

# Breathing Space: The Amalgamated Toxicity of Ground Zero

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[The world is] made up of compost of the millions and millions who have died and are blowing about. The dead are blowing in your nostrils every hour, every second you breathe in. It's a macabre way of putting it, perhaps; but anything that's at all accurate about life is always macabre. After all, you're born, you die.

—Francis Bacon<sup>1</sup>

In the early hours of January 5, 2006, in his parents' house in Little Egg Harbor, New Jersey, James Zadroga passed away due to a respiratory disease, a black lung disease, and mercury on the brain.<sup>2</sup> At the age of thirty-four, he was a retired New York City Police Department (NYPD) officer. For the last year of his life he had been dependent on a portable oxygen tank, round-the-clock pain-relief medication (eight tablets of OxyContin a day), and about twelve other drugs. His debilitating physical symptoms were accompanied by short-term memory loss. Zadroga was one of the first responders to the destroyed World Trade Center (WTC), and subsequently spent approximately 470 hours working as part of the rescue operation at Ground Zero. Though he was the first NYPD officer to be legally recognized as having become seriously ill as a result of exposure to toxic chemicals at the site, receiving more than one million dollars in compensation, the direct causal link between his time at Ground Zero and his death was subsequently challenged, making his body, and more specifically the interpenetration of his bodily material with the airborne toxic remains of the collapsed buildings, into the subject of political and legal controversy.

Though there is perhaps nothing new in itself about legal disputes over financial and moral liability for deaths and injuries, the case forms a nexus of several of the different factors responsible for the increasing relevance, and indeed urgency, of rethinking the relations between architecture and forensics. The forensic dimension is here not concerned, as some reports were, with how and why a building collapsed—and whether, as some conspiracy theories have it, it was the work of interested state parties<sup>3</sup>—but rather with its actual materiality and chemical composition as it evaporated from solid to a gaseous medium whose component parts possessed a toxicity that affects the human body.<sup>4</sup> The three forensic reports ostensibly produced in order to establish the cause of Zadroga's

death, and the debates surrounding their interpretation, focused on the presence of toxic elements within the lung tissue. At stake was the question of whether these toxic particles derived from the material of the WTC building, and whether agents representing governmental institutions—who, according to the Fifth Amendment to the US Constitution, abused their authority by willful deception regarding the toxicity of matter present in the air—could be deemed liable for injuries incurred by public workers “in the line of duty.” Thus the case raises the question of whether the September 11 attacks, widely recognized as an act of terror and a human catastrophe, should not also be considered an environmental disaster. Further, it may prompt us to ask whether it is ever possible, in cases of the destruction of life, to make straightforward distinctions between environmental and other kinds of cause (for instance, acts of intentional violence or direct negligence); and indeed, to consider how we deal—politically, legally, methodologically, conceptually—with the shift from linear chains of cause and effect to the dispersed, nonlinear field of causal factors that occurs when architecture is no longer a static, background dimension of a lived environment, but a dynamic constituent of it, infused even into the breathable atmosphere.

The initial autopsy was performed by Dr. Gerard Breton, a pathologist and contractor to the medical examiner's office in Ocean County. Breton found Zadroga's lungs to be “massive in size, three times heavier than the usual weight, and firm to the touch.”<sup>5</sup> This observation is similar to descriptions of the harm caused by asbestos: when asbestos fibers are inhaled, they become trapped in the small air sacs (alveoli) through which gas exchange takes place in the lungs. Because asbestos fibers are long, sharp, and irritating to lung tissue, the alveoli close up around them with the eventual result that the lungs become hard, fibrous, and inelastic. Over time, the continued irritations cause cancer in some individuals. When Breton continued to dissect the lungs he found “a large number of foreign-body granulomas,” a response of biological tissue to any foreign material in the tissue. The scarring that had built up around the inorganic particles “was so extensive and severe that the right ventricle of Zadroga's heart had thickened from the strain of trying to force blood through the ravaged vessels and capillaries.”<sup>6</sup> The dust-like inorganic particles Breton found in Zadroga's lung tissue were identified by the Armed Forces Institute of Pathology as composed of talc, cellulose, calcium phosphate, and methacrylate plastic. Breton concluded that Zadroga had died from respiratory failure due to severe panlobar granulomatous pneumonitis (a fatal infection of the lung characterized by granulomas) and added in the clinical, scientific language of the autopsy report that “it is felt with a reasonable degree of medical certainty that the cause of death in this case was directly related to the September 11 incident.”<sup>7</sup> This was the first official link made by a medical expert between the hazardous air at Ground Zero and the death of a first responder.

Breton's finding that Zadroga died from a "history of exposure to toxic fumes and dusts" seemed initially to have established with near certainty a direct causal link between the air of the attack site and his illness. It was cited as evidence in several ongoing lawsuits alleging that the toxic composite of fumes and dust at Ground Zero was deadly.<sup>8</sup> These claimants were residents and employees in Lower Manhattan who had been left by the Environmental Protection Agency (EPA) with a contaminated airspace and a fine dust that had settled on every surface. Dust, writes Steven Connor, is "amorphous, without form and almost void. [...] This allows it to be thought of as metamorphic, with the same capacity to assume any form." It is thus the antimatter and negative form of form. Dust can get everywhere, insinuating itself into every crevice.<sup>9</sup> It settled everywhere around Ground Zero—as far as six blocks away from the WTC—to the depth of three inches.<sup>10</sup>

In February 2006, one month after Zadroga's death, the District Court in New York allowed key claims in a class-action lawsuit to go forward and Judge Deborah Batts ruled that the EPA and its former administrator Christine Todd Whitman had violated residents' and workers' constitutional rights by making statements

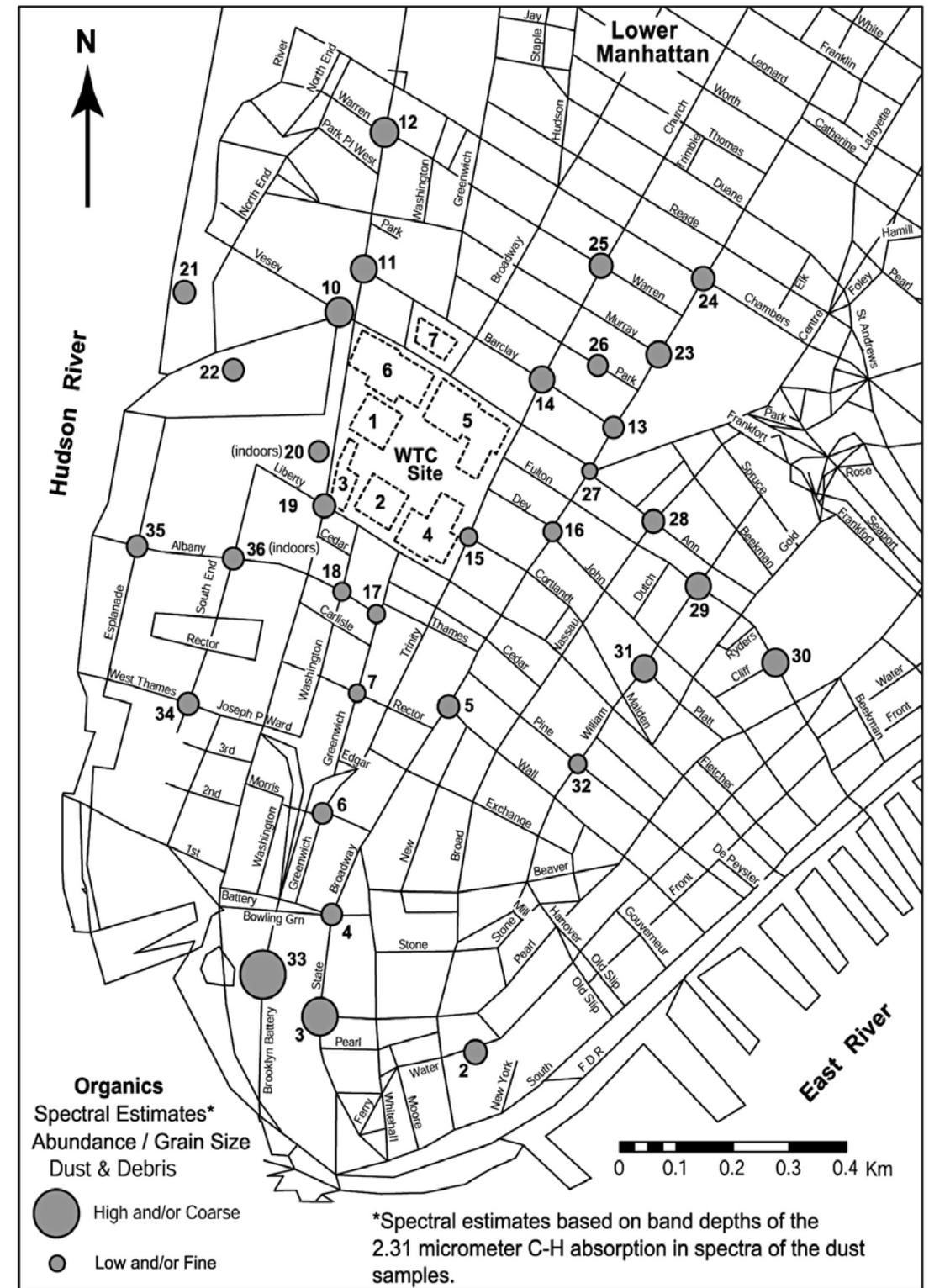
that the air was safe, thus knowingly placing the victims in the way of harmful contamination.<sup>11</sup> In Judge Batts's view, "Whitman's deliberate and misleading statements made to the press, where she reassured the public that the air was safe to breathe around Lower Manhattan and Brooklyn, and that there would be no health risk presented to those returning to those areas, shock the conscience."<sup>12</sup>

The political impact of the Breton report was also seen in the call made by the senators of New York and New Jersey, among them Hillary Clinton, for the governor of New York City, George Pataki, to extend the list of September 11 victims to include first responders who had become chronically ill after working at Ground Zero, entitling them and their families to compensation.<sup>13</sup> During the bill-signing ceremony for this legislation at the WTC site on August 14, 2006, Pataki made direct reference to Zadroga.<sup>14</sup> However, despite these measures, the issue of paying compensation to first responders and their families was soon complicated by challenges to the original Breton report and its apparent establishment of a direct causal link. Following the new legislation, it was deemed necessary to provide further verification of the cause of Zadroga's death. Thus in the summer of 2007, copies of the first



Fig. 2. (right) Spectral estimates of organic material abundance/grain size in surface samples of the WTC dust and debris. Point 14 shows where the sample WTC01-14 was collected. Source: G. A. Swayze, R. N. Clarke, et al., "Spectroscopic and X-Ray Diffraction Analyses of Asbestos in the World Trade Center Dust," in *Urban Aerosols and Their Impact: Lessons Learned from the World Trade Center Tragedy*, J.S. Gaffney and N.A. Marley (eds.), *American Chemical Society Symposium Series 919* (Oxford: Oxford University Press, 2006): 40–65.

Fig. 1. Artist Pat Moore in her family's apartment on Cedar Street, New York City, May 31, 2002. The apartment is covered with WTC dust. Photo: Paul Fusco/Magnum Photos.



autopsy and Zadroga's medical files were sent to Dr. Charles Hirsch, Chief Medical Examiner of New York City and often cited as the "father of modern forensic pathology," who retired at the beginning of 2013.

Hirsch had built the largest public DNA laboratory in the country, which allowed his office (the New York Office of the Chief Medical Examiner) to identify the remains of the victims of the September 11 attacks. He himself was injured in the attacks after he responded to the scene and was caught in the collapse of the South Tower of the WTC. He was rescued from the rubble to later lead his team through the recovery and identification of victims' remains. Directly contradicting Breton's findings, Hirsch concluded that the talc and cellulose found in Zadroga's lungs did not derive from Ground Zero: rather, "the embedded material was pharmaceutical debris produced by injecting a solution of crushed prescription pills."<sup>15</sup> In light of this, the open lawsuit was closed in 2007 before any financial compensation or medical assistance to the (mostly low-wage) workers was granted. The air and the maximum amount of toxic particles it should carry within a city hadn't been brought back under control by law.<sup>16</sup>

The president of New York's Detectives' Endowment Association doubted Hirsch's findings and suspected that the city was preparing itself for pending class-action suits from Ground Zero first respondents and workers. A few days later Joseph Zadroga, James Zadroga's father, attended a conference with Dr. Michael Baden, who had used one of James Zadroga's lung tissue slides for a segment on September 11-related illnesses on the HBO series titled "Autopsy: Post-mortem with Dr. Baden." During this appearance the pathologist announced that he had no doubt that Zadroga's death was a result of exposure to toxic dust at Ground Zero. He acknowledged the fact that granulomas can result from injecting medications but stated: "You could see glass fibers there. You don't get that from injecting drugs."<sup>17</sup> He had noted earlier that Breton hadn't observed any needle scars on Zadroga's arms. In October 2007 Mayor Bloomberg caused an outrage when he addressed the subject while accepting an award at Harvard's School of Public Health. He claimed that James Zadroga was not a hero. "We wanted to have a hero and there are plenty of heroes," Bloomberg said. "It's just in this case science says *this* was not a hero."<sup>18</sup>

However, Breton's report was criticized for failing to make a direct comparison between the particles found in Zadroga's lungs and dust gathered from the site of the attack. Thousands of air samples from Lower Manhattan were tested for asbestos by the US EPA, using different technologies to identify fibers of a certain length, and some contained asbestos at levels above the clearance standard of the 1986 Asbestos Hazard Emergency Response Act. Still, in the days following the collapse of the WTC Todd Whitman (the former EPA administrator) proclaimed the air that was carrying toxic particles "safe to breathe," perhaps so as to ensure a fast reopening of Wall Street on September 14, 2001.

Hereby both she and the White House misled hundreds of workers and residents by assuring them that it was safe to return to Ground Zero, which they followed only "to then be poisoned" by inhaling fibers and a most hazardous kind of air that would damage their lungs permanently.<sup>19</sup> Since then, Lower Manhattan's inhabitants have suffered respiratory problems and there have been several deaths linked to the toxic Ground Zero dust further to that of Zadroga.

In May 2002, a group of scientists at UC Davis named the DELTA Group (Detection and Evaluation of Long-range Transport of Aerosols) performed what they described as "the most thorough analysis yet" of Ground Zero dust and smoke. The study was based on the analysis of air samples from a rooftop air monitor about one mile north-northeast of Ground Zero. The scientists noted that very fine particles were found at high levels not previously found in ambient air. These very fine particles, carried in the unprecedented clouds that traversed Manhattan's airspace, are riskier to human health than larger, coarse particles. Later, in September 2003, the same group presented their new findings, which showed that the fuming WTC debris pile was a chemical factory that exhaled pollutants in dangerous forms that could penetrate deep into the lungs of workers at Ground Zero. The conditions must have been dreadful for people working at Ground Zero without appropriate protection gear or respirators, and only slightly less so for those working or living in adjacent buildings, notes the study's coauthor, Thomas Cahill, an expert on constituents and transport of airborne particles.<sup>20</sup>

One kind of matter in this dust and smoke cloud over Ground Zero was asbestos fiber; its material history can be traced in the forensic analysis of the dust.<sup>21</sup> Asbestos is the name given to a group of six different fibrous minerals that occur naturally in the environment. These asbestos minerals consist of thin, separable fibers. Asbestos fibers do not have any detectable odor or taste. They do not dissolve in water or evaporate and are resistant to heat, fire, and chemical and biological degradation. Because of these properties,

Fig. 3. (left) The use of superfine asbestos is recommended for use in a wide range of applications. Asbestos Corporation Limited (ACL) advertisement, undated.

Fig. 4. (center) Asbestos advertisement, 1970.

Fig. 5. (right) Asbestos advertisement, undated.



asbestos has been mined for use in a wide range of products, mostly in building materials and heat-resistant fabrics.

In modernity the history of asbestos is that of a mineral that started a tremendous industrialization process around the world, with a peak in 1973, the same year the WTC opened its doors. At that time the mineral fiber was a favored building material. It was highly heat-resistant, easy to incorporate, and relatively inexpensive.<sup>22</sup> As a result, tons of asbestos-containing products such as insulation and fireproofing were applied in the architecture of the WTC: “At least forty stories of the North Tower received the permanent fireproofing protection of the sprayed mixture of asbestos and cement.”<sup>23</sup> In 1971, by mid-construction all new uses of asbestos in the United States were banned by the EPA. One week after the WTC collapsed, Brooklyn College environmental scientist Arthur Langer questioned the replacement of asbestos.<sup>24</sup> The inventor of the asbestos spray used in the North Tower, Herbert Levine, believed it would have been essential to avoid a collapse and save lives.<sup>25</sup> The insulation was originally designed to protect the building from collapse for four hours, which might have saved trapped occupants. Instead, “the World Trade Center Health Registry estimates about 410,000 people were exposed to a host of toxins including asbestos” in the aftermath of the collapse.<sup>26</sup> Airborne asbestos had been pulverized into ultrafine particles during the implosion of the WTC towers.<sup>27</sup> The magnitude of the asbestos level above the legal limit of a building next to Ground Zero showed that Ground Zero had essentially itself become toxic.

But how exactly does asbestos enter the body? According to physicists the dermal absorption of asbestos is minimal, but dermal contact may lead to secondary ingestion or the inhalation of dust. The primary routes of human exposure to asbestos are inhalation and ingestion. Crucially, when inhaled as toxic, microscopically fine particles, the lungs are no longer able to filter the asbestos fiber. Inhaled fibers penetrate varying levels of the body’s organs, depending on their size and shape. As the lungs and other organs attempt to eliminate the presence

of the fibers through a gradual exertion, the asbestos pieces either clear the respiratory areas and exit through mucus, or further scar the organ in which they remain lodged. The carcinogenic potential of these fibers mainly affects the respiratory system when inhaled over a long period. This comes as no surprise, since all commercial forms of asbestos are known to be human carcinogens. Case reports and epidemiological studies have found that



Fig. 6. (below, left) Asbestos Corporation Limited (ACL) advertisement in Asbestos magazine, an industry publication which lauded the use of asbestos in the construction of the World Trade Center, when the demand for asbestos was declining. The fire in the WTC in 1981 was thus a welcome incident for the industry to advertise the product again. ACL is a Canadian company. November 1981.

Fig. 7. (below, right) Advertisement indicates Raybestos- Manhattan as America’s largest producer of asbestos textiles, woven into yarns, tape, cloth, packings, safety clothing, laminated plastics, phenolic-impregnated tapes (for rocket & missile components), brake linings, clutch facings, and automatic transmission friction parts.



Fig. 8. (above) Johns-Manville advertisement, 1936. This demonstrates the simplified asbestos marketing during the era of significant growth of asbestos usage. The features of the advertisement show some of the basics of the asbestos concept: its raw mineral form and its fluffy cotton-like processed form being easily handled. The advertisement includes an easy to remember catch-phrase: “The Magic Mineral.”

Fig. 9. (below) 1970s Johns-Manville advertisement celebrating the “benefits” of asbestos fiber.

exposure to asbestos causes respiratory-tract cancer, pleural and peritoneal mesothelioma (tumors of the membranes lining the chest and abdominal cavities and surrounding internal organs), as well as other forms of cancer, and that occupational exposure to complex mixtures of asbestos increases the risk of lung cancer.<sup>28</sup>

DELTA Group’s new report gives an estimate of the types of pollutants people were exposed to at Ground Zero. When the Twin Towers collapsed tons of concrete, glass, furniture, carpets, insulation, asbestos, arsenic, benzene, benzopyrene, cadmium dioxins, fibreglass, gypsum, heavy metals, plastic, silica, PAHs, PCBs, smoke detectors, mercury and gold (from several thousand fluorescent light bulbs), lead from thousands of computer monitors and titanium from the paint on the WTC walls, computers, and paper were reduced to enormous, oxygen-poor debris piles that burned until December 19, 2001.<sup>29</sup> In that pile, some of the materials that had combined with organic matter and the abundant chlorine from papers and plastics then escaped to the surface as metal-rich gases. They either burned or decomposed into very fine particles capable of penetrating deeply into human lungs. In the air samples, four classes of particles were identified that have been named by the EPA as likely to harm human health. For each of these pollutants, the DELTA Group scientists recorded the highest levels in their careers. After the debris fire

was out, pollution levels dropped. As the DELTA group noted:

The debris pile acted like a chemical factory. It cooked together the components of the buildings and their contents, including enormous numbers of computers, and gave off gases of toxic metals, acids and organics for at least six weeks.<sup>30</sup>

The effect of several toxins coming together in an “amalgam” reaction increased the hazardous nature of each material, making this hazard larger than the sum of its parts.<sup>31</sup>

In the early hours of September 11, 2001, NYPD Detective James Zadroga arrived at Ground Zero in Lower Manhattan to take part in the recovery efforts. He stepped onto this debris pile and took his first breath on site.

When breathing this debris pile, one inevitably inhaled the amalgamated toxicity of September 11: the building itself, the planes, their components and the trash that makes our daily environment, as well as the traces of human bodies, and with these smaller traces of the drugs they themselves

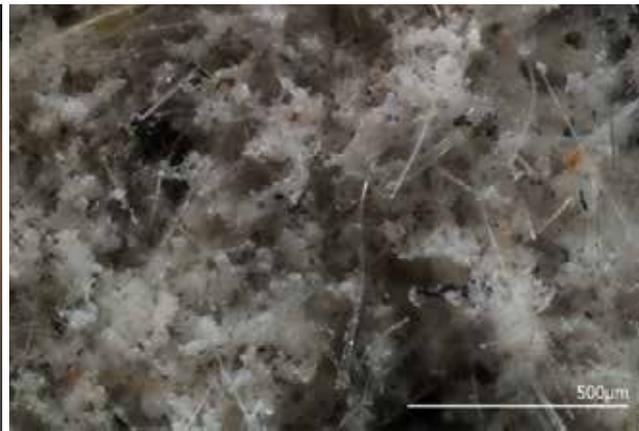
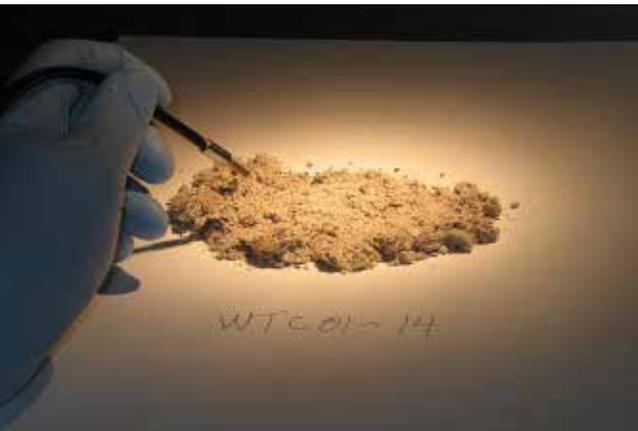
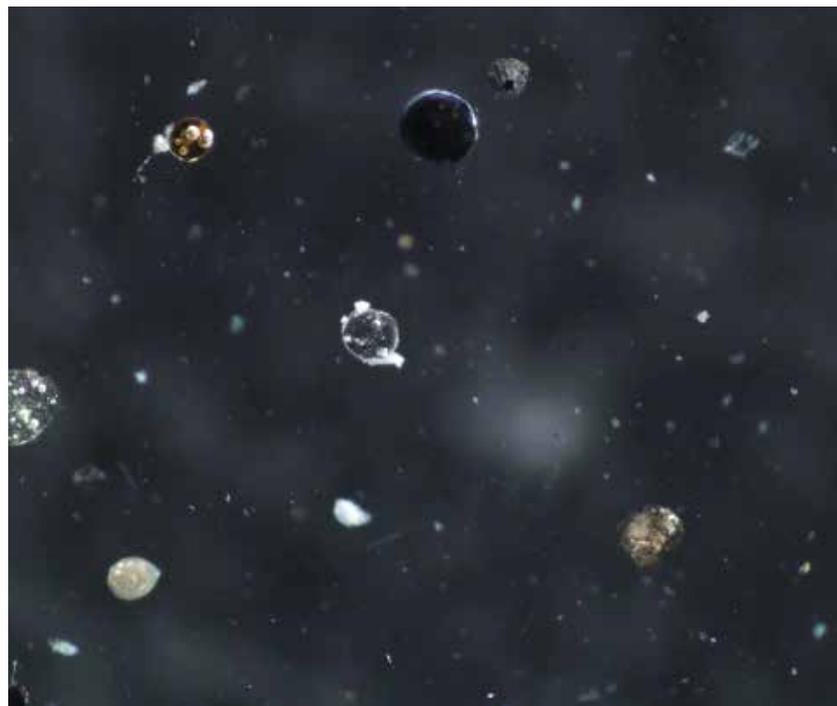


Fig. 10. (left) Closeup of sample WTC01-14 being measured with a spectrometer. The black cord with the steel tip is the fiber-optic probe of the spectrometer. Source: United States Geological Survey (USGS).

Fig. 11. (right) Photograph of WTC dust. Source: www.archive.org.

Fig. 12. Microsphere image of WTC dust. Source: www.archive.org.

had been taking. With the body, buildings, objects, and other bodies intermeshed in this way, the source of any toxic element found in the “assembled” body becomes inextricable. The capacity to link the original source (the microfibers or molecules in the air) to the forensic evidence in order to make legal claims on the part of the “forgotten victims” of September 11 thus remains a difficult venture.



- 1 Francis Bacon, interviewed by Joshua Gilder in “I Think about Death Every Day,” *Flash Art*, no. 112 (May 1983): 17–21. Cited in Wilson Yates, “Francis Bacon: The Iconography of Crucifixion, Grottesque Imagery, and Religious Meaning,” in *The Grotesque in Art and Literature: Theological Reflections*, eds. James Luther Adams and Wilson Yates (Cambridge: Wm. B. Eerdmans Publishing Co., 1997), 143–92, at 146.
- 2 Interview with Joseph Zadroga in Penny Little, dir., *9/11: Dust and Deceit at the World Trade Center* (USA, 2007), 60 min.
- 3 See for instance “9/11 Truth Movement,” <http://www.911truth.org>, last accessed November 2013.
- 4 For a related forensic analysis of dust as a “material witness” in which buildings and humans were radically entangled, see Susan Schuppli, “Impure Matter: A Forensics of WTC Dust,” in *Savage Objects*, ed. Godofredo Pereira (Guimarães: Fundação Cidade de Guimarães, 2012), 120–40.
- 5 Jennifer Kahn, “A cloud of smoke: The complicated death of a 9/11 hero,” *New Yorker*, September 15, 2008.
- 6 Ibid.
- 7 Anthony DePalma, “Debate Revives as 9/11 Dust Is Called Fatal,” *New York Times*, April 14, 2006. The term “reasonable degree of certainty” is the standard term used in court by forensic experts to mean that, given the available information, it is very likely that the opinion is correct.
- 8 Ibid.
- 9 Steven Connor, “Pulverulence,” *Cabinet*, no. 35 (Fall 2009): 71–76, at 71.
- 10 Christopher Turner, “Bacon Dust,” *Cabinet*, no. 35 (Fall 2009): 79–81, at 80.
- 11 Anthony DePalma, “Judge Dismisses 9/11 Suit Against Former Head of E.P.A.,” *New York Times*, April 23, 2008. On April 22, 2008, the United States Court of Appeals for the Second Circuit overruled the district court, stating that Todd Whitman could not be held liable for her public statements to New Yorkers that the air was “safe to breathe” after 9/11. *Benzman v. Whitman*, 523 F.3d 119 (2d Cir. 2008).
- 12 *Benzman v. Whitman*, No. 04 Civ. 1888, 2006 WL 250527 (S.D.N.Y. Feb. 2, 2006). See also Jerrold Nadler, “Court Approves Key Components of Lawsuit Against EPA for Failure to Clean up WTC Dust,” Congressman Jerrold Nadler’s Website, February 1, 2006, <http://nadler.house.gov/press-release/court-approves-key-components-lawsuit-against-epa-failure-clean-wtc-dust>.
- 13 Kahn, “A cloud of smoke.”
- 14 Michael Cooper, “Pataki Signs Law Increasing Death Benefits for Ground Zero Workers,” *New York Times*, August 14, 2006.
- 15 Kahn, “A cloud of smoke.”
- 16 See Sheila Jasanoff, “Thin Air,” in *Débordements—Mélanges offerts à Michel Callo*, ed. Madeleine Akrich (Paris: Presses de Mines, 2010), 191–201, at 201. Jasanoff states in her essay that it was law that brought the air back under physical, economic, and political control in regard to the case *Massachusetts v. Environmental Protection Agency*, 549 US 497 in 2007.
- 17 Melissa Grace, “City says drug use, not dust, killed 9/11 hero James Zadroga,” *NY Daily News*, October 26, 2007.
- 18 Nini S. Moordhead, “Bloomberg Recants HSPH Comment,” *Harvard Crimson*, November 1, 2007.
- 19 Interview with Congressman Jerrold Nadler in Little, *Dust and Deceit*.
- 20 Editorial, “Trade Center air laden with very fine particles, DELTA scientists find,” *California Agriculture*, vol. 56, no. 3 (May–June 2002): 84.
- 21 See “World Trade Center USGS Bulk Chemistry Results,” United States Geological Survey (USGS), <http://pubs.usgs.gov/of/2001/ofr-01-0429/chem1/index.html>, last accessed September 2013.
- 22 See “Asbestos and the World Trade Center,” <http://www.asbestos.com/world-trade-center/>, last accessed September 2013.
- 23 Andrew Schlafly, “Did Flawed Science and Litigation Help Bring Down the World Trade Center?” *Journal of American Physicians and Surgeons*, vol. 8, no. 3 (Fall 2003): 89–93.
- 24 Cited in James Glanz and Andrew C. Revkin, “Haunting question: Did the ban on asbestos lead to loss of life?” *Vaccination News*, September 18, 2001, <http://www.vaccinationnews.com/DailyNews/September2001/Asbestos.htm>.
- 25 Cited in Steven Miller, “Cautionary tale: Al Qaeda’s unseen ally: Environmental extremism,” Nevada Policy Research Institute Issue Brief, December 11, 2001, <http://www.npri.org/publications/a-cautionary-tale>.
- 26 See “Asbestos and the World Trade Center.”
- 27 Ibid.
- 28 The International Agency for Research on Cancer (IARC) concluded that there was sufficient evidence for the carcinogenicity of asbestos in humans. See IARC Summaries & Evaluations, “Asbestos,” Supplement 7, *International Programme on Chemical Safety* (1987): 106, <http://www.inchem.org/documents/iarc/suppl7/asbestos.html>.
- 29 Robin Herbert, Jacqueline Moline, et al., “The World Trade Center Disaster and the Health of Workers: Five-Year Assessment of a Unique Medical Screening Program,” *Environ Health Perspect*, vol. 114, no. 12 (December 2006): 1853–58. The study found that nearly 70% of WTC rescue and recovery workers suffered new or worsened respiratory symptoms while performing work at the WTC site. The study was established to identify possible WTC-related health effects in responders. It found that about 28% of those tested had abnormal lung function tests, and 61% of those without previous health problems developed respiratory symptoms. However, it is important to note that these symptoms may be related to exposure to debris components other than asbestos.
- 30 DELTA report, cited in “Trade Center Debris Pile Was a Chemical Factory, Says New Study,” *UC Davis News and Information*, September 10, 2003, [http://news.ucdavis.edu/search/news\\_detail.lasso?id=6679](http://news.ucdavis.edu/search/news_detail.lasso?id=6679).
- 31 An amalgam is a substance formed by the reaction of mercury with another metal. Almost all metals can form amalgams with mercury, the notable exception being iron.