

## ACCEPTANCE OF THE CLARK P. READ MENTOR AWARD: WE ARE SCIENTISTS, BUT WE ARE IN THE PEOPLE BUSINESS



**Raymond E. Kuhn**

Department of Biology, Wake Forest University, Winston-Salem, North Carolina 27109.

My comments may be construed as being directed only to professors, but I want to emphasize to the undergraduate and graduate students that we are all involved in mentoring. I hope that my comments may assist you as you become more and more involved as mentors while your careers develop.

I am one of those people who can safely say that each day is a joy and a surprise. I am surprised each day because as a young man from then rural Georgia I had not planned to go to college. After high school, I worked for a while as a mechanic, then was a truck driver out of Atlanta for nearly two years. While I was driving trucks, I lost a promotion to a young man who had attended college for just one year. Losing that promotion led me to realize that this college stuff could be a really good idea. I began taking some remedial courses at Georgia Tech at night while still driving a truck and within a few months enrolled at Carson-Newman College in Tennessee.

To my great surprise, I fell in love with academics and learning. In no small part, this was due to my close association with professors in the Department of Biology. Among them was Professor Will John Cloyd, who proved to be a great mentor and encouraged me to try a research project. Although the project was more an exercise in techniques than science, it was my introduction to research. Professor Cloyd was also my closest advisor when I had to choose between going to medical school and going to graduate school. Graduate school won out, and I am thankful to this day for that decision.

My Ph.D. advisor at the University of Tennessee was Professor Ronald Fraser, an embryologist who studied formation of body segments (somites) in chick embryos. I was, however, not interested in developmental morphology but rather the cellular and molecular events that led to embryonic differentiation of cells and tissues. My research focused on changes in methylation of transfer RNA during the first 72 hours of chick development. Dr. Fraser, though kind in his approach to my work,

acknowledged that he had no idea what I was trying to do. Nonetheless, he was supportive and encouraging throughout my tenure at the University of Tennessee.

In the middle of my third year of graduate studies, a position as Assistant Professor became available at Wake Forest University. Jerry Esch and I had met while he was at Tennessee to give a seminar and recommended me to the staff at Wake Forest. I visited, talked to all the faculty members, did not give a seminar for some reason, and was offered the job, which I accepted. I have been at Wake Forest now for 39 years.

During the last few months of research for my Ph.D., I had decided that I would change areas of research once in my own lab. I had taken a course at the University of Tennessee offered by Drs. Alex Shivers and Nazareth Gengozian that emphasized immunological techniques. I became fascinated with immunology. On arrival at Wake Forest, I immediately began learning as much about immunology as I could. Part of this effort was to spend a summer working with Dr. Gengozian at Oak Ridge in transplantation immunology in mice and marmosets.

The focus of my interest in immunology, however, shifted when Jerry Esch showed me a mouse infected with the larval stages of *Taenia crassiceps*. I was astounded that, in chronic infections, the biomass of the parasites could exceed the biomass of the mouse. My immediate response was to ask why the immune system would allow these parasites to survive in what had to be a hostile immune environment. Having never had a parasitology course, I devoured the literature and discovered the work of Professor William H. Taliaferro. Papers he wrote in the 1930s and 1940s were simply amazing and still provocative in the early 1970s, asking questions that remained unanswered yet begged investigation three and four decades later. I implore all students not to ignore the older literature. There is much to learn about truly important discoveries made by creative scientists long before the advent of PCR, immu-

noassays, electron microscopes, and, indeed, the structure of DNA and genes.

Hooked on parasites, I began designing a study system. My criteria were that it had to have a mouse host, it had to have an acute phase and a chronic phase, it had to be a protozoan, and it would not involve fecal samples. It had to be a protozoan so that if the immune system was effective in killing a percentage of the parasites, one could quantify the percentage. During this time of designing my own system, Jerry and I successfully completed a few studies on the developmental biology of larval *Taenia crassiceps*.

As I surveyed the literature, including parasitology textbooks, *Trypanosoma cruzi* came up. This parasite fit all my criteria. The only drawback was that it was infective to humans and there was no effective treatment. Accepting this drawback, my students and I studied the immunobiology of experimental Chagas disease for the next 25 years without a single lab infection. Some 15 years ago, I decided that my years of working with *T. cruzi* were enough, and I returned to studies on larval cestodes.

I have been privileged throughout my career to have excellent young people working in my lab. These included a host of undergraduates, 35 graduate students, several technicians and a couple of postdoctoral fellows. I remain in close contact with many of the former undergraduates as well as with almost all of my former graduate students and postdocs.

One of the keys to effective mentoring is simply sharing your curiosity and enthusiasm. In the early 1970s, few professional meetings had sessions, or even interest, in the immunology of host-parasite relationships. I personally craved an opportunity to meet and discuss research on immunoparasitology and knew that a meeting focused on this research would enrich the experiences of my students. My ideal meeting would be one where a small group could meet in a casual setting with uninterrupted time to talk about research on parasites. In 1974, I contacted a few young immunologists interested in parasites and invited them to come to a small lodge owned by Wake Forest in the mountains of southern Virginia—Dan Colley, then at Vanderbilt; Dick Seed, then at Texas A&M; Darwin Murrell, then at the Navy; Carter Diggs and Ray Perry at Walter Reed, and Ray Damian at Georgia. I asked them if they would like to come to this mountain lodge for three days where we could present our work and get to know each other. I also told them that there was a small bunkhouse reserved for the women that could sleep about 10 people, but only six other beds in the main house. Most of us, therefore, would have to sleep on the floor in sleeping bags or outside in tents. We would fix our own meals, do the dishes, and clean up. All members of each lab, including technicians, undergraduates, and graduate students, were invited. Except for Darwin Murrell, I had never met any of the people before I made the phone calls, but everyone I called agreed to attend. We named the meeting the Fancy Gap Immunoparasitology Workshop, because it is held in Fancy Gap, Virginia. In October of this year, we will meet for the 34th time. I have not kept detailed records, but I suspect that about a thousand different people from a dozen or more countries have attended this meeting over the years.

Fancy Gap, as the meeting has come to be called, has been a fertile ground for graduate students searching for postdocs, for collaborative projects, and for developing steadfast friend-

ships. The meeting also took away the hesitancy that young students have of approaching senior investigators. Those of us who founded the meeting take pride that no student, graduate or undergraduate, has ever paid to attend.

Since I learned that I would be a recipient of Clark P. Read Mentor Award, I have spent a good bit of time reflecting on mentoring. Although every effective mentor uses different approaches, even strategies, in mentoring students, I think that mentoring encompasses a few important, perhaps even universal elements. In the few minutes we have left here, I thought I would share some of my approaches to mentoring students in my laboratory.

Starting work in a laboratory is difficult and awkward for both undergraduates and graduate students. Often, it is the first time they will have put their classroom knowledge to work at the bench. They generally don't know what they want to do or how to do it. They just know they want to learn about research, which is, altogether, a very acceptable reason. I have found it helpful and effective to have a small project in mind for each new student. The project would pose no serious technical difficulties, would be a meaningful study, and would give the student needed experience to develop confidence in his or her laboratory skills. It is not uncommon that a student would take this small project, add his or her own ideas, and develop it into a thesis or dissertation.

As students progress, it is extremely important that they be given the independence to pursue their most ambitious ideas. Ideas generate questions and good questions form the basis of good science. It is important for students to learn early that "If it is not worth doing, it is not worth doing well!" On occasion, students let the techniques with which they are familiar and comfortable dictate the scope of their ideas. I have emphasized to students over the years that it isn't necessary for them to know how to do the study. If the question is good, we'll either learn the techniques necessary or develop them. When technical limitations are no longer feared, creativity is enhanced.

At the same time, even the best of ideas lead to failure. Failure is difficult to accept, especially when you are relatively inexperienced with failure. It is the gambler who will finally hit the jackpot. If a scientist succeeds in all of his or her projects, he or she is not gambling on his or her best ideas. Learning to accept and learn from failure is a mainstay of becoming a productive and effective scientist. Failure is life's way of preparing one to succeed. Students need to know that, as a mentor, you are not going to be judgmental but instead will comfort, encourage, and guide them. It is especially important to demonstrate that you believe in them and have confidence in their abilities.

Independence can only occur when students develop their own ideas and when they can formulate their own plans for answering their own questions. All of us know of some circumstances where an advisor gives a student a section of a grant and tells the student that the project described in that section will be his or her thesis or dissertation. The student is encouraged then to complete the experiments as described dutifully, to satisfy their research requirement. This approach does not create an independent and creative young scientist. More often than not, this will result in a technician who, if diligent enough, will only later become a creative and productive scientist. In

addition, it is grossly unfair to the student and, in my opinion, an expression of selfishness on the part of the advisor.

As students mature, become more independent, and provide their own ideas for research, it is critical that they know the advisor trusts them, has confidence in them, understands their trials and tribulations, and is available for consultation and support. Praise and recognition are only slightly behind the need for food, shelter, and clothing, especially in research, and praise should not be used sparingly when young people are molding themselves into mature, young scientists. As they gain more and more independence, the responsibility of planning and perseverance must fall more and more on their shoulders. We can help in many ways in this aspect of their growth. Learning early on to plan research carefully is critical. It is important for students to remember the old saying that, "If you don't know where you are going, any road will take you there."

It is clear that mentors must be managers, in one way or another, but we must not be micromanagers. We have to recognize that the main difference between the students and us resides only in the level of experiences we have and the level of scientific maturity. Students must know they can disagree with their advisor's suggestions and must feel free to explain why they disagree.

Having said all this, it is part of mentoring to understand that each student is unique. They have very differing approaches to life and to science. Even the best of students get discouraged during their tenure (as, I must acknowledge, do their professors). Some students become overwhelmed, and some become frustrated. It is during these times that we as mentors must have the perception to provide the impetus for them to move for-

ward. We need to praise, bribe, threaten, push, pull, or just get out of the way. It is not uncommon that all of these enticements will be appropriate at various times for the same student during his or her time in the lab.

Every student is a diamond in the rough and it is a privilege to see these students become ever more the jewels they are. If we, as mentors, are successful, our associations with our students will be lifelong experiences where we will continue to learn together.

To be the recipient of the Clark P. Read Mentor Award, and to be in the company of those who have previously received this award, is a great honor. I would like to thank my students for their support of me for this award through their letters, for their continuing friendship, and, most importantly, for their own accomplishments as productive scientists and as mentors themselves. I have great pride in them and would like to espouse the virtues of each of them but we would be here for the next couple of days if I got started.

I would also like to thank the dear friends and colleagues with whom I have traveled while following those pesky and fascinating parasites. Many of those friends are here with us at this meeting. Jerry Esch introduced me to the study of parasites and is a steadfast friend and colleague. Austin (Mac) McInnis was a patient and helpful mentor, long before we ever met, while teaching me to be a fair and thorough reviewer of manuscripts for the *Journal of Parasitology*. John Janovy is nothing less than an inspiration and one of the most talented people I have ever known. Dan Colley, Dick Seed, Mike Kemp, Barbara Doughty, Darwin Murrell, David Dean, Don Harn, Joe Urban, and a host of other Fancy Gappers have been friends and supporters who walked with me through the wonderment of science.