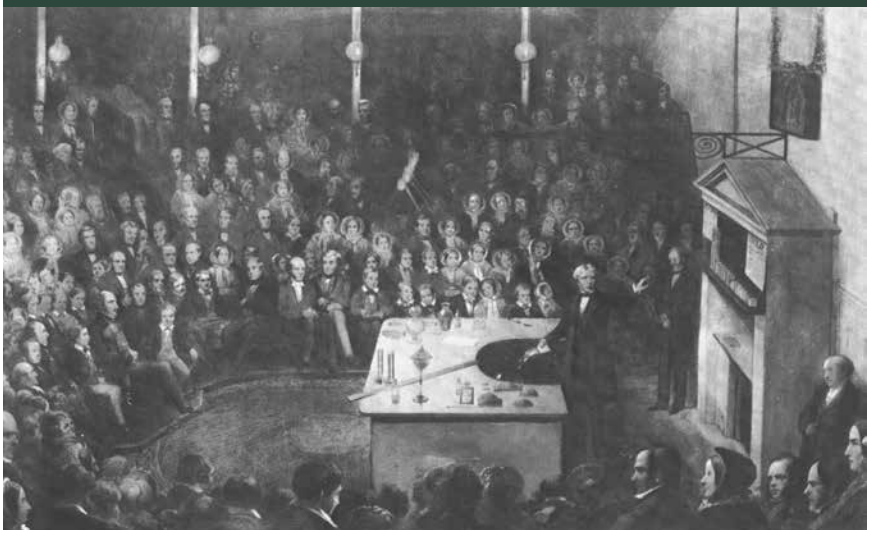
Once Upon a Christmas Cheery, In the Lab of Shakhashiri

November 30 & December 1, 2013
Chemistry Building, UW-Madison

www.scifun.org

Origin of the Christmas Lecture



Michael Faraday, the noted English physicist and chemist, lived from 1791 to 1867. He was a gifted lecturer who began giving his Christmas Lectures for children and their families 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 his guidance. 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, and to question nature directly whenever anyone discovered something out of the ordinary.

Bassam Z. Shakhashiri is professor of chemistry at the University of Wisconsin-Madison and the first holder of the William T. Evjue Distinguished Chair for the Wisconsin Idea. The Encyclopedia Britannica cites him as the "dean of lecture demonstrators in America."

• He has given over 1300 invited lectures and presentations around the world. He has been featured widely in the media including the New York Times, Washington Post, Newsweek, Time, the German language Business Week, NBC Nightly News, National Public Radio, and CNN. He appears as a regular guest of Larry Meiller on the Ideas Network of Wisconsin Public Radio.

• He is the recipient of 7 honorary doctoral degrees and over 35 awards, including the 2003 American Association for the Advancement of Science Award for Public Understanding of Science and Technology, "for his tireless efforts to communicate science to the general public, and especially children."

• Inducted in 2004 into the Hall of Fame of the national chemistry fraternity Alpha Chi Sigma.

• In 2005, received the Madison Metropolitan School District Distinguished Service Award for a Citizen, the CHEMICAL PIONEER Award from the American Institute of Chemists, was elected Fellow of the Wisconsin Academy of Sciences, Arts and Letters and cited in the Answer Book of Capital Newspapers as "the coolest UW professor."

• National Science Board 2007 Public Service Award for "extraordinary contributions to promote science literacy and cultivate the intellectual and emotional links between science and the arts for the public."

• 2013 Carl Sagan Award for Public Understanding of Science, for "Outstanding contributions and accomplishments as a recognized magnifier of the public's understanding of science" from the Council of Scientific Society Presidents.

• 2012 President of the American Chemical Society. He will serve as ACS Councilor for life.

• Bassam and his wife June live in Madison. Their daughter Elizabeth, a 2007 alumnus of UW-Madison, graduated in May 2010 from the University of Michigan Law School and lives in Chicago.

Ruthenium

Ruthenium is a very hard, silvery metal. It is a member of a group of metals called platinum metals, because they resemble platinum in appearance and behavior. The other platinum metals are rhodium, palladium, osmium, iridium, and, of course, platinum. These metals are clustered together in the periodic table of elements.

Ruthenium is rather rare in the Earth's crust, with world reserves of about only 5,000 tons. It is most often found in trace amounts in the ores of other metals such as copper and platinum. Because it is rare, it is rather expensive, costing about three times as much as silver, but still only about 5% as much as platinum. The element was discovered in 1844 by Karl Claus, a Russian-German chemist, who named it after Ruthenia, the Latin name for Russia.

Because ruthenium is very hard and resistant to corrosion, its major use is in making electrical contacts. It is electroplated onto the contacts to make them wear-resistant and reliable. It is also used to make alloys, which are mixtures of two or more metals. Adding just one tenth of one per cent (0.1%) of ruthenium to titanium makes the titanium 100 times more resistant to corrosion. It's also used to harden gold and platinum in jewelry.

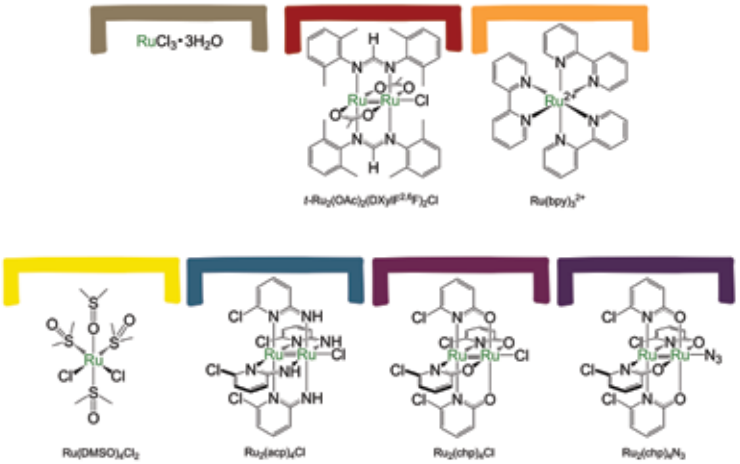
Like most transition metals, ruthenium forms many compounds that are brightly colored. Perhaps the best known of these is a compound that contains ruthenium 2+ ions surrounded by three molecules of bipyridine, a nitrogen-containing organic compound. This compound is bright red-orange, and it gives off a deep red glow when exposed to ultraviolet light. This compound has been extensively investigated as a sensitizer in the conversion of solar energy into chemical energy sources such as hydrogen.

Some newly-discovered ruthenium compounds contain an unusual chemical feature. The molecules of these compounds contain two ruthenium atoms that have a chemical bond between them. Some of these molecules have been assembled by the group of WISL Fellow Prof. John Berry, here in the chemistry department of the UW-Madison. The photo on the next page shows solutions of some of these new compounds. These compounds show the wide range of colors of ruthenium compounds.

Celebrating the 44th Annual Presentation of

Once Upon a Christmas Cheery, In the Lab of Shakhashiri

With Element Number 44 ~ Ruthenium



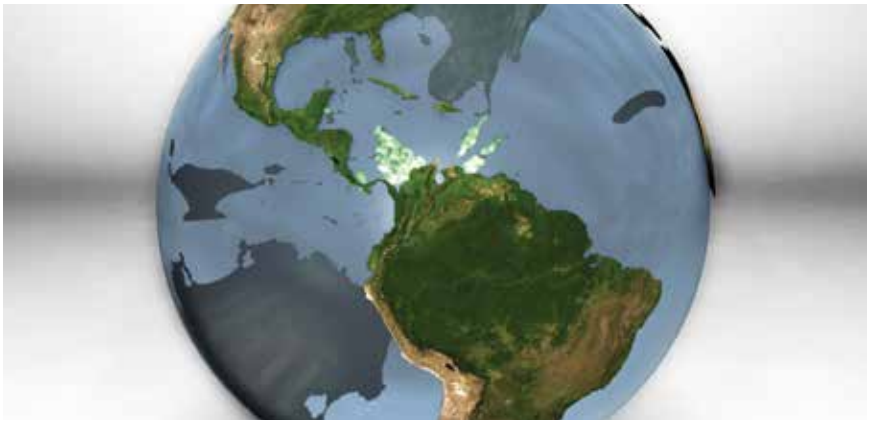
Thanks to Amanda Corcos and John Berry for providing the solutions in the photograph.

Science & Society

Today our biggest challenge

is to help sustain Earth and its people in the face of population growth, finite resources, malnutrition, spreading disease, deadly violence, war, climate change, and the denial of basic humans rights, especially the right to benefit from scientific and technological progress.

Climate change affects everyone, so everyone should understand why the climate is changing and what it means for them, their children, and generations to follow.



We encourage everyone to engage in respectful conversations about climate change.

The public can learn more about climate change at:

www.climate.nasa.gov

Scientists can learn about how to communicate the science of climate change at:

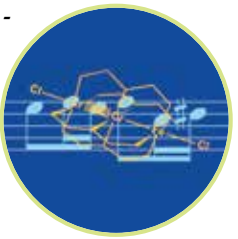
www.acs.org/climatescience

• Wisconsin Initiative for Science Literacy •

The dual mission of WISL is to promote literacy in science, mathematics and technology among the general public and to attract future generations to careers in research, teaching and public service. Science literacy is important because it allows all of us to make informed decisions in a world that relies daily on science and technology. It is essential for the well-being of our society that all citizens develop an appreciation of science, the benefits of technology, and the potential risks associated with advances in both. **www.scifun.org**

Science, the Arts and the Humanities

Creativity, passion and the urge for expression and exploration are essential human qualities that inspire science, the arts, and the humanities, and thus constitute a common bond among them. WISL helps people explore, discuss, and cultivate the intellectual and emotional links between science, the arts, and the humanities.



Chemical of the Week

The more we learn about chemicals the more we can appreciate their properties and uses. Every week you can learn fascinating facts and useful information by selecting one or more of these topics, available on the scifun.org website.

Communicating Chemistry Research to the General Public

The WISL encourages all PhD students to include a chapter in their thesis communicating their research to non-specialists. The goal is to explain the candidate's scholarly research and its significance to a wider audience that includes family members, friends, civic groups, newspaper reporters, and politicians. You can read the theses at www.scifun.org/Thesis_Awards/thesis_awards.html

Home Experiments

Layered Liquids

MATERIALS
- ¼ cup (60 ml) dark corn syrup or honey
- ¼ cup (60 ml) dishwashing liquid
- ¼ cup (60 ml) water
- ¼ cup (60 ml) vegetable oil
- ¼ cup (60 ml) rubbing alcohol
- Tall 12-oz (350 ml) glass or clear plastic cup
- two other cups for mixing
- food coloring

INSTRUCTIONS

1. Fill glass with syrup or honey 1/6 of the way, being careful not to get syrup on the sides of the glass.
2. Tip the glass slightly and pour an equal amount of the dishwashing liquid slowly down the side of the glass.
3. Mix a few drops of food coloring with water in one of the mixing cups. Color the rubbing alcohol a different color in another mixing cup.
4. Tip the glass slightly, and pouring very slowly down the side of the glass, add first the colored water, then the vegetable oil, and finally the colored rubbing alcohol.

QUESTIONS

Can you think of several ways that the liquids in the glass are different? Try to describe some properties that differ in each of the liquids in the glass. What happens when you stir the liquids?

Sinking and Floating Soda Cans

MATERIALS
- an unopened can of regular soda
- an unopened can of diet soda
- a large aquarium or sink

INSTRUCTIONS

1. Fill the aquarium or sink almost to the top with water.
2. Place a can of regular soda into the water. Make sure that no air bubbles are trapped under the can when you place it in the water. Does it sink or float?
3. Repeat the experiment with a can of diet soda—does it sink or float?

QUESTIONS

Can you explain why one can sinks, and the other can floats? Are there any varieties of diet soda that sink? Can you think of other factors that might influence which sodas float or sink?


SCIENCE
IS FUN


SCIENCE IS FU


SCIENCE
IS FU

This Year's Guests

Rodney Schreiner, Senior Scientist at UW-Madison, has presented science shows in a wide variety of locations including the Epcot Center and has collaborated on 43 Christmas Lectures.

C. Marvin Lang, Emeritus Professor of Chemistry at UW-Stevens Point, has presented hundreds of demonstration shows around the world.

Marc Fink, WISL Fellow, is professor emeritus in the UW School of Music, principal oboist of the Madison Symphony and former member of the Wingra Woodwind Quintet.

Hinano Ishii, a junior and president of Arts Enterprise at UW-Madison, is currently studying flute under Stephanie Jutt and pursuing a degree in Music Performance.

Acknowledgements

The 44th Annual Christmas Lecture is made possible through the cooperation and support of:

University of Wisconsin-Madison

Department of Chemistry

Evjue Foundation

Wisconsin Public Television

Public Broadcasting System

Donors to WISL

Become a Donor to WISL

You can join Professor Shakhashiri and his friends in supporting the Christmas Lecture and other WISL programs by sending a gift to the University of Wisconsin Foundation. You may send your tax-deductible contribution to:

The Shakhashiri Science Education Fund
UW Foundation
US Bank Lockbox 78807
Milwaukee, WI 53278

Your gift is greatly appreciated.

2014 Wonders of Physics
with Professor Clint Sprott

Saturday, February 8, 2014
at 1, 4, and 7 p.m.

Sunday, February 9, 2014
at 1 and 4 p.m.

Saturday, February 15, 2014
at 1, 4, and 7 p.m.

Sunday, February 16, 2014
at 1 and 4 p.m.

Free tickets available after January 1, 2014 at:
sprott.physics.wisc.edu/tickets.htm

Thank you to everyone who joined us
for the 2013 Wisconsin Science Festival!

WISCONSIN SCIENCE FESTIVAL
CURIOSITY UNLEASHED. 2013

Festival events can be viewed
online at wisconsinsciencefest.org

Join us next year for the
2014 Wisconsin Science Festival!
October 16-19, 2014

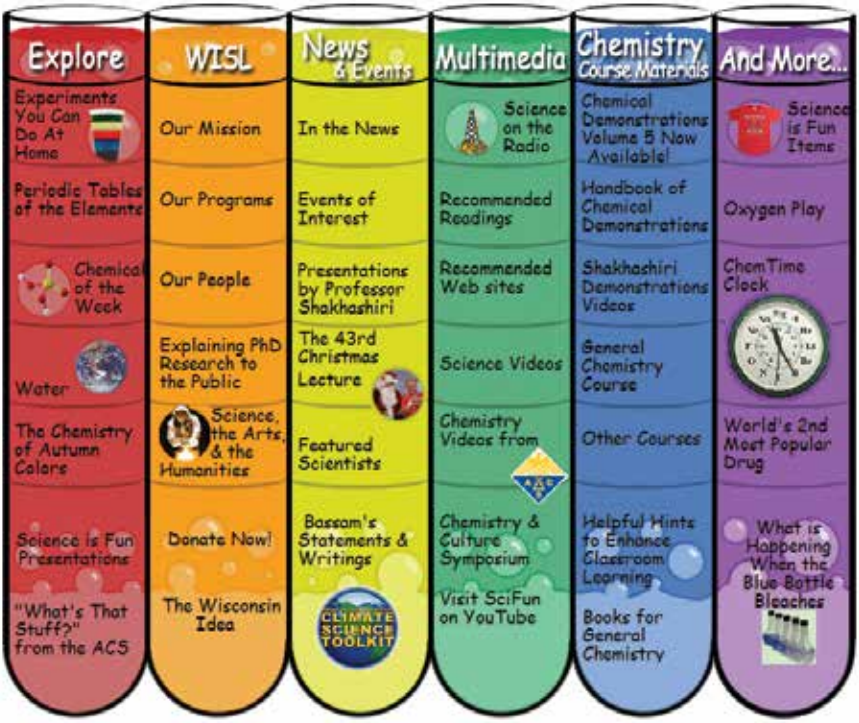
SCIENCE IS FUN

in the Lab of Shakhashiri

The master of chemical demonstrations and science policy advocate, University of Wisconsin-Madison Chemistry Professor Bassam Z. Shakhashiri, shares the fun of science through home science activities, public presentations, scholarship, and other programs of the Wisconsin Initiative for Science Literacy.

Bassam Z. Shakhashiri is the 2012 ACS President

Wisconsin and the Morrill Land-Grant Act Sesquicentennial



Wisconsin Public Television Telecasts

December 22 • 7:00 a.m. (On WPT)

December 25 • 2:00 p.m. (On WPT)

December 21 • 5:00 p.m. (On The Wisconsin Channel)

December 29 • Noon (On The Wisconsin Channel)

Check local listings for telecast times elsewhere around the country.

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