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History of Love Canal and SUNY at Buffalo's Response: History, the University Role, and Health Research

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History of Love Canal and SUNY at Buffalo's Response: History, The University Role, and Health Research

A. Theodore Steegmann, Jr.*

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I. Introduction

This paper offers an overview of one of the most important environmental milestones in our history. Beyond the dramatic changes in the lives of Love Canal residents themselves, the events there marked the dawn of our awareness, as a nation, of environmental hazards, and led to major changes in governmental policies. I will present a brief history of the events, note the State University of New York at Buffalo's (UB) role in the crisis, and offer some observations on conducting science in an emergency atmosphere.

In preparation for this paper, I went back to Love Canal to take some pictures and to talk. Two people there, expressing their positions with eloquence and conviction, pretty well laid out the polar views of the situation. A guy in a truck said he had lived there all his adult life and lives there still—in one of the remaining occupied houses. He said neighborhoods around the dumpsite are not dangerous now and were not then. In short, he believed that a beautiful community was destroyed because everyone panicked. From a workman rebuilding a driveway in the area being resettled (Black Creek Village) came the opposite view. He said there are still chemicals in the ground, it is still dangerous here, and the idea of resettlement is the stupidest thing he ever heard. He had grown up east of the old dump in the LaSalle Housing area, now a grassy field. These statements also reflect positions held twenty years ago by residents, governmental representatives, chemical companies, health investigators, and attorneys.

II. A Capsule History of Events at Love Canal

Table 1¹ sketches some of the principal events before and during the Love Canal crisis.² In a ditch remaining from a failed

¹ See *infra* App. A for principal events of the Love Canal crisis.

² Full treatments appear in other works. See generally LOIS M. GIBBS, LOVE CANAL: THE STORY CONTINUES (1998) (author tells a detailed story of her experience as a resident of Love Canal); ADELIN G. LEVINE, LOVE CANAL:

hydroelectric enterprise, Hooker Chemical, the City of Niagara Falls, and possibly unknown others began dumping industrial wastes and refuse, starting in 1942 and ending in 1954. Some of the waste was toxic to humans and other vertebrates. Against legal advice from Hooker Chemical and from their own attorneys, the Niagara Falls School Board bought the now-capped dump site to construct the 99th Street School. A building was constructed at the very eastern edge of the filled ditch. Some of the land was sold to a sub-division developer and settlement around the site proceeded. By 1976 there were the first tremors of trouble to come, and due to complaints and press coverage, Calspan Corporation was hired to do an environmental assessment. Their report was disturbing, and by the spring of 1978, an Environmental Protection Agency (EPA) investigation detected toxins in the basements of “Ring 1” homes.³ New York State responded with some rapidity. On the recommendation of Health Commissioner Robert Whalen, a health emergency was declared for inner ring homes and evacuations soon began.

While all of that was relatively straightforward, the real struggle then started. Citizens in the “outer ring” of homes, those not immediately adjacent to the dumpsite, became alarmed that the toxins may be reaching out beyond the first two rings. Lois Gibbs and the Love Canal Homeowners Association ran a grassroots survey and were convinced that old stream courses (swales) were conducting toxins into the heart of their neighborhood. Their data, analyzed by health researcher Beverly Paigen, supported this, but the New York State Department of Health (NYS DOH) study in the same area did not. The State resisted further evacuation, unconvinced and fearful of the implied costs, but pressure from citizens and the press escalated.

SCIENCE, POLITICS, AND PEOPLE (1982) (discussing the obstacles faced by the residents of Love Canal and how they handled the crisis); ALLAN MAZUR, A HAZARDOUS INQUIRY: THE RASHOMON EFFECT AT LOVE CANAL (1998) (accounts of the Love Canal investigation examining the interplay of political, social and scientific issues).

³ Ring 1 homes were those with land abutting the old canal, on East 97th Street and West 99th Street. *See infra* App. C for map of the Love Canal site.

By the spring of 1980, an EPA study detected chromosomal damage among residents of the outer ring. Implications of the findings and mishandling of the situation led to an emotional and political firestorm that burned off the last agency resistance. After an agonizing delay in which further studies were started by Beverly Paigen and other groups, October finally saw a federal bill signed to fund home buyouts. As the immediate crisis spooled down, the Love Canal Revitalization Agency was formed to clean up the mess, but with an eye toward redevelopment of the area for residential and commercial use.

The area north of Colvin, called Black Creek Village,⁴ is now refurbished and reoccupied. Despite assurances from federal and state agencies, anxiety continues about the safety of raising families here. If the opposition is correct it will never be habitable, but many think it is safe enough now. The quality of information needed to make these judgments is still surrounded by uncertainty. Why that is so is in a tale in itself.

III. The University at Buffalo Responds to the Crisis

About fifteen miles southeast of Love Canal lies the State University of New York's main Buffalo campus, with our Medical School a little further in toward the city. As one of the great "Centers" of the State University of New York (SUNY) system, it seems reasonable that we should have "done something" to provide help during the crisis. Guidance and answers were what everyone wanted. Few of us then understood the complexities.

Outsiders, and many insiders, saw the university as a helpless or unhelpful giant. I talked to a distinguished senior professor, telling him that I was going to report on UB's role in Love Canal and I asked what he thought. He replied, "Well, that will take about one paragraph."⁵ That view was shared by an equally distinguished environ-

⁴ See *infra* App. C.

⁵ Interview by Paul McClennan with Lester Milbrath, Professor, State University of New York at Buffalo, Buffalo, NY. (Sept. 11, 1998).

mental journalist who had watched it all unfold in the late 1970s. He thought UB's role was not even worth the paragraph. Lois Gibbs, President of the Love Canal Homeowners Association, put it this way:

The health department wasn't the only less-than-helpful agency. Except from a few people working on their own—like Dr. Vincent Ebert, a geographer, Addie Levine, a sociologist, and Dr. Paigen—we didn't get any help from the State University (SUNY) at Buffalo either. We had many technical questions about the construction, the testing procedures and the ways chemicals could disperse through an area. The president of SUNY at Buffalo said he would set up a university task force. They were going to have a meeting of the steering committee, and he sent me a letter saying they were setting it up. But to this day, that's all they ever sent me.⁶

Did the University really do nothing? That depends on whether you see it as a top down corporate structure, or a neighborhood of scholars.

This is how the University responded from the top down: our administration established the Lee Panel in 1978, shortly after the crisis broke. Vice-President Albert Somit called George Lee, Dean of Engineering, to ask him to chair a committee on Love Canal. The committee membership was named by Dr. Somit. Professor Lee was told that the group was to act as a panel of experts. When questions came in about Love Canal, Dean Lee would direct them to the proper member for answers. However, the objective here was only to field questions, not to start research.⁷ The UB administration had been warned through the SUNY Chancellor's office to keep their hands out of the situation—the thinking apparently being that UB, as a state agency, could be sued. While this might sound to the neutral observer like a strange way to run a railroad, it does reflect the institutional culture of the time, the looming threat of legal action and one of the dysfunctional aspects of our relationship to the state. It is clear that

⁶ GIBBS, *supra* note 2, at 85.

⁷ George Lee, Professor, State University of New York at Buffalo, personal communication in Buffalo, NY, Sept. 10, 1998.

George Lee felt the chill of this constraint very strongly. The national political environment was pretty bad as well, and many of the faculty, who attended what was apparently the only general faculty meeting on Love Canal, came to express outrage rather than to offer expert help. This was also the post-Watergate, post-Vietnam era and universities were starting to suffer the anti-institutional backlash that is with us still. On the Niagara Frontier, the local press—in strong sympathy with the plight of those living at Love Canal—became very critical of this enormous and powerful university just standing by.

When the health crisis intensified at Love Canal in the spring of 1980, Medical School Dean John Naughton was asked by the Assistant Secretary of HEW in Washington, D. C. if UB would direct a health study of the population, even then in the process of evacuation. The understanding was that the Center for Disease Control (CDC) would provide a contract in support of equipment and personnel. By the summer of 1980, an amended directive arrived saying that UB, the CDC, and now the EPA were to put together a joint proposal. The CDC advanced some starter funds. Dean Naughton then assembled a team including many department chairs, all with strong credentials. He will have more to say on these events below.⁸ As things unfolded, there were too many cooks in the kitchen. State Health commissioner Harvey Axelrod thought UB should go ahead, but the CDC was favoring Columbia University as the main contractor, and proceeded to form its own advisory panel.⁹ However, by this time, the EPA chromosome study scare started, and the citizens became increasingly convinced that none of the scientists knew what they were doing, Beverly Paigen's group excepted. Scientists became convinced that it was almost impossible to work in a pressure cooker, and agency turf competition tied everyone's hands. As this went around and around, Ronald Reagan was elected President and effectively stopped federal health research on this issue.

⁸ See *infra* App. B.

⁹ John Naughton, Professor, State University of New York at Buffalo, personal communication in Buffalo, Aug. 11, 1998.

Even as events of 1978 emerged, three UB professors began playing roles in the crisis—Dr. Wayne Hadley (biology), Dr. Vincent Ebert (geography), and Dr. Adeline Gordon Levine (sociology). Another grass roots effort by Beverly Paigen (Roswell Park Cancer Institute) was in the same free enterprise mode. While the University did little to support these efforts, neither did it interfere with them. Professor Wayne Hadley became an advisor. Lois Gibbs and the Love Canal Homeowners Association, while not the only movement that had a powerful role in forcing government action, ultimately influenced the promotion of major environmental legislation. Hadley gave her critical guidance through the maze of political institutions and technical reports, especially early in the emergency when no one else would listen. His role is explained in the following quote from Lois Gibbs' book:

I went to my brother-in-law, Wayne Hadley, a biologist and, at the time, a professor at the State University of New York at Buffalo. He had worked on environmental problems and knew a lot about chemicals. I asked him to translate some of that jibber-jabber in the articles into English. I showed Wayne Mike Brown's [newspaper] articles listing the chemicals in the canal and what they were. I was really alarmed by his answer. Some of the chemicals, he said, can affect the nervous system. Just a little bit, even the amount that's in paint or gasoline, can kill brain cells. I still couldn't believe it, but if it were true, I wanted to get Michael out of that 99th Street School.¹⁰

The immediate outcome was that they would not transfer her son out of the school, and so fomented a rebellion. Wayne Hadley became a trusted advisor and guide through the strange maze this young housewife was about to enter. He was both technical expert

¹⁰ GIBBS, *supra* note 2, at 27.

and systems broker. Regardless of all of our official roles and duties, this may still be one of the most valuable things we can do.

As soon as the crisis emerged, Professor Vincent Ebert contacted Lois Gibbs. She was most concerned about the spread of toxins from the dumpsite to the neighborhoods beyond 99th Street, the so-called "outer ring." Working as a soils expert, he immediately started an on-site survey, supplemented by geological technical reports.¹¹ He found that while canal soils are relatively impermeable, cracks and sand layers allow potential migration of lechates. It was already known that the bedrock here dips southward, allowing migrating chemicals to reach the Niagara River. However, some of the surface water drains northward into Bergholtz Creek, and then west and south to the river. Dr. Ebert recognized that swales cross the original path of the canal and were filled with unconsolidated material, so leaving natural drainage conduits away from the canal. "Thus the basic setting of Love Canal can be likened to a leaky bathtub filled to the rim.... The overflow and ground seepage found its way into permeable soil layers, desiccation cracks of the [highly clay] soils, topographic depressions, and old swale channel."¹² As an unpaid volunteer, Professor Ebert contributed a lot, and early enough to have impact as testimony at Albany hearings in 1979. The second consequence of his effort was to be kicked off the site by the New York officials when it became clear that he intended to openly publish a report.

Professor Adeline Levine, during the same time period of 1978, had begun to gather field interviews and documents to record the evolution of the entire event. Her later book *Love Canal: Science, Politics and People*,¹³ has become a classic in the environmental literature. Professor Levine first heard of the Love Canal crisis on a newscast in August 1978 and visited the site just as Ring I was being vacated. She and her graduate research methods students took on the formidable

¹¹ Vincent Ebert, Professor, State University of New York at Buffalo, personal communication in Buffalo, NY, Sept. 3, 1998.

¹² Vincent Ebert, *Love Canal: An Environmental Disaster*, 10 TRANSITIONS 2, 6 (1980) (on file with the BUFFALO ENVTL L. J.).

¹³ LEVINE, *supra* note 2.

interviewing and recording task—eventually continuing for about 3 years of field work. What came out was an outstanding synthesis of the politics, emotion, science and drama of one of the key environmental crises in our history, all carefully documented. Not only does it consider a range of views, but it was also published in record time. A good bit of what I am presenting in this paper is due to her efforts, and of course, you will also hear from her directly a little later.

In the spring of 1979, UB's Environmental Studies Center sponsored a four part public forum on the Love Canal Crisis, in a teach-in type format. While it attracted a scatter of officials and environmentalists, it is not clear that it led to any specific actions.¹⁴

Finally, when the crisis was nearly over, in the summer of 1980, two other UB faculty members conducted research, both a part of Beverly Paigen's health study of children from the outer ring area, with control group comparisons. I supervised a growth study, in which we found shorter stature in the exposed children. And Professor Stephen Barron, a UB neurologist, did a nerve conduction study, finding a somewhat ambiguous, borderline exposure effect. So in the final phase, we began to get some better quality data. But arguments continued in the scientific community, and in the end, decisions were made on the fate of the community without clear guidance from the research, largely on political grounds. It may not have mattered whether the university responded strongly or not. While part of the reason for it being taken out of scientists' hands may have been due to the slow pace at which we produce information and the pressured environment, the scientific work itself bears a closer look.

IV. Scientific Work at Love Canal

Science here was a long way from the clinic and laboratory, with all of their securities. It was rough, fast field work at a low level toxic exposure site—a situation designed to promote borderline results and disagreements. Allan Mazur's 1998 book *A Hazardous*

¹⁴ Lester Milbrath, personal communication.

*Inquiry*¹⁵ offers this outsider's analysis. "The scientific study of Love Canal looks more like a prizefight than a search for truth. Some commentators on this and other technical controversies have given up the notion of objectivity regarding scientific expertise, as no different than any other resource that can be used to win political goals."¹⁶ Had Mazur been there, he would probably have seen not so much a prize fight, but rather a search for truth in the face of adversity. What we need to understand is that situations like this will never be business-as-usual investigations. Let's take a look at what happened.

New York Department of Health (NYS DOH) studies of June 1978 must be called "emergency epidemiology." The way things work, then and now, is that the NYS DOH has primary responsibility for protecting public health. In March 1978, the NYS DOH heard from the Department of Environmental Conservation (DEC) that basements of fourteen dwellings backing onto the canal proper show evidence of a number of dangerous organic compounds. The next month, Health Commissioner Robert Whalen visited Love Canal and was dismayed by smelly black ooze in the basements and surface waste near the 99th Street School. By June 1978, his investigators started a health study of inner ring residents, including a long questionnaire and blood sampling. Dr. Whalen also ordered cleanup of surface wastes and fencing of the canal site. Results of these studies were pretty rough and ambiguous, but they were all that the officials had. The inner ring group showed higher than expected numbers of birth defects, and there was a cluster of miscarriages on south 99th Street. Though there were no signs of elevated acute illnesses, this was enough for the NYS DOH on August 2 to order emergency relocation of Ring I residents.¹⁷ Critics found fault with this study on the following grounds:

¹⁵ MAZUR, *supra* note 2.

¹⁶ *Id.* at 92.

¹⁷ NEW YORK STATE DEPARTMENT OF HEALTH, LOVE CANAL: PUBLIC HEALTH TIME BOMB 27-32 (Sept. 1978). *See also* LEVINE, *supra* note 2, at 28-29; Mike Brown, *Evacuation of Kids Urged*, NIAGARA GAZETTE, Aug. 2, 1978, at 1 (references to Whalen's evacuation order).

1. There was no control group of unexposed people.
2. Blood testing was mismanaged and some of the samples were lost.
3. Family physicians were slow in providing requested records.
4. The questionnaire was long, dense and hard to understand.
5. And finally, reports were slow to appear and many were never published.¹⁸ It is not clear the extent to which results influenced the Commissioner's decision, but he had seen enough. The first evacuation was ordered.

NYS DOH studies in the fall of 1978 expanded to the outer ring of homes and by December of 1978, they concluded that there was no excess miscarriage rate beyond the first ring. While that was going on, Lois Gibbs came up with the swale hypothesis—that the illnesses and problems reported to her seem to cluster along former low, wet areas and stream beds, since filled in but recalled by older residents. Beverly Paigen begins working with Gibbs to help her analyze results of a survey taken by the homeowners themselves. Distrust of the NYS DOH was growing. Paigen's analysis shows clusters of kidney and bladder problems, elevated miscarriage rates, and other disorders. Although the NYS DOH was using a different set of swale maps, the two groups of investigators were in contact in an effort to rectify the disagreements. At the very least, the NYS DOH had finally been forced to listen to Paigen's conclusions. By January 1979, the new State Health Commissioner, David Axelrod, accepted the presence of fetal disorders in the "wet areas" (swales and ponds). In early February, he recommended removing pregnant women and young children from the outer ring, but not a complete evacuation. The idea of splitting up families this way caused extreme annoyance

¹⁸ LEVINE, *supra* note 2, at 87-89; MAZUR, *supra* note 2, at 164-66.

within the community. Later in the spring of 1979 Beverly Paigen testified before a congressional committee, reporting a miscarriage risk of 3.5 times normal in the wet areas, and other disorders at rates higher than those reported by NYS DOH.

Example:	<u>Birth Defects</u> ¹⁹	<u>Wet</u>	<u>Dry</u>
	DOH	12.5%	5.1%
	Paigen	20.0%	6.8%

Paigen explained these differences as a result of the NYS DOH insisting on physician verification of health problems. This made the NYS DOH values seem relatively low.

Paigen's high morbidity values were criticized as well. She recognized flaws in her own work:

1. Time and resources were in short supply
2. Her data collectors were not professionals;
3. Conditions were not verified medically; and
4. Interviewers and respondents may have over-reported.

Others criticized her as well, particularly for lack of objectivity

1. This was not a "double-blind"²⁰ research design.
2. Some residents knew the "swale theory" and where their houses were in reference to swales.
3. The analysis was exploratory, not deductive—a mistake that a "real epidemiologist" would not make.
4. The wet and dry areas were adjusted geographically to fit the data. Further, any wet

¹⁹ MAZUR, *supra* note 2, at 173.

²⁰ A double-blind study is a study in which neither interviewer nor respondent knows the hypothesis.

area was used, not just those draining away from the canal.

Those of you who know Beverly Paigen personally will recognize that the last accusation is nonsense, and the third implies that there is only one way to understand things. Nor is it clear how you run a double blind study design when everyone involved suspects what the problem is (toxin related health effects) and where the toxins came from. In fact, she conducted her studies with very modest financial support, and maintained a much lower cost/benefit ratio than did the state.

Later NYS DOH studies were done at the area where a swale exits, near the canal at 99th Street. They cut a trench down to the base of the old stream bed, striking water. However, it was not contaminated, nor were there differences found between other wet/dry areas.²¹ There was also concern that clusters may have been due to patterns of factors such as smoking or occupation.

Meanwhile, everyone seemed to have ignored one critical piece of research. Rowley and Christian began a study of field mice called meadow voles around Love Canal in 1979. To make a long story short, they could scarcely find any voles in the fields nearest the canal—a habitat where there should have flourished—and those that were trapped showed shorter lives, the toxin Lindane in their body tissues and the type of liver problems that flag chemical exposure.²² These studies, using control groups and standard protocols, are hard to fault.

The EPA Chromosome Study²³ caused consternation both in the community and among scientists. Eleven out of the thirty-six samples examined showed abnormalities, but the investigators could

²¹ MAZUR, *supra* note 2, at 180.

²² John J. Christian, *Love Canal's Unhealthy Voles*, 8 NAT. HIST. 8, 8-16 (1983).

²³ Dante Picciano, *Pilot Cytogenic Study of Residents Living near Love Canal: A Hazardous Waste Site*, MAMMALIAN CHROMOSOME NEWSLETTER No. 21, at 86-93 (1980).

not convert these findings into clinical advice. At that, the community finally lost its temper and seized two EPA field men as “hostages,” probably precipitating final solutions. A second study, by the CDC, finds no significant exposed/control differences in chromosomes, but reexaminations of the first study’s data generally support their accuracy.

By June 1980, Governor Hugh Carey was frustrated with conflicting scientific opinions and appointed a panel of experts to resolve disagreements. The panel, chaired by Lewis Thomas of Sloan Kettering Cancer Institute, drew these conclusions:

1. There were no acute health problems linked directly to exposure.
2. Chronic health problems are neither proven nor disproven—particularly cancers and reproductive disorders.
3. They found the EPA chromosome study to be “paradigm of administrative ineptitude.”
4. Barron’s nerve conduction study did more harm than good because of the small sample.
5. The Paigen studies were anecdotal, lacked controls and failed to get medical verification.
6. The NYS DOH managed to produce only suggestions instead of findings, sharing many of the supposed faults of Paigen’s work.

From this, Hooker Chemical published a pamphlet proclaiming that there were no health problems at Love Canal. Mazur’s evaluation of this report is that it:

1. was arrogant to a fault;
2. failed to include key data and did not really cite evidence; and

3. mostly managed to increase antagonisms and damage reputations.²⁴

In short, the Thomas panel made many of the same types of mistakes it had accused the investigators of, and in fact did not do what the Governor had asked it to do—resolve disputes. My own view is that this panel was not qualified to evaluate field studies, distinguished though they may have been in other areas. I reviewed literature on twenty-six toxic waste sites published between 1980 and 1990. Of the eighty-eight authors on all of these reports, not a single one was found on the Thomas panel. It is not clear that any of them had done community studies. They seemed too quick to condemn, given the complexity of the situation, and I suspect that if any of these panelists had had family members living at Love Canal, they would have urged them to move, shaky though the evidence may have been. It is clear to any objective observer that attacks like these and other state actions ultimately led Beverly Paigen and her husband (also a distinguished scientist) to leave this area—surely the kind of losses that are not helpful to us. The state had killed the messenger.

The final round of studies began in 1980 as the NYS DOH conducted further research on the outer ring group. By 1981, they concluded that health problems here were pretty much what they were anywhere. However, they confirmed elevated low birth weight figures and more miscarriages in wet areas. When they finally did a cohort analysis, it appeared that most of the low birth weight cases occurred early in the community's history while toxins were still being dumped into the ditch.²⁵ Careful consideration of the history of toxic waste sites is now emerging as a critical research strategy.

Beverly Paigen also begins a second round of studies on children of outer ring homeowners as well as renters, both compared to nearby control groups. Since children are more vulnerable to toxins than adults, this represented a critical and insightful change in tactics.

²⁴ MAZUR, *supra* note 2, at 184-86.

²⁵ Nicholas J. Vianna & Adele K. Polan, *Incidence of Low Birth Weight Among Love Canal Residence*, 226 SCI. 1217, 1218-19 (1984).

Her results had some agreements with those of the NYS DOH, but we also found stature retardation (something not influenced by reporting bias, and the anthropometrists did not know who was from what area). Generally, wet/dry health distinctions persisted despite efforts to discredit them.²⁶

What many of the critics fail to recognize is that when a crisis like that at Love Canal emerges, residents tend to become polarized. Some are convinced their health problems have been induced by toxins, and may over-report symptoms. However, based on our recent research in Niagara County, there may be as many who deny health threats from the environment and may under-report. This tends to increase the variance in reported conditions, but does not clearly intrude a directional bias. This is a substantial problem that needs serious investigation.

V. Scientific Conclusions

1. Fetal damage has been observed among those most likely to have been exposed.²⁷
2. Growth retardation is hard to refute. While it may not be a problem in itself, it is a sign of toxin exposure, and is as current as the children's ages.
3. Those in wet areas showed more health and other problems than those in dry or control areas, though the differences were not great.
4. We ignore the vole evidence at our peril. Living on the very earth of Love Canal itself, these little field creatures had shortened lives,

²⁶ Beverly Paigen et al., *Prevalence of Health Problems in Children Living Near Love Canal*, 2 HAZARDOUS WASTE & HAZARDOUS MATERIALS 23, 23 (1985); Beverly Paigen et al., *Growth of Children Living Near the Hazardous Waste Site, Love Canal*, 59 HUM. BIOLOGY 489, 500 (1987).

²⁷ However, this may have been more of a problem early in the history of the community rather than later.

and the types of liver problems due to one of the compounds found there—dioxin. The children played in that same earth near the 99th Street School.

VI. What Love Canal Has Taught Us

A. Lessons for the scientific community are as follows:

1. Be prepared. If you get a call for help tomorrow, what exactly will you do?
2. Go to the community. Talk to people, and make yourself listen.
3. Be constructive in your criticisms of colleagues' work. Be sure you do not confuse laboratory or clinical settings with field data gathering. Recognize that you may be defensive.
4. Science is the art of the possible. If you have only 500 households in your sample, deal with it. If your tools do not match the task, make new tools.
5. Use parsimony. Trust the voles. Multidisciplinary work is more likely to resolve ambiguity than specialized effort.

B. Universities also have something to learn:

1. Top down research is less likely to work than that originating in the researcher's head.
2. A little seed money goes a long way, but don't require a 20 page grant application to get it.
3. Advanced, multidisciplinary training in environmental assessment is no longer an option.
4. Political constraint on research is an exceptionally bad practice.

C. Finally, here are some thoughts for the policy field:

1. Science had an effect at Love Canal through committee testimony, public meetings and the press. Journal publication is too slow in a crisis.
2. Turf defense issues pushed government agencies responsible for public welfare into conflict. Someone needs authority to coordinate government agency efforts.
3. Secrecy is a bad idea.
4. Self interest distorts everything.

VII. Conclusion

We learned a lot trying to manage the crisis at Love Canal. We just need to heed the lessons. Most of the studies did not disagree as much as many of the players tried to assert if we accommodate for some methodological differences. There truly is more than one way to understand things, and we need to adhere to all, not to one.

Appendix A**Table 1. Love Canal: Key Events**

1. 1942-1954: Toxic wastes dumped
LaSalle Housing built (west of the dump)
2. 1953-1955: School Board buys the dump site
99th Street School built
Neighborhood development
(north and east of the dump)
3. 1976-1977: Citizens complain
Press coverage begins
Calspan study
4. Spring 1978: EPA finds Ring I toxins
Health Commissioner visits the site
Citizen action group forms
5. Summer 1978: NYS DOH preliminary study
August 2, health emergency declared for
Ring I households
6. Fall 1978: NYS DOH health survey, Outer Ring
Gibbs/Paigen study starts
Swale theory conceived by Gibbs

7. 1979: Partial evacuation, Outer Ring
ABC's "The Killing Ground" airs on
national television
NYS DOH resists full evacuation
8. 1980: EPA chromosome study
Paigen begins canal/control study
October, President Carter signs
Senator Javits' home buyout bill
Love Canal Revitalization Agency formed
9. 1981/2: EPA re-tests, finds Inner Ring, storm sewer
toxins
US Health Dept says Outer Ring toxins are not
at significantly higher levels than in
surrounding areas, but study is criticized
10. 1988: NYS DOH re-tests, finds North & West areas
"suitable for residential use"
11. 1990: "Black Creek Village" (North of Colvin)
approved for reoccupation

Appendix B**Table 2. University at Buffalo faculty members
who served on the U.B. Task Force on Love Canal
(The Naughton Panel), 1980.**

John Naughton (Medicine), Organizer

Robin Bannerman (Medicine, Genetics)

Edward Carr (Pharmacology)

Max Chilcote (Erie County Laboratories)

John Edwards (Medicine, Genetics)

Elliot Ellis (Pediatrics)

Diane Jacobs (Pediatrics)

Robert Kloke (Pharmacology)

Adeline Levine (Sociology)

Ross Markello (Anesthesiology)

James Nolan (Medicine)

A. Theodore Steegmann, Jr. (Anthropology)

Harry Sultz (Social & Preventive Medicine)

John Vena (Social & Preventive Medicine)

Appendix C

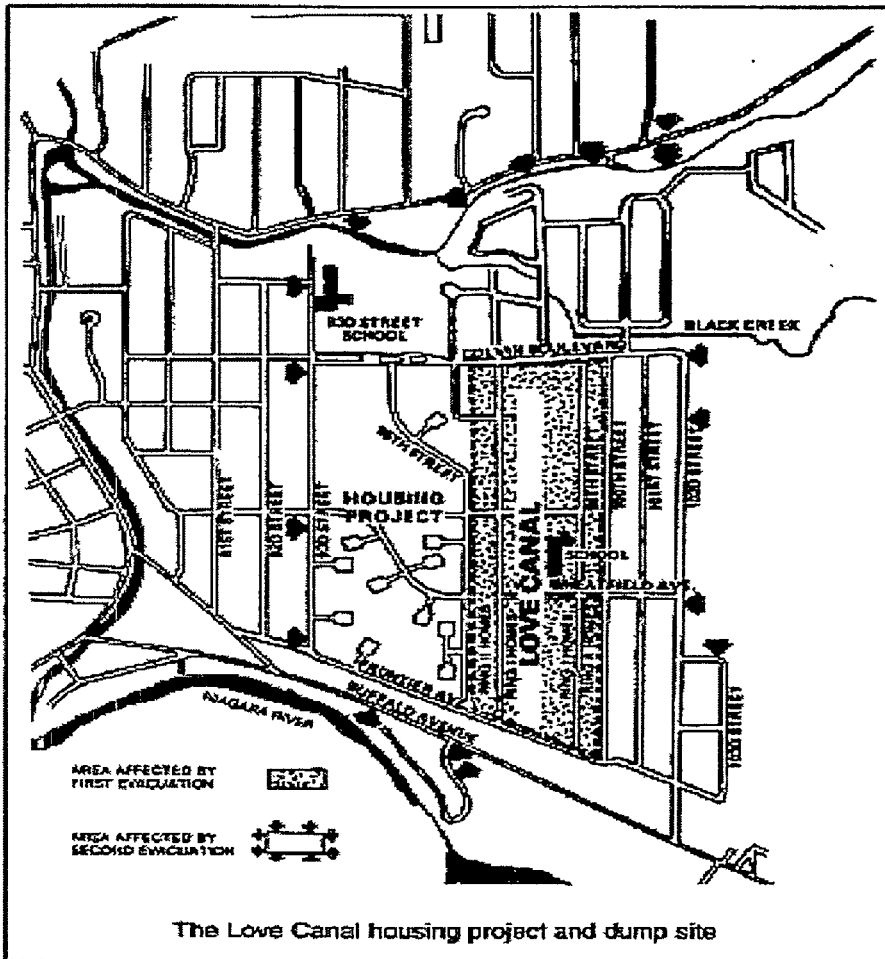


Figure 1. This map shows the geography around Love Canal during the environmental crisis of 1978 to 1980.²⁸

²⁸ GIBBS, *supra* note 2, at 18.