

**36th Annual**  
**Once Upon a**  
**Christmas Cheery**  
**in the Lab of Shakhshiri**

**2005**



**December 3rd & 4th - 1:00 & 4:00 pm**  
**Farrington Daniels Chemistry Building**  
**University of Wisconsin-Madison**

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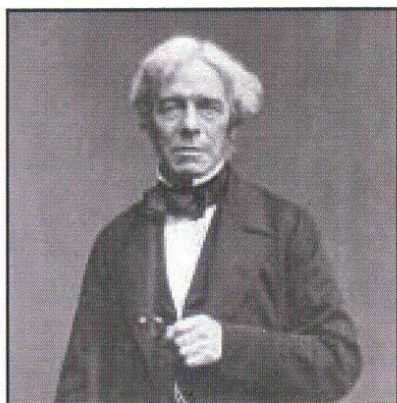
Wisconsin Public Television telecast:  
4:00 pm, Friday, December 23, 2005  
8:00 am, Sunday, December 25, 2005



## 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 Institution of Great Britain 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. Throughout the 19 annual Christmas Lectures that he presented, 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.





36

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Krypton

This is the 36<sup>th</sup> annual presentation of the Holiday Lecture, "Once Upon a Christmas Cheery in the Lab of Shakhshiri." It is fitting for a chemist to mark the 36th anniversary with the element whose atomic number is 36, namely krypton.

The element krypton is completely different from the fictional kryptonite of the Superman comics. Kryptonite, supposedly fragments of Superman's home planet, Krypton, is so active it could even kill Superman. However, the element krypton is so inert it's almost impossible to get it to react chemically with any other substance. This is a good thing because you're breathing some of it right now. Krypton makes up about one part per million of Earth's atmosphere. Apparently, Superman's creators just thought krypton was an interesting and exotic word. It comes from the Greek "kryptos" meaning "hidden." The word "kryptonite" is also used for a bicycle lock and appears in popular song lyrics.

Krypton was discovered in 1898 during experiments in liquefying air. On Earth, krypton is always a gas. It liquefies at  $-152^{\circ}$  Celsius and becomes a white, crystalline solid at  $-156^{\circ}$  Celsius. Krypton gas is about three times as heavy as air. It is colorless, odorless, non-toxic, and noncombustible. Along with neon, argon, and xenon, it is sometimes called a "noble gas" because it doesn't combine with any other element. No compounds of krypton are found in nature. After years of trying, however, chemists finally got krypton to combine with fluorine, the most reactive element. These compounds decompose at room temperature and above. In 2003, a compound containing bonds between krypton and carbon and between krypton and hydrogen was created; it is stable only in solid krypton below  $-250^{\circ}$  Celsius.

Krypton's use is limited because it's fairly expensive, about \$30 per liter. It's used in specialty light bulbs, fluorescent tubes, and lasers and a slightly radioactive isotope, krypton 85, is used to monitor chemical reactions and detect leaks from sealed containers. Check out items like bicycle lights and camera flash units and you may find that they contain krypton. From 1960 to 1983 the wavelength of the orange-red emission from the krypton-86 isotope was used as the standard for the meter, but the meter is now defined in terms of the speed of light.

# **BASSAM Z. SHAKHASHIRI**

**William T. Evjue Distinguished Chair  
for the Wisconsin Idea**

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

Dr. Shakhshiri is probably best known to the public at large for his annual program, “Once Upon a Christmas Cheery/In the Lab of Shakhshiri,”; that attracts enthusiastic live and television audiences across the country. 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. Shakhshiri’s attachment to hands-on science.

Dr. Shakhshiri is a guest on TV and radio talk shows across the country and is a regular guest on the Larry Meiller Show 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. Shakhshiri came to the United States in 1957 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 chemistry faculty at the University of Illinois, Urbana, Dr. Shakhshiri 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. Shakhshiri founded the Institute for Chemical Education (ICE) and served as its first director.

Dr. Shakhshiri has given over 1000 invited lectures and presentations in the US and other countries. He has co-authored several publications including *Workbook for General Chemistry*; *Chemical Demonstrations: A Handbook for Teachers of Chemistry, Volumes 1, 2, 3 and 4*; and semi-

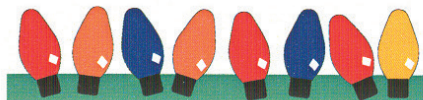


programmed booklets on equilibrium, kinetics, and organic chemistry. Another of his pioneering efforts is an interactive chemistry exhibit on permanent display since 1983 at the Chicago Museum of Science and Industry.

From 1984 to 1990 Professor Shakhshiri served as Assistant Director of the National Science Foundation for Science and Engineering Education. As the NSF chief education officer he presided over the rebuilding of all the NSF efforts in science and engineering education after they had been essentially eliminated in the early 1980s. His leadership and effectiveness helped set the annual NSF education budget at its current level of about \$800 million. His NSF strategic plan launched most of the NSF education programs of the last decades.

Among his over 30 awards are the 1977 Kiekhofner Distinguished Teaching Award from UW-Madison, the 1979 Manufacturing Chemists Association Catalyst Award, the American Chemical Society James Flack Norris Award for Outstanding Achievement in the Teaching of Chemistry (1983) and the ACS Award in Chemical Education (1986), and the 2003 "Public Understanding of Science and Technology" of the American Association for the Advancement of Science. In 1995 he was cited in the *Year Book of Encyclopaedia Britannica* as the "dean" of lecture demonstrators in America. In 2004 he was inducted into the Hall of Fame of the national chemistry fraternity Alpha Chi Sigma. In 2005 he received Madison Metropolitan School District "Distinguished Service Award for Citizen", was elected Fellow of the Wisconsin Academy of Sciences, Arts and Letters, received the CHEMICAL PIONEER Award from the American Institute of Chemists, the ACS Helen M. Free Award for Public Outreach for "lifelong accomplishments and for explaining and demonstrating science with charisma and passion", and was cited in the Answer Book of Capital Newspapers as "the coolest UW professor." He is the recipient of five honorary doctoral degrees.

Dr. Shakhshiri currently directs the Wisconsin Initiative for Science Literacy (WISL) and its various programs including Science in the City; Science, the Arts, and the Humanities; Women in Science; Science on the Road; and Conversations in Science. For more information about the goals and scope of WISL, please visit our web site at [www.scifun.org](http://www.scifun.org).



## Wisconsin Initiative for Science Literacy

The Wisconsin Initiative for Science Literacy sponsors many programs in addition to the **Holiday Lecture**. Among its offerings are Science Is Fun presentations and hands-on workshops. In the **Science Is Fun presentations**, a group of UW students travel to a school or other civic organization and demonstrate a series of educational and entertaining scientific phenomena. If you like the Holiday Lecture, you'll also like the Science Is Fun presentations. **Science Is Fun Workshops** are offered on the third Saturday of most months at UW's Space Place in the Villager Shopping Center on South Park Street. At these sessions, students and parents work together on a set of hands-on experiments dealing with one of a wide range of science topics, such as energy, sound, polymers, light, or ecology. If you are interested in participating in either Science Is Fun presentations or the Space Place hands-on experiments, please check the Science Is Fun Web site at [www.scifun.org](http://www.scifun.org). There you will find information about how to request a Science Is Fun presentation for your school or group, and details about the Science Is Fun Workshops at Space Place.

## Support the Holiday Lecture



For 35 years, audiences have been entertained and edified by Professor Shakhshiri's Holiday Lecture. Even people who have not attended a Holiday Lecture have been able to enjoy the show through television broadcasts across the country. Presenting the annual Holiday Lecture requires the combined efforts and support of many collaborators and friends. You can join Professor Shakhshiri and his friends in supporting the Holiday Lecture by making a gift to the *Shakhshiri Science Education Fund* at the University of Wisconsin Foundation. You may send your tax-deductible contribution to:

**Shakhshiri Science Education Fund (attn Wendy Richards)**  
**University of Wisconsin Foundation**  
**P.O. Box 8860**  
**Madison, WI 53708-8860**

Your gift, no matter the amount, is greatly appreciated.





## A Home Science Experiment

You have probably seen the rainbow of colors reflected from the surface of a compact disc. This rainbow is produced when white light from the sun or from a light bulb is separated into its colors. You can use a compact disc to examine the colors produced by many different light sources, such as street lights, neon signs, computer screens, and fluorescent lights.

It is easiest to see the separate colors produced by a lamp when the lamp is the only light source around. In other words, examine the lamp with all other lights out. Look at the reflection of the lamp in the surface of the CD. Then gradually tilt the CD back and forth. You will see other reflections of the lamp, but these reflections reveal separated colors. Some lamps, like an incandescent lamp, produce all colors of the rainbow. Others, like fluorescent lamps, produce only a few colors. If you look at a white dot on a black background on a computer screen, you will see only three colors. Make a record of the colors that you observe for various kinds of lamps.

## ORDER YOUR CHRISTMAS LECTURE VIDEO

You can have your very own copy of this year's Christmas Lecture on DVD! Also available are **SCIENCE IS FUN** buttons, shirts, hats, mugs, Chem Time Clocks, periodic-table cups, and the 4-volume set of *Chemical Demonstrations: A Handbook for Teachers of Chemistry*. All of these and many more great science fun items are available from

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