32nd Annual

Once Upon a Christmas Cheery in the Lab of Shakhashiri

December 2001

December 2, 3 (1:00 & 4:00 pm)
Farrington Daniels Chemistry Building
University of Wisconsin-Madison

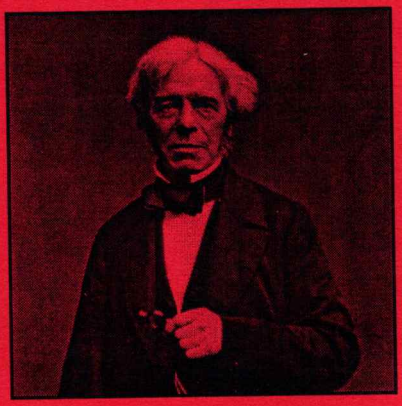
December 8, 9
Discovery Place, Charlotte, NC

www.scifun.org

Wisconsin Public Television telecast:
3:30 pm, Monday, December 24, 2001
8:00 am, Sunday, December 30, 2001

The Origin of the Christmas Lecture

Michael Faraday, the noted English physicist and chemist, lived from 1791 to 1867. He was a gifted lecturer, and he began giving his Christmas Lectures for children at the Royal Instituion of Great Britiain in the 1840s. Faraday loved simplicity, and he had a strong sense of the dramatic. His audience entered wholeheartedly into the world of science with him as guide. His ideas were still considered very unorthodox at that time, and children, who had not yet adopted conventional ideas, would react enthusiastically to the ones he presented. Eventually, the lectures became very popular, and even the Prince of Wales attended and learned about the mysteries of electricity. Faraday sought to awaken the sense of wonder in his listeners. He knew that once a person could be made to wonder about the world, it was only a short step to studying it. He strove to point out that if you looked closely at the most ordinary thing, such as the force of gravity, it ceased to be ordinary and became somehow miraculous. Faraday did all he could to urge his listeners to see and judge for themselves, to experiment–to question nature directly–whenever anyone discovered something out of the ordinary.



Bassam Z. Shakhashiri

William T. Evjue Distinguished Chair for the Wisconsin Idea

"Scientist by training, teacher and public servant by trade, advocate by conviction, optimist by nature"– that is the way Bassam Z. Shakhashiri describes himself. As Professor of Chemistry at the University of Wisconsin-Madison, Dr. Shakhashiri finds outlet for all four attributes, to which he might add a fifth: entertainer by avocation.

Dr. Shakhashiri, as a matter of fact, is probably best known to the public at large for his annual program, "Once Upon a Christmas Cheery/In the Lab of Shakhashiri,"; seen on television throughout the country. The science oriented "magic" show has played to packed houses at such varied places as the University of Wisconsin-Madison, the National Academy of Sciences and the Smithsonian's National Air and Space Museum in Washington, and Boston's Museum of Science. The one-hour show as well as two half-hour shows are featured year round on PBS and on other stations. The Christmas Lecture, which is in the tradition of the great British scientist Michael Faraday, is only one demonstration of Dr. Shakhashiri's attachment to hands-on science. He is well known nationally for his development and use of demonstrations in the teaching of chemistry in lecture rooms and laboratories as well as in such less formal settings as convention centers, shopping malls and retirement homes.

He is a guest on TV and radio talk shows across the country and is a regular guest on the Larry Meiller Show on the Ideas Network of Wisconsin Public Radio. He has been featured in newspaper, magazines, national and local radio and television including the *New York Times*, the *Washington Post*, *Newsweek, Time*, NBC Nightly News, CNN, and the Larry King Show.

A native of Lebanon, Dr. Shakhashiri is the son of a physician who is retired from the U.S. National Institutes of Health in Bethesda, MD. The Shakhashiris, father, mother, son and two daughters, came to the United States in 1957 when Bassam was 18 years old with one year of college (at the American University of Beirut) behind him. He completed undergraduate work at Boston University (Class of '60) with an A.B. degree in chemistry, served as a teaching fellow at Bowdoin College for one academic year and then earned master's and Ph.D. degrees in chemistry at the University of Maryland ('64 and '68 respectively).

After a year of post-doctoral research and two years as a junior mem-

ber of the chemistry faculty at the University of Illinois, Urbana, Dr. Shakhashiri joined the faculty of the University of Wisconsin in 1970, a position he has held since. In 1977 he was the founding chair of the University of Wisconsin System Undergraduate Teaching Improvement Council. In 1983 Dr. Shakhashiri founded the Institute for Chemical Education (ICE) and served as its first director.

His SCIENCE IS FUN! presentations in Madison at shopping malls, the Capitol Square, the Great Walk of the Muscular Dystrophy Association, KIDS EXPO, *etc.*, as well as his visits to schools and colleges, have reached tens of thousands of students, their teachers, and parents throughout Wisconsin.

Dr. Shakhashiri has given over1000 invited lectures and presentations in the United States and other countries. He has co-authored several publications including *Manual for Laboratory Investigations in General Chemistry*; *Workbook for General Chemistry Audio-Tape Lessons*; *Chemical Demonstrations: A Handbook for Teachers of Chemistry, Volumes 1, 2, 3 and 4; and semi-programmed booklets on equilibrium, kinetics, and organic chemistry. The Shakhashiri Chemical Demonstrations Videotapes and Videodiscs* were published in 1991 by Holt, Rinehart and Winston, Inc. and Saunders College Publishing Company. His publications, television programs, and web site (www.scifun.chem.wisc.edu) are the bases for what thousand of chemists and teachers present annually during National Chemistry Week, National Science and Technology Week, and on a daily basis in classrooms and science museums across the country and elsewhere. Another of his pioneering efforts is an interactive chemistry exhibit on permanent display since 1983 at the Chicago Museum of Science and Industry.

On June 26, 1984 he was sworn-in as Assistant Director of the National Science Foundation for Science and Engineering Education by the President's Science Adviser. In this position he was the principal education officer of the federal agency chiefly concerned with research in the natural sciences and engineering. As such, he was responsible for the design and administration of a wide variety of programs to improve all levels of education in mathematics, engineering and the sciences.

He presided over the rebuilding of the NSF efforts in science and engineering education after they had been essentially zeroed-out in the early 1980's. He established NSF's integrity and credibility by the quality of the staff he hired, the design of new programs, and the securing of funds. His visionary strategic plans were designed and implemented with the aid of a most distinguished national advisory committee which he appointed and with the support of Congress. Systemic reform programs were launched; elementary and middle school programs were introduced along side reju-

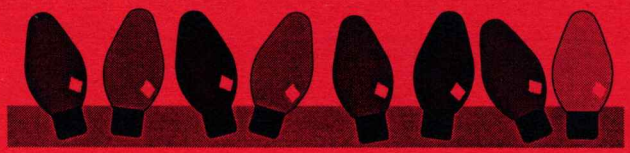
venated and expanded high school programs; undergraduate programs were created and increased; and graduate fellowships and traineeships were buttressed. His leadership and effectiveness in developing and implementing national programs in science and engineering education became legend and have helped set the annual NSF education budget at over $600 million.

In September of 1990 he returned to Madison and has taught introductory level chemistry to over 600 students annually. He vigorously continues his advocacy for both increasing the flow of talent to careers in science and achieving science literacy by the public at-large. He was elected to a variety of faculty committees including the Executive Committee of the Physical Science Division, the Executive Committee of the Graduate School, and the Honorary Degrees Committee. He is a leader in the Freshman Learning Community Program and the Women in Science and Engineering Program.

Dr. Shakhashiri is a member of many scientific and educational organizations including the American Chemical Society, in which he has held numerous leadership positions at the local and national levels. In 1986, he was elected a fellow of the American Association for the Advancement of Science. In 1987, he was elected an honorary member of the South Carolina Academy of Science and in 1990 an honorary member of the Alabama Academy of Science.

Among his many awards are the 1977 Kiekhofer Distinguished Teaching Award from the University of Wisconsin-Madison, and the 1979 Manufacturing Chemists Association Catalyst Award. He is the youngest recipient of two of the American Chemical Society's most coveted recognitions–the James Flack Norris Award for Outstanding Achievement in the Teaching of Chemistry (1983) and the ACS Award in Chemical Education (1986). In 1982 he was given the Ron Gibbs Award of the Wisconsin Society of Science Teachers. In 1995 he was cited in the *Year Book of Encyclopaedia Britannica* as the "dean" of lecture demonstrators in America. In 1998 he was given the Sacred Heart University Presidential Initiative Award in recognition of his national contributions to advancing science education. He is the recipient of five honorary doctoral degrees.

Dr. Shakhashiri serves on many national boards and governing bodies including the Board for the Merck Institute for Science Education; the National Advisory Board of *The Scientist*; and the national board of the Center for Chemical Education at Miami University (Oxford, OH).



32
Ge
Germanium

This year marks the 32nd annual presentation of the Holiday Lecture, "Once upon a Christmas Cheery in the Lab of Shakhashiri." It is fitting for a chemist to mark the 32nd anniversary with the chemical element whose atomic number is 32, namely germanium.

The existence and properties of the element germanium were predicted by Mendeleyev in his 1871 paper "The Periodic Law of the Chemical Elements." It was first isolated in 1886 by Winkler who named it in honor of his German homeland. Many of germanium's properties were virtually identical to Mendeleyev's predictions.

The principal commercial source of germanium is zinc sulfide ore from Missouri, Kansas, and Oklahoma. These ores contain only about 0.05% germanium. The element germanium has silvery-white metallic appearance. Unlike metals, however, it is hard and brittle, and it is a poor conductor of electricity.

The most important use of germanium is as a semiconductor. Before it can be used as a semiconductor, it must be extensively purified, most commonly by zone refining. In this process a zone or band in a germanium bar is melted, and the melted section is moved along the bar. Impurities tend to move along with the melted band. By repeating the process many times, nearly all of the impurities are concentrated at one end of the bar. To make a semiconductor from the very pure germanium, a small amount of arsenic, gallium, or other elements, is added to the germanium. Semiconductors made in this way are used to make transistor components in thousands of electronic devices. The element germanium is also used to form alloys with metals such as copper. The copper-germanium alloy is a golden color and very resistant to corrosion.

ORDER YOUR CHRISTMAS LECTURE VIDEOS!

You can have your very own copy of this year's Holiday Lecture on videocassette! Use this handy order form to obtain copies of this year's program, as well as copies of programs from previous years.

The cost of the tapes is $30.00 for one, $50.00 for any two, and $20.00 each for any three or more.

_____ copies this year's Lecture

_____ copies 2000 Lecture **_____ copies 1999 Lecture**

_____ copies 1998 Lecture **_____ copies 1996 Lecture**

_____ copies 1994 Lecture **_____ copies 1993 Lecture**

Cost of tapes $_____

Wis residents add 5% sales tax $_____

Total $_____

Enclosed is a check payable to **UW Christmas Lecture**. (Please do not send cash. Sorry, charge and COD orders cannot be accepted.)

MAIL COMPLETED FORM TO:

UW Christmas Lecture
Department of Chemistry
University of Wisconsin-Madison
1101 University Avenue
Madison, WI 53706-1322

Name_____

Address_____

City_____ **State**_____ **Zip**_____

Acknowledgements

The 2001 Christmas Lecture is made possible through the cooperation and support of:

University of Wisconsin-Madison
Department of Chemistry
Alpha Chi Sigma Chemistry Fraternity
Bucky Badger
Wisconsin Public Television
Public Broadcasting System
DuPont Office of Education
Evjue Foundation
Educational Innovations, Inc.
Anonymous Donors
Santa Claus
Santa's Elves