



46<sup>th</sup> ANNUAL

**Once Upon a  
Christmas Cheery,  
In the Lab  
of Shakhshiri**

**December 5 & 6, 2015**

**Chemistry Building, UW-Madison**



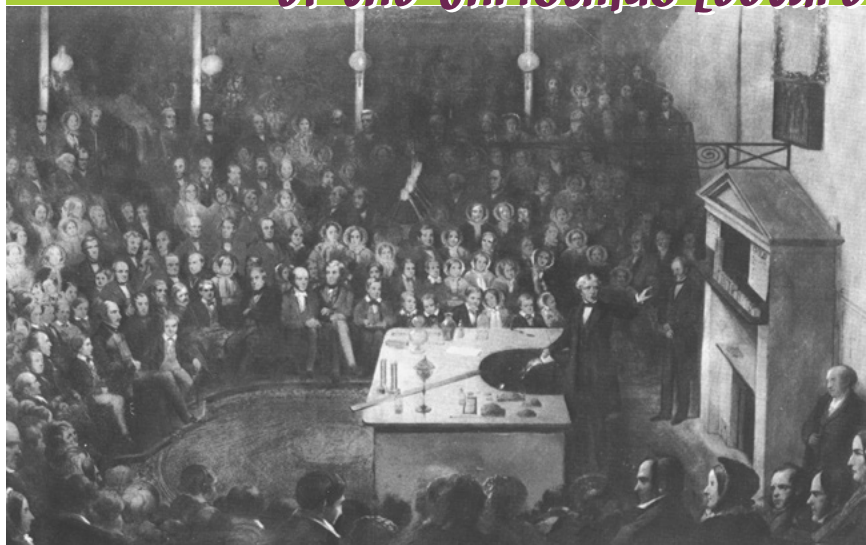
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# ORIGIN

## *of the Christmas Lecture*



**M**ichael 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. Shakhshiri'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.



**UW-Madison** was founded the same year Wisconsin became a state, in 1848, after approval by Wisconsin's first governor Nelson Dewey. In 1866 it received Wisconsin's land grant after Congress adopted the Morrill Act in 1862.

The UW mission states, "The primary purpose of UW-Madison is to provide a learning environment in which faculty, staff and students can discover, examine critically, preserve and transmit the knowledge, wisdom and values that will help ensure the survival of this and future generations and improve the quality of life for all. The university seeks to help students to develop an understanding and appreciation for the complex cultural and physical worlds in which they live and to realize their highest potential of intellectual, physical and human development. It also seeks to attract and serve students from diverse social, economic and ethnic backgrounds, and to be sensitive and responsive to those groups that have been underserved by higher education."



# What Is 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 167th 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 believe we must strive to protect and enhance it 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.

From 1984-90 Bassam 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 has been featured in newspapers, magazines, national and local radio and television; these include the New York Times, Washington Post, Newsweek, Time, NBC Nightly News, National Public Radio, CNN, and the Larry King show. He appears as a regular guest on the Ideas Network of Wisconsin Public Radio.

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

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**

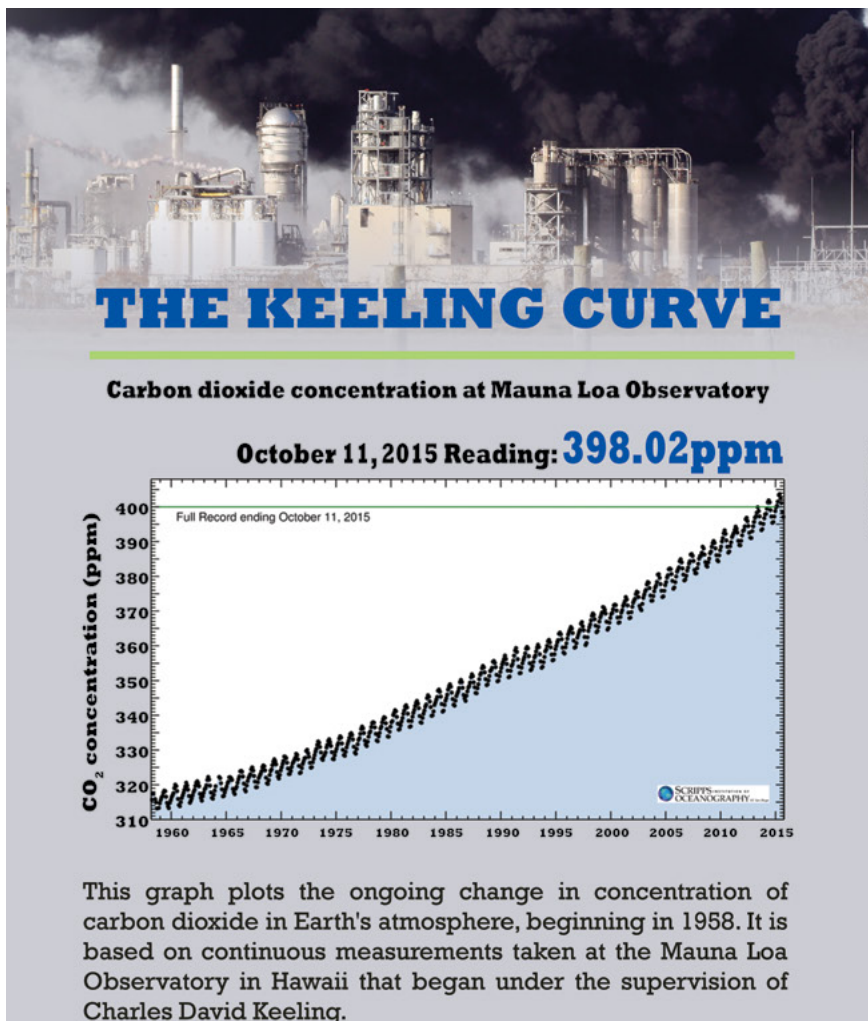


# *Climate change affects everyone,*

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](http://www.climate.nasa.gov) and [whatweknow.aaas.org](http://whatweknow.aaas.org)**

**Scientists can learn about how to communicate the science of climate change at:**  
**[www.acs.org/climatescience](http://www.acs.org/climatescience)**











## 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. Your financial support enables WISL to reach multiple audiences and to maintain rich intellectual and emotional connections with and among our audiences. You may send your tax-deductible contribution to:

**The Shakhshiri Science Education Fund**  
**UW Foundation**

**US Bank Lockbox 78807**  
**Milwaukee, WI 53278**

*~ Your gift is greatly appreciated. ~*



# 2015 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 45 Christmas Lectures.

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

**Jim Maynard** UW-Madison Chemistry demonstration senior specialist.

**Juliana Mesa Jaramillo & Ross Duncan** are Doctoral Candidates in Bassoon Performance at UW-Madison, under the instruction of Professor Marc Vallon.

## Acknowledgements

The 46<sup>th</sup> Annual Christmas Lecture is made possible through the cooperation and support of:

University of Wisconsin-Madison

Department of Chemistry

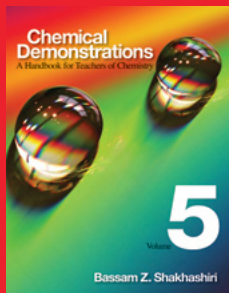
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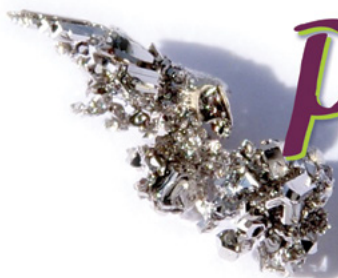
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# Palladium

The element with atomic number 46 is palladium. It is a silvery metal of moderate hardness, softer than tungsten but harder than silver. Palladium is one of the rarest elements in the earth's crust and is, thus, expensive. Its average cost over the last four years has been about \$700 per ounce. About 200 tons of palladium metal are produced each year. Most of the world's palladium is produced as a byproduct in the purification of platinum ores from Russia and South Africa.

Palladium metal was first produced in 1803 by William Hyde Wollaston, who extracted it from impure platinum. He named it after a newly-discovered asteroid that had been named Pallas, which is an alternate name of the Greek goddess of wisdom, Athena.

Palladium has a number of properties that make it useful for a variety of purposes. Palladium has many catalytic properties, and over half of its annual production is used in catalytic converters for automobiles. These converters transform dangerous molecules produced in a car's engine into environmentally safer ones.



Palladium is also used as a catalyst in commercial chemical processes, where it can add or remove hydrogen from hydrocarbons or form bonds between carbon atoms. This latter use was the focus of the 2010 Nobel Prize in Chemistry.

Unique to palladium is its ability to absorb 900 times its own volume in hydrogen gas. Because of this, palladium can be used as a filter to separate hydrogen gas from other gases. This property is also at the center of research into using palladium for storing and transporting explosive hydrogen safely.

Because palladium metal is chemically unreactive, palladium plating is used to protect electronic components from corrosion. Some palladium is also used in jewelry, where it is alloyed with gold to make white gold.





# Wisconsin Public Television Telecasts



## On WPT:

Saturday, December 19 at 6:00 a.m.

Thursday, December 24 at 10:30 a.m.

Friday, December 25 at 3:00 p.m.

## On the Wisconsin Channel:

Friday, December 25 at 12:00 p.m.

Saturday, December 26 at 5:00 p.m.

**Check local listings for telecast times elsewhere around the country.**



## PUBLIC ENGAGEMENT

ONE OF THE HALLMARKS OF THE

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