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Biographical Sketch of M. Eugene Rudd

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M. Eugene Rudd was born in 1927, in Fargo, North Dakota, of Norwegian ancestry, and has retained a lifelong interest in Norwegian arts and culture. While in high school he worked in a photographic studio, developing what turned out to be a lifelong interest in its technical aspects. After graduating from high school he served for 18 months in the U. S. Army Signal Corps where he was able to put his knowledge of photography to use. He obtained his undergraduate education at Concordia College, Moorhead, Minnesota, graduating in 1950. (In 1992, Concordia College presented him with an honorary D.Sc. in recognition of his distinguished career in science and education.) He was married in 1953 to Eileen L. Hovland, with whom he had three children, Eric, Nancy and Leif. His graduate studies began at the University of Buffalo, where he was a teaching assistant from 1950-1954. He completed his course work and examinations for the Ph.D., but opportunities for research were limited so in 1954, upon receiving an invitation from Concordia College, he took an M.A. and accepted a job first as Assistant, then Associate Professor and Professor of Physics at Concordia College, in the years 1954-1965.

In 1958, while he was a faculty member at Concordia, the College received a surplus Cockcroft-Walton accelerator from Iowa State University through two Concordia alumni. A separate building was constructed for it, and Gene assisted Prof. Carl Bailey in installing it. In 1960, wishing to finish his Ph.D. and wanting to gain experience on an accelerator similar to the Concordia machine, he chose to work with Prof. Ted Jorgensen at the University of Nebraska, who had returned from wartime research in nuclear physics at Los Alamos to initiate a program of research in atomic collisions. With his Ph.D. studies at Nebraska completed in 1962 while on leave from Concordia, Rudd was made Professor of Physics at Concordia College. At Concordia he built an apparatus to make additional measurements of the type he had made at Nebraska, of the angular and energy distribution of electrons produced by proton impact on gases, and secured a contract from the Atomic Energy Commission in 1963 to support the work. During the course of these measurements he discovered fine structure in the electron spectrum from helium due to autoionization from doubly excited states. This led to a National Science Foundation research grant in 1965. After improving the resolution of the instrument to what was near the state of the art in electron spectroscopy at that time, he was able to identify previously unobserved Rydberg series and studied Auger electron spectra as well. As a result of this pioneering work, the study of autoionizing emissions from ion-atom collisions soon became a separate, well-developed field of study.

When Professor Jorgensen began to think about retirement, Henry Valk, who was then department chairman, began a national search to find someone to head up the atomic collisions program at Nebraska. To his pleasant surprise the name that was continually advanced was Gene Rudd, whose work even then at Concordia was being supported by NSF (and has since been continuously supported by NSF, representing one of the longest-funded atomic physics programs in the history of this agency). Gene returned to Nebraska as Associate Professor of Physics in 1965, and was made Professor in 1968, a position which he has held since with distinction. In 1970-72 he was Acting Chairman of the Physics Department on the departure of Henry Valk to become Dean at Georgia Tech.

Gene's research in atomic collision physics has been characterized by originality and thoroughness. He has written review articles and chapters in the Encyclopedia of Physics and elsewhere, and is a co-author on a book on atomic collisions. He has published more than 75 refereed research papers, many of which were of seminal importance. He was the first to study systematically the dependence of the probability for electron emission in ion-atom collisions on the incident ion's energy, and on the ejected electron's energy and angle of emission. In 1964 he made the first experimental observation of doubly excited atomic states produced by heavy particle impact on rare gas target ions with sufficient resolution to identify the states. In 1968 with Ted Jorgensen he made the first experimental observation of "Doppler shifts" of ejected electron spectra. In 1970 came his most famous "first", the observation that a significant component of the ejected electrons travel with a velocity equal to that of the incident ion (a mechanism of ionization called "electron capture to the continuum"). In a collaboration with Joe Macek, the electron promotion model was used to describe the ejection of high energy electrons in low energy collisions.

Rudd's pioneering work continues. He has begun the first experimental measurements of proton impact on atomic hydrogen. This process is fundamental because it involves only 3 particles, and hence has been well studied theoretically. It is fundamental in astrophysics since protons, electrons and hydrogen atoms are among the primary constituents of stars. His work is fundamental in other areas as well. Electrons ejected in atomic collisions in matter produce additional ionizations, and break molecular bonds. These processes produce radiation damage. Rudd's data has led to further investigations of biological effects of heavy ions in human tissue, of the effects of incident cosmic rays on computers in satellites, and to a host of other phenomena. It has been said by Eugen Merzbacher, former president of the American Physical Society, that Rudd's name among the authors of a research paper inspires general confidence in the results and vouches for their reliability. His painstaking data compilations have been of immense value to atomic and radiation effects physicists.

Rudd's work has been well recognized. He is a Fellow of the American Physical Society, and was chairman of the Division of Electron and Atomic Physics of the American Physical Society in 1980. He was also a member of the Committee on Atomic and Molecular Science of the National Academy of Sciences in 1980, the organizer and chairman of a symposium on the History of Spectroscopy, and Chairman of the Report Committee on Secondary Electron spectra of the International Commission on Radiation Units and Measurements 1989-present. At the University of Nebraska he received the Outstanding Scientist Award from Sigma Xi in 1973, and the Burlington-Northern Distinguished Teacher-Scholar Award in 1991.

In his teaching and service to the University, Rudd has brought to bear the same

care, attention to detail, and enthusiasm for continuous improvement that he brings to his research. He served for three years (1978-81) on the College of Arts and Sciences Task Force on the Liberal Arts, which instituted the current liberal education requirements for the College. He then developed both two-semester and one-semester "Liberal Arts Physics" courses which he has taught for 12 semesters since 1980. Since no suitable texts for these courses could be purchased, he developed his lecture notes into a book. In the past five years Rudd has developed two other new courses: a physics course on scientific revolutions for the UNL Honors Program; and a course on "Issues in Science and Religion," which stemmed from his service on the Area Studies Committee for Religious Studies in the College of Arts and Sciences.

Rudd's interest in teaching not only the laws of physics but its history has led to other novel teaching contributions. In the Fall of 1978, he and Duane Jaecks held an exhibition of historically significant scientific instruments in the Sheldon Art Gallery. In 1987 he organized an exhibition in Love Library entitled "Light and Color: An Exhibition of Notable Books from the History of Optics," whose annotated catalog drew praise from 3 faculty members in Harvard's History of Science Department. More recently he wrote a history of physics and astronomy at UNL entitled "Science on the Great Plains" which has been published as a "Nebraska Studies" book by the University of Nebraska Press. His collection of historically significant scientific books and instruments is extensive.

There was also an overarching teaching component to Professor Rudd's research. His research students developed a wide range of experimental as well as critical thinking skills. Because of this outstanding background his research students have gone on to contribute to a wide range of fields. Some of these areas include university teaching and research, governmental and industrial research and development, and medical physics. But most telling of Rudd's success as a teacher are the comments of students who got to know him well. One undergraduate wrote: "I worked for Dr. Rudd for approximately a year and a half. I consider that time as the best learning experience of my college career." A former doctoral student wrote that Rudd's strengths as a teacher are "interest, dedication, and caring." Undergraduates write that "his enthusiasm is contagious" and that "he encourages students to find connections between physics and life."

A most apt description of Gene Rudd has been given by one of his associates in the area of religious studies, Professor John D. Turner, Cotner Professor of Religious Studies, Classics and History at UNL. "Eugene Rudd is truly a scholar of the Renaissance variety, vastly well-rounded, on the cutting edge of his field, yet with a solid grasp of the history of his own discipline and of the many intellectual giants on whose accomplishments it now stands. A humble, unassuming and thoroughly decent human being. Eugene is the paragon of a university professor in the highest sense of the term, an inspiration to all who have known him."