Alfred Clarence Redfield
1890–1983
President of the Ecological Society
of America—1946

G. E. Hutchinson, May 10, 1983. "I have great admiration and very warm feeling for Alfred Redfield."

Thomas Park, May 28, 1983. "I like him and admired him."

George M. Woodwell, June 2, 1983. "He was certainly the most distinguished scientist of our community in Woods Hole. Whatever topic we take up in our pursuit of ecology, we are always pleased to find the tracks of Dr. Redfield leading out ahead."

It is impossible to do justice to any man's life in a few pages of print. This would be the case for the least productive, least outstanding man, and Redfield did not fall in those categories. Scientist, scholar, philosopher, naturalist, active citizen, teacher, administrator; there might well now be no Ecological Society of America if it had not been for him.

In recent years there has been a tendency for professionals to describe themselves as "ecologists" rather than as "naturalists." The new term—essentially a twentieth century term—includes what of old we called "botanists" as well as "naturalists," who were essentially zoologists. Not many people then were, or now are, thoroughly competent in both plant and animal ecology, but Redfield came close to it. In later years he confessed to an interest in biochemistry, geology, geophysics, physiology, limnology, and some other subjects, and in no case was it a merely amateurish interest. Ketchum (1965) gives a bibliography of some 94 titles, from which some idea of Redfield's broad interests may be gleaned.

Redfield was born in Philadelphia, but soon after the family moved to Wayne, Pennsylvania, on the Main Line. Redfield did not remember when he first began to wander in the outdoors; nature was part of his earliest recollection. When he reached his teens arrangements were made to send him to Haverford School. He seems to have been very serious-minded in those school days. It was here that a combination of his experience with Main Line Quakerdom, his mother's consuming Episcopalianism, and the Darwinian issue set his lifelong suspicion of organized religion. In college he discovered fun.

Redfield finished Haverford School in 1909, took his first college year at Haverford College, but then was encouraged by his naturalist associates to go up to Harvard to work with Professor George Parker, which he did in 1911. Harvard at that time was still a gentleman's school and Redfield took advantage of this by supporting himself in part by tutoring. This turned out to be a significant experience for him, and set his own direction as a teacher.

A special academic experience at Harvard was a course taken by accident because of a schedule conflict. This turned out to be a class in Geomorphology taught by William Morris Davis, which later proved influential in sharpening Redfield's awareness of coastal and Pleistocene geology and of process in landforms.

Redfield graduated with a Bachelor of Science (1914), a diminished degree because he did not have Latin. He was elected to Phi Beta Kappa. He immediately began work toward the Ph.D., which he completed in 1917. In those days instead of an agonizing search for a dissertation topic, one was assigned a project. Dr. Parker reached in a file and pulled out an assignment involving the reaction of the horned toad to adrenaline in connection

with its coloration. Redfield would recount a story of going to a Kosher butcher shop to excise adrenal glands from steers and of hacking away, getting bloody and flustered, without locating them. It turned out the butcher routinely sold the glands for medical use. They were already gone.

In the 1930's, the first decade of its existence, the Woods Hole Oceanographic Institution was an informal place. During this time Redfield became Chairman of Biology at Harvard. This was a difficult time because the Depression was requiring painful cuts and there was pressure to fire young faculty. Redfield did not take the stresses of academic battles easily, so it was a relief when, in 1933, he had reason to work at Woods Hole the year round. He retained his faculty position at the Harvard Medical School, but never returned to work in Cambridge. He left behind a good harvest of his "young men," the graduate students he taught to write clearly and think precisely.

In Redfield's Harvard years he was becoming interested in the ecological persepective. He proposed to the dean, "Shouldn't we institute a course in ecology?" "No-o-o," was the reply, according to Redfield's story, "Let's leave that to the, ah, midwestern colleges."

One of the satisfactions of living as a year-round resident in Woods Hole was that of participating in local government and conservation activities. Redfield served for many years as a conservation commissioner and was especially proud of his accomplishments there.

Redfield's involvement with the Ecological Society of America has been discussed by both Ketchum (1965) and Odum (1966). I add here a few explanatory notes and an account of how he helped salvage the bankrupt Society.

In 1947 William Dreyer was secretary of the Society, over which Aldo Leopold was presiding from his deathbed. The Society was small, had not grown appreciably for twenty years, and operated in the red. Every year Duke University, through (and no doubt at the instigation of) A. S. Pearce, made up the deficit. It looked as though the Society might not last much longer. Leopold, probably at the suggestion of Dreyer, appointed a Finance Committee to see what could be done. Redfield was chairman. Henry Oosting of Duke, business manager of the Society, and I were the other two members. Redfield was of the opinion that it was essential to raise the dues. I was convinced that the fundamental difficulty was that the Society was too small; the membership must be increased. I think Redfield and G. Evelyn Hutchinson of Yale brought the limnologists into the Society, which then appointed Herbert Hansen chairman of a committee of two to increase the membership further. Redfield and Hansen were phenomenally successful. The growth of membership from about 1948 onward is spectacularly graphed in Burgess' (1977) outline history of the Ecological Society, and it has kept growing. Redfield insisted, rightly, that the dues be increased a little, and the two moves resulted in a viable Society.

In World War II, Redfield and Bigelow were running a variety of research projects for the United States Navy, in Woods Hole. Redfield's work, or some of it, was declassified after the war, and the *New York Times* for 8 June 1946 mentions a patent issued to Redfield and Vine (U.S. Patent 2,401,583) for a method of eliminating the track of foam left by a ship, a track that is more visible from the air than the ship itself. This work on the foam-track is not strictly in the field of ecology, but rather in the field of physics or physical chemistry, and indicates the breadth of Redfield's scientific and technological grasp. To this day, the ratio of the quantity of nutrient elements in oceanic waters is commonly referred to as the Redfield ratio. The *New York Times* for 24 April 1956 mentions that Redfield had been awarded the Alexander Agassiz medal for his work in oceanography.

Ketchum (1965) reports that Redfield retired in 1957, but this permitted him to intensify his work on the salt marshes of the American East Coast, and especially the great salt marsh at Barnstable, on Cape Cod. Apparently he had been interested in this since boyhood, and in 1972 he summarized his findings in one of his last major papers, "Development of a New England Salt Marsh." When I wrote to congratulate him on this work, he replied that he was beginning to have trouble with his legs when scrambling around in those slippery environments; he was 81 years old. This limitation was no doubt exasperating to him, for his mind was still intensely alert.

The last time I met him, in 1980 at Woods Hole, he was already bedfast, and I think he remained so until his death three years later. This is a long time to be so restricted, but his

wife, a remarkable woman, though herself rather deaf and thereby limited, took exceptional care of him.

For some years Redfield was a member of the Cosmos Club of Washington, D.C., the premier scientific club of the world, I suppose, and he was admitted as an oceanographer, which is appropriate, since his sponsor was Roger Revelle, also an outstanding oceanographer. Redfield resigned in 1963; he was not enamored of big cities or the seats of the mighty. But though it is unusual for a man to be both a botanist and a zoologist, it is still more unusual for a man to be both a physicist and a biologist, and Redfield was both. It was hard to find a field where he did not have a surprising competence. He was also an ardent conservationist. A fine laboratory at Woods Hole is named the Redfield Building, in appreciation of his long years of outstanding work there.

I return for a moment to Redfield's final report on Barnstable Marsh. The essay is a summary of many years work of his own, and an analysis of still earlier work by others. But though it is an excellent, indeed masterly, scientific treatise, there is apparently a subtler message intended. In this paper, Redfield gives heights, depths, distances, and thicknesses in English units, and does not translate them into metres, millimetres or kilometres. In giving grain sizes of sand and clay he does, however, use millimetres. Here is an outstanding scientist, a Ph.D. of Harvard, with honorary degrees from several foreign universities, an "Eminent Ecologist" and a past president of the Ecological Society and other societies, who refused to be stampeded into using the metric system when English units would be more quickly understood by most of the natives of Barnstable and most of the visitors to Barnstable and the readers of English-language journals. He was no pedant. In his farewell address, by example rather than precept, he is advising us, if we hope for understanding and financial support of science, to write in the language of the common people, not in some exotic language that will be less widely understood. He shows his wisdom by his action, and his kindliness and modesty by saying nothing obtrusive about it. His daughter adds, "You are right about the metric system. Alfred never did accommodate to it."

In his scientific work Redfield was primarily a "local": he knew the Cape Cod area well. But he did know some more distant places. He had studied at the Cavendish Laboratory in Cambridge, England, and travelled by train to the high Andes (about 1921) to investigate adaptations to high altitudes. In the 1950's he investigated Lake Maracaibo as an oil-producing environment and for its tidal regime. He travelled much about the U.S.A. in the 50's, giving a series of Sigma Xi lectures. He was a visiting scientist at Friday Harbor, Washington State, in 1947 and at La Jolla a few years later, probably when Roger Revelle was still there.

His daughter Elizabeth sums up the essential tenor of Redfield's life as "the thoughtful delight with which he faced experiences." "He lived life," she says, "very fully." The impression he gave me was of a man not afraid to stand alone, able to think for himself, and who did not try to fit into current dogmas whose validity he doubted. I hope that among his descendants, and elsewhere, the future will see others like him.

Acknowledgments

This memorial owes as much to Elizabeth (Redfield) Marsh, Redfield's elder daughter, as it does to me; in fact more. We have both tried to describe the man rather than his works, with which others have dealt and will deal in the future.

Literature Cited

Ketchum, Bostwick H. 1965. Limnology and Oceanography **10**:R1–R7.

Odum, Eugene P. 1966. Alfred C. Redfield, Eminent Ecologist. Bulletin of the Ecological Society of America **47**(4):166–167.

Burgess, Robert L. 1977. The Ecological Society of America: historical data. Reprinted from F. N. Egerton and R. P. McIntosh, editors. History of American ecology. Arno, New York, New York, USA.

Redfield, A. R. 1972. Development of a New England salt marsh. Ecological Monographs **42**:201–23.

Frank W. Preston
Butler, PA

A more extensive biography of Dr. Redfield is available on request from the *Bulletin* office.—Ed.