents. Iraq has declared to us now in recent days that all these biological agents have been destroyed (but) we have not been able to verify this. Iraq has plenty of empty munitions, as well as the components for biological weapons. . . . so if you marry these two things together you get new weapons." "Ekeus Sees No Lifting of Iraq Sanctions Soon," Reuters (Bonn), September 4, 1995. Rasheed notified Ekeus of Iraq's intent to continue cooperation in an August 8 telephone call. Spertzel, interview. On August 11, Aziz said Iraq's cooperation would continue, and the next day Iraq's Ambassador to the UN, Nizar Hamdoon, noted there was no longer a deadline for sanctions to be lifted. Smith, "Iraq Rushes to Preempt Defectors' Arms Disclosure"; UN Doc. S/1995/864, Annex, para. 9; Barbara Crossette, "Germ War Plan Underreporting, Iraq Tells U.N.," *New York Times*, August 23, 1995, A1. On the Kamal's debriefing by U.S. intelligence officials, R. Jeffrey Smith, "Iraq Admits Working on Biological Weapons Systems," *Washington Post*, August 19, 1995, A17.

22. Five days after Kamal's defection, Hossam Amin, chief of the National Monitoring Directorate, wrote a six-page letter to Saddam's son Qusay detailing exactly what Kamal knew. Just before his defection Kamal was briefed on the status of Iraq's weapons concealment efforts. Barton Gellman, "Iraq's Arsenal Was Only on Paper; Since Gulf War Nonconventional Weapons Never Got Past the Planning Stage," *Washington Post*, January 7, 2004, A1.

24. Aziz reiterated to Ekeus on the 14th that Iraq had withdrawn the ultimatum. UN Doc. S/1995/864, Annex, para. 14.

25. Ekeus said that no diplomat in history had ever been in a better position. "U.N. Envoy Details Iraq's Admission of Germ Warfare," *Washington Times*, August 24, 1995, A1.

27. The Iraqis said they filled a total of 166 R-400 bombs with biowarfare agents, putting anthrax into 50 bombs, botulinum toxin into 100, and aflatoxin into 16. They also loaded anthrax into 10 SCUD missile warheads and botulinum toxin into 15 SCUD warheads. R. Jeffrey Smith, "U.N. Says Iraqis Prepared Germ Weapons in Gulf War," *Washington Post*, August 26, 1995, A1; "UN: What the New Iraqi Disclosures Reveal," Reuters (United Nations), August 26, 1995; "U.N. Envoy Details Iraq's Admission of Germ Warfare," *Washington Times*, August 24, 1995; Stephen J. Hedges, Peter Cary, and Linda Fasulo, "Baghdad's Dirty Secrets," *U.S. News & World Report*, September 11, 1995, 41–42. UN Security Council Resolution 678 (1990) authorized the use of "all necessary means" to reverse Iraq's invasion of Kuwait. UN Doc. S/1995/864, Annex, para. 75 (w), (x).

28. Saddam stated this to FBI Special Agent George Piro, who met with Saddam daily until his execution. George Piro, interviewed by Scott Pelley, "Iraq War: Saddam's View," *60 Minutes*, CBS News Division, March 18, 2008.

34. Aziz stated that Kamal, not he, was responsible for the bioweapons program when he gave Ekeus Iraq's declaration on August 5, 1995. Charles Duelfer, *Hide and Seek: The Search for Truth in Iraq* (New York: Public Affairs, 2009), 108.

37. Though Iraq engineers were evasive about the parallel Zubaidy device, the inspectors believed that Zubaidy was forthright about his dispersal device and they could also confirm part of what he said through the 1989 annual report on the bioweapons program and other documents. The inspectors later recovered parts of the Zubaidy or perhaps the parallel Zubaidy device. Examining the parts at the Canal Hotel, they could see that the Iraqis had probably made different prototypes. One piece, a tank, was just a truncated version of the DB2 bomb to hold anthrax stimulant for the prototype sprayer. Barton, interview; Spertzel, interview.

38. This suspicion dates to the late 1980s, when the Iraqis contacted two European firms about developing a “warhead with a restraining parachute for its al-Hussein missile,” a feature useful for delivering biological, not chemical agents. Crossette, “Germ War Plan Underreporting, Iraq Tells U.N.” The Haidar farm videos showed special SCUD warheads filled with chemical agents but not with biowarfare agents. Eventually, UNSCOM obtained some of the stainless steel and aluminum inner containers of these warheads. Former UNSCOM chief inspector, interview with author, London, August 18, 2005.

39. Oddly, the Iraqis described ricin as a possible “magic bullet” cure for cancer. Spertzel, interview. Also, Smith, “U.N. Says Iraqis Prepared Germ Weapons in Gulf War”; “UN: What the New Iraqi Disclosures Reveal”; “U.N. Envoy Details Iraq’s Admission of Germ Warfare”; Hedges, Cary, and Fasulo, “Baghdad’s Dirty Secrets.”

49. On May 5, 1996, Amin said that Kamal’s girlfriend had telephoned after Kamal’s defection to tell him that “important things” were at the Haidar farm, but on August 16, 1996, Amin said that was not true and substituted another yarn. Barton Gellman, “A Futile Game of Hide and Seek,” *Washington Post*, October 11, 1998, A1. See also UN Security Council, *Report of the Secretary-General on the Activities of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Resolution 687 (1991)*, Doc. S/1997/301, April 11, 1997, para. 52; Duelfer, *Hide and Seek*, 109–110.

56. Ekeus’s previous encounter with Kamal had been quite different and left a negative impression on Ekeus. In the summer of 1991, Kamal, then Iraq’s defense minister, strutted into a meeting with Ekeus and International Atomic Energy Agency (IAEA) inspector David Kay at the home of Tariq Aziz. Kamal had a big gun in his waistband and flopped on a sofa like a spoiled child. When Ekeus warned Aziz that things would get worse for the Iraqis if they did not cooperate with inspections, Kamal just laughed. Ekeus found him to be an incredibly arrogant man. Ambassador Rolf Ekeus (former UNSCOM executive chairman), interview with author, Stockholm, August 24, 2005.

57. No recording was made of this meeting, which lasted almost three hours. Instead of Ekeus’s normal interpreter, Jordan’s King Hussein provided an interpreter. The IAEA’s deputy director, Professor Maurizio Zifferero, was Kamal’s chief interlocutor on nuclear matters. Former senior UNSCOM official, interview with author, New York City, August 30, 2005. Also, “Smidovich Notes on Kamal Meeting,” August 22, 1995, 1.

58. Kamal also told CNN that anthrax was their most important biological weapon, describing it as “a very dangerous weapon. But there is a problem in delivering it. You can deliver it by planes or by missiles but it will not have the impact or coverage of a nuclear weapon.” “Interview Transcript: Addendum to Transcript of Correspondent Brent Sadler’s Exclusive Interview with Hussein Kamel,” CNN, September 21, 1995, [http://www.cnn.com/WORLD/9509/iraq\\_defector/kamel\\_transcript/index.html](http://www.cnn.com/WORLD/9509/iraq_defector/kamel_transcript/index.html).

59. The proximity fuse to detonate above ground was similar to the ones in Iraq’s artillery shells, conventional warheads used during the Iran-Iraq War, and in its missiles to disperse landmines. Kamal said that Rasheed and Amer Al Sa’adi ran competing programs to develop



proximity fuses for a biological missile delivery system. He claimed that Iraqi warheads successfully separated in the missile attacks against Israel in 1991. Kamal noted that Iraq refrained from using chemical weapons during the Gulf War because they feared a U.S. nuclear retaliation. "Smidovich Notes on Kamal Meeting," 13. One of Kamal's most startling post-defection statements involved the command authority over chemical and biological-tipped weapons during the 1991 Gulf War: "Saddam declared that if contact with him were severed and if SSO officers believed that communications had been broken off because of a nuclear attack on Baghdad, they should mate the chemical and biological warheads in their custody with missiles in the possession of the regular missile force and launch them at Israel." Ibrahim al-Marashi, "How Iraq Conceals and Obtains Its Weapons of Mass Destruction," *Middle East Review of International Affairs* 7, no. 1 (March 2003): quote on page 56. See also UN Doc. S/1995/864, Annex, para. 28.

60. Kamal said, "Most work was done at Dora on anthrax." This statement contradicted what Iraq would later declare, namely that only botulinum toxin was made at Al Daura. "Smidovich Notes on Kamal Meeting," 6. Kamal told the press that storage of documents on Iraq's unconventional weapons caused the standoff at the Ministry of Agriculture in the fall of 1991, after which Iraq adopted a tactic of hiding the documents in separate places, including ministries, offices, and homes. "Interview Transcript with Hussein Kamel."

61. Kamal was unresponsive to questions, at this point as "a totally broken down man." Ekeus, interview. Kamal may have been worried that the revolt in Iraq that he hoped to lead was not materializing. He said in an interview with *Time* magazine that Iraqi soldiers, intelligentsia, and citizens were ready to overthrow Saddam, and that in Iraq "[t]here should be pluralism and political parties. We should put an end to these shameful executions." He explained his defection "as motivated by the interests of the country. I reached the point where I found [criticizing erroneous policies] to be futile. For the past 15 years Iraq has not stopped fighting. It has ended up accumulating debts that will require generations and generations to repay. There are too many executions in our society, too many arrests. . . . For these reasons I left." Kamal's return to Iraq is puzzling, given his acknowledgment that "I knew even before my departure they would be ready to set aside the entire Iraqi budget to eliminate Hussein Kamel." Dean Fischer, "Inside Saddam's Brutal Regime," *Time*, September 18, 1995, <http://www.time.com/time/magazine/article/0,9171,983427,00.html?promoid=cnn1>.

62. Kamal and several relatives were killed on February 23, 1996, three days after returning under the impression that Saddam had given them an unconditional pardon. John Lancaster, "Iraqi Opposition Tells of Wider Bloodshed After Defectors' Return," *Washington Post*, March 1, 1996, A24.

63. UNSCOM's next report to the Security Council only said of the meeting, "[u]seful information was obtained." UN Doc. S/1995/864, Annex, para. 18.

65. UNSCOM 125/BW27 ran from September 27 to October 11, 1995. UN Doc. S/1995/864, Annex, para. 75.

67. This scientist provided some field test data. Spertzel, interview. Murtada glowered as he monitored the BW28 interviews. "He was threatening them with his eyes; if I were Iraqi I would have thought he would strangle me." Gabriele Kraatz-Wadsack, DVM (former UNSCOM chief biological weapons inspector), interview with author, Berlin, August 15, 2005.

68. The Iraqis were under orders not to share certain details, but they were otherwise apparently not told what to say. The inspectors were unaware that Saddam apparently issued a death threat to weapons scientists, insisting that they turn in any remaining documents to the National Monitoring Directorate after the Haidar farm event. CIA, "Regime Strategic Intent," 54.

69. UNSCOM also had overhead imagery that showed the Iraqis excavating twenty-five pits. Spertzel, interview.

71. When the regular staff returned to Al Daura in 1992, they were able to make some vaccine but fell far short of the original production capacity because they could not re-create the integrity of the negative air pressure system and some equipment had also been modified. Given the sanctions, the Iraqis could not turn to the French, who built the plant, for technical assistance. On the telltale visual signs of the temporary containment partition, Hamish Killip (former UNSCOM chief biological weapons inspector), interview with author, Isle of Man, August 22, 2005; Barton, interview; Spertzel, interview; Kraatz-Wadsack, interview; former senior UNSCOM official, interview with author, New York City, September 1, 2005. On the construction of the temporary containment wall for biowarfare agent production, see UN Security Council, *Annex: Twenty-Second Quarterly Report on the Activities of the United Nations Monitoring, Verification and Inspection Commission in Accordance with Paragraph 12 of Security Council Resolution 1284 (1999)*, Doc. S/2005/545, August 30, 2005, 8, para. 11.

72. The Iraqis said the initial changeover from civilian to military hands occurred in September 1989. A 141-liter seed fermenter and six larger fermenters of capacity ranging from 1,425 to 2,500 liters were reportedly used to produce botulinum toxin. UN Special Commission, *Final Report: UNSCOM 139/BW33*, Chief Inspector Richard Spertzel (New York, n.d.), 6–7. Also on the scant visual evidence of the fermenter alterations, Barton, interview; Spertzel, interview; Killip, interview; Kraatz-Wadsack, interview; former senior UNSCOM official, interview with author, September 1, 2005.

73. At Al Taji, holes and faint markings on the tiles in the wall indicated where the connecting pipes were for the methanol, and the single-cell protein equipment helped to confirm that legitimate activity also occurred at this site. Kraatz-Wadsack, interview. Also on the lengthy interviews with the Iraqis at the purported site of their field tests. Killip, interview.

74. At Al Daura, the Iraqis said they made botulinum toxin from November 1991 to mid-January 1991, while at Al Hakam they rushed production of *Clostridium perfringens* and additional quantities of anthrax. The Iraqis claimed the tests of a modified aircraft drop tank failed, but they nonetheless built and stored three of them. UN Doc. S/1995/864, Annex, para. 75, (j)(u)(v)(w), 78. The Iraqis planned to mount the spray tank on a Mirage F1 strike aircraft, having determined through testing that the ideal attack height was between 160 and 320 feet. Operationally, a MiG-23 was to fly alongside the unmanned drone. Killip, interview; Tom Mangold and Jeff Goldberg, *Plague Wars* (New York: St. Martin's Press, 1999), 311.

75. The Iraqis claimed to have hidden three drop tanks for a while before destroying them. Barton, *The Weapons Detective*, 170.

76. The inspection task list included accounting for Iraq's biological bombs and special warheads, destroying any that remained intact; locating and destroying other dispersal systems; confirming Iraq's destruction of bulk biowarfare agents; and finding and destroying the missing growth media. R. Jeffrey Smith, "Iraq's Drive for a Biological Arsenal," *Washington Post*, November 21, 1997, A1.

79. Iraq also worked with a virus that would cause chronic diarrhea. Robin Wright, "Iraqis Admit to Broad, Virulent Germ War Plan," *Los Angeles Times*, September 6, 1995, A1.

80. At first, Al Diyat stated that he began to make aflatoxin in April 1990, but later said production took place from September 1990 to early January 1991. Since the flasks were reportedly stacked in a rather small space, Spertzel wondered, "After a week of this, how much glassware are they going to have left?" Spertzel, interview. Also mystified by the aflatoxin choice and production claims, David Kelly, PhD (former UNSCOM chief biological weapons inspector),



interview with author, Washington, DC, December 17, 2002; Killip, interview; Ron Manley, PhD (former UNSCOM chief chemical weapons inspector), interview with author, London, August 19, 2005; Kraatz-Wadsack, interview; Debra Krikorian, PhD (former UNSCOM biological weapons inspector), interview with author, Washington, DC, June 21, 2005. Initially, Al Diyat said that he grew *Aspergillus* spp. in 5-liter flasks at Salman Pak, then moved his work to Fudhaliyah in 1989. He also gave a third time frame, April-May 1990 to December 1990, for the aflatoxin production at that site. UN Doc. S/1995/864, Annex, para. 75 (a) to (t). Indicating discord between the two scientists, Rihab Taha yelled at Al Diyat, who was recruited into the weapons program from the Ministry of Agriculture, during an interview. Barton, *The Weapons Detective*, 165, 170.

81. Soil samples taken off the northern end of Al Hakam tested positive for live anthrax spores, but dumping the water used to clean the fermenters could have generated that result. A farmer said he found one of the bomb casings near Al Hakam and shot it with a gun, and the inspectors actually recovered a bullet-hole ridden casing from the Euphrates. Barton, *The Weapons Detective*, 169–170, 173.

85. Iraq provided modest documentation, including the diary of a junior military engineer about the destruction of chemical and biological weapons, to supplement its verbal accounts. UN Security Council, *Tenth Report of the Executive Chairman of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Security Council Resolution 687 (1991), and Paragraph 3 of Resolution 699 (1991) on the Activities of the Special Commission*, Doc. S/1995/1038, December 17, 1995, Annex, paras. 10, 61–65, 67.

93. Former top Soviet bioweaponer Ken Alibek took similar liberties: “It was not until Saddam Hussein’s son-in-law, Hussein Kamel, defected in 1995 that the West came to know the extent of Iraq’s germ warfare program.” Ken Alibek with Stephen Handelman, *Biohazard* (New York: Random House, 1999), 277–278.

96. Said Ekeus, “Why would Iraq go to all that trouble without preparing weapons?” International political sentiment at that time, given the humanitarian crisis in Iraq, was to lift the sanctions. Ekeus recalled the Security Council’s discomfort with his report that what Iraq disclosed about its bioweapons program meant that UNSCOM was not close to confirming Iraq’s biological disarmament. Ekeus, interview. Also on the briefing of the Security Council after Iraq’s July 1st admission, former senior UNSCOM official, interview with author, August 30, 2005; Charles Duelfer (former UNSCOM deputy executive chairman), interview with author, Washington, DC, November 15, 2007; Spertzel, interview. On the inspectors’ strong concerns about weaponization following Iraq’s July 1st disclosure, Stephen Black, “UNSCOM and the Iraqi Biological Weapons Program: Technical Success, Political Failure,” in *Biological Warfare and Disarmament: New Problems, New Perspectives*, ed. Susan Wright (New York: Rowman & Littlefield, 2002), 294. Also arguing that the program was not uncovered because of Kamal’s defection, Gabriele Kraatz-Wadsack, “The Role of Scientists in Verification,” in *Assessing the Threat of Weapons of Mass Destruction: The Role of Independent Scientists*, vol. 61, ed. J. L. Finney and I. Slaus, NATO Science for Peace and Security Series E: Human and Societal Dynamics (Amsterdam: IOS Press, 2010), 50.

97. For instance, Ekeus noted that Kamal told him that his personal Arabic translator, a Syrian national, was “an Iraqi agent who had been reporting to Kamel himself.” John Barry, “A Defector’s Secrets,” *Newsweek*, March 3, 2003, 2, 6.

98. Of its pre-August 1995 conclusions, UNSCOM stated they were “generally based on accepting Iraq’s declarations at face value. Analysis of the new material shaped the direction of the Commission’s subsequent work including the emphasis on obtaining verifiable evidence including physical materials or documents; investigation of the successful concealment activities

by Iraq; and the thorough verification of the unilateral destruction events.” *Letter from the Executive Chairman of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Security Council Resolution 687 (1991) Addressed to the President of the Security Council (dated January 25, 1999)*, Doc. S/1999/94, January 29, 1999, Annex, para. 12.

99. “Kamal wouldn’t know a fermenter from a chemical reactor. Details were definitely not his strength.” Barton, interview.

102. “Kamal had good organization skills. He was like the CEO of General Motors. The CEO doesn’t necessarily know the intricacies of the braking system of the newest SUV. Kamal knew the money, the mobilization of resources.” Ekeus, interview.

104. Barton, an Australian intelligence analyst, recalled impressions of Kamal’s incoherence and knowledge of his surgery, as well as Ekeus’s report that Kamal was “a bit strange, not right.” Barton, interview. A senior UNSCOM official viewed Kamal as lucid. Former senior UNSCOM official, interview with author, August 30, 2005. On the fact that very few within UNSCOM knew about Kamal’s brain surgery, Spertzel, interview.

105. Echoing this viewpoint: “Kamal didn’t tell us an awful lot that we didn’t know or suspect.” Former UNSCOM staff member, interview with author, New York City, September 2, 2005.

110. The documents included “a massive volume of extraneous data,” such as the number of ballpoint pens Iraq ordered in the late 1980s. CIA, *Iraqi Weapons of Mass Destruction Programs* (Washington, DC, February 13, 1998), 4. Iraq told UNSCOM in May 1996 that some weapons-related documents were burned at another farm west of Baghdad just a few days before Ekeus was taken to the Haidar farm on August 20. UN Doc. S/1997/301, para. 51.

118. Test animals are normally specially bred and fed to ensure reliable test results. The Iraqis told UNSCOM inspectors that they used stray dogs. Kraatz-Wadsack, interview; Killip, interview; former senior UNSCOM official, interview with author, August 30, 2005. See also Barton, *The Weapons Detective*, 161.

119. Some viewed the photograph as evidence of human testing; others thought it might have been documentation of an accidental exposure. Bruce Auster, Stephen J. Hedges, Linda Fasulo, “In Iraq, Hints of Biological Atrocities,” *U.S. News & World Report*, January 26, 1998, 46.

120. The Iraqis originally built the area where the Al Muthanna test chamber was situated for nerve agent production. The inspectors did not learn whether Iraq’s biological tests followed the normal graduation pattern of starting with smaller animals and moving to larger ones, culminating with primates, which most closely resemble humans. UNSCOM had documentation and interviews that most of the inhalation tests were done at Al Muthanna. Killip, interview. These large-animal chambers, imported from Germany, could easily fit two people. One inspector worried that the videos would confirm intelligence reports of human testing. The Iraqis tried to persuade this inspector to allow them to keep the chambers for pesticide development, but the inspector insisted on their destruction. Former UNSCOM chief chemical weapons inspector, interview with author, January 31, 2006. Also on the inhalation test videos, Kraatz-Wadsack, interview. On the animal and possible human tests, Alan George, “Iraq Used Animals to Test Germ Arsenal,” *Washington Times*, September 27, 1995, A16.

121. The Iraqis used a chiller truck to bring agent from Salman Pak to the test range. Killip, interview with author, August 22, 2005. Also on the majority of the tapes showing weapons tests, Manley, interview; Krikorian, interview; Kraatz-Wadsack, interview.

123. Such tests involve lots of rote labor and can be slipshod unless the workers are taught the principles of weapons testing. Former UNSCOM chief inspector, interview with

author, August 18, 2005. Iraq's initial trials were tentative and not well designed or conducted. For instance, the videos showed test animals escaping when the blast from the munitions knocked over their cages and a GB-250 rocket falling from its stand but the Iraqis not bothering to re-set it before the test. Killip, interview; Manley, interview; Krikorian, interview.

129. For example, in an inspection shortly before the defection, without prompting Gen. Raad declared that Iraq had converted about nine SA-2 missiles, which Iraq was allowed to keep, into surface-to-surface missiles. Raad's volunteered incriminating statement about a violation of the post-war restrictions "might have been in anticipation that Hussein Kamal would say that." Neither UNSCOM nor Coalition forces, which were monitoring Iraqi weapons tests via radar, had detected the modification of the SA-2. Former UNSCOM chief inspector, interview with author, London, August 18, 2005. Hence, senior Iraqi officials knew Kamal was going to defect to allow Iraq to relinquish the bioweapons program. In another example, Ekeus was sure that Kamal's close aide Rasheed would be shot after Kamal's defection, but Rasheed somehow convinced Saddam that he would investigate how Kamal isolated all the money for these weapons programs. Rasheed's survival could be interpreted as Saddam's approval of Kamal's defection. Ekeus, interview. Another theory held that a clash with Saddam's son Uday prompted Kamal's departure. On the various theories about Kamal's defection, Mamoun Fandy, "A Ruse by Saddam?" *Boston Globe*, August 26, 1995, 11.

131. A Jordanian interpreter who worked with UNSCOM's biological inspectors said that the word on the street was that Kamal's defection was planned to provide the Iraqis an excuse to reveal more about the biological program, a ploy to get the sanctions lifted. Kamal would then return home a hero. Spertzel, interview. Also on the possibility that Kamal's defection was arranged to allow Iraq to save face, foreign ministry official, interview with author, London, August 17, 2005.

132. With yet another variant of the scapegoat theory: "I have the sneaking suspicion that Hussein Kamal's defection was all planned. Saddam wanted to get rid of him anyway. It was all a big game of Saddam's." Former UNSCOM chief inspector, interview with author, August 18, 2005.

135. Stated Ekeus, "A bit later, fearing the consequences of the defection, the Iraqi authorities released even more detailed information. But we had already uncovered the basic facts." Rolf Ekeus, "Defection and Detection," *New Perspective Quarterly* 20, no. 1 (Winter 2003): 58. Seconding the view that Kamal's defection was partly caused by what UNSCOM knew about Iraq's bioweapons program, Barton, interview.

## Chapter 6

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1. This filling line, located in one of the warehouses in the southern production area, could have been used for commercial purposes or weapons fill. Gabriele Kraatz-Wadsack, DVM (former UNSCOM chief biological weapons inspector), interview with author, Berlin, August 15, 2005.

2. Searching for a previously tagged biosafety cabinet in one of the warehouses in the Southern production area, Krikorian encountered a large amount of spilled date palm molasses, which attracted pigeons. Krikorian began to laugh about slipping on the molasses, which the Iraqis might have used for media, and getting "tarred and feathered," to which the Iraqi escort responded that they referred to the pigeons as "stealth bombers" since they knocked off chunks of concrete and debris. Debra Krikorian, PhD (former UNSCOM biological weapons inspector), interview with author, Washington, DC, June 21, 2005.

3. A December 15, 1995, letter from Ekeus to Gen. Amer Rasheed requested a freeze of activities at Al Hakam and Al Daura. Al Hakam was sealed on December 17. UNSCOM, *Draft Inspection Report: UNSCOM 145/BW35*, Chief Inspector David C. Kelly (New York, n.d.), 2, 24. Also, United Nations (UN) Security Council, *Report of the Secretary-General on the Activities of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Resolution 687 (1991)*, Doc. S/1996/258, April 11, 1996, para. 77; Kraatz-Wadsack, interview.

4. Some preferred that Area D at Al Hakam not be eliminated since it was built in 1992, after the manufacture of anthrax at Al Hakam. Others were in the flatten-everything-at-both-sites camp. Spertzel, for one, wanted to see Al Hakam “returned to desert.” Some inspectors considered the decision to let Al Daura stand for vaccine production a politically astute show of good faith. Kraatz-Wadsack, interview; David Kelly, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, December 17, 2002; Richard Spertzel, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, July 1, 2005; Krikorian, interview.

5. Hossam Amin, head of the National Monitoring Directorate, proposed Iraq’s order of destruction as he maneuvered to keep certain capabilities. Taylor recalled, “I had to be draconian. I knew if we gave an inch they would take a mile.” Terence Taylor (former CBW commissioner and UNSCOM chief inspector), interview with author, Washington, DC, May 12, 2005. The Iraqis made no requests to save Al Daura’s air-handling system or the equipment that UNSCOM had selected for destruction. They made many informal requests not to destroy assorted items such as fire extinguishers, toilet bowls, desks, chairs, and window air-conditioning units. To encourage cooperation, Taylor fenced these items in a compound and told the Iraqis they could have them after Al Hakam was destroyed. Brig. Gen. Mohammed Mahmoud Bilal, who had overseen the filling of the biological munitions, kept his superiors informed as items were put in the compound. In writing, Iraq asked to relocate three industrial chillers from Al Hakam to hospitals. Ekeus agreed, but roughly two years would pass with repeated reminders from UNSCOM before Iraq finally situated the chillers in hospitals. Kraatz-Wadsack, interview; Taylor, interview.

6. The International Atomic Energy Agency had tagged Iraq’s stores of HMX at Al Q’aa Q’aa for disposal but agreed to give the material to the UNSCOM BW31 team. RDX explosive is normally used for demolition work. In the initial attempt to flatten the animal house, the inspectors fixed the charges for the more powerful HMX conservatively and the demolition was only partially successful. The second attempt pulverized the building. Taylor, interview; Kraatz-Wadsack, interview.

7. The heavy steel bunker door was flat on the ground, its lock still intact. Equipment would have been needed to pry open the bunker. Because Taylor’s team was so busy with the destruction operations, Kelly, Spertzel, and an expert from industry made a special quick trip to Iraq to confirm that the “stolen” equipment was a small production line originally from Al Taji. The Iraqis may have put on this charade to harass the inspectors or perhaps because they thought it made them look as if they were cooperating with the destruction effort. Kraatz-Wadsack, interview; David Kelly, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, December 17, 2002; Spertzel, interview.

8. Major pipes attached to walls were cut and filled with cement, while the ceiling ducts were filled with expandable foam. Concrete in the overhead ductwork would have brought down the ceiling. Forty pieces of equipment were left at Al Daura, twenty-eight were destroyed at Al Hakam. Taylor, interview; Krikorian, interview; Kraatz-Wadsack, interview. Also, UN Security Council, *Report of the Secretary-General on the Activities of the Special Commission*

*Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Resolution 687 (1991)*, Doc. S/1996/848, October 11, 1996, Annex, para. 15; Waiel Faleh, "Iraq Fells Plant for Germ Warfare," *Washington Times*, June 10, 1996, A13; Jon Leyne, "UN Destroys Iraqi Germ War Plant," *The Observer*, June 9, 1996, A1. On the destruction of twenty-two tons of growth media, Gabriele Kraatz-Wadsack, "The Role of Scientists in Verification," in *Assessing the Threat of Weapons of Mass Destruction: The Role of Independent Scientists*, vol. 61, ed. J. L. Finney and I. Slaus, NATO Science for Peace and Security Series E: Human and Societal Dynamics (Amsterdam: IOS Press, 2010), 51.

9. This baselining process included all materials, items, equipment, and activities that could be used for offensive bioweapons work. The sites ran the gamut from drug companies to breweries, equipment development facilities, university laboratories, supply agencies, and agricultural companies. UN Security Council, *Report of the Secretary-General on the Activities of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Resolution 687 (1991)*, Doc. S/1995/864, October 11, 1995, paras. 64–67; Kraatz-Wadsack, "The Role of Scientists in Verification," 47–49.

10. Bar-coded, tamperproof tags were placed on key dual-use items. The monitors ranked facilities according to those with the highest potential for rapid conversion to bioweapons activity. The sites deemed most risky were those in categories A and B. Monitors went to category A sites twice monthly, with the exception of Al Hakam, which the monitors dropped in on more frequently and irregularly. Kraatz-Wadsack, interview; Krikorian, interview; UN Security Council, *Report of the Secretary-General on the Activities of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Resolution 687 (1991)*, Doc. S/1997/301, April 11, 1997, sect. 2 (B), para. 27.

12. The biological monitors also audited some sites. Krikorian, interview; Hamish Killip (former UNSCOM chief biological weapons inspector), interview with author, Isle of Man, August 22, 2005; Kraatz-Wadsack, interview. For a brief description of biological monitoring, Stephen Black, "UNSCOM and the Iraqi Biological Weapons Program: Technical Success, Political Failure," in *Biological Warfare and Disarmament: New Problems, New Perspectives*, ed. Susan Wright (New York: Rowman & Littlefield, 2002), 290–291.

14. Iraq had to file notices about the change in status or location of equipment thirty days in advance. Kraatz-Wadsack, "The Role of Scientists in Verification," 47–49.

16. The monitors identified the facility with three undeclared production lines in 1997. UNSCOM reported such significant equipment finds and aggregate data from the biological monitors to the Security Council. The monitors filed a daily report with UNSCOM headquarters in New York. Krikorian, interview; Kraatz-Wadsack, interview; UN Security Council, *Report of the Secretary-General on the Activities of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Resolution 687 (1991)*, UN Doc. S/1999/401, April 9, 1999, para. 49.

17. Members of the Biological and Toxin Weapons Convention convened in Geneva to negotiate a legally binding monitoring protocol for this 1975-vintage treaty, which has no monitoring provisions. Nations conducted trial inspections at commercial and military facilities to test whether certain monitoring and inspection tools were up to the task of identifying possible violations of the treaty's prohibitions on the development, production, and stockpiling of germ weapons. During the negotiations, the term of art employed for monitoring was *visits*, which were variously formulated as voluntary visits, visits to build transparency, and non-challenge visits. The process to craft a protocol began to collapse in July 2001, when the U.S. government announced that it would reject the draft agreement. Gordon K. Vachon, "Verifying

the Biological Weapons Convention: The Role of Inspections and Visits” and Ali A. Mohammadi, “Verifying the Biological Weapons Convention: The Role of Visits and Inspections,” in *Enhancing the Biological Weapons Convention*, ed. Oliver Thranert (Bonn: Dietz Nachfolger, 1996), 147–157. A full account of the negotiations can be found in Jez Littlewood, *The Biological Weapons Convention: A Revolution Failed* (Aldershot, U.K.: Ashgate Publishing, 2005). The draft protocol can be found at <http://www.opbw.org>. On the U.S. rejection of the draft, John R. Bolton, undersecretary for arms control and international security, *The U.S. Position on the Biological Weapons Convention: Combating the BW Threat* (remarks at the Tokyo American Center, Tokyo, August 26, 2006).

19. This systematic search technique involved the deployment of multiple subteams throughout a building, each conducting a quick appraisal of their assigned room(s), followed right away by a more deliberate check for documents that included an initial evaluation of the relevance of documents by a translator and an expert, copying or photographing of documents as needed, searches of computer files, and overnight translation of documents of interest. The inspectors also searched roofs and basements. UNSCOM, *Report of UNSCOM 142/BW34: April 30–May 7, 1996*, Chief Inspector Hamish Killip (New York, n.d.), 1; UNSCOM, *Draft Inspection Report: UNSCOM 145/BW35*, 8–9.

22. Killip described these volumes as “a meticulous piece of work, almost all sources are cited, and from that they were able to make demands on international libraries for many of the original source articles.” “Biological Terrorism,” *Background Briefing*, ABC Radio National, August 29, 1999, <http://www.abc.net.au/rn/talks/bbing/stories/s48674.htm>.

25. Other than the missing keys, the only things amiss at Al Daura were the lack of tags for three double-jacketed tanks and a 75-liter fermenter that the plant’s director, Ismail Kanderian, claimed was damaged and therefore unusable. This fermenter appeared to be functional but was missing instrumentation and a stirrer. UNSCOM, *Report of UNSCOM 142/BW34: April 30–May 7, 1996*, paras. 34, 36, 51–52.

26. For example, the drug company sent a memo to the Ministry of Defense about the study of the plant possibly making auto-injectors for atropine, an antidote for chemical nerve agents. UNSCOM, *Draft Inspection Report: UNSCOM 145/BW35*, 6–7.

27. According to Bilal, Hussein Kamal gave orders to destroy documents connecting the institute with Al Muthanna. Bilal personally inspected the site to see that this order was implemented. Ghazi said that he too ensured this instruction was followed and that the Ministry of Health had a standing order to destroy old documents every five years. UNSCOM, *Draft Inspection Report: UNSCOM 145/BW35*, 12–13, L–8.

38. When Kelly asked Bilal if any other documents might be in the private possession of Iraqis, Bilal insisted that no more documents could be in private homes because of the reward money offered from “the highest level” to individuals who turned over documents so that Iraq could “end this ordeal [of inspections and sanctions] forever.” He claimed that the captain who turned over eight documents, particularly the diaries that included information about the destruction of SCUD missiles, was given 250,000 Dinars. UNSCOM, *Draft Inspection Report: UNSCOM 145/BW35*, K–5.

29. In this May 16, 1996, interview, Ghazi also stated that Taha had stored some seed cultures at the institute during the war because the institute had a backup generator and its electrical supply to their cold storage facilities was therefore more reliable than most other locations. Ghazi said that he did not know the contents of Taha’s package or when it arrived or was picked up, and that he knew of no documents about this temporary storage arrangement. Taha did her master’s work with Ghazi; Abdul Rahman Thamer, one of Taha’s top assistants, his

PhD. Taha told the inspectors she stored the culture collection for the biowarfare program, which she handed over to Kelly on the first bioweapons inspection. UNSCOM, *Draft Inspection Report: UNSCOM 145/BW35*, 7, L-7.

30. Bilal's argument was that Ali Za'ag's work was done when the institute was part of Al Muthanna, which helped to initiate the biological weapons program and then transferred it to the Technical Research Center in 1987. All of the military research and production of biowarfare agents took place under the auspices of the Technical Research Center. Then, at the end, Al Muthanna "only" helped out with the weaponization. He said that Al Muthanna's role was direct but that it was not 100 percent involved in the bioweapons program. UNSCOM, *Draft Inspection Report: UNSCOM 145/BW35*, 13, K-9 to K-11.

32. For example, the team inspected Al Kindi on May 17, 1996, New Year's Day on the Muslim calendar, and came away with two undated documents that corroborated the transfer of the Olsa fermenters from Al Kindi to Al Hakam, and related to Hussein Kamal and the Ministry of Industrialization and Military Industry. UNSCOM, *Draft Inspection Report: UNSCOM 145/BW35*, 4-5, 7.

33. In some documents, research on other toxins was implied but not specified. Spertzel, interview.

35. Inspectors placed the samples taken with dry, sterile cotton swabs in sterile cryo-vials, which were maintained at room temperature and stored with chain-of-custody procedures in a locked laboratory in the Baghdad Monitoring and Verification Center. Inspectors maintained a log of all samples, including a photograph of all equipment sampled. Cdr. James Burans, "Update on Sampling and Analysis of Samples Collected at Al Hakam and the Hoof and Mouth Vaccine Facility: 'Saddam, Are You Sure You Cleaned That Equipment?'" briefing slides (Washington, DC, Naval Medical Research Institute, n.d.); UNSCOM, *Draft Inspection Report: UNSCOM 145/BW35*, 4, 17-20, 24-25, 27. Also on sampling, Spertzel, interview.

37. During the BW2 mission, which dated from August 8 to September 9, 1995, samples were taken from a site where Iraq supposedly dumped bulk agent. UNSCOM, *Draft Inspection Report: UNSCOM 145/BW35*, 4.

41. "From the strategic plan, then you've got everything. From there, you can take a retrospective look back to what they did and how they did it because you basically know the why," said inspector Dr. Robert Kadlec. "Everybody knew about the small civilian group centered around Taha that did the agent production. However, we never really got to the truth of what the military had done with delivery. Nobody, not UNSCOM, not the UN Monitoring, Verification, and Inspection Commission, not the Iraq Survey Group, really got to the bottom of biological weaponization." Robert Kadlec, MD (former UNSCOM biological weapons inspector), interview with author, Washington, DC, February 23, 2006. Also on the importance of understanding the strategic plan for a weapons program, Kelly, interview; Spertzel, interview; Killip, interview.

44. Iraq formally submitted this mammoth declaration on June 22, 1996. UN Doc. S/1996/848, Appendix I, Section I, para. 1.

45. On the refusal to allow site access, Ekeus stated, "There is a high probability that Iraq is hiding items which we are convinced still exist in the country." Barbara Crossette, "Years After War, Iraq Is Probably Still Hiding Arms, U.N. Says," *New York Times*, June 13, 1996, A11. See also, Barbara Crossette, "Iraq Isn't Doing So Well at Hide and Seek," *New York Times*, June 16, 1996, section 4, page 3. Regarding Iraq's provision of three folders of data to Ekeus, Adnan Malik, "Iraq Gives U.N. Inspector Banned-Weapons Records," *Washington Post*, June 23, 1996, A27.

46. UNSCOM 146/BW36 was one of the two aborted interview missions. A Spertzel-led team, UNSCOM 157/BW40, finally conducted the interviews and derived some "valuable"

information that sometimes countermanded Iraq's declaration. UN Security Council, *Letter Dated 25 January 1999 from the Executive Chairman of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Security Council Resolution 687 (1991) Addressed to the President of the Security Council*, Doc. S/1999/94, January 29, 1999, Appendix III, para. 188.

52. Abdul Rahman Thamer identified the location of the purported sheep pit, where he said they had incinerated the carcasses prior to burial. Deep in the trenches, the inspectors found chips of brick, tree roots, and the occasional syringe, petri dish, pipette, or ampoule, but no carcasses. At one point, the Iraqis brought in the purported driver of the bulldozer who had buried the carcasses, who was no more accurate than Thamer. The excavation area looked as though the Iraqis had dug up the remains and backfilled the area. The back of the mission t-shirt, which became known as the dead donkey dig, pictured a donkey with its legs up in the air. Former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, Washington, DC, February 21, 2006; Kraatz-Wadsack, interview; former UNSCOM biological weapons inspector, interview with author, February 4, 2006; Kelly, interview; Spertzel, interview.

53. For spore production (such as for *Bacillus anthracis* or *Bacillus subtilis*), UNSCOM estimated that a maximum of two production runs could be made per week, but that it was reasonable for three runs to be made each fortnight and credible to conduct one run each week. For the manufacture of botulinum toxin, the corollary figures were a maximum of three runs each fortnight, a reasonable production rate of one run per week, and a credible production rate of one run every ten days. UNSCOM, *Final Report: UNSCOM 139/BW33*, Chief Inspector Richard Spertzel (New York, n.d.), 16. On the second day of the BW33 mission team, Kamal, who had returned to Iraq, was assassinated. UN Security Council, *Report of the Secretary-General on the Activities of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Resolution 687 (1991)*, Doc. S/1996/259, April 11, 1996, paras. 72–4.

55. The two written sources indicate that the Al Taji production line made 150 liters of anthrax and the Olsa fermenters, 8,275 liters. From the verbal accounts of fermenter operations, the inspectors calculated that the 2,401 liters and 12,600 liters, respectively, could have easily have been made in the Al Taji and Olsa lines. UNSCOM, *Final Report: UNSCOM 139/BW33*, 10–11.

56. Ahmed's opinion was that gas gangrene was not weaponized because it was considered secondary to anthrax and botulinum toxin. UNSCOM, *Final Report: UNSCOM 139/BW33*, 14.

57. The drop tank was designed for use with Mirage fighter jets. UNSCOM, *Final Report: UNSCOM 139/BW33*, 12–13.

60. The Iraqis said that the fermenters at Salman Pak and Al Hakam were idle for several months in 1989 and 1990. UNSCOM, *Final Report: UNSCOM 139/BW33*, 19.

61. This extraneous media, supposedly only a few kilograms, came from the Veterinary Research Laboratories, unspecified "military supplies," and media left over from the production of single-cell protein at Al Taji. UNSCOM, *Final Report: UNSCOM 139/BW33*, 11.

62. Iraq concentrated aflatoxin from growth of *Apergillus* spp. At first, the Iraqis said they used 200 milliliters of solvent, then they switched to the use of 300 milliliters of solvent for a 20 percent average recovery. UNSCOM, *Final Report: UNSCOM 139/BW33*, 21–24. Noting that Iraq's production of aflatoxin in flasks demonstrated that advanced technology is not required to make biowarfare agents, Kraatz-Wadsack, "The Role of Scientists in Verification," 52.

63. This document, among those from the Haidar farm, was dated July 10, 1990, and signed by Taha and Emad. UNSCOM, *Final Report: UNSCOM 139/BW33*, 24–25.



65. Mona Al Jabouri's account of trichothecene correlated with the 1988 annual report of Iraq's bioweapons program. Taha, Emad, and Bilal signed the recommendation to fill munitions with wheat smut. UNSCOM, *Final Report: UNSCOM 139/BW33*, 25–28.

67. The BW45 inspection ran from January 10 to 20, 1997. Another inspection, UNSCOM 174/BW47 from February 25 to March 4, 1997, also investigated the decision making associated with Iraq's biowarfare program. Spertzel, interview.

68. The samples were analyzed for botulinum toxin A/B, ricin, Staphylococcal enterotoxin B, *B. anthracis*, *Y. pestis*, *Brucella sp.*, and *F. tularensis*. UNSCOM's laboratory in Baghdad did initial analysis on six vials with lyophilized contents and intact seals using antigen capture enzyme-linked immunosorbent assay and PCR. On two of these samples, PCR assay returned positives for *B. anthracis* antigens. The Naval Medical Research Institute conducted analyses on 250 samples. Burans, "Update on Sampling and Analysis of Samples Collected at Al Hakam and the Hoof and Mouth Vaccine Facility," briefing slides; UNSCOM, *Draft Inspection Report: UNSCOM 145/BW35*, 4, 17–20. Also on these analytical results, Kraatz-Wadsack, interview.

69. Samples were collected from interior surfaces of equipment using sensor ports and access ports and by opening fittings. The UNSCOM 145 team also recommended much more aggressive sampling of equipment, including of ball valves, threaded fittings, diaphragms with pressure fittings, filters, condensation traps, impellers, and exhaust pipes on fermenters. On continuous centrifuges, the team suggested sampling of outlets, threaded fittings, and plates. Burans, "Update on Sampling and Analysis of Samples Collected at Al Hakam and the Hoof and Mouth Vaccine Facility," briefing slides; UNSCOM, *Draft Inspection Report: UNSCOM 145/BW35*, 21–23.

71. The inability to detect evidence of botulinum toxin at Al Daura is not altogether surprising since botulinum toxin has no DNA. Had spores of botulinum toxin been present, it would have been possible to detect DNA. The inspectors did not necessarily expect to find botulinum spores because they are anaerobic. Spertzel, interview; Kraatz-Wadsack, interview.

72. The United Kingdom and the United States were among the nations known to have weaponized the Vollum strain before halting offensive biological weapons research in favor of biodefense research. See annotated material for endnote 65, Chapter 3.

74. As explained in Chapter 3, Iraq, according to its own records, obtained the Vollum strain from the American Type Culture Collection.

76. The inspectors explored the periods of time the fermenters were not in operation to tighten their estimates of how much agent the Iraqis made. Therefore, questions honed in on how long it took plant personnel to change a mechanical seal or complete other operational tasks. William Lebherz (former UNSCOM industrial biotechnology expert), interview with author, Washington, DC, February 13, 2006. The formal interviews were held at the National Monitoring Directorate, located on the campus of Baghdad University, and according to standard procedure the inspectors asked a day in advance for Iraq to produce different individuals for the interviews. Spertzel, interview.

78. The UNSCOM 169 mission ran from January 9 to 20, 1997. UN Doc. S/1997/301, Appendix I, Section I, para. 4.

79. This UNSCOM 174 mission was conducted February 24 to March 3, 1997. UN Doc. S/1997/301, Appendix I, Section I, para. 6.

81. An order supposedly was given to destroy documentation after five years, but the inspectors found numerous records dating back more than five years on matters that did not pertain to the bioweapons program, and when it suited them the Iraqis turned over older documents. Kraatz-Wadsack, interview; Spertzel, interview.

82. After the 2003 Gulf War, Al-Hindawi and other Iraqis stated that Iraq also developed a substitute media at Al Tuwaitha that could yield better sporulation of anthrax than commercially available media. Kadlec, interview with author, February 23, 2006.

83. A document found in a laboratory described a toxicity test conducted with *Clostridium perfringens* that compared the agent grown in domestically made peptone with the agent grown from imported peptone made by Oxoid and Fluka. The document also stated that the sanctions propelled Iraq to make growth media indigenously. The Al Tuwaitha staff said they tested making smaller amounts of peptone in the laboratory prior to engaging in large-scale manufacture. Kraatz-Wadsack, interview. Also on the ease of making growth media from raw materials, Krikorian, interview. On UNSCOM's confirmation that Iraq was capable of making peptone, casein, tryptone, yeast extract, see *U.S. Policy in Iraq: Next Steps, Hearing Before the Senate Committee on Governmental Affairs, Subcommittee on International Security, Proliferation, and Federal Services*, U.S. Senate (March 1, 2002) (testimony of Richard O. Spertzel).

84. Kelly led the mission, UNSCOM 189/BW51, from July 4 to 25, 1997, that went to thirteen sites to investigate Iraq's domestic capability to make dual-use biological equipment. Kelly's team included experts from industry on the manufacture of various types of equipment. Twelve major industrial establishments of the Military Industrialization Commission worked on the manufacture of dual-use biological equipment. Spertzel, interview. See also, *U.S. Policy in Iraq*, testimony of Richard O. Spertzel.

86. The inspectors also viewed the remnants of R-400 munitions recovered from the Euphrates and burial pits at Al Hakam. Al Sa'adi's seminar filled with presentations was held in Iraq from May 18 to 22, 1996, with the UNSCOM team led by Igor Mitrokin. Spertzel, interview.

88. The Iraqis were also accustomed to draining, washing, and refilling their chemical munitions frequently because their chemical agent lost much of its potency within six to ten weeks. Ron Manley, PhD (former UNSCOM chief chemical weapons inspector), interview.

89. The inspectors suspected that the Iraqis conducted at least one additional field trial with an experimental device, one with LD-250 bombs, and two with 122mm rockets. Initially, Nassir al-Hindawi's recollections of an LD-250 trial closely matched the Haidar farm documentation and then, after a break in the interview, he told the inspectors an entirely different version that resembled what was in the June 1996 declaration. When confronted with this odd turnabout, Amin admitted that Bilal had asked Al-Hindawi to consider how his remarks differed from what the other interviewees said, thus pressuring Al-Hindawi to change his account. Spertzel, interview.

90. Several Iraqis involved in the R400s trials, including the veterinarian who assisted with the animals used in the trials, described in August 1995 how two R400s apiece were filled with botulinum toxin, a simulant, or aflatoxin. UN Doc. S/1999/94, Appendix III, para. 40; UN Doc. S/1997/301, Appendix I, Section I, para. 2; UN Security Council, *Report of the Secretary-General on the Activities of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Resolution 687 (1991)*, Doc. S/1997/774, October 6, 1997, Annex, para. 77.

92. While the majority of the bioweapons tests were conducted at the Al Muhammadiyat facility, the Iraqis said that a few were also done at Al Hakam. The drop tank was tested at Abu Abaida Air base in mid-December 1990. National Monitoring Directorate, Republic of Iraq, *Full, Final and Complete Disclosure of Iraq's Past Biological Programme*, May 1996, para. 6.2, pages 165–170, 174.

94. The inspectors had reason to believe that Iraq stored twenty-five warheads on the banks of the Tigris because satellite imagery showed that Iraq excavated twenty-five pits there

on July 8, 1991. However, the Iraqis claimed that only fifteen pits were deep enough to hold warheads, which the Iraqis would have known when they dug the pits in the first place. Therefore, no reasonable explanation existed for why they excavated ten pits with nothing in them. Killip, interview; Spertzel, interview. Though they later revised their declaration, the Iraqis declared that from January 12, 1991, until mid-June 1991, ten botulinum-toxin-filled SCUD warheads were stored under a tarpaulin in the Mansuriyah tunnels and five SCUD warheads filled with anthrax, four with aflatoxin, and six with botulinum toxin were located in an embankment along the Tigris canal. National Monitoring Directorate, Republic of Iraq, *Full, Final and Complete Disclosure of Iraq's Past Biological Programme*, paras. 2.5, 6.6, 6.7, pp. 41, 179–181, 183–184. Iraq did not provide any documentation on the production or filling of biological SCUD warheads. UN Doc. S/1997/774, Annex, para. 78–79.

95. Iraq later conceded that no chemical warheads were destroyed at Al Nibai and that they brought in the remains of some chemical warheads to mix with other seeded nosecones to create the debris field shown to the inspectors in 1992. UN Doc. S/1999/94, Appendix III, para. 202.

96. Iraq stated in August and September 1995 that the biological SCUD warheads bore the letters “C,” “D,” and “E” to differentiate them from the chemical SCUD warheads, which were marked with the letters “A” or “A+ B.” In December 1995, they switched to say that the terms *Special 3*, *Special 4*, and *Special 5* were used instead of letter designations. A Special 3 warhead purportedly contained botulinum toxin (agent A), a Special 4 warhead, anthrax (agent B), and a Special 5 warhead, aflatoxin (agent C). Then their June 1996 declaration stated that a Special 5 warhead contained agent A, botulinum toxin, because a document indicated that 16 Special 5 warheads existed. The assertion that they filled 16 SCUDs with botulinum toxin rather than aflatoxin was more plausible, but the Iraqis provided no documentation to support their altered story. The UNSCOM BW44 mission ran from December 12 to 17, 1996. Spertzel, interview.

97. Lt. Col. Merea first claimed that the ten warheads from the railroad tunnels at Al Mansuriyah arrived at Al Nibai exactly at 4:00 P.M. on July 10, 1991, the day that his wife gave birth to a baby girl. However, another worker who supposedly drove the warheads to Al Nibai said he had never been there and took them instead to Ishaki. Merea later said that he picked up the warheads at Ishaki and drove them to Al Nibai, again arriving on the afternoon of the 10th. These accounts differed from prior written declarations and verbal statements, as well as from the September 1997 declaration, which stated that the warheads were destroyed in two explosions, one on the night of July 9 and another on July 10. Lt. Col. Hisham, interviewed in December 1996 and October 1997, claimed that twelve warheads were placed in one pit, thirteen in another, and both pits were simultaneously detonated. In interviews on October 22, 1997, Brig. Gen. Hisham Mohammed, who supposedly supervised the destruction of the warheads, gave two different accounts of this activity over the course of the same day, the first full of detail and the second ending with a statement that he might not have witnessed anything having to do with the destruction of biological warheads. In November 1997, UNSCOM briefed the Security Council that the Iraqis in the previous eight months had given three different written versions and that Sa’adi and Rasheed had given two additional and different oral accounts about the destruction of the biological SCUD warheads. Spertzel, interview. The Iraqis gave the inspectors a note on the receipt and destruction of special warheads on July 9, 1991 at Al Nibai, then later disagreed that this was what occurred. UN Doc. S/1997/774, Annex, para. 82.

98. The satellite images also captured the UNSCOM helicopter and U-2 that were circling over Al Nibai at the time. Spertzel, interview.

100. The inspectors were concerned that Iraq's accounts of temporary storage for the biological warheads might be off if Iraq retained biological warheads past the date they stated they destroyed them in mid-July 1991. UN Doc. S/1997/774, Annex, para. 82.

101. A base commander and a security official did not agree that the R-400s were moved to Al Azziziyah for destruction in early July 1991, casting doubt on that account. Spertzel, interview with author, July 1, 2005. According to the declaration, fifty R-400s with botulinum toxin and twenty-five with anthrax were buried at both Airfield 37 and at Al Azziziyah. Three and four R-400s filled with aflatoxin and botulinum toxin were also stored, respectively, at Airfield 37 and Al Azziziyah. The Airfield 37 burial site was between a dirt runway and a paved runway. National Monitoring Directorate, Republic of Iraq, *Full, Final and Complete Disclosure of Iraq's Past Biological Programme*, para. 2.5, 6.6.1, 6.7, p. 41, 180–183. An intelligence tip first led a joint chemical-biological team to visit Airfield 37 in November 1991, but they did not stay long at the site because their helicopter was unable to fly, which meant they could not use metal detection equipment to survey this large area. Rod Barton, *The Weapons Detective: The Inside Story of Australia's Top Weapons Inspector* (Melbourne: Black Inc. Agenda, 2006), 82, 88–89, 171.

102. The Iraqis claimed instead that they destroyed the R-400s filled with chemical agent at Airfield 37. The base commander and base security officer at Airfield 37, both of whom were present in 1990 and 1991, denied during an interview in mid-June 1997 (UNSCOM 190/CB4) that biological weapons were ever stored on-site. The inspectors suspected that Saddam's special security forces had responsibility for the R-400 biological bombs that were apparently stored there in late 1990 and early 1991. Spertzel, interview. A 1991 UNSCOM team at Al Azziziyah accounted for twenty-five R-400s from the remnants it found, but did not sample the fragments. UN Doc. S/1999/94, Appendix III, paras.41–42, 47, 182, 202.

103. Bilal said they brought just enough explosives for 157 munitions, which meant they could not go back and attempt a second round of detonations. Killip, interview; Spertzel, interview; Kraatz-Wadsack, interview. For Killip's account of this discovery, Tom Mangold and Jeff Goldberg, *Plague Wars* (New York: St. Martin's Press, 1999): 310–311. The UNSCOM 173/BW46 mission ran from February 12 to 19, 1997. UN Doc. S/1997/301, Appendix I, Section I, para. 5. On the number of R-400s recovered, UN Doc. S/1997/774, para. 81. The UN Monitoring, Verification, and Inspection Commission returned to Al Azziziyah in early 2003 and recovered another five intact bombs and enough R-400 pieces that when added to the tally from Killip's excavation accounted for 128 of the 157 bombs supposedly destroyed there. UN Security Council, "Past Storage, Handling, and Deployment of Chemical and Biological Munitions by Iraq," in *Eighteenth Quarterly Report on the Activities of the United Nations Monitoring Verification and Inspection Commission Submitted in Accordance with Paragraph 12 of Security Council Resolution 1284 (1999)*, Doc. S/2004/693, August 27, 2004, Appendix I, para. 21, p. 11.

104. The inspectors could drill sampling holes safely because the Iraqis removed the bursters from the bombs when they deactivated the agent. Spertzel, interview; Kraatz-Wadsack, interview. Stating that three munitions dug up in 1997 had residues of botulinum and that tests of the weapons showed no evidence of aflatoxin, UN Doc. S/1999/94, Appendix III, para. 42, 47. Stating that only two of the R-400s recovered at Al Azziziyah contained potassium permanganate, UN Doc. S/1997/774, Annex, para. 81.

106. Some ten thousand photographs were taken of the empty munitions at Al Muthanna. Also recalling Killip and Barton examining these pictures to count the biological R-400s, Manley, interview. In addition, UN Doc. S/1999/94, Appendix III, paras.47, 202.

109. The same group of Iraqis handled both their chemical and biological weapons and did not necessarily make distinctions between the two. The Iraqis considered biological agents to be a more toxic chemical, which is why they referred to the biological rounds as special chemical weapons. Killip, interview.

110. According to the declaration, one hundred of these bombs were for agent "A," seventy-five for agent "B," and twenty-five for agent "C." The numbers 1 and 2 were used to denote chemical fills, while the number 3 was for biological agent "B," 4 for agent "C," and 5 for agent "A." The letters "A" and "B" were also used to indicate chemical fills, so the biological warheads were initially to be marked also with the letters "C" for agent B, "D" for agent C, and "E" for agent A. The Iraqis instead went with only the numerical markings. National Monitoring Directorate, Republic of Iraq, *Full, Final and Complete Disclosure of Iraq's Past Biological Programme*, Chapter VI, paras. 6.2.5, 6.2.8.4, 6.4.2, p. 172, 174, 176; Chapter VII, para. 6.2.5, p. 172.

112. The letter "C" was used to indicate aflatoxin and "D" to indicate wheat smut. National Monitoring Directorate, Republic of Iraq, *Full, Final and Complete Disclosure of Iraq's Past Biological Programme*, Chapter VII, para. 6.2.5, 6.4.2.1, 6.2.2.4, pp. 167, 172, 177. The 1990 annual report described the scale-up process Iraq used to take their production of *Clostridium perfringens* from 5-liter flasks to the 10- and 14-liter fermenters, with the aim of industrial-level production. This report also spoke of using agent "C" or aflatoxin in tests with 122mm rockets. "Annual Confidential Report for 1990," marked "Top Secret" and "Personal," to the Minister of MIMI, from Ahmed Murtada Ahmed, Acting Director General (Iraq: Technical Research Centre, A Hakam Division, January 15, 1991), 2, 6–9.

115. Iraq declared that the Technical Research Center ordered the Nasr State Establishment to stop making the R400-A after it was determined that the epoxy coating was not suitable for aflatoxin. Production of the R400-A halted at "about 175 bombs." National Monitoring Directorate, Republic of Iraq, *Full, Final and Complete Disclosure of Iraq's Past Biological Programme*, para. 6.2.4.4, p. 171; UN Doc. S/1999/94, para. 47.

116. The Iraqis would have brought more bulk agent to Al Muthanna, they stated, but they needed to evacuate the location, which they assumed was a bombing target, prior to January 15, 1991. National Monitoring Directorate, Republic of Iraq, *Full, Final and Complete Disclosure of Iraq's Past Biological Programme*, Chapter VI, para. 6.4.2.3, p. 178.

119. On the total number of R-400s made and declared destroyed unilaterally, UN Doc. S/1999/94, para. 34. Note that the table in Appendix II, para. 11 of UN Doc. S/1999/94 records an Iraqi declaration of 992 R-400s unilaterally destroyed. Iraq declared the manufacture of 200 R-400s for biological agents. National Monitoring Directorate, Republic of Iraq, *Full, Final and Complete Disclosure of Iraq's Past Biological Programme*, Chapter VII, para. 6.2.5, p. 172.

120. The inspectors found remnants of roughly sixty R-400s at Al Azziziyah. Of the forty-three empty biological R-400s, Iraq claimed that thirty-six of those destroyed at Al Muthanna were destined for biological fills. In December 1994, six biological R-400s that the Iraqis said were faulty and unusable were fished out of the Euphrates River. UN Doc. S/1999/94, para.34, Appendix III, para. 47.

121. The Iraqis stated that they melted 191 R-400s because they were defective and another 117 R-400s because they were not filled with chemical or biological agents. UN Doc. S/1999/94, para.34, Appendix II, para. 11.

122. The Iraqis said they made and delivered to Al Muthanna 1,024 R-400s for chemical fills and 200 R-400s for biological fills, but interview and some documentary evidence indicated that more than 1,224 R-400s were filled with chemical and biological agents and later

destroyed. Spertzel, interview with author, July 1, 2005. Air Force documents indicate that from June to September 1990 the Nasr State Establishment churned out 1,359 bombs, of which 117 went unfilled and were melted. The manufacturer transferred the other 1,232 to Al Muthanna, Al Hakam, and the Air Force for filling with chemical and biological agents. Amb. Richard Butler, Presentation to the UN Security Council, June 3, 1998, <http://www.fas.org/news/un/iraq/s/980603-unscom.htm>, Section IV, Biological Weapons Related Issues; UN Doc. S/1997/774, Annex, para. 78–79, 81.

123. Al-Diyat reportedly left through Jordan for the United Kingdom. Kraatz-Wadsack, interview. Also on the lack of correlation involving letter designations for the biowarfare agents, Killip, interview.

124. Iraq stated that one hundred R-400-A's and fifty R-400-A's were filled with botulinum toxin and anthrax, respectively. UN Doc. S/1999/94, Appendix III, paras. 38, 47.

125. The inspectors did not necessarily expect to find botulinum toxin residues since the heat generated by the explosion of the warheads and the subsequent burial of the missile pieces would probably have eliminated such evidence. The missile remnants that sampled positive for anthrax came from excavation pits P1 and P3 at Al Nibai. A U.S. laboratory analyzed the samples in mid-1998. Spertzel, interview; Killip, interview; Kraatz-Wadsack, interview. Also, UN Doc. S/1999/94, Appendix III, paras. 34, 205; UN Security Council, *United Nations Monitoring, Verification and Inspection Commission, Summary of the Compendium of Iraq's Proscribed Weapons Programmes in the Chemical, Biological, and Missile Areas*, Doc. S/2006/420, June 21, 2006, para. 249, p. 64; Appendix I: "Past Storage, Handling, and Deployment of Chemical and Biological Munitions by Iraq," in UN Doc. S/2004/693, August 27, 2004, para. 20, p. 10.

126. Rasheed's flip-flop threw everything out of kilter and also made Rasheed's wife, Taha, look incompetent, but that was beside the point. Kraatz-Wadsack, interview. A senior Iraqi official stated that many more than one hundred R-400-A bombs were filled with botulinum toxin and fewer than fifty were loaded with anthrax. As UNSCOM officially described the contradiction between the physical evidence and Iraqi statement on the missile warheads, "[c]onfusion reigns, even among Iraqi officials, over how many warheads were filled with particular BW agents." Also on the statement by a senior Iraqi that many more than one hundred R-400-A bombs were filled with botulinum toxin and fewer than fifty were loaded with anthrax, UN Doc. S/1999/94, quote from Appendix III, para. 205, also, Appendix III, paras. 35, 47, 205–206. On the impact of Rasheed's statement, "That statement threw everything out of kilter," Spertzel, interview.

127. Another flippant exchange occurred in a high-level technical meeting in Baghdad in September 1997, when inspector Igor Mitrokin was protesting the frequent changes in Iraq's accounting for its biological weapons. For example, Mitrokin pointed out that after the Iraqis verbally told the Ekeus delegation in mid-August 1995 that Iraq had seventy-five chemical SCUD warheads and twenty-five biological ones, they changed their declaration to a total of seventy-five unconventional warheads, with fifty filled with chemical agents and twenty-five with biological agents, as Table 6.2 indicates. Al Sa'adi insisted that UNSCOM not make an issue of this inadvertent error. In the ensuing exchange, Al Sa'adi threatened the inspectors for challenging Iraq's most recent version of the truth and quipped, "What difference does it make, a few hours or a few minutes" as to when they gave an accurate account. Spertzel, interview; former senior UNSCOM official, interview with author, August 30, 2005.

## Chapter 7

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3. The mission ran from April 9 to 16, 1997. Terence Taylor (former UNSCOM CBW commissioner and chief inspector), interview with author, Washington, DC, May 12, 2005; Gabriele Kraatz-Wadsack, DVM (former UNSCOM chief biological weapons inspector), interview with author, Berlin, August 15, 2005.

5. Al-Akidy earned his MA and PhD degrees in the United Kingdom. Taylor, interview.

7. At the time, Taylor said, “The Iraqis had briefly mentioned the program to us, but what was new was the extent of the work which had been done on it, far more extensive than they declared.” Edith Lederer, “Team Uncovered Iraq Biological Weapon Plan, U.N. Says,” Associated Press, April 24, 1997. See also United Nations (UN) Security Council, *Letter Dated 25 January 1999 from the Executive Chairman of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Security Council Resolution 687 (1991) Addressed to the President of the Security Council*, Doc. S/1999/94, January 29, 1999, Appendix III, para. 83; Central Intelligence Agency (CIA), *Iraqi Weapons of Mass Destruction Programs* (Washington, DC, February 13, 1998), 4–5.

8. For example, UNSCOM 213/BW58, a mid-January 1998 mission led by Spertzel, attempted to flesh out the specifics of Iraq’s work with ricin, which the Iraqis referred to as agent E. Richard Spertzel, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, July 1, 2005.

9. Note that the Catholic church signals the election of a new pope by burning only the ballots of the cardinals gathered to select their new leader, which changes the color of the smoke emerging from the roof of the Vatican Palace from black to white.

11. After a spring 1994 mission, inspectors described the Razi Institute as a “busy R&D laboratory for the development of diagnostic assays for human medicine.” UNSCOM, *UNSCOM 78/BW5, Draft Inspection Report* (New York, n.d.), 3.

12. To pursue diseases such as Crimean-Congo Hemorrhagic Fever, Kamal ordered a team of veterinarians and epidemiologists to conduct a viral survey throughout Iraq. Robert Kadlec, MD (former UNSCOM biological weapons inspector), interview with author, Washington, DC, February 23, 2006.

15. The Defense Intelligence Agency based its report on a source other than Ken Alibek, a top deputy in the former Soviet bioweapons program, who had previously voiced concerns that some personnel involved in the U.S.S.R.’s weapons program might have shared smallpox, other agents, or know-how with proliferators. William J. Broad and Judith Miller, “Government Report Says 3 Nations Hide Stocks of Smallpox,” *New York Times*, June 13, 1999, A1. CBS reporter Mike Wallace stated that the intelligence source was a senior Middle Easterner who said that a Russian scientist from the State Research Center of Virology and Biotechnology, better known by its acronym VECTOR, stole the virus and passed it to Iraq. Mike Wallace, “Smallpox: Years After Eradicating the Virus Among the General Population, Some Countries May Be Using the Smallpox Virus as a Biological Weapon,” *60 Minutes*, CBS News, October 1, 2000; Kadlec, interview with author, February 23, 2006. A Russian virologist from VECTOR also alluded to Iraqi possession of smallpox before he perished. Kadlec, interview. VECTOR, which is located in Koltsovo, Siberia, is one of two laboratories worldwide authorized by the World Health Organization to maintain a collection of smallpox strains, the other being the Centers for Disease Control and Prevention in Atlanta, Georgia. Ken Alibek with Stephen Handleman, *Biohazard* (New York: Random House, 1992), 270–279.

16. Kadlec points out that another possible route to Iraqi possession of the virus was that instead of responsibly destroying the smallpox virus as the World Health Organization requested and expected its members to do after the disease's eradication, Iraq might have also simply kept smallpox in liquid nitrogen. The global public health watchdog declared Iraq smallpox-free on the basis of a survey of Iraqi children and exchanges of letters and phone calls with Iraqi officials about the subsequent destruction of the virus. No international authority visited Iraqi public health and research laboratories at the time to confirm Iraq's destruction of the smallpox virus. Kadlec, interview.

18. Said Spertzel, "Ali was too good of a virologist not to take into consideration the detrimental effect of the release of camelpox on domestic populations, not just potential enemies." Spertzel, interview. Also on Iraq's camel pox research as a surrogate for smallpox, David Kelly, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, December 17, 2002; Kadlec, interview. On the basis of interviews with senior Iraqi officials involved in the formulation and implementation of this decision, Hussein Kamal is said to have been the key decision maker, relaying the order to the senior managers of Iraq's bioweapons program. Also on Iraq's work with camel pox and interest in smallpox, CIA, "Biological Warfare" in *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD* (Washington, DC, September 30, 2004), vol. 3, pp. 25–28.

19. In June of 2003, three Iraqis who had worked in the bioweapons program told the Iraq Survey Group that the Baghdad Central Public Health laboratory had retained smallpox cultures in violation of the World Health Organization order to destroy such cultures after the eradication of the disease in 1979. One of these individuals was both a scientist and an intelligence officer. This trio also said that within the larger laboratory the Iraqi Intelligence Service had run a smaller, secret laboratory that it sanitized and abandoned prior to October 2002, leaving no visible signs of a higher-containment laboratory at the Central Public Health laboratory. A laboratory technician from the Central Public Health laboratory said that several cultures, including smallpox, were taken when the facility was looted after the fall of Baghdad in the 2003 Gulf War. Kadlec, interview.

22. In her remarks, Albright dwelled on the past and possible future dangers inherent in Saddam's Iraq: "We do not agree with the nations who argue that if Iraq complies with its obligations concerning weapons of mass destruction, sanctions should be lifted. Our view, which is unshakable, is that Iraq must prove its peaceful intentions. It can only do that by complying with all of the Security Council resolutions to which it is subject. . . . And the evidence is overwhelming that Saddam Hussein's intentions will never be peaceful." Secretary of State Madeleine Albright, Remarks at Georgetown University, Washington, DC, March 26, 1997.

24. Along a similar line, Spertzel "felt like the responsibility for holding Iraq accountable was solely on the chief inspector because you could no longer count on the Security Council, the Brits, or the U.S., or of Butler for support. The Iraqis knew and exploited this." Spertzel, interview.

26. "We are nothing in Baghdad. We are at their complete mercy," he said. "They can just stop our work at any time." Ekeus's comments were made on June 17, 1997, at a meeting of foreign policy experts. Barton Gellman, "A Futile Game of Hide and Seek: Ritter, UNSCOM Foiled by Saddam's Concealment Strategy," *Washington Post*, October 11, 1998, A1. During his tenure as chairman, Ekeus and his family received various threats. Ekeus stated that he left UNSCOM because the Swedish government could no longer hold open his next post, the ambassadorship to the United States. Ambassador Rolf Ekeus (former UNSCOM executive chairman), interview with author, Stockholm, August 24, 2005; Spertzel, interview. On the change of leadership, UN



Security Council, *Report of the Secretary-General on the Activities of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Resolution 687 (1991)*, Doc. S/1997/774, October 6, 1997, para. 11.

28. Throughout 1997, UNSCOM pressed intensely, sending in thirteen teams to investigate the unresolved issues in Iraq's bioweapons program. Among these missions were a Spertzel-led team, UNSCOM 184/BW49, from May 9 to 14, 1997, to discuss Iraq's full, final, and complete declaration and UNSCOM 189/BW51, which Kelly took into Iraq from July 7 to 21 to examine issues associated with Iraq's past bioweapons program. Spertzel also headed two missions to investigate Iraq's past program, UNSCOM 193/BW53 and UNSCOM 200/BW56, from August 8 to 15 and September 9 to 13, respectively. Andrew Roberston of Australia had UNSCOM 199/BW55 in Iraq from September 8 to 20 for the same purpose. A joint chemical and biological team, UNSCOM 190/CBW4, also was also fielded, from June 12 to 19. Graham S. Pearson, *The UNSCOM Saga: Chemical and Biological Weapons Non-Proliferation* (New York: St. Martin's Press, 1999), 156–167.

29. This inspection was mounted to find evidence about prohibited activity or the involvement of the military in prohibited activities or in the deployment of unconventional weapons. Iraq had yet to account for over one hundred thousand special munitions that it claimed were used from 1981 to 1988. The Iraqis could have hidden the unaccounted chemical munitions. Later, Iraq refused to provide this document to UNSCOM. Kraatz-Wadsack assumed that Iraqi forces used these weapons against the Kurds. Kraatz-Wadsack, interview. Also, Tom Mangold and Jeff Goldberg, *Plague Wars* (New York: St. Martin's Press, 1999), 297–299; Richard Butler, *The Greatest Threat: Iraq, Weapons of Mass Destruction, and the Crisis of Global Security* (New York: PublicAffairs, 2001), 163–164, 196; Charles Duelfer, *Hide and Seek: The Search for Truth in Iraq* (New York: Public Affairs, 2009), 152–153; UN Doc. S/1999/94, Annex D, para. 30; CIA, "Regime Strategic Intent," in *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD*, vol. 1, 60–61.

33. The student said that she came to that laboratory once a month. Her explanation raised the questions of why rats to be killed were being fed and why they would use the unethical autoclave option to euthanize the animals instead of using injections. This student, who said she was studying *Clostridium difficile*, produced a receipt for the rats, but when it was translated the receipt was for four hamsters. The inspectors also found handwritten notes on *Clostridium difficile* in the office. Over a two-hour period, none of her stories made sense. Samples of the test tubes showed them to contain growth media. Spertzel's interview team was in Iraq from September 7 to 19, 1997. Spertzel, interview; Kraatz-Wadsack, interview. *Clostridium difficile* is a gram-positive, spore-forming bacillus that produces exotoxins that cause disease in humans.

34. Seaman knew that the laboratory's director, Dr. al-Tikriti, was genial and garrulous and would have delayed her inspection for some time. Kraatz-Wadsack, interview. Saddam Hussein feared assassination attempts by food poisoning or the placement of an agent on his clothing. Mainly, the SSO tested his underwear for poisons. UNSCOM stated that the SSO documents described dual-use biological activities and materials. UN Doc. S/1999/94, Annex D, para. 27. The press tended to sensationalize coverage of this incident by stating it involved Iraq's bioweapons program. Gellman, "A Futile Game of Hide and Seek."

35. Other records on this possible purchase dated to 1994. Two engineers from Salman Pak and Al Hakam, a Military Industrialization Commission official, and another individual from the Chemical Engineering Design Center interacted with the Russians, who agreed to sell the Iraqis five 10,000-liter fermenters plus the auxiliary equipment such as seed fermenters and tanks to mix media. Spertzel, interview. Also, UN Security Council, *Report of the Secretary-General on the*

*Activities of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Resolution 687 (1991)*, Doc. S/1998/332, April 16, 1998, para. 67; R. Jeffrey Smith, "Did Russia Sell Iraq Germ Warfare Equipment? Document Seized by UN Inspectors Indicates Illicit Deal," *Washington Post*, February 12, 1998, A1. The Iraqis requested equipment that could filter to 99.99 percent air purity. Alibek with Handelman, *Biohazard*, 275.

37. Once sanctions were lifted, Russia expected that Baghdad could sell enough oil to pay off its debt. For its part, Iraq demanded more Russian inspectors at UNSCOM. Smith, "Did Russia Sell Iraq Germ Warfare Equipment?"; *Knight-Ridder Financial*, "Russia to Build Iraqi Energy Plants When Sanctions Lifted," *Journal of Commerce Newspaper*, June 7, 1995, B6. See also Duelfer, *Hide and Seek*, 105.

40. As Yugoslavia broke apart, ethnic and religious tension between Bosnians, Croats, and Serbs erupted into a civil war. Although Croat forces initially also attacked Bosnian civilians, they signed a peace treaty in 1994. When Serb aircraft violated a no-fly zone in 1994, NATO conducted wide air strikes against Bosnian Serb infrastructure in 1995, which ended the hostilities and brought about the Dayton Peace Agreement, signed on November 25, 1995. Over 97,200 people were killed during the Bosnian War; 65 percent were Bosnian Muslims, 25 percent Serbs, and over 8 percent Croats. Civilians constituted 40 percent of the fatalities. International Covenant on Civil and Political Rights, Human Rights Committee, "Bosnia and Herzegovina Report" (UN, October 30, 1992); Ann Devroy, "Bosnia Croats, Muslims Agree to Confederation; Serb Stance Awaited," *Washington Post*, March 19, 1994, A17; John Pomfret, "NATO Jets Bomb Serb Airfield; Action Was Warning Against Repeated Cross-Border Attacks," *Washington Post*, November 22, 1994, A1; Elaine Sciolino, "Balkan Accord: The Overview; Accord Reached to End the War in Bosnia; Clinton Pledges U.S. Troops to Keep Peace," *New York Times*, November 22, 1995, A1; "Research Shows Estimates of Bosnian War Death Toll Were Inflated," Associated Press, June 21, 2007.

41. The roots of the conflict in Rwanda originate in its status as a trust territory under Belgian administrative authority. The Tutsi minority held the monarchy and resisted democratic institutions until a Hutu insurgency, supported by the Belgians, overthrew it in 1959. In 1990, exiled Tutsis formed the Rwandan Patriotic Front and invaded Rwanda. A civil war ensued, and after the peace treaty was signed in 1993, militias began rounding up and killing all Tutsis as well as Hutus who opposed the killings. The United Nations Assistance Mission for Rwanda was created in 1993 to ensure the ceasefire. The genocide did not end until the French-backed Rwandan Patriotic Front took control of the capital of Kigali. While the Rwandan government puts the death toll at 1,071,000 people, 90 percent of them Tutsis, the United Nations set the number at 800,000. GlobalSecurity.org, "Rwanda Civil War," <http://www.globalsecurity.org/military/world/war/rwanda.htm>; UN, "Rwanda—UNAVMIR Background," [http://www.un.org/Depts/dpko/dpko/co\\_mission/unamirFT.htm](http://www.un.org/Depts/dpko/dpko/co_mission/unamirFT.htm) - HISTORICAL; Helen Vesperini, "No Consensus on Genocide Death Toll," April 6, 2004, <http://iafrica.com/news/worldnews/314365.htm>.

42. Spertzel's UNSCOM 200/BW56 mission concentrated on the role of the Al Hazen Institute in the early days of Iraq's bioweapons program. Spertzel, interview.

45. This resolution passed in mid-November, when the Security Council condemned Iraq's move to prohibit American inspectors and extended the suspension of reviews that could lead to the lifting of sanctions. John M. Goshko, "Iraq Expels 6 American Inspectors; U.N. Orders Team to Leave Baghdad as Stakes Escalate in Standoff," *Washington Post*, November 14, 1997, A1; "Iraq: Road to the Current Crisis," *Washington Post*, February 15, 1998, A34. Although other permanent Security Council members split regarding the maintenance of sanctions, with the

United States and United Kingdom working to sustain sanctions and Russia and France paired to lift them, the Chinese were neutral. “[T]o the Chinese, it was a spectator sport.” Duelfer, *Hide and Seek*, footnote 1, p. 485.

47. Although recognizing problems in other areas, the commissioners highlighted the biology portfolio as particularly problematic. The commissioners recommended that UNSCOM maintain records of all “Iraqi efforts to frustrate [its] work, by concealment, obstruction, restriction of access or other means, so that the Security Council can be kept informed.” UN Security Council, *Letter Dated 22 November 1998 from the Executive Chairman of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Security Council Resolution 687 (1991) Addressed to the President of the Security Council*, Doc. S/1998/922, November 24, 1997, Annex, paras. 20, 2. Also, “Russians Break Iraqi Deadlock,” Reuters, November 21, 1997; “Iraq: Road to the Current Crisis,” *Washington Post*, February 15, 1998, A34; Philip Towle, *Enforced Disarmament: From the Napoleonic Campaigns to the Gulf* (Oxford: New Oxford University Press, 1997), 191–196.

52. The first biological weapons inspection team examined a Kolb chamber of sufficient size for human testing that the Iraqis had removed from Salman Pak and crushed. UNSCOM destroyed other test chambers. More than one UNSCOM inspector believed Iraq engaged in human testing. Former UNSCOM chief inspector, interview with author, New York City, January 31, 2006. Israeli intelligence reportedly indicated that in the 1980s ten Iranian war prisoners died after being tied to stakes and exposed to anthrax from a detonated bomb, while fifteen Kurdish prisoners, similarly staked outdoors, fell ill a week after exposure to camel pox, which was dispersed by an aircraft. An aerosolization chamber was reportedly used to expose dozens of other prisoners to anthrax. According to Iraqis, other Iranian prisoners were tied to beds in an underground facility near Salman Pak and exposed to anthrax sprayed from the ceiling. The prisoners were returned to Abu Ghraib, then released to die at home. Marie Colvin and Uzi Mahnaimi, “Saddam Tested Anthrax on Human Guinea Pigs: Iraq Tested Anthrax on POWs,” *Sunday Times* (London), January 18, 1998, 12.

55. Kraatz-Wadsack’s team found fairly extensive documentation at Abu Ghraib for prisoners for the years 1993, 1996, and 1997, making the gap in the facility’s records all the more obvious. Kraatz-Wadsack, interview with author, August 15, 2005. Butler instructed Kraatz-Wadsack not to interview prisoners so that Iraq could not accuse UNSCOM of usurping the human rights role of the International Red Cross. Butler, *The Greatest Threat*, 120–125. Of the inspection at Abu Ghraib, Butler told ABC, “The records were there. We had evidence this (testing) may have taken place.” Barbara Slavin, “Council Calls Iraqi Action ‘Unacceptable,’” *USA Today*, January 15, 1998. Ekeus said that worries about tests on human subjects were “foremost in our minds, but I’ve never seen any proof.” Bruce Auster, Stephen J. Hedges, Linda Fasulo, “In Iraq, Hints of Biological Atrocities,” *U.S. News & World Report*, January 26, 1998, 46. See also Stephen J. Hedges, “UN Seeks Proof of Iraqi Tests on Humans,” *Chicago Tribune*, January 30, 1999, A6; Stephen J. Hedges, “Iraqi Arms Tests: Fears Strong, Proof Elusive,” *The Gazette*, Montreal, January 31, 1999, A9; Mangold and Goldberg, *Plague Wars*, 299–300. Though definitive evidence was never found that Iraq tested biowarfare agents on humans, the Iraq Survey Group found evidence that the Iraqi Intelligence Service conducted such tests with chemical warfare agents (such as ricin). Aimed at developing tools to use against enemies of Saddam Hussein’s regime, the activity was apparently not connected to Iraq’s military biowarfare program. Duelfer, *Hide and Seek*, 415–416; “Biological Warfare,” in *Comprehensive Report of the Special Advisor to the DCI on Iraq’s WMD*, vol. 3, 3.

56. Three permanent Security Council members, China, France, and Russia, opposed the threat of “very severe consequences” for Iraq’s refusal to cooperate with inspections. James Bennet, “Clinton Describes Goals for a Strike on Iraqi Arsenals,” *New York Times*, February 18, 1998, A1; John M. Goshko, “3 on Security Council Oppose ‘Automatic Trigger’ on Iraq,” *Washington Post*, February 28, 1998, A20; Barton Gellman, Dana Priest, and Bradley Graham, “Diplomacy and Doubts on the Road to War,” *Washington Post*, March 1, 1998, A1.

57. “I think he was serious when he took this engagement,” continued Annan. “I think he realizes what this means to his people.” Julian Beltrame, “Annan Says He Trusts Saddam,” *The Gazette* (Montreal), February 25, 1998, A1. Also, Duelfer, *Hide and Seek*, 141–142.

58. The Security Council blessed this deal on March 2, 1998, with resolution 1154. UN Security Council, *Memorandum of Understanding Between the United Nations and Iraq, in Letter Dated 25 February 1998 from the Secretary-General Addressed to the President of the Security Council*, Doc. S/1998/166, February 27, 1998.

59. The official function of these diplomats was to observe the inspection activities and report “on any matter they deem appropriate.” UN Security Council, Annex, *Procedures under Paragraph 4 (b) of the Memorandum of Understanding Between the United Nations and the Republic of Iraq of February 23, 1998, in Letter Dated 9 March 1998 from the Secretary-General Addressed to the President of the Security Council*, Doc. S/1998/208, March 9, 1998, para. 11 (b).

60. No wonder, Ekeus continued, Aziz issued a statement about the new Annan modalities that was celebratory in tone. Ekeus, interview. For Ekeus’s terms, see Chapter 3.

61. Ekeus took serious issue with the use of inspections to prove a political point, meaning to assert the principle that UNSCOM could inspect any location in Iraq, rather than to pursue a bona fide inspection objective. Ekeus, interview. Also, Duelfer, *Hide and Seek*, 145–151.

64. Aziz first suggested a TEMs-like process to Ekeus in February 1992. Tim Trevan, *Saddam’s Secrets: The Hunt for Saddam’s Hidden Weapons* (London: HarperCollins, 1999), 17. The concept resurfaced in October of 1996, when Aziz visited several capitals complaining that UNSCOM’s evaluation of Iraq’s programs was unfair. Iraq asserted that no progress would be made on the biological portfolio unless Ekeus dismissed his permanent biological team. Ekeus understood the political necessity of having some type of a forum to attempt resolution. Given his preference for a scientific approach, Ekeus suggested scientific peer reviews of the materials on unresolved issues. Aziz welcomed this suggestion, and Ekeus momentarily agreed to the Iraqi proposal that the experts would consider only the information contained in dossiers prepared by the UNSCOM staff until his staff pointed out that information outside of UNSCOM’s files, particularly the data that Iraq was deliberately withholding from UNSCOM, was pertinent to the discussion. The formula used allowed Iraq to present information as well and the experts could also raise questions of their own. Spertzel, interview; Ekeus, interview.

65. This group of experts met from September 29 to October 3, 1997. UN Doc. S/1997/774, Annex II, Annex II, para. 4. See also paras. 2–3, 5 (a–k), 6. In addition, Erik J. Leklem, “Iraqi BW Program May Be Key to Standoff with UN,” *Arms Control Today* 27, no. 3 (October 7, 1997): 25.

67. While in Baghdad, Butler consented to Aziz’s proposal that the outside experts would consider only the information contained in a dossier that UNSCOM would compile and give to Iraq before the meeting, implying that Iraq was under no obligation to provide additional documentation. Butler initially agreed to a late January 1998 date for the biological TEMs, but he was advised to postpone because a previously scheduled round of international negotiations would draw the majority of the international community’s biological weapons experts. Spertzel, interview. The final terms of the TEMs are stipulated in UN Security Council, *Letter Dated 17 December 1997 From the Executive Chairman of the Special Commission Established by the*

*Secretary-General Pursuant to Paragraph 9 (b)(i) of Security Council Resolution 687 (1991) Addressed to the President of the Security Council*, Doc. S/1997/987, December 17, 1997, para. 38.

68. The U.S. laboratory at Aberdeen, Maryland, got positives for VX disulfide and a stabilizing chemical in June 1998, but reports leaked of contradictory analysis from the Swiss laboratory and of a deliberate French delay in conducting their analysis. According to a chemist who was involved, the laboratory was instructed not to provide UNSCOM with all of its analytical results because Paris was pushing to get the sanctions lifted. Former UNSCOM chief chemical weapons inspector, January 31, 2006. Also, "Dispute Surrounds French Tests of Iraqi Warheads for Nerve Gas," *Washington Post*, October 8, 1998, A26; Jim Hoagland and Vernon Loeb, "Tests Show Nerve Gas in Iraqi Warheads," *Washington Post*, June 23, 1998, A1; Christopher S. Wren, "Lab Reports of Iraq Poison Bolster Case for Sanctions," *New York Times*, June 24, 1998, A7; Lee Michael Katz, "U.S. Vows to Keep Pressure on Iraq After Nerve Gas Report," *USA Today*, June 24, 1998, 11A; John M. Goshko, "Iraqi Nerve Gas Tests Confirmed," *Washington Post*, June 25, 1998, A30; Barbara Crossette, "New Tests Dispute U.S. Finding of Iraq Nerve Gas," *New York Times*, September 18, 1998, A8; Barbara Crossette, "France Detects Iraqi Nerve Gas, Experts Assert," *New York Times*, October 7, 1998, A1.

69. The special warheads TEM was held from February 1 to 6, 1998, the VX TEM from February 2 to 6, 1998. Iraq destroyed all of the special warheads, leaving very little remaining physical evidence. Among other issues, the special warhead TEM tried to figure out what changes Iraq made to a warhead for biowarfare agents. A conventional warhead carries approximately 800 kilograms of explosives, but if 150 kilograms of anthrax slurry were the payload instead, the uncertainty revolved around the missing 650 kilograms of missing weight and the possible trajectory changes that might have caused. Former senior UNSCOM official, interview with author, August 30, 2005. Also, UN Security Council, *Letter Dated 19 February 1998 from the Executive Chairman of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b)(i) of Security Council Resolution 687 (1991)*, Doc. S/1998/176, February 27, 1998, Enclosures I and II.

70. Sellstrom was aware that his technical background was not ideally suited to the task, but Iraq firmly opposed any of UNSCOM's headquarters biological staff as chair of this meeting. Sellstrom planned to turn to UNSCOM's staff for technical expertise, as needed. The UNSCOM staff made a studied effort not to push its interpretation of events on the experts. The briefing books contained the original Iraqi documents, and the briefings consisted of a review of the progression of events and the factual evidence. UNSCOM also opened all of its files to the experts. Ake Sellstrom, PhD (former UNSCOM chief inspector), interview with author, Stockholm, August 24, 2005. Also on Sellstrom's selection instead of an UNSCOM biological staffer, Kraatz-Wadsack, interview.

72. Al Sa'adi pointed out that Guo Anfeng, PhD, was from a country sympathetic to Iraq and insinuated that UNSCOM's biological staff had unduly influenced Guo. Spertzel, interview; former UNSCOM chief biological weapons inspector, interview with author, Washington, DC, August 28, 2005.

74. Iraq tested the drop tank at Abu Obeydi Airbase with an anthrax simulant, *Bacillus subtilis*, and had previously declared that the tanks were to be loaded with anthrax. The Iraqis also considered using drop tanks with MiG-21 aircraft. An Iraqi document described the field test of the Zubaidy device with *B. subtilis* in August 1988 as successful. The Zubaidy device, which was a modified aerosol generator, could be used with helicopters or slow-moving fixed-wing aircraft. UN Doc. S/1999/94, Appendix III, paras. 47, 50, 55-56.

75. Simply put, the Zubaidy device was a modified crop sprayer that could be mounted on a helicopter or an aircraft. The inspectors considered the Zubaidy something of a mystery since they never got the full story about this device from the Iraqis or the Germany company. A second device, an unpowered drone aircraft involving a Zubaidy-like sprayer, was also apparently under development. Rod Barton (former UNSCOM biological inspector), interview with author via telephone, May 20, 2005; Spertzel, interview. Also, UN Doc. S/1999/94, Appendix III, para. 57–59; Mangold and Goldberg, *Plague Wars*, 312.

77. The Iraqis said they stacked Erlenmeyer flasks, which have a conical base and cylindrical neck, in rows on top of each other to make aflatoxin. These glass flasks all would have had to be turned on a daily basis, an approach likely resulting in the breakage of a considerable number of flasks. Debra Krikorian, PhD (former UNSCOM inspector), interview with author, Washington, DC, June 21, 2005. One reason the inspectors never got answers to some questions about Iraq's production of aflatoxin is that the scientist principally responsible for this work, Emad Al-Diyat, mysteriously disappeared. Mangold and Goldberg, *Plague Wars*, 309.

87. The consensus report contained only five recommendations, which disappointed Kelly and Killip, who had hoped that the expert panel would make scientific recommendations on how to achieve closure on the outstanding issues in the biological portfolio. Alternatively, Kelly wanted the biological TEM to reconvene to tackle those issues. Kraatz-Wadsack, interview. Stating that the TEM report was more harsh than UNSCOM's, foreign ministry official, interview with author, London, August 17, 2005.

90. Iraq asserted that Butler's latest report to the Security Council was brimming with "tremendous and flagrant fallacies and lies." Barbara Crossette, "Iraq Again Threatens to Halt Arms Inspections," *New York Times*, April 24, 1998, A3.

91. The briefings took place on June 3 to 4, 1998. Amb. Richard Butler, Presentation to the UN Security Council (New York, UNSCOM, June 3, 1998), Section IV, Biological Weapons Related Issues.

93. The UNSCOM technical staffers gave Butler little support when he turned to them for assistance because they viewed his approach as elevating procedure over substance. Barton, *The Weapons Detective*, 181. For Butler's account, Butler, *The Greatest Threat*, 76–79.

95. This mini-TEM, as it was known, took place from July 13 to 28, 1998. Sellstrom, interview.

96. Al Sa'adi's explanation of the missile fragments coming from a single warhead was not feasible because the warheads were blown apart by explosives and the fragments in question did not fit together. Taha's explanation was similarly implausible. To begin with, a 2,550-liter tank, which weighs over a ton, is hardly the type of mobile tank one would use to transfer agent. Yet Taha asserted that this tank was used to transfer botulinum toxin from Al Daura to Al Hakam, and while at Al Hakam was used to store anthrax. Though the Iraqis steam cleaned the tank, some anthrax must have remained inside when the tank was taken back to Al Daura. Spertzel, interview.

97. Aziz normally met only with UNSCOM's hierarchy. Spertzel, Amin, and Al Sa'adi also attended the meeting. The two Iraqis bowed to Aziz, who sat on a raised platform in a huge office. After hearing out Aziz, Sellstrom made his own pitch to break the logjam, telling Aziz that as a technical specialist he thought that it was essential for Iraq to divulge the names of the people behind the bioweapons program. Sellstrom knew that knowledge of the program's organizational structure would give UNSCOM some control over any future attempts to restart a program. Aziz, he asserted, could do this overnight. If no names were forthcoming, Sellstrom predicted the impasse would continue indefinitely because UNSCOM could never give Iraq a

clean bill of health on the biological program without new data. Iraq's only other choice, Sellstrom added, was to make this a political issue in the Security Council, and he recommended the latter course. The quartet departed with Al Sa'adi and Amin backing out of the room, bowing. Sellstrom declined to meet Aziz again the next day. Sellstrom, interview. Also on this meeting, Spertzel, interview.

100. Butler recalled Aziz making threats of a much more personal nature during this meeting. Butler, *The Greatest Threat*, 81–82. On Iraq's moves to suspend cooperation with UNSCOM, CIA, "Regime Strategic Intent," 61–62.

101. Emphasizing the frustration Aziz expressed in a recent telephone call, Annan told reporters, "I don't think we'll need military forces." Some suggested that tensions between Aziz and Butler might have contributed to the breakdown and that some Security Council delegations favored replacing Butler. Other diplomats said that Annan had not discussed the possibility of a new approach with the Security Council. David Osborne, "Annan Seeks UN 'Rethink' on Iraq," *The Independent*, August 7, 1998, 13; Laura Silber, "Annan Suggests Surprise New Line on Iraq," *Financial Times*, August 8, 1998, 3.

102. British officials feared that the response was inadequate and thought tougher measures were needed, while U.S. President Bill Clinton said that America was unwilling to consider any changes to the sanctions regime or to the United Nations' approach to Iraq. "UN Officials at Odds Over Baghdad," Associated Press, August 7, 1998; Silber, "Annan Suggests Surprise New Line on Iraq."

103. Technically, Ritter cited the reason for his resignation as the failure to uphold Resolution 1154, which condemned Iraq's August 5, 1998, decision to halt UNSCOM inspections and stated that the Security Council would not conduct its regular quarterly review of whether Iraqi compliance merited lifting of economic sanctions until UNSCOM and the International Atomic Energy Agency reported the full resumption of inspections. UN Security Council, Resolution 1194 (1998), UN Doc. S/Res/1194, September 9, 1998, para. 3.

104. Ritter denied passing intelligence to Israel, but the public relations damage was done. Barbara Crossette, "No Yielding to Inspectors by Baghdad," *New York Times*, October 3, 1998, A4. Also, Duelfer, *Hide and Seek*, 167. On the operations Ritter ran to unravel Iraq's concealment program and Ritter's utility to Iraq for propaganda purposes, 117–135, and footnote 3, page 492.

105. "The Iraqis knew that this separate unit was intelligence. I've got no problem with intelligence being collected on inspections, but don't serve the Iraqis this big, obvious target on a plate. The resolutions did not say UNSCOM should have a unit to prevent deception. That is how UNSCOM collapsed." Former UNSCOM chief biological weapons inspector, interview with author, August 28, 2005. Agreeing, Killip, interview. Summarizing the views of UNSCOM inspectors:

His biggest sin . . . is that he gave Baghdad the Israeli intelligence card, a mistake when so many neutral, third-world countries are watching. . . . His subsequent . . . revelations . . . about UNSCOM's alleged spying role did little to help him or UNSCOM's reputation amongst the powerful friends of Iraq within the Security Council. . . . Ritter must be held accountable for retarding, albeit inadvertently, the process of biological disarmament of [Iraq.]

Mangold and Goldberg, *Plague Wars*, 316.

106. As Duelfer explained, "WMD and UNSCOM were surrogates for the real problem," namely the confrontation between Washington and Baghdad regarding the

continued existence of Saddam's regime, with the UN Security Council and UNSCOM caught in the middle. Duelfer, *Hide and Seek*, 160.

111. Although Iraq cut off cooperation with UNSCOM, it allowed International Atomic Energy Agency inspectors to continue to perform their jobs. UN Security Council, *Letter Dated 31 October 1998 from the Deputy Executive Chairman of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b)(i) of Security Council Resolution 687 (1991), Addressed to the President of the Security Council*, Doc. S/1998/1023, October 31, 1998.

113. The addendum to Aziz's November 14, 1998, letter to Secretary General Annan contained Iraq's preferences for the comprehensive review. This letter can be found at <http://www.meij.or.jp/text/Gulf War/1998111401.htm>.

117. Kelly was the chief inspector on UNSCOM BW70 and BW71, which ran, respectively, from December 1 to 6 and December 10 to 14. Kraatz-Wadsack led UNSCOM 260/BW72, which was conducted from December 6 to 10, 1998. An ongoing monitoring and verification mission was also in Iraq in early December, led by Diane Seaman. UN Doc. S/1999/401, para. 34–36. Overall, the Iraqis were fairly cooperative, but they interfered with the biological inspectors' efforts to interview graduate students and other facility personnel when the inspectors went on site. UN Security Council, *Letter Dated 15 December 1998 from the Executive Chairman of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Security Council Resolution 687 (1991) Addressed to the President of the Security Council*, Doc. S/1998/1172, December 15, 1998.

118. UNSCOM had documents about the H.E. Daniel Ltd. yeast extract imports, which Samarra Drug Industries mostly consumed producing an appetizer tonic for humans and animals called "Toniphase." When the inspectors carefully inventoried the media at six sites in Iraq prior to destruction of the media in mid-1996, they found 25-kilogram barrels with bags that had 26.5 kilograms of media at Al Kindi; elsewhere the 25-kilogram containers had only 10 kilograms of media. Some of the bags inside these containers had H.E. Daniels Ltd. labels. Iraq would not say how the original material was consumed or whether the material found in these containers was replacement media, either imported or produced in Iraq. UNSCOM understood that at least one Iraqi facility, Al Tuwaitha, had developed a capability to make growth media. Kraatz-Wadsack, interview; Spertzel, interview. Also, UN Doc. S/1999/401, para.34–36.

119. Only electronic equipment was stolen from Al Asmara. These reports described the mess that the looters left. The report to Murtada bore the signatures of Taha, Thamer, and the chief of security. Barton, interview; Spertzel, interview. During these last interviews, the Iraqis claimed that the person who took the missing growth media had been killed. Kraatz-Wadsack, interview. See also Barton, *The Weapons Detective*, 183–184.

122. Under threat of impeachment, many condemned Clinton's decision to bomb Iraq as an attempt to distract international and domestic attention from his presidential and personal crisis. Colin Brown, "Attacks Legal and Justified, Says Blair," *The Independent*, December 17, 1998, 1; Francis X. Clines and Steven Lee Myers, "Attack on Iraq: The Overview; Impeachment Vote Delayed as Clinton Launches Iraq Air Strike, Citing Military Need to Move Swiftly," *New York Times*, December 17, 1998, A1; Timothy J. Burger and Kevin McCoy, "Clinton Foes Suspect a Stall," *New York Daily News*, December 17, 1998, 2; Bob Deans, "The Iraq Crisis: U.S. Begins Iraq Attacks; Impeachment Put on Hold; Destroying Saddam's Weaponry," *Atlanta Journal and Constitution*, December 17, 1998, A1.

124. Ekeus explained that the origins of this debacle began in 1997, when UNSCOM believed that only two prohibited missiles remained in Iraq but the U.S. and British counts were



higher. All that UNSCOM needed to confirm Iraq's disarmament to the Security Council was the document archive the inspectors knew Iraq kept to restart its weapons programs. UNSCOM's senior officials—Ekeus, Charles Duelfer, and Nikita Smidovich—agreed with Scott Ritter about the need to try to break Iraq's concealment tactics to get these documents. Iraq kept moving the document cache in convoys, so UNSCOM installed the listening device for their radio traffic. This action, Ekeus noted, was within UNSCOM's mandate. Before long, the Iraqis figured out that UNSCOM was listening because they encrypted their radio traffic. Ekeus briefed Butler on this operation, and Smidovich advised Butler to stop it because with the encryption it was not useful. Butler continued the operation, putting it in Ritter's hands. At that juncture, the activity, according to Ekeus, took on intelligence collection overtones. Ekeus, interview. On the breaking story, Tim Weiner, "U.S. Aides Say U.N. Team Helped to Install Spy Device in Iraq," *New York Times*, January 8, 1999, A1.

127. Part of this uproar accompanied the publication of Ritter's book in April 1999, when he spoke frequently about U.S. intelligence infiltration of UNSCOM. Of his remarks and book, UNSCOM spokesman Ewen Buchanan described them as "consistent only in their inconsistency" and perfectly geared to "serve Saddam Hussein's propaganda machine." Philip Shenon, "Former U.N. Arms Inspector Is Criticized by State Dept.," *New York Times*, February 24, 1999, A6. Also, John M. Goshko, "U.N. Inspector Again Denies Spying Charge," *Washington Post*, January 9, 1999, A14; Tim Weiner, "U.S. Spied on Iraq Under U.N. Cover, Officials Now Say," *New York Times*, January 7, 1999, A1; John M. Goshko, "Chief U.N. Arms Inspector Sees Trouble in Spy Charge: Butler Says He Did Not Know of Espionage," *Washington Post*, March 4, 1999, A2.

130. Other reasons for the possible understatement of bulk agent production include unexplained periods of time when Iraq claimed its fermenters were not used and UNSCOM's possession of data indicating that Iraq imported 600 kilograms of growth media more than Iraq declared. Iraq declared making 340 liters of *Clostridium perfringens*. UN Doc. S/1999/94, Appendix III, paras.67–68, 78, 88.

135. Anonymous U.S. and British officials concurred that UNSCOM had no future. Barton Gellman, "UNSCOM Losing Role in Iraqi Arms Drama: Bickering Security Council Seeks Alternatives," *Washington Post*, January 28, 1999, A19. Russian Ambassador to the UN Sergei Lavrov, who had long publicly demanded Butler's dismissal and UNSCOM's dissolution, told the media, "I don't care about UNSCOM. . . . It's a joke." "UNSCOM Says Iraq Submitted New Data on Germs Warfare," Reuters, April 10, 1999.

137. Lavrov's standing charges were that the Australian UNSCOM chairman was "unprofessional, untrustworthy, biased and impolite." Judith Miller, "Besieged U.N. Commission Chief Will Not Seek Another Term," *New York Times*, February 5, 1999, A3.

140. Comparing UNSCOM to UNMOVIC, UNSCOM historian Stephen Black termed the latter "an organization with a similar mandate but a starkly different modus vivendi." Stephen Black, "UNSCOM and the Iraqi Biological Weapons Program: Technical Success, Political Failure," in *Biological Warfare and Disarmament: New Problems, New Perspectives*, ed. Susan Wright (New York: Rowman & Littlefield, 2002), 289.

145. Russia, he stated, also erroneously accused UNSCOM of taking orders from the CIA. "Sadly, I think what was going on was their attempt to absolutely, finally kill UNSCOM," said Butler. "They wanted . . . to demonstrate that UNSCOM was an evil organization that misled the council." Edith Lederer, "Butler Blames Death of UNSCOM on Russia, China and France," Associated Press, August 3, 1999. More circumspectly, Black attributed the end of UNSCOM "to changing national objectives and political neglect of the deteriorating disarmament situation in

Iraq.” Black, “UNSCOM and the Iraqi Biological Weapons Program: Technical Success, Political Failure,” 286.

## Chapter 8

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3. “A strength of UNSCOM was its ability to organize an inspection at the drop of a hat. I was somewhat amazed that in a minute I could put \$1 million worth of assets in the air with one phone call.” Former UNSCOM chief inspector, interview with author, London, August 18, 2005. Also crediting UNSCOM’s ability to assemble teams rapidly on a shoestring budget as an organizational strength, foreign ministry official, interview with author, London, August 17, 2005, Ron Manley, PhD (former UNSCOM chief chemical weapons inspector), interview with author, London, August 19, 2005; Terence Taylor (former UNSCOM CBW commissioner and chief inspector), interview with author, Washington, DC, May 12, 2005; David Kelly, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, December 17, 2002; former UNSCOM staff member, interview with author, New York City, September 2, 2005; former senior UNSCOM official, interview with author, New York City, August 30, 2005.

4. UNSCOM headquarters called individuals to ascertain their willingness and availability to serve as chief inspectors then drafted a mission statement, whenever possible in coordination with the chief. “We’d ask the Finnish ambassador for an expert in welding fermenters from company “x” in four weeks. We almost always got who we wanted.” Hamish Killip (former UNSCOM chief biological weapons inspector), interview with author, Isle of Man, August 22, 2005. Also on the ability to tap top global talent, Rod Barton, PhD (former UNSCOM biological inspector), interview with author via telephone, May 20, 2005; Jeff Mohr, PhD (former UNSCOM chief biological weapons inspector), interview with author via telephone, June 27, 2005. UNSCOM called individuals to ascertain their willingness and availability to serve as chief inspectors. Once a chief agreed to certain dates, UNSCOM headquarters drafted a mission statement, whenever possible in coordination with the chief.

8. As a precaution, team chiefs often assigned someone to watch problematic inspectors to ensure that they did not become a further liability. Most inspectors behaved professionally but some drank, had psychological problems, or just never showed up for the day’s activities. One French inspector, for example, missed two days of a mission without explanation and another had a suit made instead of inspecting a site. At the time, most Russian inspectors could earn more in one day of UN per diem than they could for a month’s work in Russia, so they were disinterested in their assignments during inspections. Killip, interview; William Lebherz (former UNSCOM industrial biotechnology expert), interview with author, Washington, DC, February 13, 2006; Debra Krikorian, PhD (former UNSCOM biological weapons inspector), interview with author, Washington, DC, June 21, 2005.

10. What Iraq did was not that different from the bioweapons programs of the 1960s, and a real expert would know the techniques that the United States and U.S.S.R. used then. “Some of the inspectors weren’t real experts; they pretended to be experts or they were experts in something, but not in biological weapons programs. Some of them knew only how it was done on paper.” Former senior UNSCOM official, interview with author, August 30, 2005. “Another inspector who had been on the trilateral inspections of the U.S.S.R.’s biological facilities asked me why the Russians had placed a tank beside a centrifuge. Again, stunned, I explained that the fermentation process can create a foam. Before the material is fed into the centrifuge it is moved into a holding tank, which helps break the foam.” Former UNSCOM inspector and chief

of product development in an offensive biological weapons program, interview with author, February 21, 2006.

12. Franz recalled that industry experts were rarely on UNSCOM teams because the emphasis was more on security and weapons than on research, scale-up, production, and technology. David Franz, DVM, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, June 29, 2005. Agreeing that industry expertise was “the one missing component” on UNSCOM biological teams, Krikorian, interview.

13. Kelly described the December 1994 inspection of Al Hakam as particularly high caliber because of Leberz, a biotechnology industry specialist. “Industry guys could look at the hardware and say when the process didn’t make sense, and they could examine the books and pinpoint when they didn’t have any economic or business logic at all.” Kelly, interview. Also, Gabriele Kraatz-Wadsack, “The Role of Scientists in Verification,” in *Assessing the Threat of Weapons of Mass Destruction: The Role of Independent Scientists*, vol. 61, ed. J. L. Finney and I. Slaus, NATO Science for Peace and Security Series E: Human and Societal Dynamics (Amsterdam: IOS Press, 2010), 51–52.

14. “We had translators who had never worn personal protective gear or been to the Middle East. Within two or three days, they’d been up against Amer Rasheed’s foul temper or in a situation where they had to mask up.” Killip, interview. Also emphasizing the importance of employing interpreters who are prepared for this type of work and can cope with the technical nuance that is often involved in interviews with scientists, Stephen Black (UNSCOM historian), interview with author, Washington, DC, November 16, 2007. Franz recalled how much having an interpreter with scientific training enhanced the inspectors’ ability to profit quickly from documents found on site because such linguists could skim laboratory notebooks and other documents written in Arabic and inform the inspectors whether there was anything relevant in the notes to pursue. Franz, interview.

15. UNSCOM biological team chiefs often passed their interpreters lists of terminology to assist them. David Huxsoll, DVM (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, June 21, 2005; Taylor, interview; Franz, interview.

16. When UNSCOM gathered outside experts, often academics from countries that did not contribute inspectors, the experts turned out to be “even more convinced, even more outraged than UNSCOM when they read and heard the Iraqi accounts. They insisted that the investigation continue.” Foreign ministry official, interview with author, London, August 17, 2005. Also on this point, Ambassador Robert Gallucci, PhD (former UNSCOM deputy executive chairman), interview with author, Washington, DC, March 13, 2006; Ake Sellstrom, PhD (former UNSCOM chief inspector), interview with author, Stockholm, August 24, 2005; Richard Spertzel, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, July 1, 2005; Gabriele Kraatz-Wadsack, DVM (former UNSCOM chief biological weapons inspector), interview with author, Berlin, August 15, 2005.

18. The Iraqis used the Vollum strain of anthrax and also pulled data on *C. botulinum*. Huxsoll, interview; former UNSCOM biological weapons inspector, interview with author, Washington, DC, February 21, 2006; UNSCOM, *Report of UNSCOM 142/BW34*, April 30–May 7, 1996, Chief Inspector Hamish Killip (New York, n.d.), paras. 13–14.

19. In World War II, the Japanese Imperial Army’s Unit 731 experimented with gas gangrene as a weapon, as did the French, but other post–World War II bioweapons programs (for example, British, U.S., and Soviet) bypassed these agents. Sheldon H. Harris, *Factories of Death: Japanese Biological Warfare 1932–45 and the American Cover-Up* (New York: Routledge, 1994).

On other programs, see Mark Wheelis, Lajos Rozsa, and Malcolm Dando, eds., *Deadly Cultures: Biological Weapons Since 1945* (Cambridge, MA: Harvard University Press, 2006).

20. As Iraq's work with untraditional agents first came to light late in the summer of 1995, a senior UN scientist remarked, "No country I know of has ever even played with the idea of developing many of these into instruments of war. It represents highly innovative thinking and a very huge investment." For example, the inspectors were surprised that Iraq worked with hemorrhagic conjunctivitis, which causes temporary blindness, is very communicable, and has not been weaponized by any other state. Robin Wright, "Iraqis Admit to Broad, Virulent Germ War Plan," *Los Angeles Times*, September 6, 1995, A1.

21. The Iraqis said they added gas gangrene to the program early in 1988 because a large number of cases during the Iraq-Iran war "increased the suspicions that these types of bacteria might be used against Iraq by aggressive parties." Republic of Iraq, *A Full, Final and Comprehensive Report on {Biological Activity}*, May 1992, 3.

22. Environmental effects can kill the majority of particles of some agents within minutes. Wet slurries are difficult to aerosolize from sprayers, clogging them, and the mechanical forces of pushing the slurry through a sprayer can also kill large numbers of agent particles. *Health Aspects of Chemical and Biological Weapons* (Geneva: World Health Organization, 1970), 93–94. For more on the technical challenges of dispersing biowarfare agents, Karle Lowe, "Analyzing Technical Constraints on Bio-Terrorism: Are They Still Important?" in *Terrorism with Chemical and Biological Weapons: Calibrating Risks and Responses*, ed. Brad Roberts (Arlington, VA: The Chemical and Biological Arms Control Institute, 1997); Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, OTA-BP-ISC-115 (Washington, DC: U.S. Government Printing Office, December 1993), 94–96.

23. UNSCOM believed that Iraq hid its best bioweapons, specifically dried anthrax in DB-2 and LD-250 bombs, before inspections began in August 1991. Rod Barton, "Profile of a Proliferator: Iraq's Biological Weapons Program," Briefing Series (Washington, DC: Center for Nonproliferation Studies, February 2, 2001). On the assumption that Iraq would pursue a dried agent, former UNSCOM staff member, interview with author, New York City, September 2, 2005.

26. Kadlec recalled this statement by an Iraqi general before giving his own assessment of how the Iraqis ran their program: "To a certain extent, the Iraqis weren't doing all of the targeting requirements/agent selection/production criteria thinking that they needed to do, but they were thinking through some weaponization issues. Not everybody involved understood the dynamics of how to wage effective biological warfare. They lacked experience, and it showed." Robert Kadlec, MD (former UNSCOM biological weapons inspector), interview with author, Washington, DC, February 23, 2006.

28. "Huda was either the brains behind the whole bio program or wasn't involved in it at all. That she was able to leave so many inspectors with such disparate impressions is quite a feat." Kadlec, interview. Also puzzling over Amash's role, Spertzel, interview; Killip, interview; Kelly, interview; Kraatz-Wadsack, interview.

32. Taha may have been recruited through two short technical training programs that doubled as a loyalty test to screen people for further training overseas or service as technicians. Taha studied plant toxins because university officials declined her request to study infectious diseases. Spertzel, interview; Huxsoll, interview.

33. Usually, UNSCOM inspectors interpreted Taha's outbursts as a sign that they were onto something she knew should not be revealed. After one outburst Taha left the room, and the UNSCOM translator heard her yelling, "What the hell am I supposed to tell these people?" Killip,

interview. Agreeing on Taha's tantrums and their probable meaning, Mohr interview; Krikorian, interview; Spertzel, interview.

36. Also suggested as the real managers: two individuals who served as top aides to Hussein Kamal, Amer Al Sa'adi or Gen. Amer Rasheed, later Iraq's minister of oil; the dean of the College of Science at Baghdad University, Huda Amash; and virologist Hazem Ali, who headed the Razi Research Institute and researched viral agents. In his paper, Al-Hindawi reportedly argued that biological weapons, which are cheap, would be a cost-effective way to destroy Israel. Christopher Dickey and Colin Soloway, "The Secrets of Dr. Germ: U.N. Inspectors Have Begun Searching Iraqi Weapons Sites," *Newsweek*, December 9, 2002, 2.

37. After the 2003 Gulf War, a three-page list of military officials previously unknown to be involved in the bioweapons program was found that indicated heavier military involvement. Kadlec, interview.

38. Taha ran the research, development, and production activities; the Haidar farm videos showed her supervising bioweapons field tests; and her subordinates filled munitions with germ agents. Documents eventually turned up with her signature as the head of program, dated back to 1988. Via Ahmed Murtada, director of the Technical Resource Center, Taha reported to Kamal. These documents that bore Taha's signature included annual reports, requisition orders, instructions to staff, and other managerial matters. Barton, interview. Chief Inspector Hamish Killip mused about the luck of Taha as program manager because her conservative, step-by-step work habits inhibited her from taking full advantage of the resources sent her way. "If a risk-taker had been put in charge," observed Killip, "Iraq might have had a much more sophisticated capability in the first Gulf War. At times, Al Sa'adi was throwing money at her and trying to get her to get bigger fermenters and capacity and she was only going to do it step by step." Killip, interview.

41. An Iraqi scientist said that they never used such precautions for that type of activity. Former UNSCOM biological weapons inspector, interview with author, May 27, 2006.

42. Because safety is "number 1, 2, and 3" on the list in the West, "I was impaired by thinking that they wouldn't do human pathogens in that type of place," said Franz. "In Iraq, there was not a major safety program, so the logical conclusion from a Western perspective was that there just couldn't be a weapons program. This had a huge impact on the conclusions that I drew; it made me think that the things that I saw were not indicators of an offensive program." Franz, interview. Similarly, Huxsoll, interview; Spertzel, interview; Killip, interview; former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, February 21, 2006; former senior UNSCOM official, interview with author, New York City, September 1, 2005; former UNSCOM staff member, interview with author, New York City, September 2, 2005. Similar safety assessment problems occurred among some chemical weapons inspectors, who came away from Al Muthanna "saying that the place was rubbish and the Iraqis couldn't do anything there. Yet they produced a lot of chemical weapons there and killed a lot of Iranians with them." A physician from Muthanna reported an average of one hundred injuries annually, including a few fatalities. Barton, interview. For the UN's official assessment of the biosafety bias: "Considerations related to the low level of biological containment were major factors in the initial perception of the unsuitability of Iraq's dedicated biological weapons production facilities for the production of pathogens. These considerations were drawn from microbiological and manufacturing practices and standards familiar to the inspectors, who were experts on biological weapons." United Nations (UN) Security Council, *Twenty-Second Quarterly Report on the Activities of the United Nations*

*Monitoring, Verification and Inspection Commission in Accordance with Paragraph 12 of Security Council Resolution 1284 (1999)*, Doc. S/2005/545, August 30, 2005, Annex, para. 39.

49. An example of an unusual and costly step that the Iraqis took in their chemical weapons program was to use phosphorous trichloride to chlorinate the chemical thiodiglycol to get mustard. "This is very expensive stuff, and nobody in their right mind would use phosphorous trichloride for this, but since Iraq couldn't get the other chemicals, it worked. Phosphorous trichloride produces very high-quality mustard." Ron Manley, PhD (former UNSCOM chief chemical weapons inspector), interview with author, London, August 19, 2005. Before the sanctions targeted specifically at Iraq because of its 1990 invasion of Kuwait, several supplier nations began harmonizing export controls in 1985 on chemicals critical to the manufacture of poison gas because Iraq and Iran were trying to acquire these chemicals in the 1980s. For more on the Australia Group, go to <http://www.australiagroup.net>.

50. Modern biosafety requires the installation of costly ventilation equipment, training of personnel, and other protocols that can slow down a weapons program. "Some of what the safety people insist on is necessary and practical but other stuff is just bureaucratic crap, not meaningful safety protocols," said one former inspector. So long as Iraq was working with wet slurries, continued this individual, the biosafety hazard to the workers and the public was not nearly as high as it would be if Iraq were working with dry agents of 1 to 10 micron particle sizes. Former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, February 21, 2006.

53. Had he known what tasks he would be assigned, Lebherz said he would have refreshed the needed skill sets so that he could perform more ably in the field. "It wasn't clear until I got to Bahrain what they were looking for me to do. I wondered how many people got to Bahrain supposedly as some kind of expert and either had the wrong skills or otherwise couldn't cut it." Lebherz, interview.

56. Ekeus's "view was that if you were a 'missile expert' you should just be ready to go, but some inspectors had never seen a SCUD." Former UNSCOM chief inspector, interview with author, August 18, 2005.

59. Agreeing that the job of the inspectors was not to enlighten the Iraqis as to where they had made mistakes with development, production, stabilization, or weaponization of biowarfare agent, Killip said, "There were occasions where we didn't go down a road of inquiry to avoid that. Sometimes they knew their errors; sometimes I'm not sure they did." Killip, interview. "How the questions are worded will determine whether you get the real answers or what they think we need to hear." Krikorian, interview.

60. The inspectors also recommended mock inspections of facilities. Kelly, interview; Taylor, interview; former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, February 21, 2006; Spertzel, interview.

63. In America, everything is done "very large" and in a "technologically advanced" way, so U.S. inspectors are not always good at seeing how others might make weapons on a more modest scale. Having worked with the Soviets, then the Russians, for over a decade, in hindsight Franz could see how many cultural mistakes the initial U.S. and British inspectors of the U.S.S.R.'s bioweapons facilities made, appreciate the cultural differences, and chart more effective ways to work with the Russians. Franz, interview. Agreeing, Kadlec, interview; Kraatz-Wadsack, interview; former UNSCOM chief inspector, interview with author, August 18, 2005; former UNSCOM CBW commissioner, interview with author via telephone, January 23, 2005.

64. What flabbergasted most UNSCOM inspectors was that the Iraqis were so nonplussed when caught in the midst of a falsehood. "The Iraqis lied with such audacity," said Gallucci.

Gallucci, interview. When the inspectors confronted Iraqis with contradictory evidence, a biological inspector recalled, “They would look to you and say, ‘so?’” Former UNSCOM biological weapons inspector, interview with author, Washington, DC, February 4, 2005. Also, Leberherz, interview; Spertzel, interview; Kraatz-Wadsack, interview. On this matter, the former UNSCOM Executive Chairman Richard Butler recalled how Gen. Amir Al Sa’adi “told me that the reason their biological weapons program had been so ‘tiny and ineffective’ was that Iraq lacked the expertise to make it better. . . . He was lying about the scope of the program, of course, and his audacity in frankly admitting that he wished it had been greater was appalling.” Butler describes taking his complaints about Al Sa’adi’s comments to Aziz, the deputy prime minister: “‘What’s your point, Mr. Butler?’ he asked, apparently genuinely puzzled. In other words, what was wrong with having a biological weapons program if you could do it really well?” Richard Butler, *The Greatest Threat: Iraq, Weapons of Mass Destruction, and the Growing Crisis of Global Security* (New York: Public Affairs, 2000), 81. Butler recalled Aziz insinuating that Iraq’s mistake was not the lying itself but getting caught in their lies (page 82). For other Butler accounts of Iraqi lies, page 51.

65. “The scientists had to tell them they were succeeding or they’d be killed, maybe their families too. The guys at the bottom were writing what the hierarchy wanted to hear and also putting in proposals that they found scientifically interesting. The leaders didn’t really know the difference.” Manley, interview. “Lying to an absolute ruler was hazardous, Iraqi weaponeers said, but less so in some cases than the alternatives. No one will tell Saddam Hussein to his face, ‘I can’t do this,’” said an Iraqi brigadier general who supervised work related to Iraq’s rail gun. “Secrecy and a procurement system based on smuggling, Iraqi scientists said, abetted those who inflated their reports.” Barton Gellman, “Iraq’s Arsenal Was Only on Paper; Since Gulf War, Nonconventional Weapons Never Got Past the Planning Stage,” *Washington Post*, January 7, 2004, A1.

67. Therefore, advanced scientific credentials are not required to screen people leaving a building by searching their bags, to ask routine questions about why something was done a particular way, or to establish whether an individual has purported expertise. Former senior UNSCOM official, interview with author, August 30, 2005. Concurring, Stephen Black (UNSCOM historian), interview with author, Washington, DC, November 16, 2007.

68. “Culturally,” said Spertzel, “the Iraqis are initially prone to lying—maybe saying what other Iraqis need to hear, or if they don’t want to cooperate they try to tell you what you want to hear. The only way to break through is with extensive discussion,” facing down the Iraqis. Spertzel felt that being aggressive with senior officials such as Al Sa’adi and Amin was useful because they were probably in a position of defending the regime and Al Sa’adi had a tendency to lead inspectors down the “primrose path.” With the reluctant head of the forensic laboratory, Dr. Al Faluji, Spertzel used aggressiveness to get him talking, but he treated Taha with “kid gloves” because she tended to fling tantrums, which completely disrupted the interview or inspection. Illustrating another way he knew when to be more assertive, “If they served tea, we knew they were going to attempt to cooperate or at least give the illusion of cooperation. Any time an official offered no tea or insisted on an interpreter even though he spoke English very well, we knew it was going to be a hard day.” Spertzel, interview.

69. Calling the bad cop approach is a recipe for failure, Mohr, interview. “When inspectors used verbal assaults, I could just see the Iraqis clamming up. It wasn’t just what they were or weren’t saying in response, their body and facial language showed that they just completely turned off.” Huxsoll, interview. “No matter what, shouting does not work except maybe to

establish that an inspector has authority and is in charge.” Former senior UNSCOM official, interview with author, August 30, 2005.

70. One well-known bad cop was UNSCOM inspector Scott Ritter, who yelled instructions to new inspectors in Bahrain: “You are the Alpha dog, you pee on their walls!” Former UNSCOM chief biological weapons inspector, interview with author, August 28, 2005. Also recalling bad cop inspectors, Franz, interview; Krikorian, interview; Sellstrom, interview; Huxsoll, interview. One inspector made no distinction between a terrible current government and a culture that was the cradle of civilization. This inspector was almost dismissed for saying he could just “kill all the Iraqis.” Former UNSCOM chief biological weapons inspector, interview with author, August 28, 2005.

73. The Iraqis told Huxsoll about technical aspects of their tests with biowarfare agents and gave Krikorian details about their document movement and communications protocols. Huxsoll argued that inspectors need to have a plan for situations when individuals seem genuinely more interested in interaction and sharing information. Huxsoll, interview; Krikorian, interview.

77. For example, Dr. Abdul Nassir Al-Hindawi was very friendly with some inspectors. Saddam jailed Al-Hindawi in 1998, reportedly for trying to defect. Dickey and Soloway, “The Secrets of Dr. Germ.”

78. When an inspector found a very incriminating document only to have the Iraqis repossess the document at gunpoint, former UNSCOM Chairman Richard Butler asked why the document had not just been hidden in an inspector’s clothing to slip it off site. Kraatz-Wadsack, interview. Also on the mistaken belief that it was appropriate for inspectors to grab evidence any way that they could, Killip, interview.

79. “Some Iraqis tried to tell you things on the side. I never went unescorted or privately to anybody’s home. Such risks are not justifiable. Two Iraqis were very heavily punished—penalized financially and not promoted—for unauthorized contacts with inspectors, but the inspectors involved probably never knew. One of these contacts was a phone call.” Killip, interview. Taylor caught someone on his team deliberately trying to prevent UNSCOM from accumulating evidence by stealing documents, including a key document that provided evidence of Iraqi malfeasance. Reporting that some inspectors tried to sneak evidence out of Iraq, Taylor, interview; Kraatz-Wadsack, interview.

80. To prove that evidence was collected cooperatively and appropriately, UNSCOM used chain-of-custody procedures to take possession of data in the presence of Iraqis and to demonstrate that inspectors did not tamper with samples, documents, or other evidence. The inspectors also photographed or filmed the transfer of evidence. Killip, interview; Kraatz-Wadsack, interview; former senior UNSCOM official, interview with author, August 30, 2005; Taylor, interview; Spertzel, interview; former senior UNSCOM official, interview with author, August 30, 2005.

81. After a mission, chief inspectors had seven days to turn in final reports, so there was a mad dash in Bahrain to get the report done. Spertzel, interview; Lebherz, interview; Kelly, interview; Killip, interview; Taylor, interview; Mohr, interview; Kraatz-Wadsack, interview.

84. “If you didn’t debrief inspectors on site, back at the Canal Hotel one of them would say they saw something that someone with broader, deeper knowledge of the situation could have understood as important to pursue right away, on site. Debriefings were not always done and when they were, they were not always thorough.” Kraatz-Wadsack, interview. With similar remarks, Spertzel, interview; Killip, interview; Kelly, interview.

85. The military and fire service are two disciplines that routinely use hot washes to capture the lessons for others not directly involved in the emergency or disaster response or exercise.



The hot wash facilitator is charged with drawing out data points, insights, instructional anecdotes, and lessons to be learned from all participants. For example, *Increasing FDNY's Preparedness* (New York: McKinsey, 2002); *Improving NYPD Emergency Preparedness and Response* (New York: McKinsey, 2002).

86. "UNSCOM gradually came to mimic the Baghdad regime in one respect: It had compartments within compartments to obscure the details of what it knew and how." Barton Gellman, "A Futile Game of Hide and Seek: Ritter, UNSCOM Foiled by Saddam's Concealment Strategy," *Washington Post*, October 11, 1998, A1.

87. Appropriate staff from headquarters should attend such meetings. Mohr, interview; Taylor, interview; Huxsoll, interview; Kraatz-Wadsack, interview; former UNSCOM chief inspector, interview with author, January 31, 2006.

89. Preferably, UNSCOM would have briefed team chiefs across disciplines about major inspection objectives and concerns and called them in occasionally for a group discussion to improve coordination, boost analytical efforts, and elicit lessons useful across the disciplines. Between periodic team chief meetings, such a coordinator could facilitate the exchange of relevant data. Had UNSCOM institutionalized a periodic meeting of all chiefs across all portfolios, the inspectors might have been quicker to recognize the usefulness of deploying cross-disciplinary teams to sites of mutual interest. As it was, UNSCOM attached a few biologists to three chemical teams deployed at six-month intervals in 1991 and 1992. UNSCOM and the IAEA did not field a combined team of biological and nuclear specialists to Al Tuwaitha until 1995. Although the joint team sent to Al Tuwaitha did not find anything of concern to the biological inspectors, interdisciplinary teams were useful because Iraq mixed activities at sites, for example conducting chemical and biological work at some sites, nuclear and biological at others. To inspect effectively in such circumstances, "the cross-disciplinary approach should be adopted early and at regular intervals," asserted Taylor. Taylor, interview. Also on this point, Krikorian, interview; Kadlec, interview; Raymond Zilinskas, PhD (former UNSCOM biological weapons inspector), interview with author, Washington, DC, October 4, 2005; former UNSCOM chief inspector, interview with author, January 31, 2006. Cross-disciplinary missions included UNSCOM 21/CBW1 of November 1991 and the UNSCOM 39/CBW2 and the UNSCOM 47/CBW3 teams of July and December 1992. Following this line of thought, another UNSCOM chief inspector stated that "inspections should not have a false separation with each discipline keeping their own data. Having inspectors exchange information can be immensely important, and a coordinator should be appointed to ensure that substance is shared across the teams and the disciplines." Former UNSCOM chief inspector, interview with author, January 31, 2006.

91. A more serious effort was made to organize these archives after UNSCOM's abolition. Manley, interview; former UNSCOM staff member, interview with author, September 1, 2005.

95. Intelligence agencies also worry that the data they receive from international organizations will somehow be tainted. Gallucci, interview; Killip, interview.

96. "We came here blind, there was not a single piece of paper in our offices about Iraq and its weapons programs. Whatever help we could get we accepted it." Former senior UNSCOM official, interview with author, August 30, 2005. On UNSCOM's need for and solicitation of intelligence assistance in UNSCOM's early days, Ekeus, interview; Killip, interview; Sellstrom, interview.

97. Ekeus sent letters requesting intelligence assistance to over fifty countries, including Australia, France, Germany, Israel, Russia, the United Kingdom, and the United States. Ekeus, interview; Gallucci, interview; former senior UNSCOM official, interview with author, September

1, 2005. Ekeus sent letters to over fifty countries requesting assistance. “Disarming Iraq: The Work of the U.N. Special Commission,” *The Interdependent* 18, no. 1 (January-February 1992), 1.

98. The U.S. data were still reportedly the best intelligence UNSCOM received at the outset. “The CIA really dominated the provision of intelligence early on. As much as they were wrong, and they were wrong most of the time, they were still more right than anybody else. The German, British, and French information and analysis was very poor, with a few exceptions.” Doug Englund (former UNSCOM chief inspector), interview with author, Washington, DC, December 5, 2005. Russia was not that active, partly because Moscow reportedly did not consider Iraq a prime intelligence collection target. Russia did provide data to help clarify the number of SCUD missiles in Iraq’s arsenal. In the 1992–1993 time frame, France provided some data. Israel cautiously began to share data in the summer of 1994, gradually increasing cooperation after seeing how UNSCOM utilized the initial data provided. Pierce Corden (former UNSCOM deputy executive chairman), interview with author, Washington, DC, August 4, 2008. Israeli data about Iraq’s imports of growth media became the fulcrum that UNSCOM used to bust open Iraq’s cover stories about its bioweapons program after the inspectors gathered a large amount of additional data from suppliers. Ekeus, interview; Spertzel, interview; Barton, interview; former senior UNSCOM official, interview with author, August 30, 2005; Gellman, “A Futile Game of Hide and Seek;” Tim Trevan, *Saddam’s Secrets: The Hunt for Saddam’s Hidden Weapons* (London: HarperCollins, 1999), 268–269, 287–288; Rod Barton, *The Weapons Detective: The Inside Story of Australia’s Top Weapons Inspector* (Melbourne: Black Inc. Agenda, 2006), 126, 137–138.

99. Gallucci prompted the initial U.S. briefings by reminding this individual that UNSCOM would not know where to go if it did not receive help. Gallucci, Ekeus, and chief UNSCOM missile inspector Doug Englund were the only UNSCOM staff to attend the initial briefings, which took place outside of the UN building and consisted of overhead imagery and descriptions of what might be found at various sites in Iraq. Gallucci, interview. With a similar attitude regarding U.S. cooperation with UNSCOM’s counter-concealment operations, Charles Duelfer, *Hide and Seek: The Search for Truth in Iraq* (New York: Public Affairs, 2009), 124–125; former UNSCOM staff member, interview with author, September 2, 2005.

100. Johan Molander, Ekeus’s special adviser, described the first U.S. briefing to the UNSCOM commissioners in May 1991: “These guys with their dark glasses and briefcases handcuffed to their wrists come into the room. And they start lecturing the commissioners . . . like they were little children who could not really understand nuclear and chemical weapons. And they show their grainy photographs that had clearly been so degraded that you could hardly make out anything.” “British Expert on Iraq’s Secret Arms Program,” *Sunday Times* (London), February 14, 1999, 12. See also Trevan, *Saddam’s Secrets*, 58–59. Also on the initial U.S. reluctance to share intelligence data, former UNSCOM staff member, interview with author, September 2, 2005.

101. The inspections that unveiled Iraq’s nuclear weapons program in 1991 were a turning point in how the U.S. intelligence community thought about cooperation with UNSCOM. Gallucci, interview; Duelfer, *Hide and Seek*, 170.

103. U.S. pilots flew the U-2 and U.S. personnel processed the film before delivering wide- and high-resolution images to UNSCOM with a briefing. The terms for these flights, code-named the Olive Branch program, required UNSCOM to notify Iraq of the entry and exit points of the flight forty-eight hours in advance, but otherwise Iraq received no indication where the U-2 would go. For example, UNSCOM asked the United States to bracket certain events with flights to observe Iraqi activities. Iraq received advance notice of U-2 flights and could plan activities

accordingly. The U-2 cameras did not always catch exactly what the inspectors anticipated but it revealed signs (such as soil disruption) that gave them a place to start looking. Ekeus, interview; former senior UNSCOM official, interview with author, August 30, 2005; former UNSCOM staff member, interview with author, September 2, 2005. For more on Olive Branch and the helicopter flights and satellite imagery that aided UNSCOM inspections, Jean E. Krasno and James S. Sutterlin, *The United Nations and Iraq: Defanging the Viper* (Westport, CT: Praeger, 2003), 85–90; Duelfer, *Hide and Seek*, 132.

105. For instance, the briefers stated that the image showed a new building but could not comment on how it might fit into a weapons program. “I sat through so many briefings where the inspectors who had been there were explaining to the Olive Branch people what it was they were seeing on their images.” Kraatz-Wadsack, interview. Also on this point, Kelly, interview; Killip, interview. When the images showed anything “fishy,” as Ekeus put it, UNSCOM sent in a team for a closer look. Ekeus, interview.

106. The CIA rotated GATEWAY briefers every few months and they never went into Iraq, so sometimes the inspectors were more knowledgeable than the briefers. Australian and British briefers did go in-country so that they had a better feel for their subject. Killip, interview; Gallucci, interview; former UNSCOM chief inspector, interview with author, August 18, 2005; former senior UNSCOM official, interview with author, August 30, 2005. Also on GATEWAY, Barton, *The Weapons Detective*, 74–75; Krasno and Sutterlin, *Defanging the Viper*, 82; “Secrets, Spies, and Videotape,” *Panorama*, BBC One, broadcast on March 22, 1999.

107. At first, GATEWAY only briefed inbound Western inspectors and attempted to debrief all team chiefs regardless of nationality. Ekeus complained about the exclusion of some incoming inspectors, so GATEWAY initiated a two-level briefing, with a generic one for all inspectors and more detail for Western inspectors. Manley, interview. Also, former UNSCOM staff member, interview with author, September 1, 2005; foreign ministry official, interview with author, August 17, 2005; former senior UNSCOM official, interview with author, August 30, 2005. According to Leberz, briefers told the inspectors “to be skeptical of what the Iraqis said and what we saw. We looked at photos, equipments lists, and diagrammatic layouts of plants. We were told to expect from twelve to eighteen Iraqi minders and that we would be watched and listened to at all times.” Leberz, interview.

108. Debriefings usually lasted a couple of hours, which is probably inadequate to cover what happened in an inspection lasting over a week. Krikorian, interview; Franz, interview; former UNSCOM chief inspector, interview with author, August 18, 2005. Also, Barton, *The Weapons Detective*, 77–78.

109. “The French would invite us for a cup of tea at the embassy, and some of the Russian inspectors would stay at the Russian compound in Baghdad instead of their hotels. Representatives from other missions would come by to ask how the inspection had gone, some daily and others rarely.” Killip, interview. Agreeing that other countries also debriefed, former UNSCOM staff member, interview with author, September 2, 2005.

111. Doug Englund proposed a staff of two to three that could expand to ten. A Canadian initially ran this unit, but Scott Ritter was its chief until he resigned in August 1998. Englund, interview. See also, “Organizing for Dealing with Imagery and Inspection Reports,” Memorandum from Douglas Englund to Chairman Rolf Ekeus (New York, UNSCOM, August 8, 1991).

112. In addition to Ekeus, intelligence agencies tended to designate one or more UNSCOM staffers from that nation as the entry point(s) for intelligence. Nations imposed generic distribution provisos and often also stipulated that UNSCOM not share data with

individuals from certain countries. Further restrictions came with the target(s) of no-notice inspections, which were very tightly held. Sometimes even individuals in the inner circle of biological inspectors were not told mission specifics, in order to maintain the element of surprise. Mohr, interview; Killip, interview; Gallucci, interview; Manley, interview; former senior UNSCOM official, interview with author, August 30, 2005; Taylor, interview; former UNSCOM biological weapons inspector, interview with author, February 4, 2005; former senior UNSCOM official, interview with author, September 1, 2005.

114. For the highly demanding technical task of inspections, Gallucci argued for seconded personnel because the international civil servant route “makes it more important to preserve the fiction of an entirely independent organization that protects its information from member states than it is to have the best, most skilled people serving as inspectors.” Gallucci, interview with author, March 13, 2006. On the UNSCOM confidentiality agreement, Taylor, interview.

116. Of the two-way street, Killip said, “They’d already started dining with the devil and there’s no use starting to have scruples after you’ve already tasted the fruit.” Killip, interview. Also supporting two-way collaboration, Taylor, interview.

117. In another example of this type of cooperation, the International Atomic Energy Agency asked two governments to perform isotopic analysis of samples from North Korean reactors, which enabled the inspectors to catch North Korea in a lie about its reprocessing history. Gallucci, interview.

118. Gallucci elaborated that it would be acceptable for an international organization to share some data from a sensor that it deployed for inspection purposes, but an intelligence agency would be abusing the collaborative relationship if it piggybacked a sensor onto the original sensor. Gallucci, interview. UNSCOM Executive Chairman Richard Butler reportedly approved such a piggybacking arrangement. Tim Weiner, “U.S. Used U.N. Team to Place Spy Device in Iraq, Aides Say,” *New York Times*, January 8, 1999, A1; Barton, *The Weapons Detective*, 186.

119. While under way these activities undercut UNSCOM’s position and authority with the Iraqis because the Iraqis for the most part knew what UNSCOM was doing. Once Ritter’s activities became public knowledge, the damage to UNSCOM’s integrity was significant.

120. In UNSCOM’s early days, Gallucci often fielded inquiries about how UNSCOM was handling this situation, usually reversing the question: “In our shoes, where would you go to find people who know about these weapons systems; the facilities, equipment, materials, and skills needed to make them; and how to acquire and hide those capabilities? Do you think the private sector makes nuclear and chemical weapons or tries to hide them?” Gallucci then explained that “UNSCOM asked states for people with certain types of expertise, and when they arrived UNSCOM didn’t ask where exactly they came from. The bottom line is that you need very special people to find weapons programs that the inspected government is actively trying to hide. Some of them have an intelligence and military background.” Gallucci, interview.

121. UNSCOM’s mission briefings usually involved schematic diagrams of facilities to be inspected and reviewed information from prior inspections of that site. Intelligence briefings normally included overhead imagery and summaries of raw signals or human intelligence.

123. To illustrate the tensions that lack of access can cause, when UNSCOM conducted a no-notice inspection at Salman Pak in 1994, Annick Paul-Henriot, who was then in charge of the biological desk and was on that mission, was not informed of the inspection target. She was justifiably incensed, in Mohr’s eyes, even though he recognized the need to maintain tight security to achieve surprise. Mohr, interview. On the problem of not sharing

among certain nationalities, Killip, interview; Gallucci, interview; Manley, interview; former senior UNSCOM official, interview with author, August 30, 2005. On the issue of inspectors not feeling fully prepared to work effectively as part of the team if they were not briefed, Leberherz, interview; former UNSCOM biological weapons inspector, interview with author, February 4, 2005.

125. For example, an unbriefed engineer identified a previously unknown underground facility, which was a telephone exchange. Taylor, interview.

127. Individuals who paid no attention to intelligence briefings usually did not understand the intelligence process or trust the intelligence community. Krikorian, interview.

129. "I cannot recall an occasion when information with regard to certain suspected details was presented and UNSCOM didn't undertake to verify it in the field—not a single instance." Former senior UNSCOM official, interview with author, September 1, 2005. Also on Ekeus's willingness to act on solid intelligence tips, Englund, interview; Ekeus, interview; former senior UNSCOM official, interview with author, August 30, 2005.

131. "There were many intelligence leads where I was told to look at a certain building at the university, or sent to the Baghdad post office to look for missile parts, but there was nothing there. Okay, now we know." Kraatz-Wadsack, interview. Also on intelligence tips not bearing fruit, Kelly, interview; Sellstrom, interview; Killip, interview; Barton, interview; Spertzel, interview; former senior UNSCOM official, interview with author, September 1, 2005.

133. Although the site was not engaged in biological work, inside the building they were conducting research and development for missile fuel. Mohr, interview.

135. UNSCOM inspectors used the Global Positioning Satellite System to pinpoint sites, but intelligence analysts even accused them of not even being able to find the right location. A senior U.S. intelligence official would say,

"those UNSCOM guys tended to go into a building, not see anything in the first five minutes, and then just go to lunch." That was a totally ridiculous portrayal of our inspections. A SCUD is roughly forty feet long. If I went into an empty building and there wasn't an object of that size in it or some obvious disturbance on the floor or outside to indicate they'd buried one, it was reasonable to state that a SCUD wasn't there.

Englund, interview. Also on satellites versus ground truth, Duelfer, *Hide and Seek*, 62, 312.

136. "Right after one trip to Iraq, I said, 'There's nothing there,' and a senior U.S. intelligence official replied 'That's not what I see from our data.' Some people went to extensive lengths to protect their forecasts. At Langley, the allusions to and accusations of inspector incompetence or laziness or whatever resurfaced time and again." Kadlec, interview. Manley led an inspection off of a U.S. tip and afterward stopped by GATEWAY to report what he had found, at which time the intelligence officers produced various high-resolution photographs, as if to let him know what he had missed. Fed up, Manley told them a more specific briefing before the mission might have aided a more effective inspection. Manley, interview.

137. Added Franz, "Once they decide on a certain theory, they set out to prove there is noncompliance, not to test whether there is or not." Franz, interview.

138. Englund recalled the intelligence community insisting that a lot of military vehicles were located in a specific stream bed, or wadi. The inspectors went there and found older support vehicles with missing engines and flat or rotted tires. Defense Intelligence Agency analysts on this mission reported that the real vehicles had been moved, yet the slow-growing vegetation all around the old vehicles and the absence of tire tracks or ruts indicated no recent vehicle traffic in the wadi. Englund, interview. Confirming this behavior by intelligence analysts,

including some analysts who went on missions that called the inspections “disastrous” and the team chief “timid” after intelligence projections did not pan out, Gallucci, interview.

139. This assessment was based on the word of an Iraqi defector, known as “Curveball.” German intelligence officials had warned their U.S. counterparts this defector was unreliable. The mobile trailers were a highlight of U.S. Secretary of State Colin Powell’s speech to the UN on February 5, 2003. Of the purported three-truck germ weapons production capability, Kraatz-Wadsack said,

I knew from the technical features Powell described for the trucks it could not be true. This source gave the intelligence community technical data that was not operationally practical. No one would put production and all of the downstream processing and milling in trucks with a canvass top unless they wanted dead animals and people wherever the trucks went. The Iraqis spoke of a “mobile” facility, but they used the word to mean “transportable,” not on-the-road mobile. They meant something like the transportable unit they had for the chemical program, a filling unit where the bombs were made at one place, then taken to Muthanna to be filled, and then transported to their deployment site. Bio agent cannot be produced while trucks are moving around in part because ancillaries such as power and distilled water are needed. If the Iraqis hooked the trucks up to pipes and power in existing facilities, then they could make some agent.

Kraatz-Wadsack, interview. Also, Duelfer, *Hide and Seek*, 253–254, 312. Arguing that using the mobile trailers to produce hydrogen was an implausible cover story, see *Iraqi Mobile Biological Warfare Agent Production Plants* (Washington, DC, Central Intelligence Agency/Defense Intelligence Agency, May 28, 2003). For an explanation of how the U.S. intelligence community botched the handling of the Curveball information, *Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction: Report to the President of the United States* (Washington, DC: U.S. Government Printing Office, March 31, 2005), 88–111. Also, Toby Harnden, “Iraqi Defector ‘Curveball’ Admits WMD Lies,” *The Telegraph* (London), February 15, 2011, A1; Bob Drogin, *Curveball: Spies, Lies, and the Con Man Who Caused a War* (New York: Random House, 2007).

143. Although that intelligence was “critical” to UNSCOM’s biological inspections, maybe UNSCOM could have done without it. Barton, interview. The “breakthrough” on Iraq’s bioweapons program actually came from the more specific information that the suppliers provided UNSCOM as it pursued intelligence tips. Former senior UNSCOM official, interview with author, September 1, 2005.

145. “At biological facilities, the inspectors found out where the raw materials were, where the Iraqis bought the materials, what was produced during a given period, and where it went. Then, the inspectors went to all the sites involved and asked countless questions, such as why so little agent was made during a certain month and when equipment broke.” Ekeus stated simply, “Everything was generated by us.” Ekeus, interview. “I cannot remember where intelligence ever led to a key break.” Mohr, interview.

154. Pointing out the underlying risk of Iraq’s attitude toward inspections, routine arms control inspections have detected “slip-ups by the treaty violator—reflecting carelessness, incompetence, hubris, or all three.” Douglas J. MacEachin, “Routine and Challenge: Two Pillars of Verification,” *The CBW Conventions Bulletin* 39 (March 1998): 3. As discussed in Chapter 1, IAEA safeguards inspectors prior to the 1991 Gulf War did not spot Baghdad’s prohibited nuclear

weapons development efforts, and although the UN Secretary-General's quartet of special investigation teams found that poison gas attacks occurred in the 1980s Iran-Iraq War, the diplomatically worded reports did not name Iraq as the combatant responsible. Lawrence Scheinman, *Cooperative Oversight of Dangerous Technologies: Lessons from the International Atomic Energy Safeguards System* (College Park, MD: Center for International and Security Studies at Maryland, January 2005); Joseph F. Pilat, "Iraq and the Future of Nonproliferation: The Roles of Inspections and Treaties," *Science* 255, no. 5049 (March 6, 1992): 1224–1229; *Report of the Mission Dispatched by the Secretary-General to Investigate Allegations of the Use of Chemical Weapons in the Conflict Between the Islamic Republic of Iran and Iraq*, UN Docs. S/19823 (April 25, 1988).

156. Iraq may not have expected UNSCOM to concentrate on document retrieval since the IAEA did not do so, and the Iraqis could have cleared their biological facilities of important equipment, burying it or hiding it at sites the inspectors were not likely to target. Former senior UNSCOM official, interview with author, August 30, 2005. Other inspectors remarked on the slapdash job with cover stories and the facility cleanup: "Even if they knew we were coming through, we would still find some documents of interest." Former UNSCOM biological weapons inspector, interview with author, Washington, DC, February 4, 2005. Also on the ability to find documents and equipment useful to the investigation throughout UNSCOM's years, Taylor, interview; Killip, interview; Kraatz-Wadsack, interview.

168. Describing the Security Council's reaction to Iraq's December 8, 2002, declaration, "what was reality for one [member] was not reality for another." Duelfer, *Hide and Seek*, 252–253. For case studies reviewing evidence and views on biological weapons use, including the yellow rain events in southeast Asia and Afghanistan in the 1970s, North Korean claims of U.S. biowarfare agent use during the Korean War, and Cuban allegations of U.S. bioweapons use, Anne L. Clunan, Peter R. Lavoy, and Susan B. Martin, eds. *Terrorism, War, or Disease? Unraveling the Use of Biological Weapons* (Stanford, CA: Stanford Security Studies, June 2008).

169. The standard of proof also appeared different for UNSCOM and the Iraq Survey Group. Though UNSCOM unearthed little evidence of the destruction of Iraq's biological weapons, no matter what evidence UNSCOM found, in the prevailing political circumstances suspicions lingered that Iraq still had weapons or a hidden capability to make them. The Iraq Survey Group found no hidden bioweapons stocks: "They went everywhere and talked to so many people and scooped up all this paper and found no evidence of an ongoing program. That time the assertion that there was no hidden program was accepted because the bar [for proof of compliance] had dropped and the politics were different." Black, interview.

172. Of Taha's circumstances at Al Hakam and behavior during their first meeting in January 1995, Kraatz-Wadsack said, "No PhD in microbiology would want to be sent to the desert to make single-cell protein, and universally scientists live to discuss science. They are not shy or embarrassed to talk science, as Taha was. Nothing about the equipment or scale fit what the place was supposed to do." When Kraatz-Wadsack went to Al Daura a few days later, the plant's Director, Ismail Kandryan, stammered that the plant had not made anything since 1992. Kraatz-Wadsack, interview.

176. If the whole endeavor "were turned over to scientists, the likelihood of getting a correct answer on what was happening would go up by orders of magnitude. They will come up with a methodology, go in, and apply their tools." Mohr believed that the constraints placed on UNSCOM's scientists generated situations where the Iraqis could warp UNSCOM's scientific inquiries and recalled that the scientists on his teams became "exasperated, they'd shrug their

shoulders and say ‘what are we doing here?’” Mohr, interview. According to Huxsoll, “Scientists, for the most part, want to find the facts and will be less inclined to skew them one way or the other.” Huxsoll, interview. Also on this point, Kelly, interview; Kraatz-Wadsack, interview. Arguing that scientists would be more skeptical and politicians more amenable to hearing the evidence, Franz, interview.

177. UNSCOM’s in-house biologist team presented seven or eight pieces of evidence (for example, the spray drier, the growth media, the Al Hakam infrastructure) with equanimity. The outside panel of scientists debated this data’s merits and considered the lack of factual evidence from Iraq and contradictions in Iraq’s accounts before reaching their conclusion. UNSCOM, *Report Issued After Seminar of International Biological Weapons Experts* (New York: April 6–7, 1995), April 5, 1995, 3–4.

181. Kelly recalled six to eight Iraqi missiles missing when the Russians made this argument. Kelly, interview.

182. “Diplomats want their opinion backed up by reputable scientists, so they tend not to acknowledge strong evidence that opposes their objective.” Huxsoll, interview. Agreeing, Krikorian, interview. Similarly, “never to be pinned down” was another chief inspector’s view of how diplomats operated. Former UNSCOM chief biological weapons inspector, interview with author, August 28, 2005. Describing French behavior related to UNSCOM’s early efforts to penetrate Iraq’s concealment programs: “French interests were always mixed. They would keep a foot in every camp and, in this way, remain independent.” Duelfer, *Hide and Seek*, 123.

186. Ekeus waged a daily battle punctuated by occasional confrontations even with UNSCOM’s strongest allies to maintain UNSCOM’s authority. For example, when Iraq shut his inspectors out of the Ministry of Agriculture in July 1992, Iraqi Deputy Prime Minister Tariq Aziz told Ekeus that he knew the U.S. government did not strongly support forcing the issue. Absent the leverage of U.S. political and military support, Ekeus struggled to resolve the impasse. When Ekeus finally got the inspectors access, “there wasn’t one paper there.” Gradually, political support among UNSCOM’s traditional allies became so tepid that the United Kingdom and the Netherlands advanced the proposal to replace UNSCOM with another organization, and the United States did not block its passage. Ekeus, interview.

187. Describing some diplomats’ reaction to UNSCOM’s briefings: “They would repeat UNSCOM’s statement about not being able to locate ‘x’ amount of agent and ask ‘How deadly is this stuff?’ or ‘Is it in test tubes or a vast vat and does that make a difference?’ or ‘How many people can twenty-five warheads filled with this kill?’” Former UNSCOM staff member, interview with author, September 2, 2005.

188. Continuing the trajectory of the decline in UNSCOM’s reporting to the Security Council. “Then, it became if they didn’t remind us they wanted to see these summaries, we forgot.” Former UNSCOM staff member, interview with author, September 2, 2005.

190. The right balance, said a chief inspector, was to give just enough detail to allow policymakers to understand and distinguish between the realities and possibilities of what relevant technologies or materials can do. For example, while it is technically true that thousands of chemicals could be used as warfare agents, relatively few are stable and suitable for filling in munitions that will be stored for months, if not years. Former UNSCOM chief inspector, interview with author, January 31, 2006. The biological inspectors were absorbed with things that were not necessarily critical to policymakers, “Do politicians care what kind of research they were doing twenty years ago? Was it done in containment or not? On the political level these things don’t matter; on the expert level it is important.” Former senior UNSCOM official, interview with author, August 30, 2005. Agreeing on jargon-free summaries, former



UNSCOM staff member, interview with author, September 1, 2005; former UNSCOM CBW commissioner, interview with author, January 23, 2006; former UNSCOM staff member, interview with author, September 2, 2005. Advising that clear language that excludes a lot of the technical nuances can form a “one-way street” that channels the diplomats toward a desired decision, former senior UNSCOM official, interview with author, September 1, 2005.

191. In one Security Council presentation, a South American diplomat interpreted a slide that read UNSCOM could not verify the amount of growth media consumed to mean that UNSCOM inspectors were not capable of the task. The ensuing discussion dwelled on whether the problem was UNSCOM’s incompetence or Iraq’s failure to cooperate. To illustrate further, some individuals also understood the word *capability* to mean the ability to produce agents, others thought it meant agent in a munition ready to be fired. Both of these situations were classic reminders of the importance of using precise language in multilingual settings. Kraatz-Wadsack, interview.

195. As observers, the selected diplomats or policymakers in principle should not try to direct or otherwise interfere with the inspection. Killip, interview.

196. Nonproliferation and intelligence analysts might serve this function. Franz, interview; former senior UNSCOM official, interview with author, September 1, 2005.

198. To drive home his point, Franz said, “Frankly, if as an inspector I had seen a lot of the work the United States is now doing in Iraq or Russia it would have been not just a smoking gun but a reloaded smoking gun.” Franz, interview. With an eerily similar comment about the comparative difficulty of monitoring dual-use biological activities, the need to sort out international inspection measures, and the possibility that other countries might question whether some U.S. defense activities were in compliance with the Biological and Toxin Weapons Convention, Gallucci, interview.

## Chapter 9

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7. “Before they came into the interview room, the Iraqis were often coerced and rehearsed, and UNSCOM probably spent too much time on that type of approach. I never found out anything from anyone who had been warned beforehand.” Terence Taylor (former UNSCOM CBW commissioner and chief inspector), interview with author, Washington, DC, May 12, 2005. “Yes, they can always lie to you,” Barton noted. “But if cross-referenced interviews are done with a number of people, it is very hard for them to consistently lie and get their stories straight.” Rod Barton (former UNSCOM biological weapons inspector), interview with author via telephone, May 20, 2005. “Sometimes interviews can be extremely productive, there’s just no substitute for them. If you can get interviewees to talk freely, you can get a brain dump that documents and other evidence can back up. It can be a tremendous time-saver, very effective. Ideally, interviews provide the baseline and then inspectors can plug in the other data collected to see if it fits.” Former UNSCOM chief inspector, interview with author, London, August 18, 2005.

9. UNSCOM initially prepared the site diagrams from U.S. intelligence imagery but later used diagrams prepared by preceding teams. Depending on the size of the team and facility, the inspectors might work in small groups of two or three or individually. Hamish Killip (former UNSCOM chief biological weapons inspector), interview with author, Isle of Man, August 22, 2005; Stephen Black (former UNSCOM historian), interview with author, Washington, DC, November 16, 2007; Taylor, interview with author; Debra Krikorian, PhD (former UNSCOM biological weapons inspector), interview with author, Washington, DC, June 21, 2005.

12. “Some experts consider they are not there to observe or record what they see and hear, but to concentrate only on what they know.” Former senior UNSCOM official, interview with author, New York City, August 30, 2005. Agreeing on this point, Gabriele Kraatz-Wadsack, PhD (former UNSCOM chief biological weapons inspector), interview with author, Berlin, August 15, 2005.

13. The schematics for this weapons system “instantly disappeared. By the time the inspectors arrived at where the documents were supposed to be there was that empty space with dust around it.” Krikorian, interview.

14. “A whole lot goes on that you don’t need a PhD for, and some of the most important things that happened on UNSCOM inspections occurred because a guy was doing a totally mechanical inspection task,” such as screening exiting personnel. Black, interview. Agreeing that someone without “deep knowledge of an issue can be an efficient, even a brilliant inspector” who collects a tremendous amount of pertinent data by being painstakingly observant and asking questions, another former UNSCOM official stated, “They may lie to you, but about 90 percent will be true and you will get the information about the site and know what they are doing there.” Former senior UNSCOM official, interview with author, August 30, 2005.

15. Knowledge of local standards of manufacturing, safety, and documentation will help inspectors know what questions to ask and how to assess the responses. Killip, interview.

17. “I relied on my senses—seeing, hearing—and from there, whether there was logic in what I observed.” Kraatz-Wadsack, interview. Similarly, “I made my judgments based about 90 percent on what I was seeing and about 10 percent on my interaction with the people at a site.” Former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, Washington, DC, February 21, 2006.

18. The outline of pieces of recently moved equipment could be identified by where there were no bird droppings on the floor. As noted in Chapter 4, chief inspector Gabriele Kraatz-Wadsack “read” the mice feces on top of the barrels of growth media at Al Adile. Also on the need to “see what was not there as well as what was there,” Charles Duelfer, *Hide and Seek: The Search for Truth in Iraq* (New York: Public Affairs, 2009), 312.

21. For example, a country that sold two incinerators to Iraq in 1991, one that went to Al Hakam and another to the Iraqi railways, provided procurement documents that showed a secretary’s name. The secretary confirmed the procurement. Normally the Iraqis produced requested individuals for interview within a day. UNSCOM inspectors sincerely doubted that, had inspectors asked a Western government to bring in the chairman of a private company, a government procurement specialist, or the chief scientist, the turnaround would have been overnight. Killip, interview. Also on the overall remarkable Iraqi cooperation with the interview process, David Kelly, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, December 17, 2002.

25. Any Iraqis who did not sign the pledge (for example, administrators or laborers) also saw the video cameras Iraqi minders used to film inspections and formal interviews. All Iraqis knew how Saddam’s internal security agencies rooted out threats to his regime. In meetings with UNSCOM, the Iraqis understood that “if there were six Iraqis in the room, two were intelligence and one might not know the other.” Ron Manley, PhD (former UNSCOM chief chemical weapons inspector), interview with author, London, August 19, 2005. Also, Jeff Mohr, PhD (former UNSCOM chief biological weapons inspector), interview with author via telephone, June 27, 2005. On how Saddam’s internal security apparatus terrorized and repressed Iraqi citizens, Isam al-Khafaji, “State Terror and the Degradation of Politics in Iraq,” *Middle East Report*, no. 176 (May-June 1992): 15–21. On Taha’s oath, Central Intelligence Agency (CIA), “Biological Warfare,”

in *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD* (Washington, DC, September 30, 2004), 12.

26. In September 1991, chief inspector Ron Manley asked Brig. Gen. Mohammed Mahmoud Bilal, who worked in both the chemical and biological weapons programs, to provide engineering drawings of Iraq's chemical weapons production facility, Al Muthanna, to help UNSCOM plan the destruction of Iraq's chemical arsenal. "He was really in a sweat. It occurred to him that he couldn't just give me the drawings, that his life was on the line," said Manley. "I realized clearly then what a serious business this was for him. The pressures on the Iraqi scientists and managers were appalling." Manley, interview. According to Barton, the Iraqis were in a no-win situation: "These circumstances involved a lot of pressure, and in that moment they had to think through the consequences of one answer versus another." Rod Barton (former UNSCOM biological weapons inspector), interview with author via telephone, May 20, 2005. Also, Charles Duelfer, *Hide and Seek: The Search for Truth in Iraq* (New York: Public Affairs, 2009), 94.

28. With little time to prepare people for interviews because many Iraqis were brought to Baghdad from significant distances, the inspectors believed Iraqi minders instructed them not to give dates or to remember people's names or the number of items in an activity. Gen. Amer Rasheed, for example, sent a letter to the directors of biological facilities ordering them not to reveal their military activities to UNSCOM but otherwise giving them no specific concealment instruction. Taylor, interview. On the coaching of interviewees and utility of interviews, Killip, interview; David Franz, DVM, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, June 29, 2005; Barton, interview; Krikorian, interview; Richard Spertzel, PhD (former UNSCOM chief biological weapons inspector), interview with author, Washington, DC, July 1, 2005; former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, February 21, 2006. See also UN Security Council, *Letter Dated 25 January 1999 from the Executive Chairman of the Special Commission Established by the Secretary-General Pursuant to Paragraph 9 (b) (i) of Security Council Resolution 687 (1991) Addressed to the President of the Security Council*, Doc. S/1999/94, January 29, 1999, Annex D, para. 20.

29. "We thought we had it bad, but they had it tougher." Charles Duelfer (former UNSCOM deputy executive chairman), interview with author, Washington, DC, November 15, 2007.

32. Also noting the utility of Iraq's lies, Ekeus said, "If they had lied, that was always a sign that you had to dig just there." Ambassador Rolf Ekeus (former UNSCOM executive chairman), interview with author, Stockholm, August 24, 2005.

34. In a blatant example, during the trench dig at Salman Pak in mid-1994, Hossam Amin and Rasheed trotted out an elaborately dressed farmer as a supposed eyewitness. The inspectors determined after speaking with this "farmer" that he was not credible, so Rasheed quipped that if the inspectors did not like that farmer, he would get them another. Mohr, interview; Spertzel, interview; former UNSCOM chief inspector, interview with author, January 31, 2006. Even Iraq's declarations reflected their judgment about "how far to push a lie. They weren't going to put in something outrageous or unacceptable at the first glance. They were trying to preserve the program and had to declare something, so they had decided what to reveal, what to cover, and how to cover it." Killip, interview.

35. According to Dr. Nassir Al-Hindawi, whom the Iraqis originally presented as the director of Al Hakam, the Iraqis knew they had problems with the two Davids, Huxsoll and Kelly, who gave few indications of accepting the cover story. They considered other team members to be "in the bag," doubtful that anything was amiss, or having no influence on the team's decisions.

After the 2003 Gulf War, the Iraq Survey Group found several grading sheets on which the Iraqis rated inspectors from “A” for friendliness to Iraq to “C” for an anti-Iraqi attitude. Killip, interview. Later, the Iraqis tested inexperienced inspectors by deliberately citing the wrong numbers for various items of interest (such as missiles destroyed or amount of agent produced) and by pressing them to accept an account by insisting their predecessor had done so, regardless of whether that ever even occurred. Such gamesmanship undermined the authority of the inspector that was “played” and delayed the inspections. Spertzel, interview; former senior UNSCOM official, interview with author, August 30, 2005; former UNSCOM chief inspector, interview with author, August 18, 2005; Ake Sellstrom, PhD (former UNSCOM chief inspector), interview with author, Stockholm, August 24, 2005; Franz, interview; Krikorian, interview.

36. In addition to who said what, when, and where, the golden nuggets include the written record, namely the declarations. Spertzel, interview; Killip, interview; Huxsoll, interview; Kraatz-Wadsack, interview; former senior UNSCOM official, interview with author, August 30, 2005.

37. “Many inspectors thought the Iraqis were always lying but sometimes they were telling the truth about some parts of it. They would stop the story short without all of the detail, and that makes it incomplete. The inspectors have to determine all of what happened to really understand it.” Kraatz-Wadsack, interview. What the Iraqis said “might be a lie, the partial truth, or the truth, depending on the situation,” but interviews were undoubtedly rich in useful information. Huxsoll, interview. Along the same line, former senior UNSCOM official, interview with author, August 30, 2005.

39. More than one inspector reported that the Iraqis did not process or retain information pictorially, as evidenced by the difficulty they had reading maps or drawing diagrams of facilities. Therefore, the inspectors chose dates as the fact around which they would attempt to reconstruct a chain of activities because often something important (for example, a birth or a wedding) probably took place in the lives of at least one of the people involved at points temporarily near the event of interest (such as filling of weapons), allowing the inspectors to pin down the memories of the participants temporally, from which point they could begin to reassemble the event of interest. On the poor map-reading skills of Iraqis, Doug Englund (former UNSCOM chief inspector), interview with author, Washington, DC, December 5, 2005; Manley, interview; former senior UNSCOM official, interview with author, August 30, 2005.

40. Another interview rule was never to interview an Iraqi one-on-one so that the Iraqis could not say that an inspector fabricated a statement. Killip, interview; Spertzel, interview; Krikorian, interview; Kraatz-Wadsack, interview. After a statement that was at odds with the declaration the inspectors’ first questions were Which statement was correct? Who wrote that part of the declaration? Explain why a change in the declaration was being made? Spertzel, interview; former senior UNSCOM official, interview with author, August 30, 2005.

43. “Taha got a red face because she was angry. An inspector would tell her that her math was wrong, but she already knew that. She wasn’t ashamed of the lie; it was embarrassing to fake being a poor scientist. Playing dumb was what made them lose composure, not the lie itself. They knew, and we knew.” Kraatz-Wadsack, interview. Federal Bureau of Investigation (FBI) specialists coached UNSCOM’s biological experts for a day, but criminal interrogation methodology did not always fit the inspection setting. Law enforcement officers have authority to arrest and question someone, so the FBI practiced “controlling the room.” UNSCOM inspectors could request but not compel the appearance or cooperation of an interviewee. Also, the FBI wanted the interpreter seated beside the interviewee, but the Iraqis would have created a standoff if any UNSCOM personnel sat by an Iraqi. Kraatz-Wadsack, interview. Recalling that

the FBI worked with UNSCOM on interview techniques and agreeing that criminal interview and cooperative debriefings differed, former senior UNSCOM official, interview with author, August 30, 2005.

44. One of Taha's top assistants, Brig. Gen. Mohammed Mahmoud Bilal, apparently had a very poor memory, which the inspectors noticed because when he made a mistake in front of other Iraqis, they harangued him. The inspectors honed in on Bilal's often accidental misstatements as tips that something was wrong with that part of the story. Killip, interview. Also describing Bilal's naiveté, his tendency to play the clown, and his occasional impressive faculty for "stories that were unbelievable yet could not be disproved," Kraatz-Wadsack, interview.

45. Not all Iraqis exhibited physical signs of discomfort when interviewed, but other tells included scratching; sweating; awkward speech patterns; shifting body or eye movement; or, in the case of Taha, tantrums. Manley, interview; Mohr, interview; Killip, interview; Krikorian, interview; Spertzel, interview; Kraatz-Wadsack, interview. On the science of detecting deception, Committee on Military and Intelligence Methodology for Emergent Neurophysiological and Cognitive/Neural Research in the Next Two Decades, National Research Council, *Emerging Cognitive Neuroscience and Related Technologies* (Washington, DC: National Academies Press, 2008), 32–41; Paul Ekman and Maureen O'Sullivan, "From Flawed Self-assessment to Blatant Whoppers: The Utility of Voluntary and Involuntary Behavior in Detecting Deception," *Behavioral Sciences and the Law* 24, no. 5 (September 2006): 673–686.

47. "They couldn't understand some things, like how we found the missile gyroscopes or why, after four years, we started pressing about the bio program. They were worried about being blamed, so they lied thinking that the inspectors could not get to the truth from their lie." Former senior UNSCOM official, interview with author, August 30, 2005.

49. The inspectors broke a process into its various components and made maximum use of photographs, documents, videos, and observational data from inspections to devise questions. "We considered no question too trivial to ask." Spertzel, interview. Also on the detailed questions and the Iraqis negative reaction to this tactic, Kelly, interview; Black, interview; Kraatz-Wadsack, interview; Killip, interview; Mohr, interview; former senior UNSCOM official, interview with author, August 30, 2005.

51. After the 2003 Gulf War, Iraqi scientists revealed,

In every field of special weaponry . . . such deceit was endemic. Program managers promised more than they could deliver, or things they could not deliver at all, to advance careers, preserve jobs or conduct intrigues against rivals. Sometimes they did so from ignorance, failing to grasp the challenges they took on. Lying to an absolute ruler was hazardous, Iraqi weaponeers said, but less so in some cases than the alternatives. "No one will tell Saddam Hussein to his face, 'I can't do this,'" said an Iraqi brigadier general who supervised work on some of the technologies used in the rail gun.

Barton Gellman, "Iraq's Arsenal Was Only on Paper; Since Gulf War Nonconventional Weapons Never Got Past the Planning Stage," *Washington Post*, January 2004, 7, A1.

56. Inspectors could often literally see physical elements (for example, lack of any evidence whatsoever of weapons detonation) that countermanded fibs, and the Iraqis were more conscious that the person next to them had said or might say something different. Said Killip, "If you've got six people and nobody remembers, either they weren't there, it didn't happen, or somebody is lying." Killip, interview. Also on the practice and utility of on-site, group interviews,

Kelly, interview; Kraatz-Wadsack, interview; Black, interview; Krikorian, interview; Franz, interview; Taylor, interview.

57. “We made a lot of progress during interviews, challenging them with information they told us before, documentation, or something peculiar that we’d seen. When it’s an obvious lie or they make something up on the spot, it gets them into a terrible fix. A knowledgeable person knows when they hear a wrong or false explanation. As long as you probe correctly, interviews are really useful.” Barton, interview.

58. For example, on one occasion Killip pulled a small spray tank out of his bag, placed it on the table during an interview, and described its technical performance capabilities. Visibly shaken, the Iraqis then provided more detail about this weapons system. UNSCOM used the Haidar farm documents sparingly and elliptically because they found a few documents in the box of biological records that they assumed the Iraqis did not mean to give them. Lebherz, interview; Killip, interview; Kraatz-Wadsack, interview; former senior UNSCOM official, interview with author, August 30, 2005. See also Barton’s use of letters of credit, described in Chapter 4.

59. When his team uncovered documentation that Iraq had gone far further in its work with ricin than previously declared, former UNSCOM chief bioweapons inspector Terence Taylor said, “This is how it goes on. You find it out and then they declare it. And I bet you after my mission, the Iraqis will say, ‘Oh yes, we did do this work on this particular agent.’” Edith Lederer, “Team Uncovered Iraq Biological Weapon Plan, U.N. Says,” Associated Press, April 24, 1997. See also Jonathan B. Tucker, “Monitoring and Verification in a Non-Cooperative Environment: Lessons from the UN Experience in Iraq,” *Nonproliferation Review* 3, no. 3 (Spring-Summer 1996): 1–14; R. Jeffrey Smith, “Secretive Iraq Parries U.N. Arms Inspectors; Technology, Patience Pry Open Weapons Data,” *Washington Post*, November 4, 1994, A1.

61. Alteration in the amount of water and electricity consumed at a facility denoted a change in that facility’s normal activities. Gabriele Kraatz-Wadsack, “The Role of Scientists in Verification,” in *Assessing the Threat of Weapons of Mass Destruction: The Role of Independent Scientists*, vol. 61, ed. J. L. Finney and I. Slaus, NATO Science for Peace and Security Series E: Human and Societal Dynamics (Amsterdam: IOS Press, 2010), 47–49.

63. As a rule, military organizations, businesses, and scientists document their activities thoroughly. Moreover, the Iraqis had a reputation for being meticulous and redundant in their documentation practices, practically crazy or “Germanic” about record keeping. Kraatz-Wadsack, interview.

65. Note that a chemical document in those files also later proved to be significant for UNSCOM’s chemical weapons inspectors. Amidst the document cache from Iraq’s Atomic Energy Commission, U.S. intelligence community translators did not get around to transcribing this chemical document into English until 1993. The information in this document about dual-use chemicals became the basis for questioning Iraq’s account of nerve agent production. Pierce Corden (former UNSCOM deputy executive chairman), interview with author, Washington, DC, August 4, 2008. On Iraq’s nuclear weapons plans and their recovery, David Albright and Mark Hibbs, “Iraq’s Bomb: Blueprints and Artifacts,” *Bulletin of the Atomic Scientists* 48, no. 1 (January-February 1992): 31–40; Paul Lewis, “44 U.N. Inspectors Freed by Iraq with Secret Nuclear Documents,” *New York Times*, September 28, 1991, section 1, page 1; R. Jeffrey Smith and Michael Z. Wise, “Report Shows Extensive Iraqi Nuclear Effort; Records Seized by U.N. Team Indicate Testing of Missile Capable of Carrying A-Bomb” *Washington Post*, October 5, 1991, A1.

66. The Iraqis constantly said their copy machines were broken, so UNSCOM put a photocopy machine in a van. One day, for example, a team copied all of Taha’s personal files as well as the production process and plant records for Al Hakam. Lebherz, interview; Krikorian,

interview; Kraatz-Wadsack, interview; Killip, interview; former senior UNSCOM official, interview with author, August 30, 2005.

67. That pamphlet led the inspectors to one scientist who was part of the weapons program, Dr. Munam of the Al Hazen Institute, which was located on the Salman peninsula. Kraatz-Wadsack, interview; Spertzel, interview.

70. Current working documents tend to be placed in a central location in the laboratory or production facility, notes George Pierce, who has over twenty-five years of experience in industrial and academic biological facilities. George Pierce, PhD (Professor, Georgia State University), interview with author, November 27, 2007.

73. “The important thing was to get in and get the documents as expediently as possible.” Ekeus, interview.

78. “This is awful to admit, but because of how the political types tended to overreact to negative sample results, part of the calculation in taking samples was there had to be a reasonable possibility of a positive sample in order for us to take one in the first place.” Killip, interview. Also on the non-technical problems of sampling, Black, interview; Mohr, interview; Spertzel, interview; Kraatz-Wadsack, interview. Noting that the use of different sampling techniques can make a significant difference in the effectiveness of a sampling effort, Barton, interview.

81. The time required to process samples shortened considerably over the years. Huxsoll, interview; Mohr, interview; Killip, interview; Kelly, interview; Spertzel, interview.

82. UNSCOM’s sampling activities guidelines, titled “Biological Standing Operating Procedures,” covered the collection of samples, chain of custody and transportation of samples, and laboratory sample analysis. The chief inspector kept a log of all samples that inspectors took. Each sample was taken in a set of three, one for backup and two for analysis. The samples, shipped by the 1995 International Air Transport Association standards, were not inactivated prior to shipment. UNSCOM’s sample collectors were to receive two weeks of training in good laboratory practices for collection and transport of samples. UNSCOM’s branch in Bahrain provided the supplies for sample collection (such as dry ice and seals) and, although UNSCOM had a small laboratory in its Baghdad office, the Bahrain office coordinated sample analysis with the high-level containment laboratories in France, Germany, the United States, and the United Kingdom. These laboratories all operated with approved quality assurance or quality control programs and were responsible for making sure that UNSCOM’s samples arrived with intact seals and were stored in a separate, secure area. These laboratories were to analyze samples promptly and inform UNSCOM and the chief inspector of the results. Alan J. Mohr, “Biological Sampling and Analysis Procedures for the United Nations Special Commission (UNSCOM) in Iraq,” *Politics and the Life Sciences* 14, no. 2 (August 1995): 241–242.

85. One of the unknowns at that time was that some primers would not work with all samples. Mohr, interview. Huxsoll recalled the negative sampling results from the BW1 and BW2 missions at Salman Pak and Al Hakam, respectively. The Iraqis doused Al Hakam with formalin, potassium permanganate, and sulfuric acid to cover up evidence, which contributed to the inability of contemporary analytical techniques to detect biowarfare agents. Huxsoll, interview.

92. Mohr’s first inspection went to twenty-four sites. Mohr, interview, 2005. “We went to so many places in such a short period of time that I didn’t even have the chance to look at any of their documentation during the inspection.” Former UNSCOM inspector and chief of product development in an offensive biological weapons program, interview with author, February 21, 2006. Concurring, Kelly, interview.

103. For a detailed account of the negotiations, Jez Littlewood, *The Biological Weapons Convention: A Revolution Failed* (Aldershot, U.K.: Ashgate, 2005); Marie Chevrier, “The Biological Weapons Convention: The Protocol That Almost Was,” in *Verification Yearbook 2001*, ed. Trevor Findlay and Oliver Meier (London: Verification, Inspection, and Training Centre, 2001), 79–97. The Ad Hoc Group negotiations were held from 1995 to 2001, during which time many of the monitoring procedures originally proposed were watered down in a failed attempt to win the support of the U.S. pharmaceutical industry and government for the draft protocol. In contrast, an independent panel of senior U.S. biopharmaceutical industry scientists argued for much more stringent inspection procedures than those in the draft protocol, collectively asserting that skilled inspectors could employ such procedures to distinguish legitimacy from cheating while not compromising proprietary information. On the U.S. rejection of the draft protocol, Donald Mahley, *Statement by the United States to the Ad Hoc Group of Biological Weapons Convention States Parties* (statement made in Geneva, July 25, 2001); John R. Bolton, undersecretary for arms control and international security, *The U.S. Position on the Biological Weapons Convention: Combating the BW Threat* (remarks at the Tokyo American Center, Tokyo, August 26, 2006). For the proposals of U.S. pharmaceutical scientists, see Amy E. Smithson, ed., *House of Cards: The Pivotal Importance of a Technically Sound BWC Monitoring Protocol*, Report no. 37 (Washington, DC: The Henry L. Stimson Center, May 2001): 49–84, 93; *Resuscitating the Bioweapons Ban* (Washington, DC: Center for Strategic and International Studies, November 2004).

104. Albright also said, “[W]e have no proof whatsoever that the biological warfare agents that Iraq claims were destroyed years ago have, in fact, been destroyed. . . . With UNSCOM inspections and monitoring in place, the world can be sure that Iraqi efforts to deceive will be inhibited and limited in their effect.” “Text: Albright Addresses UNSCOM Inspectors,” Remarks in Manama, Bahrain, *Global Security Newswire*, November 17, 1997. “Only under increased pressure from UNSCOM and the looming defection of one of Iraq’s weapons directors did Baghdad admit the existence of its offensive BW program. . . . Even with unprecedented intrusiveness, UNSCOM, when faced with a nation dedicated to deception and concealment, unfortunately could not fully dismantle Iraq’s BW program.” John R. Bolton, undersecretary for arms control and international security, *Remarks to the Fifth Biological Weapons Convention RevCon Meeting in Geneva* (remarks made in Geneva, UN, November 19, 2001), 5. See also Kathleen C. Bailey, *The UN Inspections in Iraq: Lessons for On-Site Verification* (Boulder, CO: Westview Press, 1995), 37–53.

106. “Don’t have the politicians telling the inspectors where they can go and what they can do. That won’t make for a truthful exercise.” Mohr, interview. “If politics had not been so heavily involved before, during, and after the inspections, the inspections would have been even more successful.” Former UNSCOM biological weapons inspector, interview with author, May 27, 2006. Concurring, Spertzel, interview; former UNSCOM chief biological weapons inspector, interview with author, August 28, 2005.

107. This debate centered on whether accords could be verified to a “reasonable” level of confidence in sufficient time to mount an appropriate response to violations. Fred Ikle coined the “after detection, then what?” phrase, spawning countless articles, books, and congressional hearings wherein pro- and anti-arms-control advocates sparred over the advisability of agreements restricting nuclear testing, intermediate and strategic nuclear arms, and chemical and biological weapons. For the original article, Fred Charles Ikle, “After Detection—What?” *Foreign Affairs* 39, no 2 (January 1961): 208–220. Also on this debate, Kosta Tsipis, David W. Hafemeister, and Penny Janeway, eds., *Arms Control Verification: The*



*Technologies That Make It Possible* (Washington: Pergamon-Brassey's, 1986); John G. Tower, James Brown and William K. Cheek, eds., *Verification: The Key to Arms Control in the 1990s* (Washington: Brassey's, 1992); Brad Roberts, "Revisiting Fred Ikle's 1961 Question: After Detection—What?" *Nonproliferation Review* 8, no. 1 (Spring 2001): 10–24.

108. Spertzel voiced similar concerns about the utility of monitoring teams, which "would be worse than no inspectors because it would provide an inappropriate illusion of compliance." *U.S. Policy in Iraq: Next Steps, Hearing Before the Senate Committee on Governmental Affairs, Subcommittee on International Security, Proliferation, and Federal Services*, U.S. Senate (March 1, 2002) (testimony of Richard O. Spertzel). Expressing similar frustrations, "Iraq withstood the scrutiny of four years of the most intrusive arms control inspections without divulging any of its offensive biowarfare capabilities. While UNSCOM challenge and routine inspections highlighted a number of serious ambiguities in Iraq's story, the truth still remains elusive despite implementation over a seven-year period of all twenty-one verification measures proposed for consideration in the BWC protocol." Robert P. Kadlec, "First, Do No Harm," *Arms Control Today*, vol. 31, no. 4 (May 2001): 16–17.

109. "I wouldn't advise taking the UNSCOM experience and injecting it into another agreement. UNSCOM was operating under unique circumstances and rules." Huxsoll, interview. For Sellstrom, who oversaw the biological Technical Evaluation Meetings, "The UNSCOM experience did not teach us whether biological monitoring and inspections could be efficient enough for a BWC protocol. Unfortunately, there is no answer to that question yet." Sellstrom, interview.

110. While briefing the Security Council in mid-June 1995 on UNSCOM's findings about Iraq's bioweapons program, "I said that if anyone was worthy of the Nobel Peace Prize it would be our bio detection team because they have done such a fantastic job. I was so proud. What they did was just sensational." Ekeus, interview. "UNSCOM caused Iraq to give up virtually all of its weapons and production capabilities." Duelfer, *Hide and Seek*, 170.

111. The Iraq Survey Group concluded that mobile trailers, which the Central Intelligence Agency stated were a capability to manufacture biowarfare agents, were instead used to make hydrogen gas for the radio balloons fielded by Republican Guard artillery units. CIA, *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD*, vol. 1; vol. II, nuclear key findings, 7–8, 73–74, 83–112; vol. III, Iraq's chemical warfare program key findings, 29–60, 97–106, 113–125; biological warfare key findings, annexes A–D.

112. For example, when the UNSCOM 126/BW28 team went to Taji, faint physical evidence could be seen as the plant's former director, Dr. Nissar Al-Hindawi, described the plant's production of single-cell protein prior to its conversion to make botulinum toxin in 1988:

The holes in the tiles on the wall for the methanol connecting pipes were visible, as were the markings for the diameter of the pipes and the thin pencil line for the water scale and how the pipes should be braced. These markings fit exactly with the equipment he described for the single-cell protein operation that used to be there. Botox production did not require a methanol pipe connection into the process. The lines on the wall tiles were so thin that nobody had noticed them before, but I saw them as Hindawi spoke. These markings helped verify that legitimate activity once occurred at Taji. Inspectors can't just look at the bioweapons indications. We were also interested in establishing what Taji did before the bioweapons program.

Kraatz-Wadsack, interview. Also, Government of the United Kingdom, “UN Special Commission BW Inspections in Iraq: Lessons for the Ad Hoc Experts’ Group on Verification,” BWC/CONF-III/VEREX-WP5 (White Paper presented during Third Review Conference of the Parties to the BWC, Geneva, UN, March 30–April 10, 1992), 8–9, 10, 16.

114. “If you are up against a country that has decided not to declare its relevant activities and equipment, when inspections are well designed and planned and a diverse, up-to-date team is fielded, the facts will out.” Taylor, interview. Another interviewee said, “Detailed forensic investigation will tear away a country’s cover stories to hide a biological weapons program.” Foreign ministry official, interview with author, August 17, 2005. In agreement, Kraatz-Wadsack, interview; former senior UNSCOM official, interview with author, August 30, 2005.

115. In that regard, “[i]t is often said that UNSCOM shows the limits of intrusive arms control verification.” Stephen Black, “The UN Special Commission and CBW Verification,” *Chemical Weapons Convention Bulletin*, no. 32 (June 1996): 8.

116. “UNSCOM overcame the odds, in every sense of the word, and exposed Iraq’s program, though I’m not 100 percent sure that they ever understood the extent of that program.” Mohr, interview. “The major policy lesson was that even the most clandestine, hidden, and safeguarded biological weapons program cannot be hidden in its entirety. It is not technically possible to completely hide a program. The evidence may not be conclusive, but it can be found.” Former senior UNSCOM official, interview with author, September 1, 2005.

121. Recalling the disarray, learning curves, and delays of UNSCOM’s early months, the inspectors preferred a standing or semi-standing capability to establishing another bioweapons inspectorate on the fly. A biological inspection corps “isn’t something that you should throw together the week before an inspection.” A practical plan, Kadlec proposed, would be for the United States, United Kingdom, Australia, Germany, France, and a few other countries most likely to contribute inspectors “to agree beforehand to certain inspection standards, to work out how to share the burden, and to each commit to train a small cadre of inspectors to the agreed standards. “When pooled,” he continued, “there would be maybe thirty experts from eight or so countries. Holy smokes! That would provide a great basis to build teams. Maybe,” he mused, “it would be possible to collaborate with Russia and China beforehand as well.” Kadlec, interview. For this capacity, semiannual training in inspection fundamentals for diverse technical specialists would be useful, with additional leadership training for team chiefs to gird them for a high-stress environment, as well as tailored information-gathering from open sources and intelligence to prepare teams hand-picked from the inspectors on call. Taylor, interview; Krikorian, interview; Killip, interview; former UNSCOM biological weapons inspector, interview with author, May 27, 2006; former UNSCOM chief inspector, interview with author, August 18, 2005.

## Chapter 10

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1. After International Atomic Energy Agency inspectors erroneously concluded that Iraq was not pursuing nuclear weapons, members of the 1970 Nuclear Nonproliferation Treaty agreed to strengthen the safeguards inspections, adding no-notice inspections. Since the late 1980s over a dozen different types of inspections have been used to monitor intermediate-range and strategic nuclear arms reductions. Moreover, tremendous efforts have been made to negotiate and implement a verifiable Comprehensive Nuclear Test Ban Treaty. International Atomic Energy Agency (IAEA), General Conference, *Strengthening the Effectiveness and*

*Improving the Efficiency of the Safeguards System*, Doc. GC (40)/17, August 23, 1996; IAEA, *Model Protocol Additional to the Agreement(s) Between State(s) and the International Atomic Energy Agency for the Application of Safeguards*, Doc. INFCIRC/540, September 1997. On the effort to negotiate and verify a Comprehensive Nuclear Test Ban Treaty, Ola Dahlman, Svein Mykkeltveit, Hein Haak, *Nuclear Test Ban: Converting Political Visions to Reality* (New York: Springer, 2009). See also Elmer Engstrom, *Comprehensive Test Ban Negotiations, 1954 to 1981: Including the History of the Limited Test Ban Treaty, Threshold Test Ban Treaty, Peaceful Nuclear Explosions Treaty* (Cambridge, MA: Institute for Defense and Disarmament Studies, 1989). Since the late 1980s inspectors have proceeded matter-of-factly to verify intermediate-range and strategic nuclear arms reductions with over a dozen different types of inspection activities. For more, see Joseph P. Harahan, *On-Site Inspections Under the INF Treaty* (Washington, DC: U.S. Department of Defense, 1993); Frank Barnaby, ed., *A Handbook of Verification Procedures* (London: Macmillan, 1990).

5. Another important factor in the longevity of bioweapons programs is the existence of some source of domestic support, usually military, scientific, or both, once a political decision is taken to establish a program. John Ellis van Courtland Moon, "The US Biological Weapons Program," in *Deadly Cultures: Biological Weapons Since 1945*, ed. Mark Wheelis, Lajos Rozsa, and Malcolm Dando (Cambridge, MA: Harvard University Press, 2004), 11; Erhard Geissler, John Ellis van Courtland Moon, and Graham Pearson, "Lessons from the History of Biological and Toxin Warfare," *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, ed. Erhard Geissler and John Ellis van Courtland Moon (Oxford: Oxford University Press, 1999), 259–260; Edward M. Eitzen, "Use of Biological Weapons," in *Medical Aspects of Chemical and Biological Warfare*, ed. Frederick R. Sidell, Ernest T. Takafuji, and David R. Franz (Washington, DC: Office of the Surgeon General at Textbook of Military Medicine Publications, 1997), 442–445.

7. Eight research institutes and two proving grounds were involved in Germany's post-World War I biological weapons program, working with botulinus toxin, rinderpest, anthrax, plague, foot-and-mouth disease, potato beetles, and several other anti-crop and livestock agents. Erhard Geissler, "Biological Warfare Activities in Germany, 1923–45," in Geissler and van Courtland Moon, *Biological and Toxin Weapons*, 91–126; Jeffrey K. Smart, "History of Chemical and Biological Warfare: An American Perspective," in Sidell, Takafuji, and Franz, *Medical Aspects of Chemical and Biological Warfare*, 32. The Paris metro tests reportedly involved eight stations. Jeanne Guillemin, *Biological Weapons: From the Invention of State-Sponsored Programs to Contemporary Bioterrorism* (New York: Columbia University Press, 2005), 26, 41, 136.

8. The French began debating whether to inaugurate a bioweapons research program in 1921. Like the German test, the French one, reported in June 1938 to a commission overseeing French biowarfare research, used the agent *Bacillus prodigiosus*, now known as *Serratia marcesens*, on lines 1 and 7 of the metro. In addition to its spore-formulating and other characteristics similar to anthrax, *Serratia marcesens* was useful as a simulant because it has a red pigment that makes it easy to identify. The French experimented with agents such as diphtheria, cholera, paratyphoid, ricin, botulinum toxin, staphylococcal enterotoxin, and anthrax. Olivier Lepick, "French Activities Related to Biological Warfare, 1919–45," in Geissler and van Courtland Moon, *Biological and Toxin Weapons*, 70–90; Olivier Lepick, "The French Biological Weapons Program," in Wheelis, Rozsa, and Dando, *Deadly Cultures*, 108–131.

9. Churchill was apparently ready to consider resorting to chemical weapons in World War II, if necessary. The Gruinard Island trials were held in 1942 and 1943. The British manufactured five million cattle cakes of ground linseed, subsequently spraying the center of the cakes with a

fine suspension of anthrax and a layer of linseed meal paste to seal them. Following the late-1950s transition of Britain's offensive weapons program to defensive research only, these cattle cakes were incinerated. Gradon B. Carter and Graham S. Pearson, "British Biological Warfare and Biological Defence, 1925–45," in Geissler and van Courtland Moon, *Biological and Toxin Weapons*, 168–189; Guillemin, *Biological Weapons*, 40–56.

10. In the early Cold War days the British considered using biological weapons against agricultural targets and in tactical scenarios. The British sea trials of spray and disposal methods were conducted off of the coasts of the Antigua and Nassau islands in the Bahamas, off of the Scottish island of Lewis, in the English Channel, and in the Irish Sea. Brian Balmer, "The UK Biological Weapons Program," in Wheelis, Rozsa, and Dando, *Deadly Cultures*, 47–83.

11. The British calculus about the bioweapons threat also benefited from the access that British experts got to the U.S.S.R.'s biowarfare research, development, and production facilities in the early 1990s. David C. Kelly, "The Trilateral Agreement: Lessons for Biological Weapons Verification," in *Verification Yearbook 2002*, Trevor Findlay and Oliver Meier, eds. (London: Verification, Inspection, and Training Center, 2002), 93–109; Tom Mangold and Jeff Goldberg, *Plague Wars* (New York: St. Martin's Press, 1999), 83–84; 130–131, 198–199.

12. Canada also performed research and produced biological agents at the War Diseases Research Station at Grosse Isle, an island just thirty-five miles from Quebec City; at a laboratory at Queens University; at the Defense Research Establishment at Kingston; and at the Defense Research Establishment in Ottawa.

13. Some of Japan's attacks with biowarfare agents also sickened Japanese soldiers. Japan also experimented with tetrodotoxin, brucellosis, gas gangrene, and meningococcal infection. Though the Japanese claimed that a 150-building site near Harbin called Ping Fan was a logging camp, the facility performed research, development, and testing of biowarfare agents, including on human subjects. The Japanese euphemistically called their prisoners and test subjects "logs." Sheldon Harris, *Factories of Death: Japanese Biological Warfare, 1932–45 and the American Cover-Up* (London: Routledge, 2002); Peter Williams and David Wallace, *Unit 731: Japan's Secret Biological Warfare in World War II* (New York: Free Press, 1989); Eitzen and Takafuji, "Historical Overview of Biological Warfare," 417–418; Jeffrey K. Smart, "History of Chemical and Biological Warfare: An American Perspective," in Sidell, Takafuji, and Franz, *Medical Aspects of Chemical and Biological Warfare*, 32–33.

14. Though controversial, no deaths resulted from the U.S. human volunteer program. Conscientious objectors to war, specifically Seventh Day Adventists, fulfilled their military service obligations partly as human test subjects. The human inhalational test program at the Eight Ball involved over 2,220 volunteers and the diseases tularemia, sandfly fever, typhoid fever, three forms of equine encephalitis, Rift Valley fever, Q fever, and Rocky Mountain spotted fever. Thirty such volunteers were exposed to Q fever in open air tests at Dugway Proving Ground. Some volunteers were also exposed to cutaneous anthrax. Volunteers were also critical for human studies to develop vaccines against several diseases (such as tularemia, anthrax, Q fever). Approximately 3,500 worked at Ft. Detrick in the late years of World War II, but staffing shortly thereafter dwindled to a few hundred personnel. Smart, "History of Chemical and Biological Warfare: An American Perspective," 42–44, 52, 60–61; David R. Franz, Cheryl D. Parrott, and Ernest T. Takafuji, "The U.S. Biological Warfare and Biological Defense Programs," in Sidell, Takafuji, and Franz, *Medical Aspects of Chemical and Biological Warfare*, 427–429; John Ellis van Courtland Moon, "The US Biological Weapons Program," in Wheelis, Rozsa, and Dando, *Deadly Cultures*, 19, 25–26; Guillemin, *Biological Weapons*, 75–80, 86–90, 96–111; John Ellis van

Courtland Moon, "US Biological Warfare Planning and Preparedness: The Dilemmas of Policy," in Geissler and van Courtland Moon, *Biological and Toxin Weapons*, 213–254.

15. In the 1940s, U.S. bioweapons scientists released pathogenic organisms over Florida and the Bahamas. For large-area line source dispersal studies, in 1957 and 1958 zinc cadmium sulfide was dispersed over major swaths of the United States on several occasions. Other simulants employed were *Bacillus globigii*, *Bacillus subtilis*, and *Serratia marcescens*. The SHAD test series also involved chemical warfare agents. Smart, "History of Chemical and Biological Warfare: An American Perspective," 50, 52, 60; Franz, Parrott, and Takafuji, "The U.S. Biological Warfare and Biological Defense Programs," 428–429; van Courtland Moon, "The US Biological Weapons Program," 24–28. Also on the early years of the U.S. program, John Ellis van Courtland Moon, "US Biological Warfare Planning and Preparedness: The Dilemmas of Policy," in *Biological and Toxin Weapons: Research, Development and Use from the Middle Ages to 1945*, ed. Erhard Geissler and John Ellis van Courtland Moon (Oxford: Oxford University Press, 1999), 213–254.

16. U.S. biowarriors also performed significant work with plague, saxitoxin, glanders, brucellosis, melioidosis, and psittacosis. Similar screening resulted in a concentration on eight anti-animal pathogens and five methods of attack against plants, though U.S. scientists also studied other viruses, fungi, toxins, and anticrop agents. At several continental U.S. locations and on Okinawa Island, Japan, the United States conducted field tests in the mid-1960s of rice blast and wheat rust. U.S. researchers also worked on late blight of potatoes, other diseases that would cripple cereal crops, and defoliant agents. Smart, "History of Chemical and Biological Warfare: An American Perspective," 50–52, 60; van Courtland Moon, "The US Biological Weapons Program," 22–23, 37. For more on U.S. and U.K. anticrop activities and delivery systems, Simon M. Whitby, "Anticrop Biological Weapons Programs," in Wheelis, Rozsa, and Dando, *Deadly Cultures*, 214–218.

17. Management of the Plum Island laboratory, now known as the Animal Disease Center, transferred to the U.S. Department of Agriculture in 1954 and to the Department of Homeland Security on June 1, 2003. U.S. Department of Homeland Security, *Fact Sheet: Plum Island Animal Disease Research Center Transition* (Washington, DC, June 6, 2003).

20. A secret 1928 decree launched the U.S.S.R.'s offensive weapons program. The Gorodomlya Island field trials involved foot and mouth disease, plague, tularemia, and leprosy. Valentin Bojtsov and Erhard Geissler, "Military Biology in the USSR, 1930–45," in Geissler and van Courtland Moon, *Biological and Toxin Weapons*, 153–167; Jonathan B. Tucker and Ray Zilinskas, eds., *The 1971 Smallpox Epidemic in Aralsk Kazakhstan and the Soviet Biological Warfare Program*, Occasional Paper no. 9 (Monterey, CA: Center for Nonproliferation Studies, 2002), 5–6.

21. Soviet diplomats negotiated the Convention with their British and American counterparts; the treaty opened for signature on April 10, 1975, and the U.S.S.R. ratified it in 1975. For more information on the Convention, go to <http://www.opbw.org>.

22. More insight into the program can also be gained by extrapolating from the published technical studies of Soviet scientists. For insider accounts, Ivan Domaradski and Wendy Orent, *Biowarrior: Inside the Soviet/Russian Biological War Machine* (Amherst, NY: Prometheus, 2003); Ken Alibek with Stephen Handelman, *Biohazard: The Chilling True Story of the Largest Covert Biological Weapons Program in the World—Told from Inside by the Man Who Ran It* (New York: Random House, 1999). On-site access to these institutes began in 1991 through a trilateral U.S.-U.K.-Soviet process and continued under the program started with U.S. funds to prevent "brain drain" of former Soviet weapons scientists by offering them employment in peaceful collaborative research projects. On the trilateral inspections, Kelly, "The Trilateral Agreement,"

93–109; David E. Hoffman, *The Dead Hand: The Untold Story of the Cold War Arms Race and Its Dangerous Legacy* (New York: Doubleday, 2009), 345–357, 431–437. For more on collaborative research programs with former Soviet biological and chemical weaponeers, Amy E. Smithson, *Toxic Archipelago: Preventing Proliferation from the Former Soviet Chemical and Biological Weapons Complexes*, Report no. 32 (Washington, DC: Henry L. Stimson Center, December 1999).

23. The Ministry of Defense funded Biopreparat, which was directed by a two-star general. Anthony Rimmington, “From Military to Industrial Complex? The Conversion of Biological Weapons Facilities in the Russian Federation,” *Contemporary Security Policy* 17 (April 1996): 81–112; John Hart, “The Soviet Biological Weapons Program,” in Wheelis, Rozsa, and Dando, *Deadly Cultures*, 140–141. In a declaration about these activities, the Russian government, dating the U.S.S.R.’s bioweapons program from 1946 to March 1992, described this industrial biological capacity as being “for the production of medicinal and other protective preparations, which could also be used for the preparation of biological agents during a crisis.” “Section F: Declaration of Past Activities in Offensive/Defensive Biological Research and Development Programs,” UN doc. DDA/4-92/BWIII/ADD.2, Moscow, Russian Federation, 1992, 85. Also on the U.S.S.R.’s bioweapons program, Mangold and Goldberg, *Plague Wars*, 62–213; Guillemin, *Biological Weapons*, 141–147.

24. Building 211 at Stepnogorsk had an estimated annual capacity to make thirty thousand metric tons of nutrient media. Building 221 contained ten 20,000-liter fermenters, each four stories tall, for anthrax production, and Building 231 was for post-production operations (for example, drying or milling). With Cooperative Threat Reduction funds, the military production capacity at Stepnogorsk was dismantled and converted to peaceful purposes in the mid- to late-1990s. Hoffman, *The Dead Hand*, 460–466, 479; Gulbarshyn Bozheyeva, Yerlan Kunakbayev, and Dastan Yeleukenov, *Former Soviet Biological Weapons Facilities in Kazakhstan: Past, Present, and Future*, Occasional Paper no. 1 (Monterey, CA: Center for Nonproliferation Studies, June 1999), 4–5, 8–12. Also, Alibek with Handelman, *Biohazard*, 82–93, 96–99, 105–106.

25. The test program utilized animals ranging in size from small rodents to monkeys, sheep, donkeys, and horses. In the 1980s, some eight hundred Soviet soldiers and scientists carried out the field tests with sprayers and bombs, monitoring the dispersal of biowarfare agents through detectors and assessing their impact on test animals. Tucker and Zilinskas, eds., *The 1971 Smallpox Epidemic*, 12–17; Hoffman, *The Dead Hand*, 467–469; Bozheyeva, Kunakbayev, and Yeleukenov, *Former Soviet Biological Weapons Facilities in Kazakhstan*, 4–5.

28. Soviet scientists also worked with the Ebola, Lassa, Junin, and Machupo viruses. Alibek with Handelman, *Biohazard*, 113–118, 126–127, 175, 202; Hart, “The Soviet Biological Weapons Program,” 141, 144. Work with such pathogens is consistent with what high-level defector Ken Alibek described as a difference in philosophy between the U.S. and Soviet bioweapons programs, wherein the American program allowed development of an agent only if vaccines and other medical treatments were available, but the Soviets considered pathogens for which there was no prophylaxis or effective antibiotics or antivirals to be ideal candidate warfare agents. “Interview with Ken Alibek,” *Journal of Homeland Security* (September 28, 2000), <http://www.homelandsecurity.org/journal/Search.aspx?s=Ken+Alibek>.

29. The recombinant Legionella strain reportedly killed almost 100 percent of laboratory animals in toxicology tests. Also, Soviet scientists developed pathogens to yield peptides and spliced peptides (such as myelin) into pathogens to turn the body’s immune system against itself. Work also began to combine bacteria and viruses, hiding one inside of the other. “Interview with Sergei Popov,” *Journal of Homeland Security* (November 1, 2000, updated November 19, 2002), <http://www.homelandsecurity.org/journal/Default.aspx?oid=3&ocat=4>.

See also Alibek with Handelman, *Biohazard*, 66–67, 78, 87–89, 97, 105, 153–167, 261–262, 281; Hoffman, *The Dead Hand*, 130–134, 296–299, 325, 335, 347–248, 352, 425–426.

30. Soviet military planners divided this biological arsenal into three sectors: (1) agents to inflict a long-term disability (for example, tularemia, Venezuelan equine encephalitis); (2) intermediate, preparatory agents (for example, anthrax, Marburg, Q fever); and (3) major weapons, namely plague and smallpox. Such weapons were not for battlefield use; rather, they were to be unleashed on ports, select European countries, and U.S. and perhaps Chinese civilian population centers. Soviet military planners also considered that it would be easier to wage germ than conventional warfare in mountainous areas. “Interview with Ken Alibek”; Alibek with Handelman, *Biohazard*, x–xi, 20–21, 78, 111–114, 140–141, 166, 272, 281. The Soviets apparently did not stockpile large quantities of anti-agriculture agents. Whitby, “Anticrop Biological Weapons Programs,” 223–224; Millett, “Antianimal Biological Weapons Programs,” 229–231.

31. The Russian declaration largely described defensively oriented work. “Section F: Declaration of Past Activities in Offensive/Defensive Biological Research and Development Programs,” 85. Translated from Russian. To promote confidence in compliance with the Convention’s prohibitions, in 1986 and in 2001 treaty members agreed to provide voluntary data declarations about certain biological activities and capacities, including past bioweapons programs. For more on these confidence-building measures, Erhard Geissler, ed., *Strengthening the Biological Weapons Convention by Confidence-Building Measures*, SIPRI Chemical & Biological Warfare Studies no. 10 (Oxford: Oxford University Press, 1990).

33. Among Project Coast’s assassination concoctions were whiskey, beer, sugar, and chocolates poisoned with diseases such as anthrax, botulinum toxin, and Salmonella. Another controversial project was the attempted development of an anti-fertility vaccine, which was to be given to black women without their knowledge or consent. Several Project Coast scientists have spoken about their work, but Wouter Basson, the program’s mastermind, has said little and was acquitted of all criminal charges. Defense Minister Constand Viljoen started the program. Chandre Gould and Alastair Hay, “The South African Biological Weapons Program,” in Wheelis, Rozsa, and Dando, *Deadly Cultures*, 191–212; Mangold and Goldberg, *Plague Wars*, 214–282; Nuclear Threat Initiative, “South Africa: Biological Overview,” [http://www.nti.org/e\\_research/profiles/index.html](http://www.nti.org/e_research/profiles/index.html).

34. Allegations held that Libya worked with several toxins and pathogens but apparently never progressed to production and weaponization because of insufficient technical capabilities. U.S. and British inspectors found no significant evidence of a bioweapons program at pertinent Libyan facilities in October 2003. Libya has cooperated with the dismantlement of its other weapons of mass destruction capabilities and joined the Nuclear Nonproliferation Treaty and the Chemical Weapons Convention. Joshua Sinai, “Libya’s Pursuit of WMD,” *Nonproliferation Review* 4, no. 3 (Spring-Summer 1997): 92–99; Sharon Squassoni, *Disarming Libya: Weapons of Mass Destruction* (Washington, DC: Library of Congress, Congressional Research Service, September 22, 2006), 1–3; Patrick E. Tyler and James Risen, “Secret Diplomacy Won Libyan Pledge on Arms,” *New York Times*, December 21, 2003, A1.

36. The United States has charged that China has sustained some offensive bioweapons activities and abetted the proliferation of such weapons. *Hearing on China’s Proliferation Practices and the North Korean Nuclear Crisis, Before the United States—China Economic and Security Review Commission*, 108th Cong., 1st sess. (July 24, 2003) (statement of Paula A. DeSutter, Assistant Secretary of State for Verification and Compliance), 7–31; *Hearing on China’s Proliferation to North Korea and Iran, and Its Role in Addressing the Nuclear and Missile*



*Situation in Both Nations, Before the United States—China Economic and Security Review Commission*, 109th Cong., 2nd sess. (September 14, 2006) (statement of Paula A. DeSutter, Assistant Secretary of State for Verification and Compliance), 5–12. According to Alibek, the U.S.S.R. had indications that China was weaponizing viral agents and had a possible biowarfare facility in the vicinity of its nuclear test site near Lop Nur. Alibek with Handelman, *Biohazard*, 273.

37. Aum acquired the veterinary vaccine strain of anthrax, which will not harm humans, and the *Clostridium botulinum* strain that cult scientists isolated near the Tokachi River was also apparently avirulent. In April 1990 the cult sent a sprayer truck to spread its botulinum toxin concoction at several locations around Tokyo. That same month, no casualties resulted when Aum tried to blanket the Japanese Diet with a neurotoxin. In June and July 1993, Aum cranked up a pump on the rooftop of its Tokyo headquarters, splattering globs of its anthrax potion around the building. On March 15, 1995, Aum also placed three briefcase sprayers for biological agents in a Tokyo subway station. Amy E. Smithson, with Leslie-Anne Levy, *Ataxia: The Chemical and Biological Terrorism Threat and the US Response*, report no. 35 (Washington, DC: Stimson Center, October 2000), 71–91, 106; Milton Leitenberg, “Aum Shinrikyo’s Efforts to Produce Biological Weapons: A Case Study in the Serial Propagation of Misinformation,” *Terrorism and Political Violence* 11, no. 4 (1999): 149–158.

39. Several cult members put this *Salmonella typhimurium* “salsa” on salad bars in at least ten restaurants, on produce in supermarkets, and on drinking glasses, doorknobs, and urinal handles to try to infect Wasco County citizens. The cult also experimented with methods of poisoning the local water supply. The two Rajneeshees convicted served only thirty months apiece in prison. For a thorough epidemiological account of the Rajneeshee incident, see Thomas J. Torok et al., “A Large Community Outbreak of Salmonellosis Caused by Intentional Contamination of Restaurant Salad Bars,” in *Biological Weapons: Limiting the Threat*, ed. Joshua Lederberg (Cambridge: MIT Press, 1999), 167–184. See also W. Seth Carus, “The Rajneeshees (1984),” in *Toxic Terror: Assessing the Terrorist Use of Chemical and Biological Weapons*, ed. Jonathon B. Tucker (Cambridge: MIT Press, 2000), 115–137; Mark Wheelis and Masaaki Sugishima, “Terrorist Use of Biological Weapons,” in Wheelis, Rozsa, and Dando, *Deadly Cultures*, 286–293.

40. The average particle size of the anthrax was three micrometers, ideal to pose an inhalational threat, and the anthrax concentration was approximately  $10^{12}$  spores per gram. Letters sent to Senators Tom Daschle, NBC’s Tom Brokaw, and the *New York Post* also contained warning messages and indicated a link to Islam. Half of the twenty-two anthrax victims contracted the cutaneous form of the disease; the other half inhaled aerosolized spores. The other immediate effects of the attacks included the closure and decontamination of several buildings; the cost of decontaminating Brentwood Post Office in Maryland alone was \$130 million. On the anthrax preparation and the attacks, William J. Broad, “A Nation Challenged: The Spores; Contradicting Some U.S. Officials, 3 Scientists Call Anthrax Powder High-Grade,” *New York Times*, October 25, 2001, B6; William J. Broad and David Johnson, “Anthrax Sent Through Mail Gained Potency by the Letter,” *New York Times*, May 7, 2002, A1; Gary Matsumoto, “Anthrax Powder: State of the Art?” *Science* 302, no. 5650 (November 28, 2003): 1492–1497; “Investigation of Bioterrorism Related Anthrax,” *Journal of the American Medical Association* 286, no. 21 (5 December 2001): 2662–2663; National Research Council, *Review of the Scientific Approaches Used During the FBI’s Investigation of the 2001 Anthrax Letters* (Washington, DC: National Academies Press, 2011); Philipp Sarasin and Giselle Weiss, *Anthrax: Bioterror as Fact*



*and Fantasy* (Cambridge, MA: Harvard University Press, 2006); Marilyn Thompson, *The Killer Strain, Anthrax, and a Government Exposed* (New York: HarperCollins, 2003).

41. Letters signed “Fallen Angel” arrived in the fall of 2003 at the White House and the office of Senator Bill Frist, and were also intercepted in two post offices prior to delivery, including one with a type-written message with the ghost town threat. Dan Eggen, “Letter with Ricin Vial Sent to White House,” *Washington Post*, February 4, 2004, A7; Federal Bureau of Investigation, “Ricin Letter,” press release, Washington, DC, February 23, 2004. In the fall of 2001, the Federal Bureau of Investigation by mid-November 2001 reported notification of and response to 7,089 letters possibly containing anthrax. *Hearings on Bioterrorism, Before the Senate Judiciary Subcommittee on Technology, Terrorism and Government Information*, U.S. Senate (November 6, 2001) (testimony of J. T. Caruso, deputy assistant director, Counterterrorism Division, FBI).

42. From 1997 to 2006, terrorists executed 23,135 total attacks, including 12,806 bombings, 5,798 armed attacks, 1,689 assassinations, and 19 bioterrorist events, 12 of which are related to the 2001 anthrax attacks. Databases show an increase in bioterrorism plots, pranks, hoaxes, attempts to acquire relevant materials (such as pathogenic strains), successful acquisition of such materials, and production of dangerous pathogens. Databases on terrorist activities are available at <http://www.mipt.org> and <http://www.nti.org/db/cbw/index.htm>. Briefly, Jonathan B. Tucker and Amy Sands, “An Unlikely Threat,” *Bulletin of the Atomic Scientists* 44, no. 4 (July-August 1999): 46–52.

49. Interested Convention members participated in week-long meetings of technical experts and policy specialists each year. United Nations, *Final Document of the Fifth Review Conference of the States Parties to the Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction*, Doc. BWC/CONF.V/17, Geneva, November 11–22, 2002, 18(a); United Nations, *Final Document of the Sixth Review Conference of the States Parties to the Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction*, Doc. BWC/CONF.VI/16, Geneva, November 20–December 8, 2006, Part III, para. 7(a). Documents from these meetings are available at <http://www.opbw.org> and at <http://www.unog.ch>.

50. More specifically, biosafety consists of training for personnel in the implementation of proper laboratory technique and practice; the use of protective equipment, such as biosafety cabinets and personal protective gear; the use of prophylactic vaccines; and the design, construction, and operation of secondary physical barriers (for example, ventilation systems) to contain microbes within a defined area, preventing their release from a facility.

51. Beginning in the fall of 2001, the Bush administration emphasized its clear preference for individual national action and stifled any moves toward a coordinated, multilateral approach. U.S. Department of State, “New Ways to Strengthen the International Regime Against Biological Weapons,” Fact Sheet (Washington, DC: Department of State, October 19, 2001); John R. Bolton, *Remarks to the Fifth Biological Weapons Convention Review Conference Meeting*, Geneva, November 19, 2001; Jonathan B. Tucker, “The BWC Process: A Preliminary Assessment,” *Nonproliferation Review* 11, no. 1 (March 2004): 32–33.

52. Only institutions receiving government funding are required to follow the U.S. procedures, which are voluntary for the remainder of U.S. laboratories. Other nations that have established biosafety guidelines include Canada, the United Kingdom, Germany, China, and Russia. For more detail on U.S. and Chinese practices, see National Institutes of Health, *Biosafety in Microbiological and Biomedical Laboratories*; Amy E. Smithson, ed., *Beijing on Biohazards*:

*Chinese Experts on Bioweapons Nonproliferation Issues* (Washington, DC: Center for Nonproliferation Studies, August 2007); *Laboratory Biosafety Manual*, 3rd ed. (Geneva: World Health Organization, 2004). For more on WHO's biosafety training and resources, see <http://www.who.int/csr/bioriskreduction/biosafety/en/>.

53. Ustinov was reportedly the chief scientist responsible for weaponizing Marburg. Another Vector scientist escaped a similar fate despite a laboratory exposure to Marburg in 1990. Tucker and Zilinskas, *The 1971 Smallpox Epidemic*, 10. Other documented leaks include smallpox from a British laboratory in 1978, SARS from a laboratory in Singapore in 2003, and multiple leaks involving polio. *Symposium on Opportunities and Challenges in the Emerging Field of Synthetic Biology: Synthesis Report* (Paris: Organization for Economic Cooperation and Development, The Royal Society, 2010), 35.

55. Farmers must notify authorities of possible cases of foot and mouth disease. Swift action by British officials curbed the 2007 outbreak at a handful of confirmed cases with very little disruption to the British economy. In contrast, British agriculture and tourism lost an estimated \$16 billion when authorities had to destroy ten million cattle and sheep to stop a 2001 outbreak that originated when pigs at a Northumberland farm consumed contaminated feed. Leakage of the virus from old pipes in the effluent system at the Pirbright facility, home to Merial Animal Health, Ltd., a vaccine manufacturer, and the Institute for Animal Health, caused the 2007 outbreak. On the 2007 outbreak, see <http://www.defra.gov.uk/FootandMouth/2007/index.htm>. On the 2001 outbreak, see *Origin of the UK Foot and Mouth Disease Epidemic in 2001* (London: Department of Environment, Food and Rural Affairs, June 2002).

58. Four of the nine fundamental technological breakthroughs that could have a transformative, global impact and are predicted to occur by 2025 will lean heavily on biotechnology: clean water technology, biogerontechnology (health aids for the elderly), biofuels, and human cognitive enhancement technologies. National Intelligence Council, *Global Trends 2025: A Transformed World*, NIC-2008-003 (Washington, DC: U.S. Government Printing Office, November 2008), 47–48.

61. The outcome of experiments cannot be predicted or controlled, as illustrated when Australian researchers inserted the egg protein gene and the IL-4 immunosuppressant gene into the mousepox genome, anticipating that the modified virus would subsequently sterilize mice. Instead, the modified virus killed 80 percent of the mice infected with it within nine days. Many considered publication of this experiment controversial because it provided a roadmap to increase the lethality of smallpox. Ronald Jackson et al., "Expression of Mouse Interleukin-4 by a Recombinant Ectromelia Virus Suppresses Cytolytic Lymphocyte Responses and Overcomes Genetic Resistance to Mousepox," *Journal of Virology* 75, no. 3 (February 2001): 1205–1210. See also Rachel Nowak, "Disaster in the Making: An Engineered Mouse Virus Leaves Us One Step Away from the Ultimate Bioweapon," *New Scientist* 169, no. 2273 (January 13, 2001): 4–5. With another controversial experiment, Ariella M. Rosengard et al., "Variola Virus Immune Evasion Design: Expression of a Highly Efficient Inhibitor of Human Complement," *Proceedings of the National Academy of Sciences* 99, no. 13 (June 25, 2002): 8808–8813.

62. The research team that synthesized the polio virus required two years to do so, but the scientists who assembled the more complicated 1918 Spanish influenza virus did it within a few weeks. J. Cello, A. V. Paul, E. Wimmer, "Chemical Synthesis of Poliovirus cDNA: Generation of Infectious Virus in the Absence of Natural Template," *Science* 297, no. 5583 (2002); Terence M. Tumpey et al., "Characterization of the Reconstructed 1918 Spanish Influenza Pandemic Virus,"

*Science* 310, no. 5745 (October 7, 2005): 77–80; Jeffrey K. Tautenberger et al., “Characterization of the 1918 Influenza Virus Polymerase Genes,” *Nature* 437 (October 6, 2005): 889–893.

65. Some twenty thousand base pairs of nucleic acids, a sufficient number to assemble the polio or hepatitis B viruses, can be purchased for a dollar. Enough base pairs for more complex viruses, such as Ebola, can be purchased for a few dollars. J. Tian et al., “Accurate Multiplex Gene Synthesis from Programmable DNA Microchips,” *Nature* 432, no. 7020 (December 23–30, 2004): 1050–1054. Another estimate holds that a virus can be produced synthetically in a standard university laboratory for about \$7,500. *Symposium on Opportunities and Challenges in the Emerging Field of Synthetic Biology: Synthesis Report*, 35.

68. The centerpiece for oversight of recombinant DNA research is the Institutional Biosafety Committee, which reviews pertinent research proposals. If needed, committees advise scientists to alter their research design and strengthen biosafety measures to handle anticipated risks. Committees can also deny permission altogether for an experiment if the risks are deemed excessive. Institutional committees are required to report any problems with approved research to the National Institutes of Health. Paul Berg, “Meetings That Changed the World: Asilomar 1975: DNA Modification Secured,” *Nature* 445 (September 18, 2008): 290–291; Michael Rogers, *Biohazard* (New York: Alfred A. Knopf, 1977). See *NIH Guidelines for Research Involving Recombinant DNA Molecules* (Washington, DC: National Institutes of Health, April 2002).

70. For U.S. laboratories that do not receive funding from the National Institutes of Health, observance of the guidelines for oversight of genetic engineering research and biosafety is voluntary. Some laboratories in America and in other countries that conduct genetic engineering research have not even established institutional research and biosafety review panels. In contrast, all German facilities involved in recombinant DNA research—government, commercial, and academic institutions—must comply with German regulations, which carry criminal penalties for violations. Act on the Regulation of Genetic Engineering, as revised December 16, 1993, Section 3 (4)(5)(6), Section 39. For an overview of the United Kingdom’s oversight system, see John Steinbruner, Elisa D. Harris, Nancy Gallagher, and Stacy Okutani, *Controlling Dangerous Pathogens: A Prototype Protective Oversight System* (College Park, MD: Center for International and Security Studies, March 2007), 15–18.

72. In 2007, the U.S. National Science Advisory Board on Biosecurity echoed the U.S. National Academy of Sciences’ 2004 recommendation for peer review of proposals wherein the research would (1) render human or animal vaccines ineffective, (2) confer resistance to useful antibiotics or antivirals, (3) enhance the virulence of microorganisms, (4) compound the transmissibility of a pathogen, (5) change the natural host range of a pathogen, (6) make it harder to detect or diagnose a pathogen, and (7) aid the weaponization of a pathogen. National Research Council, *Biotechnology Research in an Age of Terrorism* (Washington, DC: National Academies Press, 2004), 5–6. In addition, the board made recommendations on the education of life scientists performing dual-use research and a code of conduct for life sciences. U.S. National Science Advisory Board on Biosecurity, *Proposed Framework for the Oversight of Dual Use Life Sciences Research: Strategies for Minimizing the Potential Misuse of Information* (Washington, DC: National Institutes of Health, June 2007). Scientists in other countries also recognize the need to update governance mechanisms. The Royal Society and Wellcome Trust, “Do No Harm: Reducing the Potential for the Misuse of Life Science Research” (report of a Royal Society-Wellcome Trust meeting at The Royal Society, London, October 7, 2004).

73. In May 1995, when Harris repeatedly inquired about the delivery of the *Y. pestis*, a concerned employee of the American Type Culture Collection alerted the Centers for Disease Control and Prevention, which requested that local police investigate after Harris told them he

believed Iraq was planning to smuggle rats infected with super germs into the United States. Police arrested Harris, who was also in possession of explosives and weapons. Jessica Eve Stern, "Larry Wayne Harris (1998)," in Tucker, *Toxic Terror*, 227–246; Smithson with Levy, *Ataxia*, 40–42.

74. Note that this definition of *biosecurity* is fairly new. Traditionally, this term refers to the protection of endemic species, principally through the management of the movement of agricultural diseases and pests. The initial U.S. pathogen control list, called the select agent list, consisted of forty pathogens known to have been weaponized and that experts believed to be likely candidates for weaponization. After the 2001 anthrax attacks, Congress passed stiffer regulations, expanding the select agent list and mandating tougher criminal penalties. The 1996 Antiterrorism and Effective Death Penalty Act, Pub. L. No. 104–132 (April 24, 1996); 2001 USA Patriot Act, Pub. L. No. 107–156 (October 26, 2001); The 2002 Public Health and Bioterrorism Preparedness Act, Pub. L. No. 107–188 (June 12, 2002). For more on biosecurity practices, Reynolds M. Salerno and Jennifer Gaudioso, *Laboratory Biosecurity Handbook* (New York: CRC, 2007).

75. Ivins, who had mental and substance abuse problems, committed suicide before the FBI filed charges. The FBI listed Ivins's access to the exact anthrax strain used in the letters, a preparation labeled RMR-1029; his pattern of late night work in the laboratory just prior to the mailings; and his evasive and erratic behavior as principal reasons to close the Amerithrax case. For the documents associated with the case, go to <http://www.fbi.gov/anthrax/amerithraxlinks.htm>. See also Marilyn W. Thompson, Carrie Johnson, Rob Stein, "FBI to Show How Genetics Led to Anthrax Researcher," *Washington Post*, August 6, 2008, A3; Scott Shane and Eric Lichtblau, "F.B.I Presents Anthrax Case, Saying Scientist Acted Alone," *New York Times*, August 7, 2008, A1; Carrie Johnson, Del Quentin Wilber, Dan Eggen, "Government to Assert Researcher Acted Alone; Detail Evidence, Suspicions Linger," *Washington Post*, August 7, 2008, A1; Joby Warrick, "Documents List Essential Clues; Taken Together Data Called Compelling," *Washington Post*, August 7, 2008, A17.

76. Variations of the insider threat scenario include an infiltrator or a long-term employee who misbehaves inside the laboratory or steals pathogens for sale, diversion to co-conspirators, or for their own plot or an insider who succumbs to pressure to provide pathogens or specialized expertise to individual(s) with malicious intent. Ivins had problems with substance abuse and was under the care of a mental health professional months prior to the attacks. Scott Shane, "Portrait Emerges of Anthrax Suspect's Troubled Life," *New York Times*, January 4, 2009, A1; Amy Gold Stein, Nelson Hernandez, Anne Hull, "Tales of Addiction, Anxiety, Ranting; Scientist, Counselor Recount Recent Turmoil in Anthrax Suspect's Life," *Washington Post*, August 6, 2008, A1.

77. USAMRIID suspended all non-essential research to enable an audit of the inventory after announcing on February 9, 2009, that a freezer in a Ft. Detrick laboratory expected to contain sixteen vials of Venezuelan Equine Encephalitis instead held twenty vials. One hundred of USAMRIID's freezers, which range in size from seventeen cubic feet to walk-ins, contain high-risk pathogens, known as select agents. The Army destroyed about half of the unlisted samples and added the remainder to the inventory list. Henceforth, USAMRIID will audit its culture collection yearly, with a quarterly check of scientists' notebooks and requirements for scientists to note factual details each time a pathogen is accessed until it is destroyed or transferred. Scott Shane, "Army Suspends Germ Research at Maryland Lab," *New York Times*, February 10, 2009, A16; David Dishneau, "Md. Lab Research Halted for Records," Associated Press, February 9, 2009; Nelson Hernandez, "Most Research Suspended at Ft. Detrick," *Washington Post*, February 10,

2009, B2; Nelson Hernandez, "Inventory Uncovers 9,200 More Pathogens," *Washington Post*, June 18, 2009, B8; Martin Matishak, "Thousands of Uncounted Disease Samples Found at Army Biodefense Lab," *Global Security Newswire*, June 18, 2009.

78. The panel suggested other ways to improve personnel screening, such as periodically cross-checking individuals cleared for access to high-risk pathogens against federal databases and enhancing the culture of mutual accountability and responsibility at facilities. U.S. National Science Advisory Board on Biosecurity, *Enhancing Personnel Reliability Among Individuals with Access to Select Agents* (Washington, DC: National Institutes of Health, May 2009). The U.S. personnel screening requirements are called a security risk assessment and specify nine reasons to deny an individual access to high-risk pathogens, for instance, if the person is a fugitive from the law. 42 Code of Federal Regulations, Part 73, "Possession, Use, and Transfer of Select Agents and Toxins; Interim Final Rule," *Federal Register* 240, no. 67 (December 13, 2002): 76889–76890.

83. The United States has over 1,350 Biosafety Level 3 laboratories and is also adding more Level 3 capacity. For more on U.S. high-containment laboratory expansion and a brief explanation of biosafety levels, go to [http://www.niaid.nih.gov/factsheets/facilityconstruct\\_06.htm](http://www.niaid.nih.gov/factsheets/facilityconstruct_06.htm). Also, *Preliminary Observations on the Oversight of the Proliferation of BSL-3 and BSL-4 in the United States*, GAO-08-108T (Washington, DC: U.S. Government Accountability Office, October 4, 2007), 9–10. India, which already had a Biosafety Level 4 at Pune, will have a total of three level-4 laboratories. Thailand and Indonesia have five and six Level 3 laboratories, respectively. Sri Lanka has a Level 3 laboratory. World Health Organization, "Biosafety and Biosecurity in Health Laboratories" (report of the regional workshop, Pune, India, July 8–11, 2008), 8.

85. Aside from the activities of the World Health Organization and the World Health Congress, the international community's efforts to take concerted action have been tepid. In 2007, Convention members discussed regional and subregional cooperation among states, agreeing on the desirability of a more harmonized approach to implement treaty obligations but stopping far short of a specific game plan to achieve it. United Nations, *Report of the 2007 Meeting of States Parties*, Doc. BWC/MSP/2007/5, Geneva, December 10–14, 2007, paras. 21–6. Nations have supplied documents about their practices at the intercessional talks in Geneva held under the Convention's auspices and in accordance with UN Security Council Resolution 1540 of April 2004, which called upon states to pass domestic legislation to prevent weapons of mass destruction capabilities from falling into the hands of subnational actors. For a listing of relevant national laws, regulations, decrees, and guidelines, go to <http://www.un.org/sc/1540/>.

87. Each day, this industry receives thousands and millions of orders, respectively, for genes and oligonucleotides. Orders that require closer scrutiny are found by screening against a database containing the sequences for pathogens of concern (such as Marburg or smallpox). Customers placing orders are also screened to confirm, at a minimum, their identity. Orders for whole genes are currently being checked, and a Virulence Factor Information Repository is being developed to facilitate the eventual screening of oligonucleotide orders. The responsible sales conduct codes of two groups of gene synthesis companies, the International Association of Synthetic Biology and the International Gene Synthesis Consortium, announced in November 2009, can be found at [http://www.ia-sb.eu/tasks/sites/synthetic-biology/assets/File/pdf/iasb\\_code\\_of\\_conduct\\_final.pdf](http://www.ia-sb.eu/tasks/sites/synthetic-biology/assets/File/pdf/iasb_code_of_conduct_final.pdf) and [http://www.genesynthesisconsortium.org/Harmonized\\_Screening\\_Protocol.html](http://www.genesynthesisconsortium.org/Harmonized_Screening_Protocol.html). See also Hubert Bernauer et al., "Technical Solutions for Biosecurity in Synthetic Biology," report on the Workshop, Industry Association of Synthetic Biology, Munich, April 3, 2008,



[http://www.synbiosafe.eu/uploads///pdf/iasb\\_report\\_biosecurity\\_syntheticbiology.pdf](http://www.synbiosafe.eu/uploads///pdf/iasb_report_biosecurity_syntheticbiology.pdf). On the broader scope of measures that could be enacted to guard against misuse of synthetic biology, Michelle S. Garfinkel, Drew Endy, Gerald L. Epstein, and Robert M. Friedman, *Synthetic Genomics: Options for Governance* (Rockville, MD: J. Craig Venter Institute, October 2007). See also Ali Nouri and Christopher F. Chyba, "Proliferation-Resistant Biotechnology: A Novel Approach to Improve Biosecurity," *Nature Biotechnology* 27, no. 3 (2009): 234–236. See as well recommendation #2, U.S. National Science Advisory Board on Biosecurity, *Addressing Biosecurity Concerns Related to the Synthesis of Select Agents* (Washington, DC: National Institutes of Health, December 2006), 11.

88. A web portal has been created where experts will use a double-tiered, confidential process to assess whether the proposed research would enhance the ability of states or terrorists to acquire bioweapons. A detailed response, including recommendations to reduce the safety and security risks of the research, is provided within two weeks. All expert reviewers are volunteers, and within a year a generic synopsis of the panel's decision that redacts the identities of the scientist(s) or institution requesting the review is posted online to aid awareness and training for scientists and institutional oversight committees. The screening portal can be accessed at <http://gsppi.berkeley.edu/EoC/uc-berkeley-synthetic-biology-security-program/experiments-of-concern>. See also E. Check Hayden, "Experiments of Concern to Be Vetted On-Line," *Nature* 457 (February 5, 2009): 643.

89. The hallmarks typical of nuclear and chemical weapons programs are not prerequisites to proliferate biological weapons, increasing the likelihood that biowarfare programs will escape the notice of intelligence agencies or be very difficult to detect. At biological facilities, "[t]here may be no obvious signs of diversion from peaceful to malevolent activities. . . . To make it trickier, there are no real choke points or bottlenecks which can be monitored." Gabriele Kraatz-Wadsack, "The Role of Scientists in Verification," in *Assessing the Threat of Weapons of Mass Destruction: The Role of Independent Scientists*, ed. J. L. Finney and I. Slaus, vol. 61, NATO Science for Peace and Security Series E: Human and Societal Dynamics (Amsterdam: IOS Press), 46. For more on the equipment, materials, and knowledge required for a biological weapons program, Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, OTA-BP-ISC-115 (Washington, DC: U.S. Government Printing Office, December 1993), 71–117; Smithson with Levy, *Ataxia*, 37–56.

90. In particular, the commission was critical of the intelligence community's reliance on a single source, an Iraqi defector codenamed "Curveball," who was poorly validated and discredited by an allied intelligence agency, to shape its erroneous assessment of Iraq's mobile biological weapons capability. *Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction: Report to the President of the United States* (Washington, DC: U.S. Government Printing Office, March 31, 2005), quotes from pages 1, 82. On Curveball and other problems with the assessment of Iraq's bioweapons capabilities, 88–111. Stating that the pre-war intelligence estimates about Iraq's unconventional weapons were "way off" and citing in particular the Curveball debacle, wherein a "single person . . . was the source for over one hundred reports about Iraq biological-weapons programs that did not in fact exist," Charles Duelfer, *Hide and Seek: The Search for Truth in Iraq* (New York: Public Affairs, 2009), 456, 470. Also, Bob Drogin, *Curveball: Spies, Lies, and the Con Man Who Caused a War* (New York: Random House, 2007).

93. The death toll could have been much higher because over five thousand people located in a southeasterly direction downwind from Compound 19 were exposed to the anthrax aerosol. Problems with the filters in Compound 19's ventilation containment system reportedly caused

the accident. For more on the Sverdlovsk, David Hoffman, "Wastes of War: A Puzzle of Epidemic Proportions," *Washington Post*, December 16, 1998, A1; Victor Israelyan, "Fighting Anthrax: A Cold Warrior's Confession," *Washington Quarterly* 25, no. 2 (Spring 2002): 17–29; Tom Mangold and Jeff Goldberg, *Plague Wars*, 66–82; Alibek with Handelman, *Biohazard*, 70–86; M. Meselson, J. Guillemin et al., "The Sverdlovsk Anthrax Outbreak of 1979," *Science* 266, no. 5188 (November 18, 1994): 1202–1208; Jeanne Guillemin, *Anthrax: The Investigation of a Deadly Outbreak* (Berkeley, CA: University of California Press, 1999).

96. Referring to the risks accompanying the sweeping advances being made in the life sciences, former UN Secretary-General Kofi Annan said, "These changes mean that we can no longer view the Convention in isolation, as simply a treaty prohibiting States from obtaining biological weapons. Rather, we must look at it as part of an interlinked array of tools, designed to deal with an interlinked array of problems." "Annan Calls for Strategy to Prevent Biological Weapons Falling into Terrorists' Hands," UN News Centre, November 20, 2006.

97. Former UN Secretary-General Kofi Annan has advocated a meeting of industrial, scientific, governmental, public health, and public stakeholders to devise tools to prevent the terrorist acquisition of biological weapons; scholars have called for a "biosecurity concert" to merge under global governance the implementation of public health programs, the prevention of bioweapons proliferation, and the conduct of life science research; and scientists have suggested U.S. conferences to grapple with the slate of issues associated with biosecurity and scientific openness. See "Annan Calls for Strategy to Prevent Biological Weapons Falling into Terrorists' Hands;" David P. Fidler and Lawrence O. Gostin, *Biosecurity in the Global Age: Biological Weapons, Public Health, and the Rule of Law* (Stanford, CA: Stanford University Press, 2007); Ronald M. Atlas, "National Security and the Biological Research Community," *Science* 298, no. 5594 (October 2002): 753–754; Julie E. Fischer, *Stewardship or Censorship? Balancing Biosecurity, the Public Health and the Benefits of Scientific Openness* (Washington, DC: Henry L. Stimson Center, February 2006), 90–91.

98. The April 12–13, 2010, summit in Washington, DC, drew forty-nine leaders, who agreed on a game plan to secure fissile materials, halt nuclear smuggling, and detect and prevent nuclear terrorist plots. Mary Beth Sheridan, "Obama Secures 47-Nation Pact at Nuclear Summit," *Washington Post*, April 14, 2010, A1; Office of the Press Secretary, "Work Plan of the Washington Security Summit" (Washington, DC, White House, April 13, 2010), or go to [http://www.nti.org/e\\_research/in\\_focus\\_nuclear\\_summit.html](http://www.nti.org/e_research/in_focus_nuclear_summit.html).

99. Proposing a global biosecurity standard based on a list of controlled high-risk pathogens; facility registration and licensing; control of access to pathogens and accounting systems for culture collections; physical security; personnel screening; an emergency response plan for security problems; and an international oversight mechanism, possibly entailing an annual international meeting wherein states report incidents and developments, monitor the implementation of the standard, and assist each other with implementation needs, Jonathan B. Tucker, *Biosecurity: Limiting Terrorist Access to Deadly Pathogens*, report no. 52 (Washington, DC: U.S. Institute of Peace, November 2003), 35–36; Jonathan B. Tucker, "Preventing the Misuse of Pathogens: The Need for Global Biosecurity," *Arms Control Today* 33, no. 5 (June 2003): 3–10. On the need to identify and protect biological materials of greatest risk, see Reynolds M. Salerno and Lauren T. Hickok, "Strengthening Bioterrorism Prevention: Global Biological Materials Banagement," *Biosecurity and Bioterrorism* 5, no. 2 (June 2007): 107–116.

101. Beyond typical criminal, financial, and professional checks, full-scope screening can add several steps to ensure physical and mental fitness to be hired and to remain employed. A mental health professional can examine applicants and periodically reexamine workers.

Similarly, tests (for example, breathalyzer and blood or urine screening) can be administered initially, periodically, and randomly to guard against alcohol and drug abuse. Employees can be obligated to self-report emotional or physical problems that may influence their judgment on the job and to report signs of such difficulties in colleagues so that the problems can be addressed with professional assistance, as needed. The annual review process for employees can cover numerous pertinent aspects of personal conduct on and off the job. Employees can also be required to state potentially controversial lifestyle elements up front to immunize them against coercion. For more detail on full-scope screening programs for U.S. personnel working with nuclear materials and weapons, U.S. Department of Energy, “Document 50.2: Personnel Assurance Program” and “Document 50.3 : Personnel Security Assurance Program,” in *Environment Safety and Health Manual* (Washington, DC, April 1, 2001); “Nuclear Personnel Reliability Program,” GAO/NSIAD-92-193R (Washington, DC: U.S. Government Accountability Office, May 1992).

103. Professions that establish codes of ethics often have reinforcing educational programs. Some societies of biological professionals have enacted ethics codes that specifically obligate members to avert bioweapons work (such as the Australian Society for Microbiology). Protection for scientists who report or “blow the whistle” on egregious misbehavior has also been suggested. For more on codes of ethics for life scientists, Nancy L. Jones, “A Code of Ethics for the Life Sciences,” *Science and Engineering Ethics* 13, no. 1 (March 2007): 25–43; Margaret A. Somerville and Ronald M. Atlas, “Ethics: A Weapon to Counter Bioterrorism,” *Science* 307, no. 5717 (March 25, 2005): 1881–1882; James Revill and Malcolm R. Dando, “A Hippocratic Oath for Life Scientists,” *EMBO Reports* 7, no. S1 (2006): S55–S60. For model education programs, see the Federation of American Scientists at <http://www.fas.org/biosecurity/education/dualuse/index.html>, the Center for Arms Control and Non-proliferation at [http://www.politicsandthelifesciences.org/Biosecurity\\_course\\_folder/base.html](http://www.politicsandthelifesciences.org/Biosecurity_course_folder/base.html), and the University of Bradford/Exeter Project on Life Sciences, Biosecurity, and Dual-Use Research at <http://projects.exeter.ac.uk/codesofconduct/BiosecuritySeminar/Education/index.htm>.

105. One scholar urges deeper reliance on full implementation of UN Security Council Resolution 1540 as part of a shift from the paradigm of technology denial, typified by export controls, to a framework of technology governance to prevent terrorist acquisition of unconventional weapons as technologies spread. Elizabeth Turpen, “Achieving Nonproliferation Goals: Moving from Denial to Technology Governance,” Policy Analysis Brief (Muscatine, IA: Stanley Foundation, June 2009).

107. Giving the Obama Administration’s verdict on a verification protocol for the Convention, Under Secretary of State Ellen Tauscher said it “would not achieve meaningful verification or greater security” or “keep pace with the rapidly changing nature of the biological weapons threat.” “Under Secretary of State Ellen Tauscher: Address to States Parties of the BWC” (Geneva, Permanent Mission of the United States of America, December 9, 2009). See also the remarks of Stephen Rademaker, U.S. assistant secretary of state for arms control, “U.S. Welcomes Biological Work Plan,” press release (Washington, DC, U.S. Department of State, November 15, 2002). For more on verification skeptics, see Henrietta Wilson, *The Biological Weapons Convention Protocol: Politics, Science and Industry*, Report no. 2 (London: Verification, Inspection, and Training Centre, December 2001), 13–14.

109. According to U.S. pharmaceutical experts, faking an entire set of records to hide bioweapons development or production at an erstwhile civilian facility would be a monumental task. Conversely, combing through regulatory data, along with other on-site inspection tools,



can make a notable contribution to confirming what a facility is doing. The industry experts project fairly high success for the proposed inspection tools and strategies to detect certain activities. Amy E. Smithson, ed., *House of Cards: The Pivotal Importance of a Technically Sound BWC Monitoring Protocol*, Report no. 37 (Washington, DC: Stimson Center, May 2001): 39–77. U.S. biotechnology and pharmaceutical industry scientists expound their counsel on these matters in Amy E. Smithson, ed., *Resuscitating the Bioweapons Ban: U.S. Industry Experts' Plans for Treaty Monitoring* (Washington, DC: Center for Strategic and International Studies, November 2004).

110. The United States and United Kingdom premised the 2003 Gulf War largely on intelligence about Iraq's unconventional weapons programs that has been seriously questioned. On March 22, 2003, President George W. Bush listed ridding Iraq of its weapons of mass destruction as the first reason to initiate the war, citing also the need to "end Saddam Hussein's support for terrorism, and to free the Iraqi people." In early February, Secretary of State Colin Powell featured U.S. concerns about a mobile biological weapons production capability in Iraq when presenting the U.S. case for war to the UN. Giving the case for the 2003 invasion of Iraq, President George W. Bush, "President Discusses Beginning of Operation Iraqi Freedom," Presidential Radio Address (Washington, DC, White House, March 22, 2003); Central Intelligence Agency/Defense Intelligence Agency, *Iraqi Mobile Biological Warfare Agent Production Plants* (Washington, DC, May 28, 2003) and "Transcript of Powell's U.N. Presentation," (New York, U.S. Department of State, February 6, 2003). In addition to assertions of a mobile bioweapons production capacity, the British government's dossier on Iraq's weapons of mass destruction capabilities included the controversial claim that Iraq had biological and chemical weapons deployable within forty-five minutes of a decision to do so. "Iraq's Weapons of Mass Destruction: The Assessment of the British Government" (London, September 24, 2002): 17–18. On these matters, see also, Duelfer, *Hide and Seek*, 4. On faulty intelligence, *Commission of the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction: Report to the President of the United States*.

111. From 1987 to 2003, barely 50 percent of Convention members submitted a data declaration once, much less annually, so arguably states have not taken the voluntary declarations regime seriously. Nations are to declare data on (1) high-level biosafety containment research centers and laboratories; (2) biodefense programs; (3) outbreaks of diseases reportable to the World Health Organization (such as polio) and unusual outbreaks of disease; (4) life sciences publications; (5) promotion of contact between scientists; (6) pertinent legislation, regulations, and other measures; (7) past offensive or defensive bioweapons programs; and (8) vaccine production facilities. For an overview, see *BioWeapons Prevention Project, BioWeapons Report 2004* (Geneva: BioWeapons Prevention Project, 2004), 25–33; Marie Chevrier, "Doubts About Confidence: The Potential Limits of Confidence-Building Measures for the Biological Weapons Convention," in *Biological Weapons Proliferation: Reasons for Concern, Courses of Action*, report no. 24, ed. Amy Smithson (Washington: Stimson Center, January 1998). In August 2007, the three-person Implementation Support Unit was established to aid communications between members and interested observers of the Convention, particularly on confidence-building measures, and to promote universal adherence to the treaty. "New Unit Created to Help World Effort Against Biological Weapon Threat," press release DC/3079 (New York, UN Department of Public Information, August 20, 2007). This unit's webpage is at <http://www.unog.ch>. Mandatory declarations would increase the amount of incoming data, necessitating qualified analysts to process, analyze, and ready data for dispersal to leaders, as needed.

112. Under the authority established in 1980 to enable the international community to assess compliance with the 1925 Geneva Protocol's ban on the use of chemical and biological weapons, the UN Secretary-General has launched twelve investigations of alleged use. For more, Jez Littlewood, "Investigating Allegations of CBW Use: Reviving the UN Secretary-General's Mechanism," *Compliance Chronicles* no. 3 (December 2006): 1–36; Jonathan B. Tucker, "Multilateral Approaches to the Investigation and Attribution of Biological Weapons Use," in *Terrorism, War, or Disease? Unraveling the Use of Biological Weapons*, ed. Anne L. Clunan, Peter R. Lavoy, and Susan B. Martin (Stanford, CA: Stanford University Press, 2008), 269–292.