William L. Schaich

Professor of Physics

Professor William L. Schaich is retiring after serving 35 years as a faculty member in the Department of Physics at IU Bloomington. Bill was born in 1944 in Springfield, Massachusetts, and he attended Maumee High School in Ohio, where he won the high school state championship in French language. He did his undergraduate work at Denison University and graduated magna cum laude in 1966 with a Bachelor of Science in Physics. He was the first person in 10 years to finish with a straight A average over his four years of study. The previous person to have accomplished this was Richard Lugar, presently the senior senator from Indiana.

That fall Bill went to Cornell University for his graduate education. At the end of that fall semester he married his childhood sweetheart, Georgia Loebrich. The Schaichs have two daughters, Amy and Lucy. Amy now lives in North Carolina while Lucy, who is married, lives in Bloomington.

Bill earned a Ph.D. in theoretical physics in 1970. His thesis was titled "Electronic Properties of Metals: Liquid Metals and Photoemission," and his thesis advisor was Professor Neil Ashcroft. For the four years he was at Cornell he was a National Science Foundation Predoctoral Fellow.

After graduation he had two postdoc appointments. The first was a year at the University of Bristol, United Kingdom, working with Professor John Ziman. The second was a two-year stint at the University of California at San Diego in La Jolla, working with Professor Harry Suhl.

In 1973 Bill came to Bloomington as an assistant professor in physics. He was promoted to associate professor in 1976 and then to professor in 1980. In his time at IU he has taken four sabbaticals. In 1979 he went to the Institut für Festkörperprobleme at the Kernforschungsanlage, Jülich, West Germany. His next sabbatical was in the physics department at The Ohio State University, Columbus, Ohio, in 1986. Then in 1993 he went to the physics department at Montana State University, Bozeman, Montana. His last sabbatical was at the Center for Research and Education in Optics and Lasers at the University of Central Florida, Orlando, in 2000.

Bill's research has been in condensed matter theory, focusing on the theory of transport and response properties of bulk metals and general surfaces. The emphasis has been on the scattering of electrons, photons, or phonons, with both linear and nonlinear processes being treated. Bill has published 114 research papers in refereed journals, four review articles in books, and four articles in conference proceedings. While at IU he has been awarded $850,000 in research grants, mostly from the National Science Foundation but also

from the North Atlantic Treaty Organization and Ion Optics, a private company. Bill is also a Fellow of the American Physical Society.

In teaching at IU, Bill has covered physics courses at all levels from introductory undergraduate courses for nonphysics majors to advanced courses for physics graduate students. Bill is particularly well known for his teaching of the advanced graduate course on electricity and magnetism. He has established a reputation for rigor and high standards in this course. In 1991 Bill received a teaching award "In Recognition of Outstanding Contributions to Physics Education," which is given annually by the physics graduate students.

Bill has directed the Ph.D. research of four graduate students who have successfully completed their degrees. Of particular note is Mike Mehl, who got his Ph.D. in 1980. Since then Mike has become a senior research scientist at the Naval Research Laboratory and has distinguished himself with a number of important pieces of work in theoretical condensed matter physics.

Bill has also directed the research of four postdoctoral research associates. One of these, Dr. Krzysztof Kempa, has become a professor of physics at Boston University. Kempa has gained an international reputation for his work in theoretical condensed matter physics.

Part of Bill's Ph.D. thesis was focused on photoemission. This is a famous topic in the field of physics. Einstein published a paper on it in 1905 that revolutionized our concept of light, and for this Einstein received his Nobel Prize in Physics (not for relativity). Einstein's work dealt with the gross effects of photoemission based on relatively crude experiments. In the present age the experiments can be carried out much more accurately using samples with extremely clean surfaces. Using the results of such experiments, electronic properties of the specific sample used can be studied. Several mechanisms are involved in the process and these had formerly been treated as independent. Bill derived a theory that unified these processes and that led to results that more accurately described the experiments than did the earlier models.

Bill did some important work on the theory of electromigration. An electrical current in a metallic wire is carried by moving electrons. These electrons collide with the atoms in the wire and cause some of the atoms to move (or migrate). This is electromigration. It usually is not an important effect in macroscopic cases such as the electrical circuits in our house. However, in electronic circuits where the electrical leads (wires) are very thin, electromigration can be rather large and lead to disastrous effects. This is something that designers of such electronic circuits must worry about. Bill carried out microscopic calculations that are useful in this consideration.

In recent times Bill has been doing calculations on the diffraction of electromagnetic waves (light) by structured surfaces. The work has been done in collaboration with several groups, including ones in Graz, Austria; Strasbourg, France; Boston; and here at IU with Professor Bogdan Dragnea in chemistry. One of several possible applications of this work is the replacement of electronics in logical circuits with photonics, i.e., using light waves instead of electrons. Such circuits can be much smaller and faster than present day devices. Another application is to develop ways to trap and manipulate individual nanometer-sized particles (like viruses) by confining and enhancing light in special geometries.

Jim Swihart