47th ANNUAL

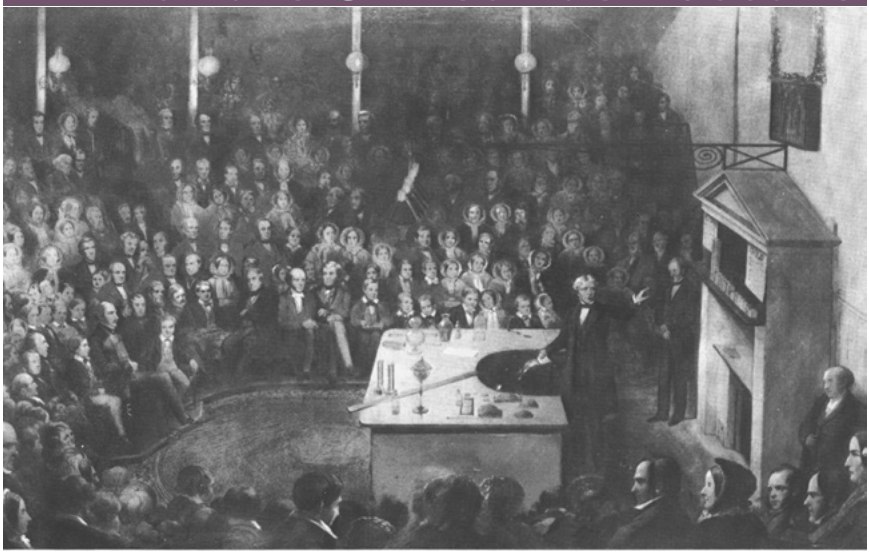
Once Upon a Christmas Cheery In the Lab of Shakhashiri

December 3 & 4, 2016

Chemistry Building
UW-Madison

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.

The Christmas Lecture @ UW-Madison

In December of 1970 the first Wisconsin Christmas Lecture was given for the students in Prof. Shakhashiri's general chemistry class. Colorful displays and exciting chemical transformations were presented.

Word spread that the Christmas Lecture was a fun event and the following year the lecture hall overflowed with students and their friends. In 1972 the Christmas Lecture was given in two evening sessions open to the public. In 1973 WHA-TV (now Wisconsin Public Television) offered to videotape the program for broadcast during the week of Christmas.

Thus began an uninterrupted collaboration between the Chemistry Department and UW-Extension to bring science to audiences throughout Wisconsin. Since then, versions of the show have played to packed houses elsewhere across the country and around the world. The goal of the Christmas Lecture has remained the same over the years and across the globe: connectivity with the audience. The ultimate purpose is to trigger cerebral and emotional engagement to heighten the audience's joy in learning.

This is the last Christmas Lecture in this hall. Construction of a new chemistry building on this site is scheduled to be completed by 2020.

Join in Sustaining our Science Outreach and make your gift to WISL today

The dual mission of the Wisconsin Initiative for Science Literacy 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. WISL programs are supported by UW-Madison and by private donations. You may mail your tax-deductible contribution to the address below or contribute online at go.wisc.edu/supportSciFun

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

~ Your Gift is Much Appreciated ~

Forward with the Wisconsin Idea

The Wisconsin Idea is one of the earliest expressions of the obligation of a great university to serve all the people of the state and, by extension, all the people of the world. It is a cherished tradition that has inspired and served generations of Wisconsinites and others from around the world. It is a manifestation of the goodness of our citizens and has greatly contributed to the betterment of our State. It has produced tangible benefits to society inside and outside our geographic boundaries. Now in its 168th year, the social contract between the University and the citizens of Wisconsin is to be maintained and strengthened with conviction. To assure continuity and progress both parties to the contract must commit efforts and resources to address the needs and challenges of the 21st century.

Quality education must remain among the highest priorities for Wisconsin. Learning is an important part of education, but acting on what we learn is just as important. All citizens and groups must work together thoughtfully and with conviction to assure that our state is productive and prosperous, healthy and happy, fair and responsible, honest and trustworthy, and to promote free-enterprise and serve the common good. Everyone must be secure in the meaning of the Wisconsin Idea as we work together to improve the connectivity between the University and the citizens of Wisconsin.

I love Wisconsin because our people are friendly, hospitable, conscientious, and have wonderful traditions, and because our state has always been progressive. I love the Wisconsin Idea and urge its advancement for the benefit of Wisconsin and its people.

~ Bassam Z. Shakhashiri

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. He has given over 1400 invited lectures and presentations around the world. He is the recipient of 7 honorary doctoral degrees and over 35 awards from the American Association for the Advancement of Science, Madison Metropolitan School District, American Institute of Chemists, American Chemical Society, National Science Board, Council of Scientific Society Presidents and more.

In 1977 Bassam became founding chair of the UW System Undergraduate Teaching Improvement Council, now called the Office of Professional and Instructional Development. In 1983 he founded the Institute for Chemical Education (ICE) and served as its first director. From 1984-90 he served as NSF Assistant Director for Science and Engineering Education. In 2002 he founded the Wisconsin Initiative for Science Literacy (WISL) and continues to serve as its director. He served as the 2012 President of the American Chemical Society.

Bassam has been featured in newspapers, magazines, national and local radio and television, and appears as a regular guest on the Ideas Network of Wisconsin Public Radio. He and his wife June live in Madison. Their daughter Elizabeth, a 2007 alumnus of UW-Madison, graduated in 2010 from the University of Michigan Law School and lives in Chicago with her husband Bob.

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 human rights, *especially the right to benefit from scientific and technological progress.*

We advance chemistry through research, education, and innovation. Basic research in science greatly increases our understanding of nature, triggers creative waves of invention and innovation, and prompts technological breakthroughs that can serve society well in the future. Solutions to the world's problems demand thinking "outside the box" and encouraging radical innovation, both coupled with transformative changes in education.

Proficiency or technical skill alone does not ensure responsibility and stewardship. In a free and civil society, people must be virtuous as well as skilled.

We must aim to effect comprehensive, fundamental, and systemic change in our own attitudes and in our behavior as scientists and as responsible citizens. Purposeful communication of the critical role of science and technology in society can help alter attitudes of the general public and can also foster collaboration among people across geographic boundaries to work together to solve global grand challenges. We have the talent and the capacity to succeed, but as scientist-citizens we must also help develop the will to take action.

Science and society have what is essentially a social contract that enables great intellectual achievements but comes with mutual expectations of benefiting the human condition and protecting our planet.

~ Bassam Z. Shakhashiri

Climate change is a global issue,

but individual choices make a difference:

~ Using more efficient lights and appliances

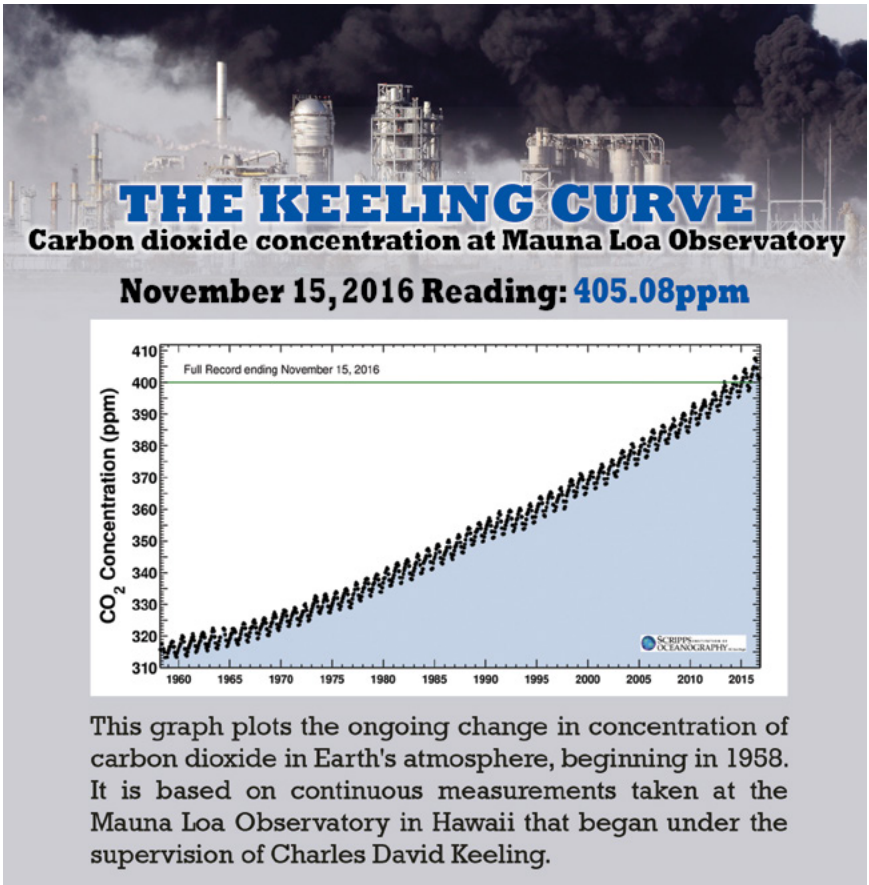
~ Using more public transportation
Driving low emission vehicles

~ Teleconferencing more and traveling less

~ Consuming less, reusing more, and recycling as much as possible

~ Supporting efforts to mitigate the undesired consequences of climate change and encouraging governmental representatives to do the same

Individual actions may have small effects, but inaction has zero effect.



This graph plots the ongoing change in concentration of carbon dioxide in Earth's atmosphere, beginning in 1958. It is based on continuous measurements taken at the Mauna Loa Observatory in Hawaii that began under the supervision of Charles David Keeling.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SCIENCE


SCIENCE
IS FUN

Guests

Rodney Schreiner Senior Scientist at UW-Madison, he has presented science shows in a wide variety of locations including the Epcot Center and has collaborated on 46 Christmas Lectures.

Bucky Badger has participated in many of Bassam's Christmas Lectures and public events, and he always obeys the safety rules!

Jim Maynard UW-Madison Chemistry Department lecture demonstrator, he has led the department's demonstration lab since 2001.

Gery Essenmacher College of Letters and Science Associate Dean Emeritus.

Indre Viskontas A neuroscientist and operatic soprano, she divides her time between the University of San Francisco Department of Psychology and the San Francisco Conservatory of Music.

ACKNOWLEDGEMENTS

The 47th Annual Christmas Lecture is made possible through the cooperation and support of:

University of Wisconsin-Madison

Department of Chemistry

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Evjue Foundation

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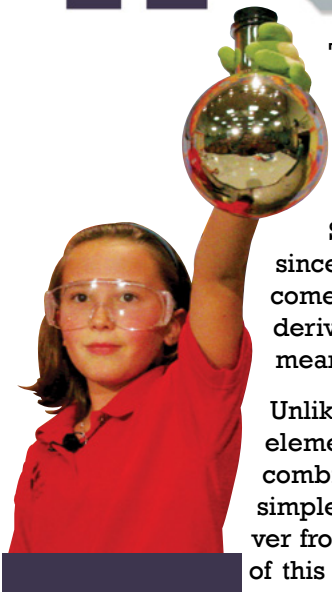
ACKNOWLEDGEMENTS

Element 47: SILVER



This is the 47th annual presentation of "Once Upon a Christmas Cheery in the Lab of Shakhashiri." It is fitting for a chemist to mark this anniversary with the element whose atomic number is 47: Silver.

Silver is a soft, white metal that has been known since antiquity. Its chemical symbol is Ag, which comes from its Latin name, argentum, which was derived from its Greek name, ἀργός (argos), which means white.

Unlike most metals, silver is sometimes found as the elemental metallic form in nature. It is also found combined with sulfur in the mineral argentite. The simple process of roasting argentite will free the silver from sulfur and produce the free metal. The ease of this process accounts for why silver is one of the seven metals of antiquity (along with gold, copper, lead, tin, mercury, and iron—metals whose chemical symbols are also based on Latin and so do not correspond to their English names).

Silver has long been valued as a precious metal. It is used to make coins in some monetary systems. The United States used silver in its 10-cent, 25-cent, 50-cent, and dollar coins for many years. However, in 1964 the value of silver in these coins rose beyond their face value, and the silver coins were replaced with coins made of other metals. In the periodic table of elements, silver resides in a column with copper above it and gold below it. This group of elements is known as the coinage metals, because they have all been used for making coins; copper is the red metal, silver is the white metal, and gold is the yellow metal.

Jewelry and silverware are usually made from "sterling silver," which is an alloy of 92.5% silver and 7.5% copper. The alloy is harder than either metal, which are both soft and easily bent. Objects made from the alloy, then, are more durable. Silver is frequently the minor component in another alloy used in jewelry, namely karat gold. In naming karat gold, 24 karat refers to pure gold, 22-karat gold is 91.7% (22/24) gold and 8.3% silver, and 18-karat gold is 75% (18/24) gold and 25% silver. These alloys are also harder and more durable than either pure metal.

Silver is an excellent conductor of both electricity and heat. If you've ever stirred sugar into a cup of hot coffee using a silver spoon, you will have noticed that the handle of the spoon becomes quite warm. It becomes much warmer than the handle of a spoon made from stainless steel, which is a much poorer conductor of heat than silver.

Many mirrors are made by depositing a thin film of metallic silver on glass. Mirrors can also be made with other metals, such as aluminum. However, silver is the preferred metal for cosmetic mirrors because it is slightly more reflective to red light than to green and blue light, so it gives a pleasing, warm "glow" to its reflected image. Faces reflected from an aluminum mirror have a relatively green complexion, which is somewhat unattractive. The silver in a mirror is on the back side of the glass, in order to protect the coating from scratches. The silver on the back is also coated with a paint or varnish to protect it from the air. Silver exposed to the air will gradually darken due to oxidation by oxygen and other gases in the air.

Silver tableware needs to be polished regularly if is to keep its white shine. Silver exposed to the air gradually becomes dark because silver reacts with sulfur-containing substances. The darkening process is even faster if the silverware is exposed to eggs, which are high in sulfur compounds. This darkening process is called tarnishing. There are numerous ways in which the tarnish can be removed. Some are chemical processes, which separate the sulfur from the silver. Others are mechanical, which rub the tarnish coating off the silver. Most commercial silver polishes use both methods simultaneously.

Until the development of digital photography, most photographs were created using silver chemistry. When silver halide compounds are exposed to light, they undergo a change which forms tiny particles of metallic silver. These particles can be made larger through chemical development, which causes the compound to turn dark. Thus, the areas of the photographs that were exposed to light become dark, forming a negative image. The negative can be reversed by shining light through it onto a second sheet, which after development forms a positive image.

Wisconsin Public Television Telecasts

Sunday, December 18 at 6:30 a.m.
Wednesday, December 21 at 2:30 p.m.
Thursday, December 22 at 8:00 a.m.
Friday, December 23 at 11:00 a.m.
Saturday, December 24 at 8:00 a.m.

Check local listings for telecast times elsewhere around the country.

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