MEMORIES OF RAYMOND LAUREL LINDEMAN

Raymond L. Lindeman was born on a farm near Redwood Falls, Minnesota, on 24 July 1915, the first child of Otto and Julia Lindeman. Throughout Ray's life his mother was a loving and supportive parent. She made several trips to Cedar Creek Bog with Ray. A younger brother, Myrl, died in 1981 of a disease now thought to be genetically related to Ray's fatal illness. Their two younger sisters are living in California. All of them attended a one-room schoolhouse near the farm and then studied at Redwood High School. Ray graduated second in his class from Park College, Parkville, Missouri. During Ray's senior year he met Eleanor Hall, then a freshman, and they were married in 1938.

An unfortunate event when Ray was seven had a definite bearing on his life. He had sustained a minor injury while playing and had gone to the medicine cabinet to get some iodine. Thinking the bottle to be empty he tilted the bottle to see if iodine was present, and some of the iodine fell in his right eye. The cornea was damaged, and had an opaque, whitish cast. Ray could tell if it was night or day with his right eye, but that was all. Fortunately his left eye served him well for the rest of his life. However, the blindness in his right eye made it necessary for him to turn his head far to the right to see something on that side, so that he frequently had a surprised or startled look. Sometimes the look on his face was quizzical, but for the most part, with his golden hair and ready smile, he generally had a friendly mien. It was my good fortune to be his office mate for four years while we were progressing toward the doctoral degree at the University of Minnesota, with major in zoology and minor in botany.

During the nineteen thirties and into the forties, Professor Dwight E. Minnich was chairman of the Department of Zoology at the University of Minnesota. Professor Samuel Eddy was the ecologist and his associate was A. C. Hodson. In the Department of Botany Professors Rosendahl and Butters were the taxonomists and W. S. Cooper was the Professor of Ecology. His associate was Donald Lawrence.

Among the graduate students in the Department of Zoology during the time of Ray Lindeman were Lloyd L. Smith and Kenneth Carlander, who later became well known in the field of fisheries biology, Walter Moore, whose specialty is fairy shrimps, and Frank Hooper, the limnologist, all of whom worked with Dr. Eddy. Melvin Green was busy with fruit flies and Magnus Olsen with tissues in general. Gustav Swanson and Walter Breckenridge are now well known as ornithologists. I was studying stream communities, but on a number of occasions Dr. Eddy said to me, "Reif, we are preparing you to be a teacher and we are preparing Lindeman to do research." Dr. Eddy was right in my case. Other than being Curator of Education at the Museum of Natural History on the campus of the University of Minnesota through one academic year (1941–1942), I have had only one job in my life, chairman of the Department of Biology at Wilkes College, where I have been the senior professor of the faculty since 1947. Concerning Raymond Lindeman, Dr. Eddy was also correct, except that with Lindeman's death on 29 June 1942, Ray had no chance to fulfill his great promise.

Many of you have read Robert Cook's account of Ray's efforts to have his magnum opus published in *Ecology* (Cook 1977) so my effort here is simply to tell you about the Raymond Lindeman I knew while we shared Room Z11 in the basement of the Zoology Building from the fall of 1937 through the spring of 1941. Ray and I were two different personalities, but somehow Ray made the adjustment readily and we were good friends. Now let me set the stage for my introduction to Raymond Lindeman.

During the summer of 1936, Dr. Eddy arranged for Walter Moore and me to work in the Superior National Forest as junior foremen of the United States Forest Service. Each of us had a crew of CCC boys, and my assignment was to study the streams that flow into Lake Superior along the North Shore. In addition to spending the summer wading in those streams, I also had my fill of fighting forest fires. So, although I was primarily interested in plankton, the summer's work of 1936 set the pattern for what was to be the nature of my dissertation.

When I returned to the campus in the fall of 1936 I found that I had been assigned to share Room Z11 with Lloyd Lewellyn Smith, an older fraternity brother whom I admired. During the summer of 1937 Lloyd and I studied at the marine station of the University of

Maine at LeMoyne, under Edward Reinhard who had also been one of Dr. Eddy's students. On our way to Maine we stopped at the University of Wisconsin and had a memorable visit with Birge and Juday, both of whom were most hospitable and showed us some of their current efforts and equipment. Shortly after our return to Minneapolis I learned that Lloyd was transferring to the University of Michigan to study with Paul Welch. His last words to me were to the effect that Raymond Lindeman was to share Room Z11 with me, and that although Ray and his office mate of the previous year had struck sparks, he thought Ray and I would hit it off very well.

Ray and I shared Room Z11 with John Wilson the first year. The first sparks were struck between Ray and me when Ray discovered that Lloyd had stashed about a dozen bundles of paper towels in one of the cupboards. Ray considered that such was hoarding and he did not approve. He carried the bundles out of the office and piled them in the hall near the door. I just as quickly carried them back in, all the while trying to tell Ray that were were lucky to have the towels, that we had not stolen them, that we should keep them and use them properly, et cetera. In a way it was comical, and although I prevailed in that minor disagreement, I learned that Ray was a person of principle and that I had better be careful in displaying my usual jocular and less direct manner. Because I lived at home and still had many extracurricular activities, most of which had not been part of Ray's life, I was not as immersed in the study of biology as was Ray. That first year may have been a trial for both Ray and John, but we became good friends and I am sure that I benefitted from my association with both.

Ray once told me that he had been financially independent from the time he was fourteen years old. That meant that he spent much of life sailing close to the wind. He mentioned singing, with a glee club at Park College, the song with the lines, "Jonah he lived in a whale, that man made his home in the whale's abdomen, etc.," but I doubt that Ray knew that "I Got Plenty of Nothin" came from *Porgy and Bess,* and he probably had not heard of George Gershwin. However, Ray liked to sing and he enjoyed the humor of that song. He was job-oriented and his tastes were simple. While I was preparing this paper Melvin Green reminded me of what a big social event it was for Ray and Eleanor, on maybe two Saturday nights a month, to have thirty cents with which they could go to the corner drug store and each have an ice cream soda.

On one occasion my mother invited Ray to our house for dinner. She asked what he would especially like to have and he requested salmon cakes. My mother could have prepared a gourmet meal. She did salmon cakes well but they were at the bottom of our list of entrees and my family tolerated them only when time necessitated her getting dinner in a hurry. Ray, in his very polite and reserved manner, kept assuring my mother that salmon cakes were exactly what he wanted. In all social situations Ray was always polite, serious, and proper. I can't say the same for myself.

With his marriage to Eleanor Hall, during the summer of 1938, and the departure of John Wilson, Ray, Eleanor, and I shared Room Z11 amicably. Ray's annual stipend as a teaching assistant was $600. The Lindemans lived in a trailer parked in a backyard near the campus, but Eleanor spent most of her waking hours in Room Z11. When someone asked Ray how one found a wife who could be so helpful in one's research, Ray replied, "Marry them young and train them yourself." When they married, Eleanor was nineteen and Ray was twenty-three. Eleanor told me Ray was very grumpy the day of the wedding. Her parents' backyard had been decorated and flowers were in bloom, but Ray did not like such fancy, and to him ostentatious, display, and he was out of sorts. During their four years of married life Ray refused to consider starting a family until he had a permanent appointment, despite Eleanor's entreaties.

Eleanor was a great help in many ways, but somewhere along the line Ray had picked up a lot of secretarial skills that I had missed before becoming a graduate student. I can still see Ray, seated at his typewriter, merrily typing something as he looked around. To this day I still have to look at the keyboard when I type. And my filing system has always looked like a magpie's nest compared with the neat arrangement Ray accomplished with just about everything. Between Ray's leaving Eleanor at Park College and their marriage, the two of them wrote a lot of letters to each

other. As had been planned, they wrote on looseleaf notebook paper, about nine by five inches, and each had a looseleaf notebook in which they kept the letters they received. All of Ray's class notes were bound with tan covers and logically organized on his bookshelf. I still have his copy of Muenscher's *Keys To The Woody Plants,* brown bound with green backing. It does not look as if Ray spent much time keying out woody plants.

Eleanor's father was the Professor of Political Science at Albion College and had taught many of the young labor leaders of the day. The politics of the Lindemans was somewhat to the left of mine. My aunt had worked with Herbert Hoover on the Sugar Board during WWI and had gone to the White House with Mrs. Hoover to help prepare her part as First Lady; thus my family were ardent Hoover Republicans. On one occasion I said something complimentary about Mr. Hoover, and Ray's vehemently expressed reply, "No sir! I can't go along with a president who called out the army against American citizens," sort of rocked me back on my heels. I had not heard of that incident, but I don't think Ray knew of Hoover's efforts with Fritjof Nansen to feed a starving Europe after WWI, or of Hoover's remarkable accomplishments during the Boxer Rebellion. Needless to say, I did not raise the subject again, but one time innocently commented to Eleanor about how explosive Ray had sounded in his comment on Hoover, to which Eleanor replied, "Why Chuck, you must be a reactionary!" I had to look in the dictionary for that word, and it was while running for city council of Wilkes-Barre in 1967 that I found out that I was a Wasp. I mention this because for the most part Ray and I were living in a time before certain problems had yet raised their ugly heads.

In our first year together before his marriage I frequently cooked the evening meal for the two of us over a Bunsen burner in Room Z11, and it was usually whole kernel corn stirred in with two eggs and heated sufficiently to be edible. Ray frequently had canned grapefruit, which he ate at noon. It is certain that our diets were not of the best, although I had the advantage of a good meal at home once in a while. However, when Eleanor came on the scene Ray ate better. Once in a while Ray and I walked across the Washington Street Bridge to a meat market where I was able to purchase cube steaks at a reasonable price, and these we took back to the trailer so that I could share a meal with the Lindemans. Ray always insisted on my walking between him and the railing. He said that he feared that he might have a sudden impulse to throw himself over. That bothered me but I never pressed for an explanation, and Ray probably could not have given one. When we were together on walks, on the intercampus streetcar, or in the office we generally talked about the subject matter of our courses, personal history, new information gleaned from the periodicals.

On a more humorous note, we were lab partners in Dr. Minnich's course in physiology. We were testing gustatory thresholds and among other stock-solutions was one of quinine diluted to one part in a thousand. I mixed a tube of the stuff, one part stock to a thousand parts water. Ray tossed the mixture into his mouth and immediately rushed to the sink to spit it out. It was galling. I quickly offered to taste a similar mixture, apologized, etc., but Ray would not hear of my subjecting myself to such punishment. He could not taste anything for several days but took the mistake in good humor. It was an honest mistake but I have felt guilty about it ever since. I should have taken a swig regardless.

Once Ray decided on a course of action his awareness of time was switched to hold. Our class with Professor Hodson in what was then called "autecology," was on the farm campus some four miles distant from the main campus and to which we travelled by intercampus streetcar. The class was from one until five on Tuesday afternoons. On one occasion Ray asked to remain in the laboratory to repeat the experiment of that day. At the next meeting of the class he handed his report to Professor Hodson, who at first did not understand the time scale. Ray had set his observations at one-hour intervals and had been there all night, until six a.m., which necessitated his walking home because the intercampus trolley was not yet in service.

For my field work my father had bought me in 1939, a 1929 Model A Ford coupe. On several occasions the Lindemans borrowed the automobile to make trips to Cedar Creek Bog. In preparation for their experiment on the survival of bottom fauna under anaerobic conditions, they went out one day to collect

the bottom material needed, in large tubs, and then spent the next thirty-six hours in Room Z11 sieving the material, counting out the several kinds of organisms into two-quart canning jars, etc. They went without sleep for more than forty-eight hours. That was how they worked.

Ray had a set of detachable rods and a piston-type coring device with which he sampled the subsurface layers of the bog. Somehow or other two of the rods parted while Ray was taking a sample and it looked as if the equipment was lost for good. However, Ray had the presence of mind to mark the spot well, and the next day his brother, Myrl, who was an inventor of sorts, managed to "cat" the lost portion and retrieve it. We all had a good laugh about that when the gear was safely back in the office. Myrl was much more of an extrovert than Ray and his exploit was just one of those things to him. Ray was very proud of Myrl's ingenuity and lavish in his praise of his brother's cleverness.

During Ray's first illness he turned a bright yellow, thanks to a blocked bile duct. He was in good spirits and rather bouncy on his hospital bed as he instructed Walter Moore and me about what to do in going to Cedar Creek Bog Lake to take the routine samples in his place. I think we followed Ray's instructions carefully, except that Walter forgot the attachment which permitted the rubber boat to be inflated by a pump. I had to blow up the boat by lung power and then go out in it to use the Ekman dredge, the Kemmerer water bottle, and the Secchi disk. It was like trying to navigate on a soggy doughnut, but we accomplished the assigned tasks, and thus Ray did not miss his scheduled routine observations.

Ray was always fair in dealing with me. I must once have said something about one of the other teaching assistants, and Ray came right back at me to the effect that the students hadn't liked my teaching at first. That kind of hurt, but I had long before learned that a friend is someone who will tell you how it really is. On the other hand, Ray was very kind in praising a paper I gave on the Pleistocene fluctuations of sea level. As thanks for the trip Walter Moore and I made to the bog when he was ill Ray gave me a German/English and English/German dictionary, autographed and inscribed, "A friend indeed." That was a real compliment.

Those of us who were studying with Professors Cooper and Lawrence on several occasions met at the home of Professor Cooper for the presentation of papers and the discussion of the subject matter. On one occasion Professor Lawrence told us of his work on the repopulation of Mount Saint Helens. I was one of the first to ask a question after the talk. My question concerned how the alpine tundra plants had been able to get across from an adjacent peak to Mount Saint Helens, but unfortunately I used the word succession in place of migration. I can still see the look of utter amazement on Ray's face as he turned to the right to look at me. He was embarrassed and, of course, I was disconcerted by Doctor Lawrence's saying that he had just told how the succession took place. Somewhat later Professor Butters asked the question properly and Doctor Lawrence admitted that he did not know. When I told Ray how I had meant to ask about migration instead of succession he chuckled and said, "So that is what you were trying to say!"

Ray and I went to the AAAS meetings in Indianapolis one year. Ray had made reservations for us at the Miller Hotel. When we asked a policeman for directions to the hotel he replied with something of a sneer, "The Miller Hotel?" It was a real hole in the wall and they gave us only one thin blanket for a double bed. We spent a couple of miserable nights trying to stay warm. One night on our way back to the hotel two black boys, from the shadows of a corner building, caught my attention and one of them held out a diamond ring in his hand and wanted five dollars for it. I had been on Ray's right side, his blind side, and he had walked on a few paces before noticing that I was not with him. I declined the offer of the ring and hurried to catch up to Ray, who then gave me hell for taking such a chance in that kind of neighborhood.

One noon in Indianapolis, Ray, Dr. Gerald Prescott, John Moyle, and I had gone to a restaurant for lunch. Ray and Dr. Prescott fell into a discussion of algae and we sat there for half an hour without ordering lunch. I knew we all wanted to hear the first paper in the afternoon, and although my first love was plankton, not bottom fauna, I finally said, all too innocently, "Who cares about algae? Let's eat!" Ray was mortified. His shocked and shouted, "Chuck!," could not have been

given more emphasis had I committed murder. John Moyle gave an embarrassed titter, but Dr. Prescott understood my intention and agreed that we had better order lunch. Ray's reaction was typical of his idea of propriety, and even better reveals how his concentration on subject matter was not bound by temporal requirements.

Being the more affluent partner of Room Z11, living at home, and single, I was able to buy a complete set of *Biological Abstracts,* Volumes 1 through 30, for thirty dollars. It wasn't long before Ray had an idea. He sat for several days with his feet on the workbench, smoking his corncob pipe, and just gazing into space. He did not attend class. I suppose he ate and slept. At the end of that thinking period he had cooked up a decimal system for classifying ecological literature. Eleanor went to work making a card file of all such titles in the *Biological Abstracts,* marking those which were in foreign languages. The file had thousands of entries and was kept up to date until Ray died, at which time Eleanor turned it over to someone at Yale.

When Robert Cook was preparing his paper on Ray's problems in publishing his paper on trophic-dynamic aspects in *Ecology* I still had on my bookshelf three of Ray's brown-bound books that Eleanor had given me. I had not touched them for years, but one day for no reason at all I took them down, blew the dust from them, and glanced at some pages. Less than five minutes later I had in my hand Robert Cook's letter asking me if I had anything that had belonged to Ray which might be put in Yale University's file as part of the Lindeman memorabilia. I immediately sent the three books and later spent an afternoon taping some recollections with Robert Cook. That I should be attracted to those three books and then have Robert's letter seems almost spooky to me.

One evening a group of the graduate students with their wives and/or sweethearts had gathered for a social evening; among other activities, each had to tell some personal anecdote. Ray told of an experience he had had on a winter's night, when, after taking his date home from a high school dance, he had run out of gas several miles from the family farm. In the moonlight, he saw a barn and having gained entrance to the barn, and being a farm boy, he threw down some hay from the loft into one of the stalls and curled up to sleep. Suddenly he was in the glare of several flashlights and found himself surrounded by several husky farmers. Despite the odd circumstances Ray was able to explain his presence to the satisfaction of the farmers and was soon taken into the farm house where he was provided with a bed for the night, a good breakfast in the morning, and some gasoline to get home. This illustrates Ray's ability to adapt to circumstances and his ability to make the best of a trying situation, plus his skill in dealing with people.

As I have suggested, Ray's attendance at class was irregular if he had a new idea he was formulating. I missed only two classes in eleven years at the University of Minnesota, but Ray's academic average was better than mine. Thus it was, on one occasion, a matter of great surprise to Professor William Clark, when, having just graded the final examination papers in physiology, in his office a few doors from Room Z11, he discovered that my score was higher than Ray's. He came down the hall and shouted in our doorway, "Reif, you tickled the — out of me. You beat Lindeman." The probable reason was that Ray had been busy working on one or more of the papers he was preparing to publish. Ray, upon hearing Dr. Clark's scatological exclamation, immediately came over to shake my hand and offer his congratulations, the quinine incident forgotten.

During the summer of 1938 I was again a junior foreman with the USFS and the CCC, working on the streams of the North Shore. During the summer of 1939 I collected, alone, samples from streams near Minneapolis. It was during one of those summers that Ray went off to Friday Harbor, and I think that experience was the high spot of his life. He had some funny things to tell when he returned. He was in good spirits and I think his health was better after that summer. He had learned the word "crud," as well as the expression "Koom da refelooshun ve all ead beaches and cream." Ray never took much time for what most Americans call recreation and that summer was a great change for him.

One time my girlfriend and I, with another couple, took Ray and Eleanor to see the University of Minnesota's hockey team play Yale. Ray went reluctantly. It was not the best of games, but luckily the other chap with us was a lithographer, so Ray spent the evening getting a lesson in lithography and didn't see the game. I was glad that it worked out that way.

Later on, Ray and Eleanor moved from the trailer to an apartment on the second floor of a house farther from the campus. It was there that I went at the end of our last semester to buy a desk from Eleanor for five dollars. We had just loaded the desk into my Model A when a Western Union boy handed Ray a telegram. Ray very calmly opened it and in a quiet voice said, almost tenderly as he put his arm around Eleanor, "Well, dear, next year we shall be living in New Haven." Eleanor smiled and must have said something, but there was no fuss. To Ray it was just a quiet acceptance of what was to be the next step.

Ray and I talked many times about my trying to arrange my information concerning stream bottom fauna according to trophic levels or at least into food chains. I had the data from more than a thousand samples collected by me and the CCC boys and hand-cleaned by WPA workers. Collecting the samples had required more than ten thousand miles of travel, and three years of my time in identifying, counting, and weighing the organisms. We had discussed the idea of energy transfer from producers to the consumers so often that I did not realize the concept of trophic levels was fairly new. I think that by the spring of 1940 Ray was in correspondence with Edward Deevey and we were familiar with his ideas of nutrients in lakes, but I had no comparable information on my streams, in which producers were very scarce. Phytoplankton was minimal and most of the organic matter was allochthonous. I had no idea where to begin with food chains, although I was certain that the term food webs would better apply. Thus it was that Dr. Minnich, having Ray's dissertation to compare with mine, after my successful defense of the dissertation, stopped at the door of Room Z11 and said, "Reif, you have a lot of good material there but it is only half-baked." Ray was sympathetic, but with the turn of events I never published any of that half-baked material.

Ray took his doctoral degree in the spring commencement of March, 1941. Walter Moore, Walter Breckenridge, and I were granted our doctoral degrees one night in June of 1941 in the stadium in a steady rain, and as President Ford handed me my diploma I commented that it was appropriate weather for aquatic biologists.

That summer I went up north to do a plankton study on Ten Mile Lake. On 7 December 1941, everything changed. I was classified IV-F and told that I would probably live two more years. That left me free to go to Ten Mile Lake again in 1942. Early in June word reached me that Ray was being taken to a hospital. Shortly thereafter I posted a letter to Ray and Eleanor in which in my usual jocular manner I tried to be humorous, cheerful, and encouraging. As that letter went out from my rural delivery mailbox another letter arrived from Eleanor telling me that Ray had died. I managed to retrieve my letter from the local postoffice, although my doing so broke postal regulations, because I knew that Eleanor would be crushed. For me Ray's passing was the end of a dream. I had thought that Ray and I would cooperate limnologically. I could have done the field work and Ray could have done the brain work.

In September of 1942 I signed a contract to teach at Wilkes College, where I have been ever since with the exception of two years, 1944 and 1945. In the spring of '44 the U.S. Navy decided I was not dead after all and drafted me. Thus I was C. B. Reif, B.A., M.A., Ph.D., Apprentice Seaman. That was a commentary on the judicious use of manpower by the military during wartime. I saw many biological things in the tropical Pacific which I otherwise would have missed. So Doctor Eddy was right. Although Ray never had a chance to continue his research I have spent a life teaching, despite the fact that I had to learn everything after my release from the Navy.

I think it was Edward Deevey who urged Ray to seek the postdoctoral fellowship at Yale. G. E. Hutchinson was a great inspiration for Ray, and Ray's year at Yale was very exciting for a young man of twenty-five. Both Ray and Eleanor were looking forward to another year of study at the University of Pennsylvania. Neither expected that Ray had so little time left.

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Source: Bulletin of the Ecological Society of America, Vol. 67, No. 1 (Mar., 1986), pp. 20-25.
Courtesy of JSTOR.