



## Ruth Patrick: A Pioneering Environmental Biologist

John Cairns, *Virginia Tech*

Ruth Patrick was nearly 106 when she died on 23 September 2013.

During her childhood, Ruth's father, Frank Patrick, took her on field trips to collect organisms to examine under a microscope at home. She told me that she remembered sitting on her father's knee so she was tall enough to look through a microscope. The result for her was a life-long interest in nature in general and in diatoms in particular.

In early 1948, Dr. Hart, a pharmacologist at Atlantic Refining in Philadelphia, heard Ruth present a talk on the sensitivity of freshwater diatoms to environmental conditions. She emphasized in the presentation that diatoms respond to aggregate environmental conditions and offer an opportunity to detect and monitor aggregate stressors in aquatic ecosystems. Hart suggested a team of specialists, including a water chemist and a bacteriologist, be assembled who was knowledgeable in all major components of the food chain. Funding was acquired from the Commonwealth of Pennsylvania, and two teams were assembled for such studies in the summer of 1948. The major study area was the Conestoga Creek near Lancaster, Pennsylvania, and a smaller study was carried out on the Brandywine Creek, also in Pennsylvania. I had the good fortune to be the protozoologist on one of the teams and to be appointed later to serve on the permanent survey team Ruth formed at the Academy of Natural Sciences. Each of us knew we were doing something quite different, and every participant was changed forever as a result of this experience. At present, the rest of the academic world is still catching up to Ruth's creative approach.

These river surveys provided a baseline of ecological conditions before actual waste discharges began. Not until the newly founded Limnology Department at the Academy carried out such a survey on the Guadalupe River for the E. I. DuPont plant near Victoria, Texas, did I realize how extensively Ruth had reframed her professional worldview. In addition to identification and description of diatoms, her new frame included: industrial waste discharges, studies of entire aquatic communities, interactions with waste treatment engineers (then called sanitary engineers), explanation of survey benefits to non-biologists, much more attention from the news media in her new role, invitations to present talks at waste treatment and pollution conferences (an uncommon experience for a museum curator), involvement in political discussions and much alteration in her previous lifestyle.

When I accompanied Ruth to industrial meetings, we often met with chief executive officers. These industry heads were always male and were very interested in seeing and talking with a woman who worked near sewage and industrial waste discharge pipes. During these occasions, I saw their curiosity change to respect and then admiration when these men realized that Ruth was a first-rate scientist with all the necessary management skills to supervise a team of scientists and to analyze a series of complex issues. I also learned that one could overcome formidable obstacles if one had enough energy, commitment, and, above all, creativity.

Determining what happens when a potential pollutant is discharged into an aquatic ecosystem, is an "after-the-fact" strategy. However, toxicity testing of the material before it is discharged provides predictive information. Fortunately, Dr. Hart, the pharmacologist, gave me his pioneering monograph on toxicity testing with bluegill sunfish, as well as the equipment used to follow the procedures in the monograph. His advice was priceless. This exchange was all completed at Ruth's request and with her approval. She also developed a superb bioassay using diatoms as the test organism. Since

easily determining whether an individual diatom is alive or dead is difficult, she used reproductive rate as a bioassay endpoint.

Ruth also carried out notable research on the colonization of diatoms on artificial substrates suspended in rivers on a device she developed and named the “diatometer,” which provided a useful link between laboratory and field studies.

I viewed Ruth as a scientist from whom I could learn much and who was launching a very exciting research project. She never asked anyone to work longer hours than she did herself. In addition to supervising two field teams during summer 1948, she also collected and identified diatoms. She worked long hours at what could be very tiring activities—this type of research involved rather arduous field work on occasions and was combined with attention to minute detail once one returned to the laboratory.

My recollection of field work with Ruth is still vivid. When she and others on the team were tired, the coffee was cold and some of the sandwiches were soaked in water at the bottom of the boat, she still wanted to collect “just one more sample.” That night, everyone worked on samples. This attention to detail, to me, is the essence of scientific investigation—have confidence that the data base is adequate and relevant.

I was fortunate to be present during Ruth’s transition from a diatom taxonomist to a research investigator of the effects of pollution upon freshwater aquatic communities. I worked for her from 1948 until 1966, when I left the Limnology Department for university life. In addition, she almost certainly saved my life when I got appendicitis on a survey of the upper Amazon River by getting me prompt medical help.

Ruth clearly anticipated the worsening of the environmental situation and contributed greatly to the concept of “use without abuse” of natural systems concept (now called sustainable use of the planet). She has won such a great number of honors and awards that listing them would require pages of type. However, one designation that may be unknown to many was given to her when the river survey team was first formed—newspapers referred to her as the “youthful, freckled-faced leader.”

Author’s contact information: [jcairns@vt.edu](mailto:jcairns@vt.edu)