Katrina, contamination, and the organization of ignorance[1]

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Contemplating the radioactive cloud drifting across West Germany from Chernobyl nearly twenty years ago, the German sociologist Ulrich Beck famously observed that "poverty is hierarchic, smog is democratic."[2] This was another way of saying that the wealthy among us could no longer buy their safety from invisible new dangers. Others taking issue with Beck's catholic fatalism countered that persistent inequalities in many parts of the world have concentrated pollution and its attendant health threats disproportionately in poor nations and in poor regions of wealthier nations.

Both points in the debate were driven home by Hurricane Katrina. Even as the storm exposed in Orleans parish the deep racial and economic divisions that structured evacuation and rescue efforts, levee breeches on two sides of the city destroyed neighborhoods wealthy, middle class, and poor. Down river in Chalmette, the fence lines once physically demarcating political conflicts between industrial polluters and their working class neighbors were made irrelevant by a million gallon oil spill that oozed crude from the Murphy Oil Refinery into adjacent neighborhoods. And in the coastal marshes to the south, Katrina's storm surge created thirty square miles of new lakes just below the tip of Orleans Parish.[3] As these and other examples illustrate, this storm transformed the nature of risk in southeastern Louisiana in ways that are unlikely to conform to pre-Katrina cultural, political, or socioeconomic realities.

Hurricane Katrina also reveals much about the limits of disciplinary thinking and the policies that both feed and follow from it. These limitations are tragically exemplified by a shattered levee system designed by engineers with little guidance from what geology teaches about the hydrodynamics of subsurface soil structures. In this sense Katrina's landfall marks the beginning of an important epistemological moment, an opportunity to engage difficult questions about what we know, what we don't know, and why.

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[1] Parts of this essay are taken from an earlier essay, "Our toxic gumbo: Recipe for a politics of environmental knowledge," posted online at: http://understandingkatrina.ssrc.org/Frickel/.

[2] Ulrich Beck. 1992 [1986]. *Risk Society: Toward a New Modernity*. London: Sage, p. 36.

[3] USGS press release, September 14, 2005. Available at: http://www.usgs.gov/newsroom/article.asp?ID=997

This essay considers the sociotechnical machineries that produce knowledge about Katrina's contamination and its attendant risks to public health.[4] My argument is that our understanding of past, present, and future threats are dangerously compromised by the very system that produces and legitimates those understandings. These systems are housed primarily in environmental science disciplines and regulatory agencies. Together, these institutions reinforce a set of expectations and practices for producing knowledge that is largely blind to the ecological and socio-historical contexts in which that knowledge is created and deployed. The result is organized ignorance – a system of knowledge production that articulates risk in ways that do not and perhaps cannot answer our most basic question: are we safe? To even begin to answer this question will require greater scholarly attention to the "problem of undone science" – explaining why some knowledge never gets made.[5] There is much at stake. What we don't know, or won't know, or can't know about risks in the new New Orleans will matter a great deal (and not just for New Orleanians).

Toxic Gumbo? Hell no!

As floodwaters in New Orleans rose, so did fears of a city awash in a "toxic gumbo" of chemical toxins and biological pathogens. Scientists were as quick to arrive at this advance conclusion as others, and not without reason. We now know that at a minimum, the floodwaters contained a complex mixture of contaminants. For nearly three weeks the city soaked in a bath of heavy metals such as arsenic, lead, mercury, and zinc along with *e. coli* and fecal coliforms, overcoated by a thin layer of petroleum-based volatile organic compounds.

VOCs break down after a week or two, and as they went, so went public discourse on contamination. Measured by "mentions" in newspaper articles, media attention to Katrina's contamination peaked during the second week of flooding. By week four, as the last of the floodwaters were pumped into Lake Ponchartrain, newspaper mentions had virtually disappeared.[6] Contrary to widespread expectations, early test data from floodwater, sediment, and surface water samples indicated that, high levels of biological contaminants notwithstanding, chemical levels were generally found to be within regulatory limits set by ASTDR, EPA, and/or Louisiana DEQ. Thus, toxic chemicals dispersed throughout the city by Hurricane Katrina apparently posed little or no appreciable health risk. Worries of bacterial contagion also dissipated as the expectant period for disease outbreaks came and went. The day after EPA released test results showing satisfactory air quality, the mayor announced plans to begin repopulating the city, with further assurance by New Orleans Health Director Kevin Stephens' that fecal coliform bacteria was "the only significant health care concern."[7] By November,

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[4] I take as basic assumptions the twin ideas that scientific knowledge is fundamentally social and that all knowledge is value-laden.

[5] See pp. 304-307 in Edward Woodhouse, David Hess, Steve Breyman and Brian Martin. 2002. "Science Studies and Activism: Possibilities and Problems for Reconstructivist Agendas." *Social Studies of Science* 32:297-319.

[6] Scott Frickel and M. Bess Vincent, "Katrina's contamination: Media discourses on the risk of return." Paper to be presented at the annual meetings of the Southern Sociological Society, March 24, 2006 (New Orleans).

[7] Gordon Russell, "Nagin maps out return to N.O.; Some businesses can return Saturday." *Times-Picayune* (September 16, 2005), A1.

seafood business owners would utter the term "toxic gumbo" in derision, blaming the *public perception* of chemical contamination for ongoing revenue losses in that industry. "Katrina cough" still begs for solid explanation, but chemical exposure no longer seems to be a serious candidate. Mold is the big worry now, and rightly so, as fungal geneticists readily admit that existing science on the vast majority of known species is thin at best.[8] Aside from a few contamination "hot spots" – a former pesticide mixing plant, two former landfills, and the Murphy Oil spill – continued testing by regulatory agencies has reinforced the narrative that, as one January headline put it, "NOLA is Safe for Kids."[9]

As I write, the entire city, parish and region are humming nearly the same tune. Political, economic, and social interests have lined up behind Louisiana DEQ's assertion that returning residents face "no unacceptable health risks." Rarely, I suspect, has this city seen such unanimity around a public goods issue. Who wouldn't want New Orleans to be safe for kids? One indicator of the stakes in the city's recovery placed in these risk calculations are official reactions to the two or three environmental groups who continue to press for more testing, better monitoring, and reinterpretation of some of the existing data. In response to a request from the National Resources Defense Council that DEQ make public the details of their environmental assessment, DEQ Secretary Mike McDaniel issued a letter to the editor deriding the "alarmists" and "scaremongers" whose "inaccurate, misleading, and often outrageous claims . . . do a grave disservice to New Orleans and the state."[10] Another indicator, less easily measured, is pressure within the local scientific community to join the booster chorus backing the risk assessments. As several environmental and medical experts have admitted to me recently, many questions about Katrina's contamination have gone unanswered and attendant health risks of living in the city remain highly speculative. But even framing the problem this way – as a technical puzzle that isn't solved *yet* – suggests that the safety question can and will be answered in time, with more science. In the meantime, more people are returning, rebuilding, and reestablishing their lives.

Will more of the same science answer the question? If so, how will we know that we know enough?

The Poverty of Testing

Knowledge about Katrina's lingering impacts hang on environmental test results, thousands of which have been conducted to date by the Environmental Protection Agency in collaboration with several other federal agencies and with the Louisiana Department of Environmental Quality.[11] Designed to measure pollution, testing links together environmental science

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[8] Joan W. Bennett, "The molds of Katrina." *Update* (New York Academy of Sciences), 6-9. Available online at: http://kerrn.org/pdf/Katrina_Molds.pdf

[9] Madeline Vann, "NOLA is safe for kids." *The New Wave* (January 9, 2006). Web address: http://www2.tulane.edu/article_news_details.cfm?ArticleID=6132.

[10] The NRDC request and McDaniel's response are posted at http://www.deq.louisiana.gov/portal/ (accessed March 3, 2006).

[11] For a summary of samples taken as of 1/16/06, see: http://www.deq.louisiana.gov/portal/portals/0/news/pdf/UnifiedSamplesGraph.pdf

disciplines and regulatory agencies. We can gain a better understanding of how these paired institutions structure undone science by considering how the logic of environmental testing champions disciplinary and regulatory culture at some cost to ecological complexity and social history.[12]

Disciplinary culture. Tests and testing practices are products of disciplinary thinking. They derive from basic sciences, adapted to fit changing regulatory requirements. For example, the environmental testing for contamination in Orleans parish owes much to analytical chemistry circa 1970. Many current tests, or their forerunners, were developed by Land Grant University chemists and entomologists working under industry contract at agriculture experiment stations during a period of heightened environmental concern and regulatory change.

Tests discipline nature by molding it to fit into a disciplinary framework of analysis and explanation. Another way of putting the point is that environmental testing reads nature through disciplinary culture. This is reflected in an emphasis in explaining ultimate over proximate causes, describing central tendencies while paying less attention to outliers, stressing the importance of minimizing Type I error but letting Type II error slide, and establishing statistical significance as a necessary condition for policy action. In 1971, cancer biologist Samuel Epstein summarized this disciplinary culture of testing as resulting in "narrow questions, narrowly defined, narrowly posed, and often narrowly answered."[13] Although the target of his criticism was the pharmaceutical industry's approach to drug toxicity testing, it is not irrelevant to environmental testing at EPA and DEQ today.

More to the point, these are not neutral technologies. Expectations – and thus politics – are built-in. The simultaneous strength of soil, air, or water testing as explanatory tools, and their weakness as instruments of comprehensive knowledge, is their precision. Tests will do only what they are designed to do, and nothing more. They will not find chemicals they are not programmed to find; they will not detect parts per billion if they are calibrated to detect parts per million; if sampling occurs near shore, tests will not detect contaminants that have moved into deeper water; if air monitors run during a rain shower, they are not likely to indicate the presence of particulate matter; and so on. In other words, the kinds of results testing produces are programmed in to the testing parameters *a priori*. We find what we seek to find, not necessarily what is there.

This is one form of organized ignorance that has nothing to do with willful deception, bureaucratic lethargy, or honest human mistakes. Technical precision and accuracy works *by itself* to thwart public understanding even as it lends an aura of legitimacy to the official agencies and offices standing behind the numbers. Here, disciplinary thinking retrofitted to regulatory goals produces ignorance by design.

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[12] The comments that follow also apply, with some modification, to tests used to measure exposure effects.

[13] Quoted in Scott Frickel, *Chemical Consequences: Environmental Mutagens, Scientist Activism, and the Rise of Genetic Toxicology*. New Brunswick: Rutgers University Press (2004), p. 93.

Ecological complexity. Environmental testing is limited in what it can tell us about the state of nature. Testing proceeds on the assumption that we can understand what's happening in nature by putting some of it – an air, water, or soil sample – inside a controlled laboratory-like environment, observing it, and measuring it. Reductionism of this sort allows researchers to make certain-sounding statements such as "benzene is present in the water column at a concentration of 5 parts per billion." The ability to provide technically accurate information is vitally important. Ideally, for example, it allows citizens and regulatory agencies to know whether and when industry violates state or federal emissions standards. But it doesn't tell us much about the water's condition in an open and dynamic ecosystem. Environmental testing can give us a snapshot image of contamination at one location at one point in time. Lots of testing can give us lots of snapshots. But neither the tests nor their aggregated results come close to mimicking natural conditions, although historically environmental scientists and engineers have sought to do just that.[14] So there is a fundamental leap of faith that the logic of testing requires us to make. Usually we are wise to take that leap, but we should remain conscious that that is what we're doing when agency officials ask that we substitute test results for "what is going on" in nature. This is not merely a philosophical issue, but one with numerous "downstream" implications for what and how we know.

The fundamental disjuncture that the logic of testing creates between knowledge about nature and nature itself is reproduced in institutions that organize and legitimate that knowledge. The tests EPA and DEQ, contracted private testing companies, and a few environmental groups have conducted are based on the compartmentalization of nature in air, soil, and water media. These testing regimes, in turn, correspond to media-specific disciplines (e.g. aquatic toxicology), regulatory bureaucracies (e.g. DEQ's Water Quality Assessment Division), and federal regulatory frameworks (e.g. Clean Water Act), each of which carves its understanding of nature, and with it the nature of pollution, into discreet components that stand at some odds to ecological reality. In short, we have organized knowledge in ways that insures that we won't really know what is going on in nature. This is another form of organized ignorance.

Social history. Environmental testing collapses time and space. Testing happens in geographical space, yet strips away the social history of those locations. Test results replace that history with numerical values that signal the presence or absence of specific contaminants which then are interpreted in terms of probabilities of a future effect or effects. Thus past and future are condensed into a one-dimensional present devoid of social context.[15]

This is in part why experts can explain away lead found in post-Katrina sediment as being "the same here today as you would expect in any urban area, whether it's Los Angeles or New York or New Orleans."[16] This statement begs the question of acceptable risk associated with lead levels in any major American city, including New Orleans prior to Hurricane Katrina. But

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[14] See for example Stephen Bocking. 1997. *Ecologists and Environmental Politics: A History of Contemporary Ecology*. New Haven: Yale University Press.

[15] Environmental tests also have social histories that are stripped away through processes of standardization. See Scott Frickel, *Chemical Consequences*, op. cit.

[16] Tulane environmental health scientist Maureen Lichtveld, quoted in Vann op. cit.

regardless, the comparison only works as long as we are prepared to accept the implicit assumption that the social history of urban contamination is largely irrelevant to risk assessment. Unlike L.A. and NYC – mega-cities with massive populations of people and automobiles – the lead in New Orleans does not come primarily from vehicles, but from pre-1970 paint that has protected and decorated its buildings for three hundred years. If the sources of lead differ, we should at least be asking whether variation in lead distribution patterns and population characteristics such as the age and spatial structure of poverty may differentially affect exposure to vulnerable groups. If we agree to assess risk in New Orleans the same way we assess risk in Los Angeles, it is because we also agree to forget about history.

In New Orleans, an old industrial city, the history of much of its contamination is buried, but not that deep. The soil structure is highly variable from place to place, as investigations of levee failures have shown. As a whole, however, local soils are relatively impermeable from below and can rapidly become saturated. Thus, chemical contaminants that leach into the top soil tend to remain near the surface.[17] This is significant in the context of a murky industrial past that has included not a little unregulated dumping (illegal or not). Somewhat less murky are the nearly three hundred proposed brownfield sites listed by the Mayor's Office of Environmental Affairs before the hurricane.[18] Some of these sites are known to be contaminated. The vast majority have not been tested, so it's impossible to tell one way or the other. At present there is no estimate of the number of new brownfields created by Katrina. Was environmental testing organized with this history in mind? Students in one of my classes are currently studying this question.

Conclusion

This essay points to how knowledge about contamination is organized to not produce comprehensive understanding. Tests will find only what they are designed to find. This is not a problem of design; it *is* the design. As enshrined in our current regulatory regime, testing ignores ecological complexity and social history – again, largely if not entirely by design. Environmental groups complain that federal and state agencies' testing efforts have fallen short of the mark and have asked for more testing and retesting. Given the reputation of the regional EPA office and the La. DEQ as administratively weak organizations, these groups are right to pressure government to do more. But we should be clear about what more testing will and won't achieve. In this instance, the obstacles to usable knowledge are deeply embedded in the machineries of knowledge production itself.

[17] George Flowers and Stephen Nelson, personal communication (February 22, 2006). Flowers and Nelson are geologists at Tulane University.

[18] Brownfields are abandoned industrial sites, some but not all of which may be contaminated.