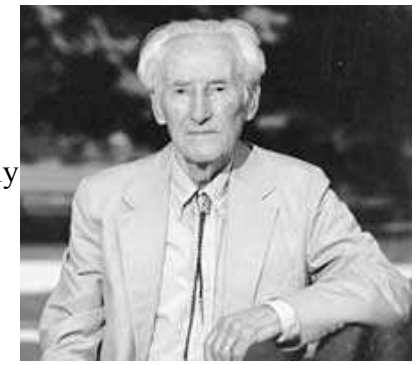
Arnold Ross



With a subject as remarkable as **Arnold Ross** (August 24, 1906 – September 25, 2002), one prays to find the special skill to frame his story so as to be worthy of the man. Although a stroke made it physically impossible to continue to teach after the age of 93, his mind was unimpaired and it can safely be conjectured that he continued to share his remarkable philosophy of learning and teaching mathematics with all who were wise enough to listen. Throughout his life he inspired and helped talented young people discover their abilities to think, reason and create, using mathematics as a vehicle. Probably no other individual has done more during the 20th century to make the nature of mathematics understandable and accessible to so many not only in the United States but also in Australia, Canada, Germany, and India. He has influenced many teachers who have adopted his point of view and in their own way continue his work and spread his message to far greater numbers than even Ross could have imagined.

Ross was born Arnold Ephraim Chaimovich in Chicago, the only child of Jewish emigrants from the Ukraine. In 1909, when his mechanical engineer father could not find work, Arnold's mother, a physical therapist, took her son back to Odessa in Russia to be near her family that could offer them support. Unfortunately, the coming of WWI in 1914 and the Russian Revolution in 1917 made things very difficult. Schools were closed but Ross' uncles, who were medical men, arranged for him to be tutored in mathematics by S.O. Shatunovsky, whom Ross remembered as a charming teacher. A group of university professors opened a gymnasium where Ross recalled that his Geometry teacher did not teach from a book or lecture on proofs. Rather he told them, "Now let's look at this. What do you think is true?" Students were required to justify their suggestions. Ross loved the experience, later saying, "I was fortunate to have an early opportunity to study mathematics under mathematicians who were

charismatic teachers."

At 16 Ross was determined to return to the United States to study with topologist E. H. Moore at the University of Chicago. Ross had to convince a member of the secret police that he was an American citizen and should be allowed to leave Russia. Fortunately, he missed one ship that was mined and sunk because his mother didn't know enough to bribe dishonest policemen. Ross then sat on the doorstep of a sea captain for a week until he was finally allowed to sail for the U.S. He returned to Chicago, but only briefly stayed with his father, who was willing to help his son if he chose to study engineering, but hearing of Arnold's goal, said: "If you want to be a mathematician you can starve on your own." Arnold moved into a room of a home of some family friends and went to work for a bookbinder. He spent long hours on the job and in the evening studied English at the Lewis Institute (now the Illinois Institute of Technology). After about a year Ross had saved up enough money to pay for one term at the University of Chicago.

Although he had no diploma or degrees of any kind, Moore took an interest in this very special student. Moore firmly believed that students are best taught who teach themselves. He didn't lecture but he made conjectures and left it to students to prove what they could. After one quarter, number theorist L.E. Dickson, who became Ross' Ph.D. advisor arranged for his tuition to be waived. In 1931 Ross earned his doctorate for a dissertation entitled *On representation of integers by indefinite ternary quadratic forms*. That same year he married Bertha (Bea) Halley.

The couple spent the next two years at Caltech where Ross had a fellowship, but in the midst of the depression they returned to Chicago. He taught mathematics and physics at the People's Junior College with classes held at a Jewish Community Center. He joined the faculty of St. Louis University in 1935 and, in 1941 attended a summer course held at Brown University designed to sharpen the skills of

scientists and mathematicians so they might contribute to the war effort. During WWII Ross spent periods of time in Rochester, New York doing war-related research at Stromberg-Carlson, an electronics and communication firm. After the war Ross succeeded Karl Menger as chairperson of the department of mathematics at the University of Notre Dame, where he diligently strove to improve the research capabilities of the university, bringing in numerous famous visiting faculty members.

In 1947 Ross began a program designed to deepen the mathematical understanding of high school and junior college teachers. A key ingredient in the program was to be "the art of personal discovery through observation and experimentation." The program got a huge boost in 1957 when the Soviets launched Sputnik and the National Science Foundation began pouring money into teacher training programs. Ross expanded the program to include talented high school students who shared classrooms, observations and experimentations with the teachers. The program, which became officially known as the Ross Summer Program, moved to Ohio State University in 1963, when Ross became chair of the mathematics department of that institution. By 1976, having met the mandatory retiring age of 70, he stepped down as a professor, but continued his role in the Ross Summer Program. It was about the only thing that kept him going when his beloved Bea died after a protracted illness in 1983. Appearing before the program's participants seemed to rejuvenate him. Ross married Madeleine Green, a French widow, in 1990. The program still runs successfully under the direction of Daniel Shapiro.

Ross' approach to sharing mathematical experiences is thankfully unconventional – if one recalls that the conventional approach is often dry as dust. Ross did not tell students about mathematics, or give demonstrations of proofs. He challenged them to make their own discoveries of the mysteries and delights of mathematics. He was equally unconventional in chairing departments of mathematics, recruiting faculty members based on his personal knowledge of their unusual and unique talents, abetted by friendships that he had made over long periods of time. This may sound like some sort of

"old boys' network," but it worked to the advantage of the students. No doubt recalling his own circumstances when he entered the University of Chicago, he accepted many students who did not have conventional backgrounds, degrees or diplomas. These included refugees from the Hungarian student revolution of 1956, who, because of their political activities and taking to the streets to face Russian tanks, were forced to flee for their lives.

All students in the program took Ross's number theory course. The faculty members were research mathematicians who were in sympathy with his belief in the benefits of experimentation and discovery. Once a frustrated student asked Ross what earthly good was number theory? He kindly replied that it had always provided him and his family with a nice living. Number theory was chosen as the basis of the program not just because it was Ross' specialty. He believed that it is an area of mathematics where relatively inexperienced students can delve into some very deep material. It is in number theory that students can best follow Ross' advice, "Think deeply about simple things." The intent of the program for students was to develop their ability to do critical and independent thinking more than it was to accelerate their mathematical education.

The University of Notre Dame was Ross' second post with a Roman Catholic University. Once Father Hesburgh, the outstanding long-time president of the University of Notre Dame, was asked by a know-nothing alumnus why a Catholic University had a Jew as head of the department of mathematics. Hesburgh responded that if the alum could find a Catholic mathematician as outstanding and talented as Arnold Ross he would consider him for the chairmanship after Ross no longer wanted the job. Hesburgh didn't believe he would have to make good on his promise for a long time. When Ross assumed his new position in 1964 at Ohio State, he induced several excellent mathematicians at Notre Dame, including Hans Zassenhaus, to follow him. In 1966 Notre Dame honored Ross by presenting him with the University's Distinguished Service Award. At the ceremony Hesburgh joked, "Arnold, I

trust you will not steal any more faculty from Notre Dame." Ross replied that he couldn't make such a promise.

In 1986 Ross received the Award for Distinguished Service to Mathematics from the Mathematical Association of America. The citation read in part, "…a distinguished mathematician and administrator, generous supporter of the research and scholarship of others, extraordinary discoverer of talent in young people … and respected practitioner of international opportunities in the mathematics science." No one can estimate the numbers of those who felt the loss a great friend when Arnold E. Ross died on Wednesday, September 25, 2002 at age 96.

Quotation of the Day: "The young man taught all he knew and more; the middle-aged man taught all he knew; the old man taught all that his students could understand." – Arnold Ross