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Fifty Years Ago: The Development of Thermal Ecology at the Savannah River Ecology Laboratory

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The recent passing of Rebecca (Becky) Sharitz in October 2018 prompts reflections on how the national laboratories created after the Second World War provided opportunities for the growth of ecology and the emergence of new fields of ecological research. Sharitz was Senior Research Ecologist at the University of Georgia's Savannah River Ecological Laboratory (SREL), and Professor Emerita in the Department of Plant Biology at the University of Georgia. Along with Michael H. Smith and Eugene P. Odum, she wrote a history of SREL for a book edited by Gary W. Barrett and Terry L. Barrett, *Holistic Science: The Evolution of the Georgia Institute of Ecology, 1940-2000*. Although the book's purpose was to celebrate the Institute of Ecology at the University of Georgia, chapters also explore how ecology developed at cooperating institutions and satellite laboratories like SREL. The chapter by Smith, Odum, and Sharitz has an interesting discussion of SREL's role in the development of the new field of "thermal ecology" starting in 1969.

SREL had been founded early in the 1950s at the Atomic Energy Commission's Savannah River Plant (later Savannah River Site), along the Savannah River in South Carolina. The Atomic Energy Commission (AEC), the precursor to the Department of Energy, operated all the national laboratories until 1974. The laboratories then came under the jurisdiction of the Energy Research and Development Administration, and eventually of the Department of Energy, created in 1977.

In the 1950s, the Savannah River Site (SRS) was developed as a plutonium producing facility for the country's nuclear bomb program. Biologists at the AEC believed it would be valuable to have ecological baseline studies done prior to this development. Faculty from the University of South Carolina and University of Georgia were interested, especially Eugene Odum at Georgia, who saw the potential for creating an environmental research park on the site. He submitted an ambitious proposal for a large scale project that included a team from Emory University, but it was rejected as too expensive. Instead, in 1951 the AEC announced it would provide modest grants of about \$10,000 to universities for ecological studies. While some faculty lost interest because of the small size of the grants, Odum did not, and submitted a smaller proposal, which was accepted. He used the funds to hire graduate students for a project centered on the study of old-field succession. An innovative aspect of this study was its focus on the roles of

both plant and animal communities in succession. The Savannah River Ecology Laboratory that Odum started cemented the relationship between SRS and the University of Georgia. As discussed by Smith, Odum, and Sharitz, it was a model for a cooperative scientific partnership between the federal government and a university.

While scientists from the Universities of Georgia and South Carolina focused on terrestrial ecology at the site, the Du Pont Company, the site's main contractor, provided funding for study of the Savannah River. Ruth Patrick, from the Academy of Natural Sciences in Philadelphia, received Du Pont funding to survey species in the river; this project developed into a long-term ecological monitoring and research program. By the time that Becky Sharitz arrived at SREL as a Research Associate in 1972, terrestrial and aquatic ecological research had been underway for two decades.

Sharitz's arrival at SREL coincided with a new research program on the effects of thermal discharges on aquatic ecosystems. Water was needed to cool the nuclear reactors at the site, and the hot water was discharged directly into streams and reservoirs. The AEC had been conducting research on thermal stress since the 1950s, at its Hanford nuclear facility on the Columbia River as well as at the Savannah River Site. However, such studies used classified information on water temperatures, and therefore could not be published. The University of Georgia faculty working at SREL tended to avoid topics involving classified data, fearing that contributing only to government documents would jeopardize their chances of promotion and tenure. But satellite infrared photography led to the declassification of water temperature data, and gave the ecologists at SREL the opportunity to develop this area of research.

A research program on "thermal ecology" started at SREL in 1969, and J. Whitfield (Whit) Gibbons, herpetologist and ecologist who came to SREL as a postdoctoral fellow in 1968-69, published the first paper from the program in 1970. SREL was well suited to studies of thermal stress. The hot water from reactors was being discharged into a diverse set of habitats, including reservoirs, natural streams, and river floodplain swamps, producing a thermal spectrum ranging from lethal to normal, across a variety of moving and still-water environments. The essay by Smith, Odum, and Sharitz described it as a "unique outdoor laboratory for thermal ecology unparalleled in the United States" (p. 113).

After Sharitz joined SREL, she and Gibbons organized the first scientific symposium on thermal ecology. It was sponsored jointly by SREL, the Du Pont Company Savannah River Laboratory, and the Atomic Energy Commission, and was published in 1974. Ruth Patrick presented a paper at the symposium, as did Howard T. Odum, who had been studying the thermal impact of a power plant at Crystal River, Florida. Dixy Lee Ray, marine biologist and Chair of the Atomic Energy Commission, noted in her preface to the volume that the challenge of meeting the nation's energy needs and deciding where to locate new power plants made studies of thermal stress increasingly important. "It is the task of ecologists and scientists to influence the early part of the decision-making process by pointing out the environmental choices which are acceptable and those which are unacceptable," she wrote.

As the research program at SREL expanded, a second thermal ecology symposium was organized in 1975. Soon ecologists were also looking at the synergistic effects of temperature changes and other environmental contaminants, and the program evolved into the Aquatic Stress Program. Although research on thermal ecology declined in the 1980s, Smith, Odum, and Sharitz credited the research program in

thermal ecology with helping to establish SREL as an ecological research leader in its own right, and not just as a satellite of the University of Georgia's Institute of Ecology.

The illuminating essay by Smith, Odum, and Sharitz also underscores the value of historical writing and reflection by scientists, who can provide insider knowledge that is not in published records or even archival sources. Essays by ecologists that reflect on their careers, growth of institutions, and the development of ecological research programs are of much value to future historians. For those who may not wish to write historical essays, the Historical Records Committee encourages you to consider doing an oral history, perhaps with a trained interviewer or a historian of science. Ecologists who are contemplating donating their papers (which might include correspondence, notebooks, teaching materials, photographs, and other records of a lifetime) to a local archive might consider doing an oral history with a trained interviewer, as part of an archival collection. The oral histories done by our committee, which focus on people who have contributed to the Ecological Society of America, become part of the Ecological Society of America's archives at the University of Georgia.

References

Gibbons, J. Whitfield, and Rebecca R. Sharitz, eds. 1974. *Thermal Ecology: Proceedings of a symposium held at Augusta, Georgia, May 3-5, 1973*. U.S. Atomic Energy Commission, Technical Information Center, Oak Ridge, Tennessee.

Smith, Michael H., Eugene P. Odum, and Rebecca R. Sharitz, 2001. Savannah River Ecology Laboratory: a model for a cooperative partnership between a university and the federal government. Pp 95-127 in G. W. Barrett and T. L. Barrett, eds., *Holistic Science: The Evolution of the Georgia Institute of Ecology (1940-2000)*, Taylor & Francis, New York.

Archival sources relevant to this subject include the Eugene P. Odum papers, Hargrett Rare Book and Manuscript Library, University of Georgia; Howard T. Odum papers at the University of Florida, Gainesville; The Ruth M. Patrick papers at the Academy of Natural Sciences, Philadelphia. The Savannah River Site History Project, a cooperative project between the Department of Energy and New South Associates, has produced a history on CD-ROM, *Savannah River Site at Fifty*, by Mary Beth Reed, Mark Swanson, Steve Gaither, J. W. Joseph, and William Henry. The table of contents and access to chapters can be found at:

<https://www.srs.gov/general/about/50anniv/CONTENTS.pdf>