10. Degree Production and Alumni Activities

by Paul C. Sharrah with contributions by Michael Lieber and Rajendra Gupta

The first student to receive a B.A. degree in physics from the University was in 1928. He went on to receive a Ph.D. degree from the University of Minnesota. Approximately 313 B.S and B.A. degrees in physics have been granted thru May, 1995. The first master's degree in physics was granted in 1940 under the direction of Dr. L. B. Ham. A total of all M.S. and M.A. degrees granted through the 1995 commencement is 167. There have been 82 physics Ph.D. degrees granted through the 1995 commencement.

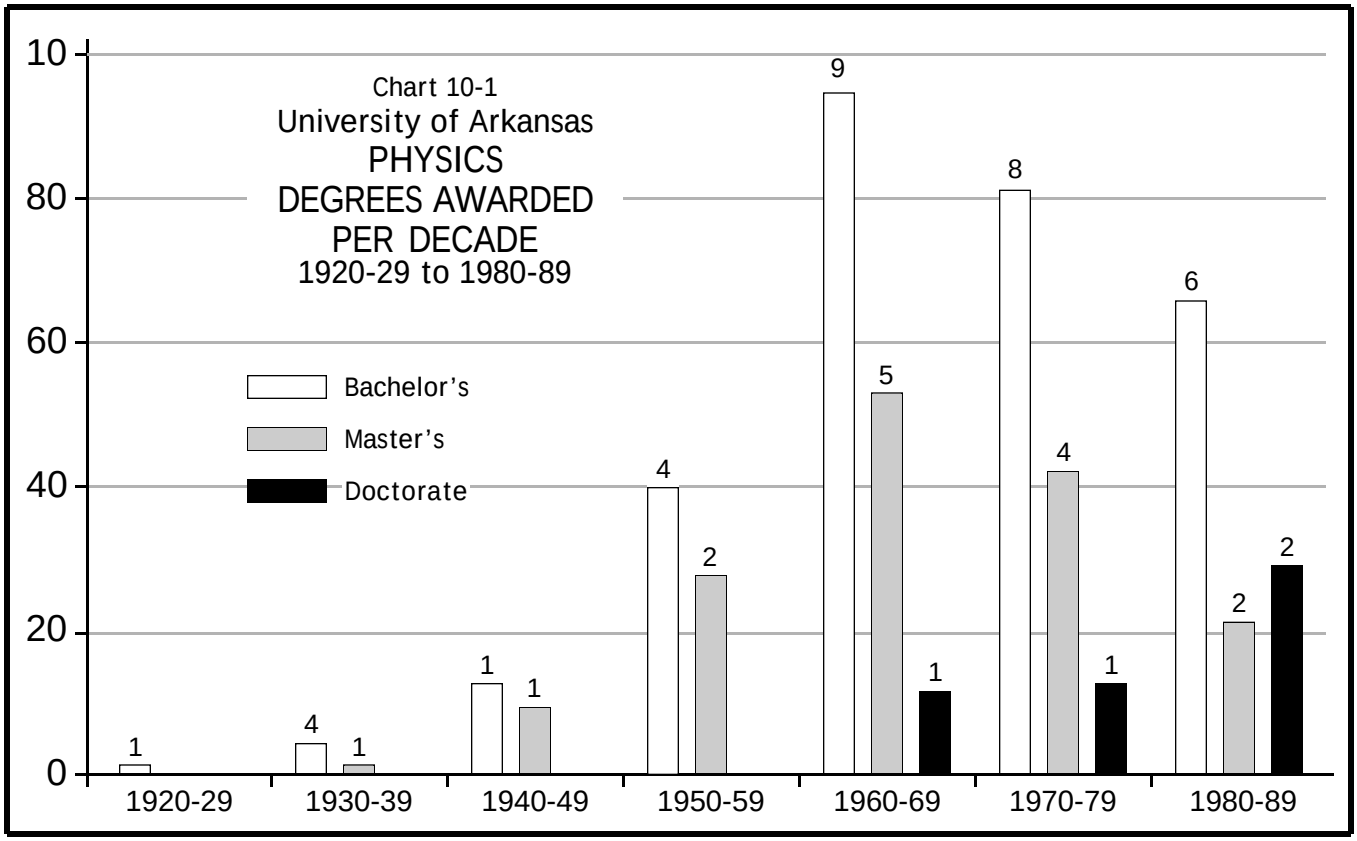
It is interesting to look at the best data we have available on physics degree production both locally and nationwide. Following the precedent set by Professor George Hale (Ref 2), the information is summarized by decades. Table 10-1 lists the number of physics degrees granted by the University at Fayetteville for each classification along with reasonable information on the physics faculty size at the end of each decade. Not included are the faculty size is the student assistants used from the early days of the University and the graduate student assistants. Also shown is the total number of all degrees granted by the University per decade. The University granted the 100,000 degree at the May 1991 commencement (Ref. 9).

The information on the number of physics degrees granted by the University is also displayed in a bar graph in Chart 10-1. The number of bachelor degrees granted reached a peak

Table 10-1
University of Arkansas
PHYSICS DEGREE PRODUCTION DATA BY DECADES
Locally and Nationwide, with Faculty Size at End of Decades

UA Physics Degrees	1910-1919	1920-1929	1930-1939	1940-1949	1950-1959	1960-1969	1970-1979	1980-1989	Total
B.A.		1	2	4	2	7	42	25	83
B.S.			2	9	38	89	39	39	276
B.A./B.S. Total		1	4	13	40	96	81	64	299
M.A.			0	1	1	0	3	4	9
M.S.			1	9	27	53	39	17	146
M.A./M.S. Total			1	10	28	53	42	21	155
Ph.D.						16	17	28	61
All Physics Degrees Total		1	5	23	68	165	140	113	515
UA Physics Faculty Size	3	3	3	4	5	11	13	15	
UA All Degrees Total‡	671	1209	2937	5234	12,129	15,840	25,557	26,089	89,666
Nationwide Physics Doctoral Degrees	*260	626	1336	1453	4898	9341	12,527	10,033	40,474

*Approximate number for decade ending in 1919 as the American Institute of Physics data only goes back to 1912.
‡Data for 1928, 1934, 1939, and 1945 from Ref. 1, page 159. Data 1960 etc. provided by James Duncan, Off. /Institutional Research.



in the decade ending 1969. Of the 96 bachelor degrees granted in that decade, 89 were B.S. degrees and the seven were B.A. degrees. Also one notes that the master's degrees reach the peak values of 53 degrees in the 1969 decade, and 42 in the 1979 decade. The physics degree production locally has been decreasing since the 1969 decade except for the Ph.D. This increase in the local Ph.D. production as compared to the masters degree production is largely due to the recent decisions relative to these two degree programs made in the physics department.

These records indicate a total of 515 physics degrees granted through 1989 and the total is close to 562 through May 1995.

The information on local physics degree production was compiled from Physics Department records, including early data kept by Ham and Sharrah, and from records of the Alumni Association. The figures for UA degree totals were obtained from the history written by Harrison Hale of the chemistry department and from the Office of Institutional Research, courtesy of James Duncan. Information on numbers of doctoral programs and graduates quoted here and in Chapter 8 were provided by Associate Graduate Dean David W. Hart.

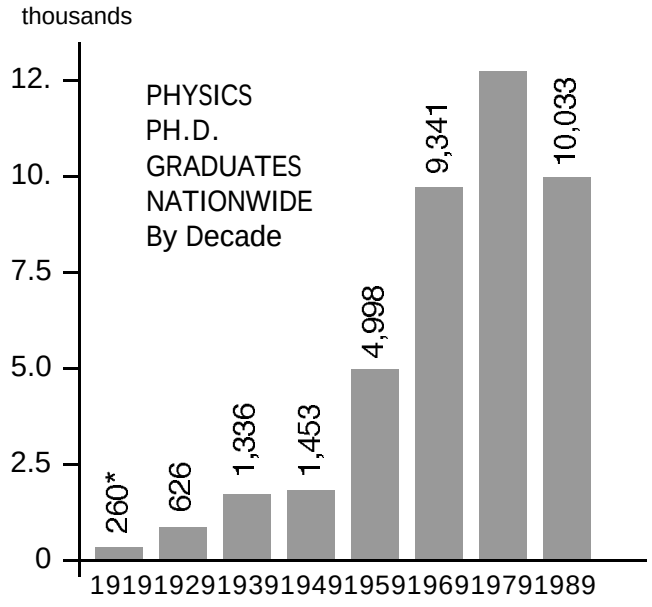
Not shown in the table or graph is the national origins of the graduate students. The number of graduate students from foreign countries has increased considerably during the last two decades. During the 1950's and 1960's there might be only one or two graduate students at a time from other countries here. Consistent with the national trend (Ref 10), this fraction has risen during the 1970's and 1980's so that of the graduate students studying here well over one-third are from other countries. A recent listing of these countries of origin includes Bangladesh, China, Egypt, Greece, India, Jordan, Jamaica, Libya, Maylasia, Nigeria, Ukraine, Russia, Taiwan, and Venezuela.

Also consistent with the increase in the number of foreign graduate students during the last two decades is the change in composition of the faculty. There had been an occasional faculty member of foreign birth in earlier times but most of these had temporary joint teaching and research appointments. There early faculty of foreign origin came from France, Finland,

Scotland, New Zealand and central Europe. Since 1970 the number has increased so that approximately one-third of the present faculty were born and received their earliest training in another country. These include China, India, and Spain.

What can one say about the quality of these early students studying physics. While the numbers prior to 1960 were small, several went on

Chart 10-2



*Approximate number for decade ending in 1919 as the American Institute of Physics data only goes back to 1912.

to obtain Ph.D. degrees elsewhere. Early Ph.D.'s include Ray R. Sullivan, Hugh R. Gingerich, Charles C. Chesley, James J. Billings, Henry Clifton, Bob Clark, Howell Lemming, James K. DePagter, Robert D. Maurer, Charles E. Jones, Glen T. Clayton, Bill J. Good, John H. Terrell, Francis Sharpton, Frank Biggs, Leon West, Lloyd Barnhart, Harold Saxe, and Joe G. Robbins. The above are those who received their undergraduate or masters training at the University of Arkansas and went on to receive Ph.D. degrees elsewhere.

Other students in later years who received doctoral degrees or additional degrees in physics and other fields elsewhere include Jack Swift, Alan Tribble, Jonathan Siegel, Leroy Humphries, Alan Wray and Clark Trantham.

Physics Degrees Nationwide

Information on the physics Ph.D. degree production nationwide is shown in Table 10-1 and in Chart 10 -2. A peaking of the number granted is reached during the decade ending in 1979, a decade earlier than our local peak Ph.D. production. Of course there can be a delay in the peaking of degrees according to type. The decade ending in 1989 shows only 10,033 doctoral degrees in physics being granted nationwide. This is a decrease over the previous decade when 12,527 doctoral degrees were granted; a decrease of approximately 20%. It will be interesting to watch the local and national degree production data and especially the data on employment opportunities. These and other interesting details are carefully considered in the publications of the Education and Employment Statistics Division of the American Institute of Physics (Ref 10). It is a curious fact that the information on the national production of Ph.D. degrees goes back only to 1912 and the information on the bachelor and masters degrees is even more spotty. Of course it is also a well known fact that many of the early chemistry and physics leaders in the United States did their graduate work or advance studies in European or British institutions.

Information on the production of doctoral degrees in physics nationwide was provided by the Educational and Employment Statistics Office of the American Institute of Physics, courtesy of Susanne D. Ellis and Patrick J. Mulvey.

Physics Degree Production 1990-1995

The recent production of physics graduates is summarized in Table 10-2. While the production of graduate degrees continues at about the same rate as shown in Table 10-1 for the graduate degrees in the decade ending in 1989, the undergraduate degree program shows that well under one half as many students were graduated. One must take into account that much of the energy of the department was used up in the much needed renovation and

TABLE 10-2

Six-Year Physics Degree Production

1990 thru 1995

B.A.	B.S.	Total B.A./B.S.	M.A.	M.S.	Total M.A./M.S.	Ph.D.	Total
1	13	14	3	9	12	21	47

TABLE 10-3

Total Physics Degree Production

1920 thru 1995

B.A.	B.S.	Total B.A./B.S.	M.A.	M.S.	Total M.A./M.S.	Ph.D.	Total
84	229	313	12	155	167	82	562

expansion of the building during a large part of this period. Also not to be ignored is the conditions of the market which generally make it harder now than in previous decades for science and engineering students to find employment. Also not to be ignored is the time and energy which has been required to seek to really establish a recognized doctoral research program. The B.A. program had been a major success story especially in the 1970s but it had been permitted to fall behind also (page 75).

Included in Table 10-3 is the data on the total physics degree production at the University of Arkansas. These numbers show a total of all undergraduate degrees granted to be 313 and the total of all graduate degrees to be 249. Eighty-four of the undergraduate degrees were B.A. and 229 were B.S. Again as pointed out above, the major portion of the B.A. degrees were granted between 1970 and 1980 when there was a major emphasis on this program within the department.

The department granted 167 masters degrees and 82 doctoral degrees, with all of the doctoral degrees granted since 1964. The major production of master's degrees was in the 1960s and 1970s with the ratio of doctoral degrees to master's being definitely on the increase. This is principally because of the relatively recent decision to encourage students who are Ph.D. bound to bypass the master's degree.

Placement

What have these 560-plus students done with themselves? Some have become college and university teachers. Others have become doctors and veterinarians. Most of the teachers are teachers of physics but one is a professor of mathematics and another is an engineering professor.

We also find one airline pilot, a financial adviser, and real estate developer, electronic and computer developers, and sales persons, and industrial laboratory workers. One early graduate went on to receive a Ph.D. at the University of Minnesota and he went into forestry research. Some went into military service and military research and development. One became an expert chef and at least one has taken up the breeding of fine horses! One manages an automobile parts business and another works for an electric power company. Physics is fun and can be useful.

Many students who minored in physics or astronomy or who shifted to another field for some good reason have had successful and interesting careers. One operated a successful camera and photography shop with his wife and often publishes in popular electronics magazines. One we heard from recently became a successful administrator in the aircraft industry. One works as a geologist and another as a hospital technician with considerable responsibility. One is an architect and is using photography and graphics skills. There are a number of others but we have difficulty keeping track of those who majored in other fields, unless they happen to correspond with us.

Alumni Activities

The Regional SPS conventions were held in 1972 and several other years. The chapter of Sigma Pi Sigma was installed in 1948 and the chapter of SPS was installed in 1968. The annual newsletter was sent out to former students by Ham and Sharrah in the 1950's and 1960's and was started up again in 1970 by Richard Anderson. It has been reactivated again in 1991 under the leadership of Surendra Singh. The physics scholarships awarded to freshmen make use of funds generated through the sale of the physics laboratory manual through the University Bookstore.

Scholarships

Physics Department gives one award each year to the best physics major called the Lingelbach Award. Funds for this award are endowed by the family of George Lingelbach in his memory. George Lingelbach was an instructor in the department from 1946 to 1965 and was primarily responsible for running the undergraduate laboratories. Recipients of this award have been: Charles D. Capps, 1969; Thomas Jackson, 1970; Louis A. Rosocha, 1971; Michael E. Jones, 1972; William F. Moore, 1973; Bruce L. Schulte, 1974; Alexander C. Calder, 1975; E. Clark Trantham, 1976; Scott N. Harrington, 1977; Kevin C. Thompson, 1977; Kris D. Kirk, 1978; Thomas E. Duerr, 1979; Joseph S. Murphy, 1980; Timothy C. Luce, 1981; Jeffrey N. Roe, 1982; Clint B. Jaco, 1984; Arlis B. Dodson, 1985; James M. Duell, 1986; Robert K. Burrows, 1987; Harold F. Bolton, 1988; Julia D. Smith, 1989; Bryant C. Heikkila, 1990; John H. Glezen, 1991; Colleen A. Wilson, 1992; Gregory W. Fox, 1993; Richard A. Burgess, 1994; and Kevin C. Fandre, 1995.

In 1985 a grant was received from the family of J. R. Porter (B.S. 1963) for an astronomy scholarship. This scholarship is named after a former professor of mechanical engineering and navy officer and avid serious amateur astronomer, Rear Admiral William C. Bryson.

Professor Bryson didn't think very highly of a planetarium; one should go out and see the real sky! He was one of the founders of the Northwest Ark-ansas Amateur Astronomy Club, along with Judge Mack Luffman of Rogers and Paul C. Sharrah. Mrs. Bryson was a faithful member of the club until her death and Eliot Neel is still a driving force in the club.

The awardees to date of the Rear Admiral William C. Bryson Scholarship in Astronomy have been Harold F. Bolton (1988-1989), Colleen A. Wilson (1989-1992), Gregory W. Fox (1992-1993), Robert S. Quinn (1994-1995) and Joshua M. Adams (1995). This scholarship and these students have enriched our program here

Alumni Achievements

Many of Physics Alumni have done well and some have achieved distinction. Biographical sketches of four of them follow:

William McMillan with Department Chair Donald O. Pederson in 1979.

William McMillan: Bill McMillan was recognized as one of the world's leading experts on the behavior of matter at extremely low temperatures.

McMillan, a native of Little Rock, studied electrical engineering as an undergraduate at the University of Arkansas. After receiving his B.S.E.E. in 1958, Bill switched his interests to physics, and earned his M.S. from the University of Arkansas in 1961. He continued his education at the University of Illinois, receiving his doctorate in physics in 1964. He then joined the theoretical physics research staff at the prestigious Bell Laboratories, where he worked on a variety of problems in liquid helium, superconductivity and liquid crystals. During a year at the Cavendish Laboratory of Cambridge University, McMillan wrote a paper that has become a classic in low temperature theory. He joined the faculty of the University of Illinois in 1972. In 1977 he received a Guggenheim Fellowship for study and research at the University of Paris. The next year, he returned to France to receive the highest prize awarded for research in low-temperature physics: the Fritz London Memorial Award. This award, named after a pioneer in

low temperature physics, is awarded every three years. McMillan was cited in recognition of "his outstanding theoretical contributions to the fundamental knowledge of superconductivity."

Robert D. Maurer, B.S. '49

At its 1979 Spring Commencement, the Univers-ity of Arkansas bestowed upon McMillan an honorary Doctor of Laws degree (LL.D.). Tragically, McMillan was killed in 1984 near Champaign-Urbana, when a bicycle he was riding was struck by an automobile. Bill was only 48 at the time, with more than a dozen papers published or in progress during his last year.

Robert D. Maurer: "Robert D. Maurer is truly the father of the optical fiber," said Roland W. Schmitt, President of the Industrial Research Institute on the occasion of presenting Maurer with the Institute's Achievement Award for 1986.

Bob, a native of Arkadelphia, received his B.S. degree in Physics, with high honors, from the University of Arkansas in 1948. From there he went to graduate school at M.I.T., receiving his Ph.D. in Physics only three years later.

He joined the research staff at Corning Glass Works, in Corning, New York, where he remained, becoming a senior research fellow, manager of applied physics, and manager of special projects. His research into the properties of very pure glasses led to the development of optical waveguides. These permit the transmission of in-formation normally carried by electrical signals along wires, but with the wires replaced by very thin glass fibers, and light pulses replacing the electrical current. Optical fibers are revolutionizing the communications industry today. Bob retired from Corning in 1989, but he still goes into the lab once a week as a consultant to the group he formerly directed.

In 1980, the University of Arkansas awarded Bob an honorary LL.D. degree. Although numerous honors have come his way — induction into the National Inventors Hall of Fame; the John Tyndall Award for Industrial Applications of Physics (first winner) from the American Institute of Physics; the L.M. Ericsson International Prize for Telecommuni-cations, awarded by the Swedish Academy of Engineering; the George Morey Award of the American Ceramic Society; and the Morris N. Lieb-mann Award of the Institute of Electrical and Elec-tronic Engineers — Maurer says he values his honorary LL.D. from the University of Arkansas most highly of all.

Wallace Hilton: Wallace Hilton, known to everyone (except his students) as Wally, was one of America's finest teachers of physics. In 1978 the American Association of Physics Teachers (AAPT) recognized his accomplishments by awarding him their highest honor, the Oersted Medal (named for a nineteenth century Danish physicist who emphasized the importance of teaching).

Wally was born in Hardin, Missouri, in 1911. He received his B.A. degree in physics from William Jewell College near Kansas City and, after three years teaching in a tiny high school, he went to graduate school. He earned an M.A. and then an Ed.D. in Science Education from the University of Missouri-Columbia, the latter in 1941. While in graduate school he also taught at the University Training High School and nearby Hickman High. During World War II Wally served as a captain in the U.S. Army Air Corps — teaching meteorology! After the end of the war, Wally came to the University of Arkansas where he earned his M.S. in physics in 1948, working primarily with Prof. Ham, but also with Prof. Sharrah and Prof. Hughes. While still working on his master's, he joined the

Jack B. Swift, B.S. '65

Professor Wallace A.Hilton of William Jewell College delivered a popular address entitled "The Homes and Schools of Sir Isaac Newton" to the students and faculty at the Sigma Pi Sigma and Society of Physics Students banquet in May of 1980. He held a Doctor of Education degree from the University of Missouri and an M.S. in physics from the University of Arkansas.

faculty of his alma mater where he remained for the rest of his professional career, serving as professor and chairman for 34 years! During the next two decades he worked to strengthen the physics department at William Jewell until it developed an outstanding reputation for a small liberal arts college, with the number of physics majors increasing over fivefold and well over 200 graduates! He published over 160 papers, many with undergraduate students as co-authors, for Wally encouraged his students to be involved in research as an essential component in their education. An enthusiast of lecture demonstrations, he collected and developed so many, that the AAPT published his book, *Physics Demonstrations* at William Jewell College, which became a standard reference. He also published two other books.

Wally was honored for his contribution to teaching physics in 1969 by being awarded the first Outstanding Teacher award given by the Missouri Science Teachers Association. Elected a Fellow of the Optical Society of America in 1976, Hilton also in that year became national president of Sigma Pi Sigma, the national physics honor society. In that same year the AAPT gave him their Distinguished Service Citation. The honors culminated with the Oersted Medal of the AAPT in 1978. Wally was cited for "his long and effective service in teaching, writing, and research," and for "his contributions to the teaching of physics, the design of laboratory experiments, and the production of demonstrations." Wally passed away in 1991.

Jack B. Swift: Jack B. Swift was elected a Fellow of the Ameri-can Physical Society in 1995 "for his contributions to the understanding of instabilities and pattern formation in convection, Couette-Taylor flow, and liquid crystals, and for the development (with Hohenberg) of the widely studied Swift-Hohenberg equation."

Jack received his B.S. in physics at the University of Arkansas in 1965 and went on to graduate school at University of Illinois. He

received the Ph.D. degree under Leo Kadanoff, a distinguished physicist, now at University of Chicago. After post-doctoral work at Max-Planck Institute für Physik and Astrophysik, Munich (1968-69) and Harvard (1969-71), he joined the faculty of the University of Texas at Austin, where he is a professor now. He has had visiting appointments at Bell labs and Brown University, was an Alfred P. Sloan Foundation Fellow, and is a member of Phi Beta Kappa.

In his early work, Swift used the mode-mode coupling formalism to investigate dynamical critical phenomena. The first quantitative predictions of the singular behavior of the thermal conductivity and diffusion constant near critical points were the results of this work. Swift's research is focused on two areas: (a) the theoretical investigation of instabilities, pattern formation, and chaos in nonequilibrium, nonlinear systems, particularly convection, and (b) the statistical mechanics of liquid crystals. In the mid 1970s he and Hohenberg developed a simplified field model which has been widely used to study patterns, instabilities, wavelength selection, onset, and the effects of thermal noise in convecting systems. He and co-workers have developed and studied methods, particularly the spectrum of Lyapunov exponents, for characterizing the complex behavior of systems exhibiting chaos. With collaborators, including members of an experimental group, he has investigated pattern competition in temporally modulated convection. He and collaborators have addressed the problem of the effects of thermal noise near hydrodynamic instabilities, with emphasis on quantitative predictions which may be compared with high precision experiments. In a long term effort, he and collaborators have studied the thermodynamic, structural, viscous, and hydrodynamic properties of nematic phase of liquid crystals.