

37th Annual
Once Upon a
Christmas Cheery
in the Lab of Shakhashiri

2006



December 2nd & 3rd – 1:00 & 4:00 pm
Farrington Daniels Chemistry Building
University of Wisconsin-Madison

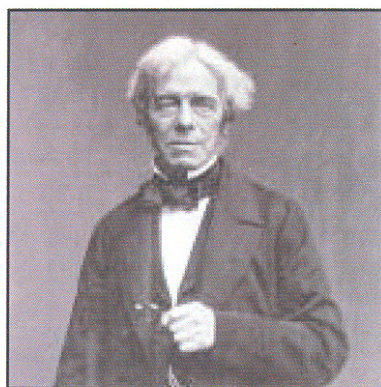
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Wisconsin Public Television telecast:
4:30 pm, Friday, December 22, 2006
8:00 am, Sunday, December 24, 2006
10:00 am, Monday, December 25, 2006

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



37

Rb

Rubidium

This is the 37th 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 37th anniversary with the element whose atomic number is 37, namely rubidium.

Rubidium is not well known because it has few practical uses. Because it's difficult to mine and refine, rubidium is expensive, and most of its potential jobs can be done just as well and more cheaply by its chemical cousins in column I of the Periodic Table: lithium, sodium, and potassium. As in the Olympics, no one remembers who finishes in fourth place.

Rubidium is not rare. It's more common on earth than lead, copper, or zinc, but it doesn't occur in nature in high concentrations. There's no known mineral that has rubidium as a major component, so it's obtained only in small amounts as a by-product of refining the ores of other metals.

Rubidium was discovered in 1861 by German chemists Gustav Kirchhoff and Robert Bunsen (inventor of the Bunsen burner). Its name comes from the Latin word "rubidus," meaning dark red. But rubidium does not look red – it's soft and silvery white, and melts at a temperature of only 39°C. Its name refers to the fact that, when burned, it produces two strong lines in the red end of the color spectrum. The word "ruby" also comes from the Latin "rubidus," but rubies don't contain any rubidium. They are composed of aluminum oxide and chromium.

Rubidium is one of the most reactive of all elements. It reacts violently with air and water and requires special handling. Rubidium is toxic and can cause severe burns on contact with skin.

There are a few uses for rubidium. It's found in some photoelectric cells and cathode-ray tubes, and it has been used as a "scavenger" to react with any gas left in vacuum tubes. The only place you are likely to encounter rubidium is when you go to a mineral water spa. Very small amounts of rubidium are often found in natural springs along with other elements like lithium, sodium, and calcium. Meanwhile, rubidium is being studied for possible medical uses and as part of superconducting materials.

Elements are like people – not all can be super stars, but all have a place in the overall scheme of things.

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 is probably best known to the public at large for his annual program, “Once Upon a Christmas Cheery/In the Lab of Shakhashiri,”; 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. Shakhashiri’s attachment to hands-on science.

Dr. Shakhashiri 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. Shakhashiri 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. 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 UW System Undergraduate Teaching Improvement Council. In 1983 Dr. Shakhashiri founded the Institute for Chemical Education (ICE) and served as its first director.

Dr. Shakhashiri has given over 1100 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 35 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 Alpha Chi Sigma. In 2005 he received Madison Metropolitan School District "Distinguished Service Award for Citizen," the ACS Public Outreach Award for "lifelong accomplishments and for explaining and demonstrating science with charisma and passion," was elected Fellow of the Wisconsin Academy of Sciences, Arts, and Letters, and was cited in the *Answer Book* of Capital Newspapers as "the coolest UW professor." In 2006 he received the Rotary Club Senior Service Award. He is the recipient of five honorary doctoral degrees. He is one of two candidates for the 2008 presidency of the American Chemical Society.

Dr. Shakhshiri 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 WISL, please visit his web site at www.scifun.org.



This year's guests

Clint Sprott, Professor of Physics, UW-Madison, is the founder of the Wonders of Physics program. For information about his upcoming shows, see <http://sprott.physics.wisc.edu/wop.htm>.

C. Marvin Lang, Emeritus Professor of Chemistry, UW-Stevens Point, has presented hundreds of demonstration shows around the world to a wide variety of audiences.

Akornefa Akyea, a junior at Verona High School, is the 2006 winner of the Bolz Young Artist Competition and has performed solo flute with the Madison Symphony Orchestra.

Rodney Schreiner, Senior Scientist at UW-Madison, has presented science shows in a wide variety of locations including the Epcot Center and has collaborated with Prof. Shakhashiri on 36 Christmas Lectures.

Bucky Badger has participated in all 37 of Prof. Shakhashiri's Christmas Lectures, and he always obeys the safety rules!

Wisconsin Initiative for Science Literacy

WISL sponsors many programs in addition to the Holiday Lecture. Among its offerings are Science Is Fun! presentations by a group of UW students and staff who travel to various locations to demonstrate the joy of science. We also offer hands-on workshops where students and parents work together on experiments on topics, such as energy, sound, polymers, light, or ecology. More information is at www.scifun.org.

Support the Holiday Lecture

For over 35 years, audiences have enjoyed Professor Shakhashiri's Holiday Lecture in person and through television broadcasts across the country. You can join Professor Shakhashiri and his friends in supporting the Holiday Lecture by sending a gift to the University of Wisconsin Foundation. You may send your tax-deductible contribution to:

Shakhashiri 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

Plastics are all around us. There are many different kinds, with a wide range of properties. Some are hard, others are soft. Some are transparent, others are opaque. Most plastics are made in factories, but here's one you can make at home.

First, in a cup dissolve 1 teaspoon of laundry borax in 5 tablespoons of water. Then, in another cup, stir together 1 tablespoon of water and 1 tablespoon of white glue (such as Elmer's Glue). Put 2 teaspoons of the borax solution into the cup of glue and stir the mixture thoroughly. The mixture will stiffen into a soft lump. Take the lump from the cup and knead it for a couple minutes. You can take the lump out of the cup and handle it.

Investigate this strange material you've made. Try stretching it quickly and see what happens. Try forming it into a ball or snake. If you let it rest, what happens to it?

We call the material you've made Gluep. It is a material that has properties of both a liquid and a solid – it's neither and it's both!

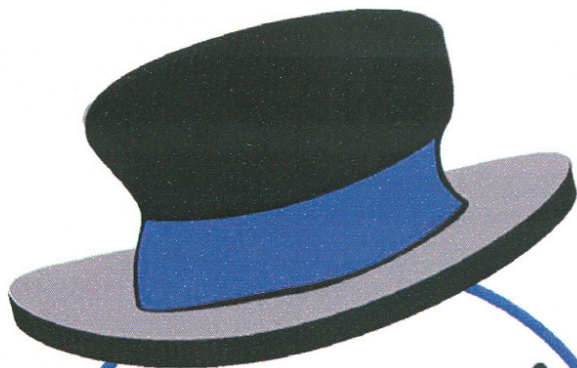
ORDER YOUR CHRISTMAS LECTURE VIDEO

You can have your very own copy of this year's Christmas Lecture on DVD (as well as DVDs from past years' shows)! 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

Educational Innovations, Inc.
362 Maine Avenue
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