Henry Eyring, President-Elect

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"Physical chemistry is everything that is interesting," so replied G. N. Lewis, the distinguished mentor of Henry Eyring at Berkeley, California, when queried about the content of this scientific discipline. If this definition be correct, then one who follows the profession of physical chemistry must be sort of a "pan-scientist," and for this title Henry Eyring is well qualified.

It is entirely appropriate that a scientist of this description should lead the American Association for the Advancement of Science, for this organization, by its very title, must be presumed to be engaged in that broad front of truth seeking and truth dissemination which applies no limiting adjectives to describe the word science.

Henry Eyring, the man, is as interesting as Henry Eyring, the scientist. He is a product of the 20th century, having been born a few weeks after its beginning in the little pioneering community of Colonia, Juarez, Chihuahua, Mexico, some hundred miles south of the United States–Mexican border and near the Mexican town of Casas Grandes. Colonia, Juarez, had been founded by a colony of U.S. citizens, including all the grandparents of Henry Eyring, who left southern Utah in search of more land which could be used for ranching. Growing up in such a community, young Henry became a youthful "cowpoke." I have seen the broad range on which Henry, as a lad, "rode herd" on unwilling range cattle, and have listened to stories of frustrating, and therefore memorable, occurrences on this range.

But this cattle range was not to be involved in Henry's future. In the words of Robert Burns, "The best laid schemes o'mice and men gang aft agley," and in Henry's case a turning point in his life came when the Mexican rebel, Salazar, threatened the little "Yankee" colony with extermination, causing the inhabitants to flee north to El Paso and safety. Henry was 11 years old at the time and he has never forgiven his elders for not permitting him to ride out on horseback with the hastily formed militia, rather than be sent out on a train with the women and children.

The experience left the family quite impoverished, since they left behind them all their possessions. Under the circumstances, Henry took his first job for hire and became a cash boy at Calisher's Department Store in El Paso. Henry reports that his beginning wage in this store was $2 per week and that this was soon raised to $3.50. His work week was 63 hours. Even this small wage helped support the family in this time of difficulty. The original idea of the family was to go back to their Mexican holdings as soon as the trouble subsided, but instead of the expected improvement, the conditions there became worse and the family decided to make a new home in Pima, Arizona, a town of a few hundred people and a short distance from Thatcher in which a good high school existed.

Henry excelled as a high school student and won the $500 County scholarship from Graham County to study at the University of Arizona. With this scholarship and extra money made by "waiting table" at the University he was able to obtain his bachelor of science degree in mining engineering. It must be remembered that in those days mining in the west was a glamour activity and held the promise of romance for a young mining engineer. During the summer months Henry worked as a timberman in one of Arizona's copper mines, but the experience was not to his liking and caused him to reorient his objectives. After graduation he obtained a graduate fellowship at his Alma Mater and went for a master's degree in extractive metallurgy; his thesis dealt with the rapidly developing subject of flotation. After receiving his master's degree he took an engineering job in a smelter, but this also failed to satisfy him, and even though he was given an alluring promise of rapid promotion by the smelter superintendent he went back to the University of Arizona where he joined the department of chemistry for a year and did a research problem in quantitative analysis. The following year found him at the University of California (Berkeley) as a teaching assistant in chemistry. He received his doctoral degree in 1927; his thesis was concerned with a problem in radiochemistry. G. E. Gibson was his major professor.

After graduation Eyring went to Wisconsin as an instructor in chemistry where he came under the influence of Farrington Daniels, and there was oriented toward reaction rate theory, to which area he has contributed as much as, and possibly more than, any other scientist. While at Wisconsin Henry met and married Mildred Bennion, so that his 2 years at Wisconsin were important ones in shaping his adult life.

The 1929–30 academic year was spent as a National Research Fellow in Haber's laboratory in Germany where Eyring worked with Polanyi in pioneering the calculation of activation energies and in developing the first potential surface on which a quantitative theory of reaction rates was later built. The year 1930–31 found Eyring again at Berkeley as a lecturer where he did the work on hydrogen-halogen reaction rates which showed for the first time that reaction rates could be predicted from theoretical considerations. This work brought him such favorable attention that H. S. Taylor offered him a staff position at Princeton University where he remained until 1946, when his interest in the needs of the West caused him to go to the University of Utah as dean of the newly organized graduate school. There he helped to build an important graduate program in Mormon country, the land to which his "converted grandparents" had immigrated from Germany and England.

Henry Eyring is a genealogist by instinct and is proud of his ancestry, which, beside the Eyring family from Coburg, Germany, includes the von Blomberg family from Prussia and the

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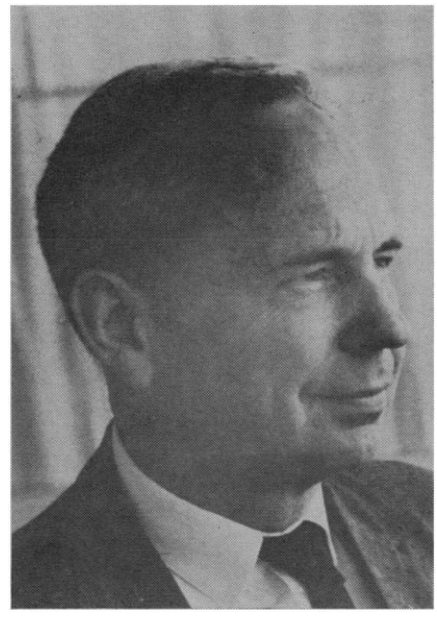
Bomeli family from Switzerland, each of which is a family of substantial and intelligent people. From them comes Henry's bias toward science. His mother comes from the Cottam and Romney families of England; many of these individuals show great talent for business, for political leadership, and for athletics, as currently illustrated by his cousin George Romney, governor of Michigan. Henry has the athletic abilities of the Romney family though he has never "gone out" for athletics, as many of his cousins have done. His athletic interests are now satisfied by frequently walking the 2 miles from his home to the university, by an occasional mountain climb, and by a yearly foot race with the graduate students studying with him. The students always win, for "Uncle Henry," as he is familiarly known to his graduate students, treats them to a banquet after the race, regardless of their success in the race.

The Eyrings have three sons, each of whom is an excellent and serious-minded student. The eldest boy, Edward M., is following his father as a physical chemist and is also at the University of Utah. His special interest at present is that of very fast reaction rates. The second boy, Henry B., is at Stanford University as an assistant professor of business administration, and Harden, the youngest, is a graduate student in physics.

During his years as university lecturer and professor, Henry Eyring has directed the doctoral thesis work of no fewer than 64 graduate students, many of whom now are numbered among the world's highly productive scientists. These students have sought out Eyring with whom to study because he is always stimulating, comes easily by novel and productive ideas, is solicitous of the progress of his students, rewards them liberally with commendation for their earnest efforts to solve difficult scientific problems, and is generous in giving the student status by making him the senior author on joint publications.

Eyring's training was that of an experimentalist, but his contributions while at Princeton were almost exclusively in the realm of theoretical chemistry, wherein the published experimental results of others became the basis of illuminating analyses which led to new concepts and increased understandings of wide-ranging phenomena to science. Hideki Yukawa, Nobel prize winning physicist from Japan, in his memoir of a trip around the world entitled, "Micro-World" has this to say of his visit to Eyring's laboratory at Princeton:



Henry Eyring

> I visited Professor Eyring at Princeton, N.J., in May 1940. . . . It was the first time to meet Dr. Eyring, although I had known him for a long time through his interesting papers in quantum theory. He was younger than I expected. After talking about his current researches, he showed me around his laboratory and introduced his students to me. I saw only slide rules and several calculators on tables, but could not find even a simple piece of experimental apparatus in his laboratory. It was my first experience to observe such a chemical laboratory.

Regardless of the observations of Yukawa, Eyring's theorizing usually has as its incentive and purpose the explanation and understanding of observed and measured phenomena. At the University of Utah he is building a laboratory of his own which now has in it several expensive and exotic pieces of equipment to study optical rotatory phenomena and the reactions of materials in high pressure environments.

The facile way Eyring's mind works in arriving at the solution of a scientific problem is a dynamic and stimulating experience for one who watches him think through a problem with chalk in hand before a group of students.

The services of Eyring are widely sought as a speaker in several areas: as an expositor of recent scientific developments to groups of professional scientists, as a discussant of science and religion to church groups and to college students during the "religious emphasis weeks" of their various institutions, and as an interpreter of science to lay groups, including high school students. During this past Christmas week he gave the first series of five popular lectures on science at the Franklin Institute in Philadelphia; these lectures have been described as a revival of the famous Faraday Christmas lectures given at the Royal Society of London over a century ago. Eyring's style and manner of speaking must be characterized as unorthodox, but his discussions are always lively, informative, stimulating, and enjoyable. His unique sense of humor—which is always at the expense of himself—is extensively used in his lectures to lay groups and makes attendance at the lectures a delightful experience.

Eyring always has on his agenda a work load which would frustrate most individuals. To meet his many appointments he travels much and in this seems indefatigable. He relaxes easily so that he can rest well on a plane, on a train, in an airport—in fact, most anywhere night finds him, so long as it is warm. He says he is a Mexican and needs only warmth to be able to rest.

Henry Eyring came to the University of Utah in 1946 as the first dean of the graduate school of that institution. In the intervening 17 years the graduate school registration has grown to about 2000 students a year. A recent survey by the U.S. Office of Education places Utah as number 40 among the graduate schools of the country in the matter of doctor of philosophy degrees bestowed in the 10-year period from 1949 through 1959. Because this statistic includes the very lean years when this program was just beginning at the University of Utah, the present standing of the University must be higher than this. As graduate dean, Eyring is sensitive to the needs and problems of the graduate student and is much more considerate of those in difficulty than are many of the younger heads of departments who think an excellent graduate school can only develop if the faculty is "tough" on students. Students who draw a reprimand from Eyring usually do so because of an infraction of the usual code of honesty and integrity, or the evidence of laziness.

The scientific publications of Eyring are extensively read and frequently re-

ferenced by other scientists. This is so probably because these publications are readily understood and the results are applicable to a wide variety of scientific phenomena. Eyring's solution to a problem usually begins with an easily understood physical model to which he applies the necessary mathematics in order to arrive at a quantitative and usable answer. Neither the method nor the answer is involved with mathematical minutia and uninterpretable symbolism; where mathematical approximations ease the way these are used. With Eyring, mathematics is a tool and not an end. The physical and chemical nature of the problem, or the answer, is never submerged in mathematical obscurity. To develop a suitable model Eyring frequently asks: "Now how would I act if I were an atom and found myself in this environment?" Such a question usually brings forth an interesting model on which to work for a quantitative result. If agreement is not attained a new model is postulated.

The breadth of Eyring's scientific contributions is partly indicated by the many scientific disciplines to which he has been a direct contributor. These include: mining engineering, metallurgy, ceramics, fuels, explosives, geology, plastics, fibers, lubricants, organic chemistry, molecular biology, analytical chemistry, radiation chemistry, electrolytic chemistry, quantum chemistry, and statistical mechanics. Most of Eyring's papers use the physical-chemical approach to the problem involved, and most have to do with the energy and time description of the making and breaking of chemical bonds, which is the most universal phenomena in the mundane world. The work of Henry Eyring gives confirmation to the comment of G. N. Lewis at the beginning of this biographical sketch.

The number of publications carrying Eyring's name as an author or coauthor now number about 350. These have appeared in many journals from several countries. Among these publications are four books, three of which are classics in their field. A new book entitled "Statistical Mechanics and Dynamics" is now in press and several more are in course of being written, including one to be entitled "The Dynamics of Life." In addition, Eyring is a director of Annual Reviews, Inc., and the editor of the series *Annual Reviews of Physical Chemistry*.

Many scientific societies include Eyring in their membership rosters; these include the National Academy of Sciences, the American Association for the Advancement of Science, the American Chemical Society, the American Philosophical Society, the American Academy of Arts and Sciences, and the Society of Rheology. He has been an officer in several of these, including: president, American Chemical Society (1963); director and president of the Pacific Division of the American Association for the Advancement of Science (1958); and vice president of the Society of Rheology (1946). Presently he is head of Section 15 (physical chemistry) of the National Academy of Sciences Committee for the National Bureau of Standards. He was appointed by the National Academy of Sciences to prepare the molecule demonstration for the U.S. exhibit at the Brussels World's Fair in 1958. In 1962 President Kennedy appointed him to the National Science Board, and he is a member of the Scientific Advisory Committee of the Welsh Foundation of Houston, Texas. It seems appropriate to mention here also that he serves his church as a member of the General Board of the Sunday schools of that organization. He takes considerable pride and delight in this activity, and the assignment has taken him on Sunday school matters throughout the United States, England, Mexico, and Canada. This church assignment is his only deviation from complete dedication and service to science.

For his distinguished contributions to science, Eyring has been given honorary doctoral degrees by five universities. The American Chemical Society has honored him with the Debye award in physical chemistry (1946); the California Section, the G. N. Lewis award (1963); the New York Section, the William H. Nichols medal (1951); and the Utah Section their Annual award (1959). The University of Arizona bestowed upon him their Alumni Achievement award (1947) and their Award of merit (1960). The Society of Rheology bestowed upon him their Bingham medal (1949). The initial recognition of Eyring's merit, however, was by the American Association for the Advancement of Science which bestowed on him the 9th Annual prize (1932), and now they honor him with the highest recognition to be bestowed by them, the president-elect of the Society, which leads to the offices of president and retiring president and chairman of the board of directors.

Peter Debye once said of Eyring, in effect: "His contributions to science are like the paintings of Frans Hals; he paints with a bold broad brush." In presenting Eyring with the Research Corporation award, Joseph W. Barker said: "He has pushed hard and successfully into the previously unknown and, like Jason, has brought home the Golden Fleece. He is a true catalyst of men's minds. In his presence ideas just naturally flow and methods of disproving them are originated." Hugh S. Taylor once commented: ". . . he possesses the Midas touch. Everything in scientific research turns to gold when brought to the attention of his fertile brain. But there are none of the evils that beset the original Midas."

The scientific contributions of Eyring are well known to his peers and recognized by them as important contributions to the onrush of scientific knowledge. Men everywhere, who enjoy the bounties of science, are blessed with these bounties partly because of the contributions of Henry Eyring which have had and will have a part in making scientific and technological progress possible.