

FLOATING POINT: A CREATIVE VISUALIZATION OF WATER QUALITY

Project concept and goals • Tiffany Holmes • September 2004

One summer when I was eight, my mother looked at the sky, grabbed my brother and I by the hand and ran to the Boston whaler motorboat docked nearby. She fired up the small engine and within minutes we sped out of Solitude Creek headed for the open waters of the Choptank River. Behind us, I could see a small crop dusting plane ducking low to spray the nearby soybean crops in the farm adjacent to our property.

My mother's panic that day resulted from her reading a fellow Marylander's text---a book that changed the world and created what we know today as the environmental movement. The bestselling *Silent Spring* caused a public outcry when it was first published in 1962. Its author, Rachel Carson had made a radical proposal: because scientific advancements sometimes interfere with natural processes, we must regulate or prohibit the use of such technologies. Carson's writing about the cataclysmic effects of pesticides on wildlife resulted in the banning of DDT, further scrutiny of farm petrochemicals, and the creation of the US Environmental Protection Agency.

Carson was an interdisciplinary scholar. Though she identified herself as a writer first, she was an accomplished scientist as well, gaining a master's degree in zoology at Johns Hopkins in 1929. Her skills as a journalist allowed her to bring crucial scientific research to the forefront of the public imagination. Science desperately needs such "crossover" people to celebrate, publicize, and make understandable the current purview of state-of-the-art research. Carson knew the book would be attacked by the chemical industry and thus included 55 pages of endnotes and a list of experts who had read and approved the manuscript. Her research, while written for a layperson's audience was up-to-date and thorough. Carson's environmental concerns still resonate today though genetically engineered pesticides, as opposed to DDT, command our attention.

I seek to emulate Carson's role as a catalytic agent to disseminate the results of current scientific research in works created for an everyday audience: art installations, media performances, as well as articles and papers. Carson had one foot in the laboratory and one foot in the TV studio. She understood the need to write in a creative, galvanizing manner to get people involved in the issues at hand.

Using Carson as a model, I plan to take on a research project that will factually and critically address the current state of the world's water supply. While on fellowship tenure, I will confront the following questions. What happens when the world no longer has enough freshwater? If the water looks clean, how can you tell if it's safe from contamination? What kinds of visualization models are there for imaging an urban watershed? What is the best way to showcase the research findings related to these questions to the public? Can performance art, internet art, or some other visual phenomenon serve as a conduit to transmit such important information to a diverse urban audience?

To begin answering these questions, I will focus initially on establishing a research context in my local community. Currently, I reside in Chicago, Illinois. Lake Michigan supplies much of the drinking water for the city. However, the lake water is subject to pollution of all varieties: groundwater and aquifer contamination, wastewater treatment, agricultural and storm runoff, and pollution from recreational boating. The city of Chicago has recognized the need to reach out to the public to communicate issues related to lake water quality—in September of 2004 Mayor Daley launched a massive program to combat stormwater runoff. In my dissertation, I plan to examine and critique the success of such public outreach efforts as well as implement and test outreach activities of my own design.

An example of an outreach activity would be a live water quality "performance" in a public space along the Chicago river---a popular place for city residents to walk. Currently, I am developing a computer interface that visualizes numeric data pertaining to water quality in a variety of real time animations. In my 2004 research residency at the Swiss Federal Institute of Technology (ETH), I designed a floatation device that houses five sensors that measure key parameters correlated to water quality: temperature, dissolved oxygen, pH, turbidity, and conductivity. The floating mass of sensors are connected to a laptop that reads the data transmitted in real time. In a large digital projection, riverside walkers see an instant picture of the amount of oxygen available for aquatic life forms.

But what is this picture? How does it communicate the data? Visualization models in science process enormous amounts of information to help researchers identify patterns in our bodies or in the environment. Data visualization techniques range from simple pie charts or x-y scatter plots to colorful contour plots and 3-D images that can be organized and viewed with various orientations and color schemes. The research focus here is to create a visualization model to be applied to a regional site---the Chicago River---to publicly transmit information about local water quality. The animation here will be a different sort of data visualization in that the researcher will use the tools and techniques of scientists to create a visualization readily accessible to the layperson. Again, one of the goals of the proposed dissertation is to educate and interest the public to current directions in scientific research and data management as well as heighten awareness of local water quality issues.

This research proposal presents many challenges. One of the obstacles is to present current chemical standards for healthy drinking water while acknowledging that these statistics change frequently. For example, experts disagree currently on what are acceptable levels of arsenic in drinking water. International studies have linked long-term exposure to arsenic in drinking water to cancer of the bladder, lungs, skin, and kidney. While lobbyists helped to secure the 10-parts-per-billion standard in 2001, critics argued that an even tougher standard of 3 parts per billion should be implemented. A second set of challenges relates to the design of the data visualization component. I must develop a computer interface that effectively communicates scientific data to a non-scientific audience without "over-simplifying" the information. Another challenge is to determine which sorts of evaluation tools will work best to

assess the effectiveness of the interface to communicate the water quality data.

My previous research experiences designing human-computer interfaces will aid my efforts in facing the second set of challenges posed by the research. In my installations, I create interfaces that require viewers to imagine data in motion—this work relates to my current interests in the creative visualization of water quality. For example, in the interactive installation, *Follow the Mouse* (2001), I replace a traditional input device with its namesake, a live mouse. The rodent's movement in the cage creates real time drawings on the computer monitor. In *Mazed* (2001-02), a piece commissioned for the J. Paul Getty Research Institute, the viewer walks through a museum exhibition, then discovers oneself in an animation composed live using images from surveillance cameras. According to art historian Barbara Stafford, "Holmes's splintering maze reminds us of the process; that the beholder is always mapped into the instrument and always leaves traces in the system."^[1]

We as a society continuously leave traces, sometimes undesirable traces in the natural systems we depend on for life. Carson asked a seemingly simple question in her groundbreaking book, *Silent Spring*: Are pesticides dangerous or aren't they? In my proposed research, I am trying to ask a similar sort of question: Is our local drinking water safe or isn't it? This year, the EPA failed to crack down on Washington DC's Water and Sewer Authority even after studies dating back to 2003 found significant lead contamination in roughly two-thirds of tested district homes. Lead levels well below federal standards have been shown to cause large IQ drops in small children. Why can't we get the lead out of the water? Why can you drink tap water in Chicago and Minneapolis and not our nation's capital? It is precisely these sorts of murky questions that I propose to investigate and clarify through the ongoing research I plan to conduct over the next several years.

[1] Barbara Stafford and Frances Terpak, *Devices of Wonder: From the World in a Box to Images on a Screen* (Los Angeles: Getty Research Institute, 2001), 114