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Mentors and Colleagues: [Dr. Clarence Connelly]

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THE ROCKEFELLER UNIVERSITY

RESEARCH PROFILES

FALL 1983

This is possibly the best place to be if you want to pursue problems on an intensive level without being encumbered by academic structure. This place is about doing science.

GRADUATE FELLOW JAMES KRUEGER

Mentors and Colleagues

Carol Rouzer, a recent Rockefeller University graduate, left New York this past August to accept a postdoctoral fellowship at the Karolinska Institute in Stockholm, a long way from Westminster, Maryland, where she grew up. While a student at Rockefeller she "bounced into a nice little finding" concerning the immune system and allergic reactions which resulted in nine scientific papers.

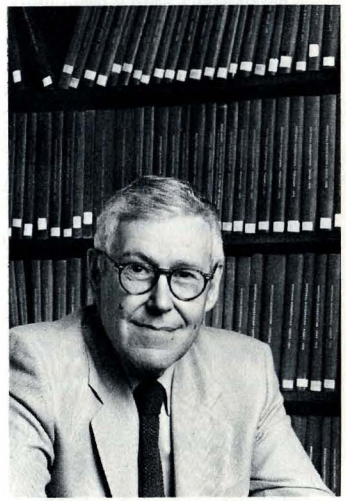
Robert Sapolsky, a fifth-year graduate fellow, also took off last summer, leaving behind his experimental rats to spend three months on the Serengeti savannas of Kenya with baboons. He has been visiting the troop for five years, beginning when he was still an undergraduate at Harvard, to observe their social behavior and take blood samples. The rats and baboons are part of a study on the neuroendocrinological aspects of stress and aging that he is conducting in the laboratory of Professor Bruce McEwen, a leading hormone researcher (and Rockefeller graduate).

When David Baltimore, class of 1964, was presented for his Ph.D., his thesis advisor commended his "ample qualifications for a productive life in research." Eleven years later, at the age of 37, Dr. Baltimore, a professor at M.I.T., was awarded a Nobel Prize for "discoveries concerning the interaction between tumor viruses and the genetic material of the cell."

Rockefeller University has been a springboard for young scientists for 82 years, during most of which time it was known as The Rockefeller Institute for Medical Research. Long before becoming a degree-granting institution in 1954, it was a major influence in upgrading medical education in this country through the hundreds of young researchers trained in its laboratories who went on to fill key positions at other institutions. Rockefeller is now known as a graduate university of science and has built a remarkably successful graduate degree program, but this depends less on formal education than on the laboratory research setting. The hundred or so students on campus at any time are outnumbered several times over by the faculty, research scientists who teach more by example than in classrooms.

The University granted its first Ph.D. degrees in 1959. All told, there are 430 alumni. Nearly 100 are full professors in universities all over the world, six of them with endowed chairs; 30 head departments or research institutes at such places as M.I.T., Harvard Medical School, the National Institutes of Health, Cambridge University, Memorial Sloan-Kettering Cancer Center, and the World Health Organization; and two are Nobel laureates.

The source of these statistics is Clarence M. Connelly. A member of the Rockefeller faculty since 1954, he became associate dean of graduate studies in 1962 and dean in 1980. He is in a direct line of descent from the program's founder, the late Detlev Bronk, and its first dean, Frank Brink, Jr., both of whom were his scientific mentors and laboratory col-



Dean Clarence Connelly. Behind him, the circulating collection of the Ph.D. theses of Rockefeller graduates.

Dr. Connelly and Frank Brink, Jr., commencement day, 1983. At the ceremonies, Dr. Connelly presented Dr. Brink for an honorary degree in recognition of his "dedication to science" and his "30 years of loving and loyal service to The Rockefeller University."

leagues for nearly all of his research career. The program is close to Dr. Connelly's heart, literally and figuratively. In the breast pocket of his shirt he carries a pack of index cards on which he keeps pertinent information about all currently enrolled students. "Those cards are famous," says Associate Dean Mary Rifkin. "He's never without them. Some of them are so worn I wonder how he can still read them. He's our walking data base."

It is the job of Dr. Connelly and Dr. Rifkin, herself a Rockefeller graduate, working with members of the faculty and with Professor Purnell Choppin, vice president for academic programs, to find and foster students they think can flourish at a university that has no formal departments and virtually no prescribed curriculum, where teaching and learning go on where the work of The Rockefeller has always gone on—in the laboratory.

"We expect our applicants to be top-notch," says Dr. Connelly. "What we look for beyond intellectual ability is that intangible combination of curiosity and independence and the maturity to perform as junior colleagues in research."

BRANCHING OUT

For James Krueger, Richard Bucala, Rosalind Segal, and 29 other biomedical fellows, that means clinical research. In 1972 the university added to its graduate studies program a six-year course, in collaboration with neighboring Cornell University Medical College, which leads to combined M.D. and Ph.D. degrees. Whether a specific study centers on cancer or dermatology, James Krueger's current concerns, or lupus erythematosus, which Richard Bucala is investigating, or rheumatology, arteriosclerosis, or diabetes, the goal is to understand the process of pathology: how disease occurs. For some biomedical fellows, the laboratory years also mean learning to do basic research—Rosalind Segal is studying the mechanisms regulating cell movement—before thinking about clinical applications.

Dr. Connelly and, from left, Graduate Fellows Ruth Montgomery, Sandra Cottingham, and David Clayton.

For Susan Fahrbach, the University's interdisciplinary approach makes it possible to study the behavior of experimental animals and the underlying cellular mechanisms. She is exploring reproductive and maternal behavior in female rats. For students like Linda Hanley-Bowdoin, who already have advanced degrees and considerable previous research experience, Rockefeller offers the chance to earn a Ph.D. while continuing to do productive science—in her case, plant molecular biology. For Peter Hotez, whose interest is tropical medicine, the University was "one of the few places I knew of doing parasitological research on the molecular level."

For Wendy Fantl of England, the United States was "the place where most of the science I read about was happening." Her reading, while an undergraduate, prompted her to write letters to scientists asking questions about their work. One such letter, sent to a Rockefeller researcher, was passed on to the dean, who sent her a catalogue. Shortly after, she received an invitation to visit the University, to interview for the student program. She remembers that when it came, "I nearly fell through the floor."

The University is also a place where some students discover that what they want to do is not what they had thought. Dr. Connelly and Dr. Rifkin encourage entering students to explore research opportunities in various laboratories before settling down, to make what James Hirsch, Dr. Connelly's predecessor, used to call "trial marriages."

"It's not uncommon," says Dr. Connelly, "for students to wind up in areas wildly different from what they would have

imagined possible when they came." Fred Cross, who was uncertain of his specific research goals when he applied, was astonished to learn that one Rockefeller student who came as a biologist left as a physicist and another did just the reverse.

"That's an extreme change, of course," says Dr. Rifkin, "but it is very important for students with that innate curiosity about science to have the freedom to delve into subjects they haven't been exposed to, that in a conventional program they might never be exposed to." Dr. Connelly agrees. "I think most people go into science not because of their interests in just one narrow field but because any one field has many cross-connections with other parts of science." In their own careers both Doctors Connelly and Rifkin have made cross-connections, Dr. Connelly from nuclear physics to biophysics and Dr. Rifkin from cell biology to her current work in parasitology. "The freedom I was given as a student," she says, "helped me develop the confidence to believe that if I encounter an interesting problem in a field I have no experience of, I shouldn't be afraid to tackle it. I learned not to be afraid of branching out."

"Of course," Dr. Connelly adds, "there's the chance students may change course so radically that their research interests can no longer be served here and they go elsewhere. That's happened. And there have been those who, although intellectually excellent, find they can't handle the lack of structure. For most students, however, the freedom and particularly the interlaboratory give-and-take that is characteristic of the way science is done at Rockefeller is a challenge and a stimulus. We try to make a good match between what we have to offer and what we think are a student's strengths and interests. But reading someone not just for today but for ten or twenty years to come is very hard to do."

For his thesis research, David Clayton is studying gene expression in liver cells. What he really wants to get to is the genetic mechanisms of the brain. Early on he thought to combine his two interests, molecular biology and neurobiology, but at the time Dr. Connelly wasn't convinced he should. "He urged me to start simply and hone my skills. I agreed grudgingly even though I knew he was right."

In the Annual Report for 1955-56 President Detlev Bronk stated: "Following some months of preparation, the first class of graduate students was this year admitted to the Institute as candidates for the degree of Doctor of Philosophy. This was an historic event."

In the photograph, Dr. Bronk, center, and Trustee David Rockefeller, third from left, then chairman of the board, congratulate the first graduates in 1959. (The Institute's name was officially changed to The Rockefeller University in 1965.)

A while ago, David and his advisor, Professor James Darnell, attended a lecture by another Rockefeller scientist, Fernando Nottebohm, in which he described his findings concerning the events that unfold in the brain cells of birds as song learning develops. "We were very excited. Suddenly we saw a feasible experimental opening for me. After the lecture we flagged Fernando down in the Faculty Club and made a date to talk. Now in addition to my liver cell studies I'm doing a sort of Saturday night side-project cloning the genes that are unique to the learning phase in canaries." Dr. Connelly, he adds, "is very enthusiastic about it."

"ASK CLANCY"

The introduction of the Ph.D. program at Rockefeller was proposed by Detlev Bronk in 1953 while he was serving as head of a committee of trustees seeking ways to revitalize the institute after the constraining years of economic depression and war. The board approved his idea and, with the retirement of Institute Director Herbert Gasser, asked him to become the first president of the new university.

Bronk's administration ushered in a period of extensive physical and intellectual expansion. He invited many distinguished scientists to establish new laboratories. Some of these groups were in fields such as physics, mathematics, and the behavioral sciences that had not been represented before on

Associate Dean Mary Rifkin, left, with Biomedical Fellow Christina Luedke, newly arrived this fall to earn a Ph.D. at Rockefeller and an M.D. at Cornell University Medical College.

the Rockefeller campus. Among his own colleagues who moved with him from Johns Hopkins, where he had previously been president and head of biophysical research, were H. Keffer Hartline, later to win a Nobel Prize for his discoveries in the neurophysiology of vision, Frank Brink, and Clarence Connelly.

A physics graduate from Cornell, Dr. Connelly had worked on radar development during World War II at M.I.T. and in England. His interest in biophysics had been stimulated by reading of the work of Bronk and other pioneers in nerve cell physiology. He first joined Bronk's group in 1946, at the Johnson Research Foundation at the University of Pennsylvania, as an American Cancer Society Predoctoral Fellow.

In his years of research, during which he collaborated closely with Dr. Brink, now retired, Dr. Connelly concentrated primarily on the relations between oxidative metabolism and the electrochemical properties of nerve cells that generate action potentials and regulate nerve excitability. In 1959 he published a paper, still quoted, describing his experiments on what is called the sodium pump, a physiological mechanism which increases electrical potential across cell membranes. The sodium pump is important for the functioning of nerve cells, skeletal muscle, cardiac muscle, and the kidney. "Clancy Connelly's paper," says Dr. Brink, "resolved a ten-year discussion in this field of research."

The design of the graduate program, as conceived by Detlev Bronk and administered successively by Frank Brink, James Hirsch, and Clarence Connelly, has changed in detail but not in character. Beyond screening applicants, allotting funds, airing grievances, and calming ruffled feathers, the primary job of the dean is to assist students in setting a curriculum and finding a mentor. To do that he must understand science and scientists.

"Clancy Connelly," says Dr. Brink, "is a problem solver with an impressive ability to focus on relevant basic principles. His talent, his experience, and his interest in a broad range of science make him a valued consultant to his colleagues and an excellent advisor for students. 'Ask Clancy' is the likely termination of any discussion of a problem. This has been true ever since he was a new graduate student himself."

WHAT'S NOT ON THE CARDS

Dr. Connelly is a reserved man, reared on a farm. When he speaks about Rockefeller students his smile broadens and he draws from his private "data base" reminiscences not to be found on index cards. He tells, for example, about one "thoroughly wonderful young man" who had written in his letter of application that at the age of six he reluctantly abandoned mathematics because he feared there were no great discoveries left to be made. Dr. Connelly adds that the young man later changed his mind and as a student at Rockefeller made important contributions to the mathematical analysis of neural activity.

It has been estimated that the housing, feeding, and equipping of each student costs the university about $25,000 a year, exclusive of faculty time. The students are fully subsidized either through grants or from operating funds. What does this investment buy? "Dr. Bronk felt, and all of us who have worked in the graduate program feel," says Dr. Connelly, "that these keen young people bring a special energy and spirit of inventiveness to the campus."

An example of that energy and spirit was described some years ago by geneticist Norton D. Zinder, John D. Rockefeller Jr. Professor, in his graduation presentation of Thierry Boon, now director of the Ludwig Institute for Cancer Research in Brussels. "He was one of those students," Dr. Zinder said,"who, taking our prescription seriously, went off into a corner somewhere and studied science on his own for two years. He proceeded to read every paper I'd ever written, coming back for detailed discussion and often with pertinent criticism... Despite this, or perhaps because of it, we came to an accommodation: we'd study genetics together." Dr. Zinder concluded by stating: "Three times in my life I have been fortunate enough to be associated with a finding that I felt was profound." Two of those findings, he said, were the thesis work of students.

Randall Furlong, a student in the theoretical physics group, recently expressed it this way: "We know that we're not the main business of the scientists here but I think it's good they found room for us. I think we keep them honest." □

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