



THE CAMILLE & HENRY DREYFUS FOUNDATION

## 2019 in Review



*Robert Langer, 2019 Dreyfus Prize winner*

# Letter from the President, Henry C. Walter



In 2019 the Dreyfus Foundation was proud to spotlight Chemistry in Support of Human Health as the topic for the biennial Dreyfus Prize. The Prize was awarded to Robert Langer of MIT, whose innovations in drug

delivery and tissue engineering have benefited hundreds of millions of people throughout the world. It was particularly gratifying to travel to MIT, where Dreyfus has such a long history, to present the award to Dr. Langer. The scientific literature shows the vast scope of his work, but hearing his colleagues and students describe his influence emphasized the many ways in which his impact will continue to grow even more through the years.

Following the awarding of each Prize, the Foundation organizes a one-day symposium on that year's topic at the spring national meeting of the American Chemical Society. This year's symposium will be held in Philadelphia on Tuesday, March 24. There will be a truly outstanding program of distinguished speakers, including Dr. Langer, who will give talks on a wide range of areas in which the chemical sciences benefit our health. We hope you will join us.

Periodically the Dreyfus Foundation also establishes a grant program that focuses on a specific area in the chemical sciences, in order to provide support at a key stage. One such initiative was the Postdoctoral Program in Environmental Chemistry, which recently completed a very successful twenty-year run. In 2019, Dreyfus announced the creation of a new program to support machine learning in the chemical sciences and engineering. This program is the result of a Dreyfus conference on the topic that was held last spring, which included many experts from both academia and industry. We anticipate that timely support of this rapidly emerging area will be beneficial to the field. The first awards will be made in the summer of

2020. Further details about this program are found elsewhere in this report and on the Dreyfus website.

In 2020 we also look forward to the sixth biennial symposium for Camille and Henry Dreyfus Teacher-Scholars. Established in 1970, the Teacher-Scholar awards are the Foundation's flagship programs. Since its inception, the awards have recognized and supported over 900 emerging leaders in the chemical sciences. At this symposium, approximately 40 of the most recent Teacher-Scholars will present posters of their research and hear talks by four prominent senior Teacher-Scholars, as well as a presentation on teaching innovations. The recent Teacher-Scholars will also produce brief videos about their research that will be posted on the Dreyfus website. All Teacher-Scholar alumni are welcome to attend the symposium, which will be held at the New York Academy of Sciences on Friday, October 23.

We were also pleased to learn of the honors recently bestowed upon a few of the Dreyfus Foundation's valued Advisors. John Rogers of Northwestern University received the 2019 Franklin Medal in Materials Engineering, *for pioneering the engineering of flexible and stretchable electronic systems for e-health and exploratory neuroscience*. JoAnne Stubbe of MIT will receive the 2020 Priestley Medal, the highest honor of the American Chemical Society, *for pioneering studies of enzymatic radical chemistry, long-range proton-coupled electron transfer, DNA cleavage by anti-cancer drugs, enzymatic formation of polyesters and purine biosynthesis*. John Tully of Yale University has been named the recipient of the 2020 National Academy of Sciences award in the Chemical Sciences, which honors innovative research that contributes to a better understanding of the natural sciences and to the benefit of humanity. Our congratulations to all of them for these well-deserved accolades.

As always, thank you for reading, and best wishes for the new year.

Henry C. Walter

# Robert Langer Wins 2019 Dreyfus Prize

**R**obert S. Langer, Institute Professor at Massachusetts Institute of Technology, received the 2019 Dreyfus Prize in the Chemical Sciences, conferred in Chemistry in Support of Human Health. The international prize, awarded biennially, consists of \$250,000, a medal, and a citation. The award ceremony was held on September 26 at MIT and featured a lecture by Langer. Video of the ceremony is available on both the Dreyfus website and on YouTube.

Langer was honored *for discoveries and inventions of materials for drug delivery systems and tissue engineering that have had a transformative impact on human health through the chemical sciences.* He has been cited as one of history's most prolific inventors in medicine and biochemistry. The drug delivery technologies that he invented have been lauded as the cornerstone of that industry, positively impacting hundreds of millions of people worldwide. The impact and influence of his work is vast, and his papers have been cited in scientific publications more than any other engineer in history.

Langer's work on drug delivery is at the interface of biotechnology and materials chemistry, with a strong focus on the study and development of polymers to deliver drugs continuously and at controlled rates for prolonged periods. His innovations in drug delivery have been translated into commercial products that have had a remarkable benefit to human health, including the treatment of brain and prostate cancer, macular degeneration, and a variety of mental health disorders including schizophrenia and opioid addiction. His pioneering work in tissue engineering (with Joseph Vacanti) has led to the creation of new skin, cartilage, bone, corneas, and blood vessels in humans. His leadership in both the underlying science and its applications has given rise to entirely new fields of the chemical sciences and engineering.

Langer is further renowned as a mentor, with nearly 1,000 former students and postdocs becoming established leaders in academia, industry, and government.

"There is no greater benefit that the chemical sciences provide to society than the many profound contributions to the science and technology of human health," stated Matthew Tirrell, Chair of the Dreyfus Foundation Scientific Affairs Committee and Director of the Institute for Molecular Engineering at the University of Chicago. "Bob Langer created two rich fields at the intersection of chemistry and medicine: controlled release materials for delivery of therapeutic macromolecules and tissue



engineering. His discoveries have been translated, often by Langer himself, to many products that profoundly impact human health. In a diverse field of chemists and chemical engineers with many powerful contributors, the enormous body and influence of Bob Langer's work stands out in a singular way."

Robert Langer has received many prizes and awards, including the National Medal of Science, the Priestley Medal, the Kyoto Prize in Advanced Technology, the Breakthrough Prize in Life Sciences, the Benjamin Franklin Medal in Life Science, the Wolf Prize, the Charles Stark Draper Award, the Lemelson-MIT Prize for Invention and Innovation, and numerous others. About 400 companies have licensed or sublicensed his inventions and over 40 companies have been spun out of the Langer lab.

Henry C. Walter, President of the Dreyfus Foundation, said, "The Dreyfus brothers, entrepreneurs in the chemical sciences, would surely have marveled at Bob Langer's remarkable creative innovation and productivity. We are proud to honor his extraordinary achievements with the 2019 Dreyfus Prize."

"It's always been a dream for me to be able to use my scientific background to help prolong life and relieve human suffering. When I look at the remarkable individuals in chemistry and chemical engineering around the world, including the people who have won the Dreyfus Prize previously, receiving this award is truly humbling," said Langer.

## ACS/Dreyfus Symposium on Chemistry in Support of Human Health

The Dreyfus Foundation has organized a one-day symposium on Chemistry in Support of Human Health, the topic of the 2019 Dreyfus Prize, to be held at the spring national meeting of the American Chemical Society in Philadelphia on Tuesday, March 24, 2020, in room 204C of the Pennsylvania Convention Center. This symposium is sponsored by the ACS Multidisciplinary Program Planning Group.



9:10 **Susan Richardson**, U. of South Carolina  
*Uncovering Emerging Water Contaminants and Making Drinking Safer*



9:45 **David Tirrell**, Caltech  
*Selective Proteomic Analysis of Cellular Sub-populations in Complex Biological Systems*



10:35 **Carolyn Bertozzi**, Stanford  
*Therapeutic Opportunities in Glycoscience*



11:10 **Richard Friesner**, Columbia  
*Computational Methods for Structure-Based Drug Discovery*



2:00 **Chaitan Khosla**, Stanford  
*Chemical Analysis and Manipulation of Celiac Disease Pathogenesis*



2:35 **Peter Schultz**, Scripps  
*Playing with the Molecules of Life*



3:25 **Sangeeta Bhatia**, MIT  
*Tiny Technologies and Medicine*



4:00 **Robert Langer**, MIT  
*Chemistry in Support of Human Health: Drug Delivery and Tissue Engineering*

## New Grant Program on Machine Learning

In December 2019, the Foundation announced a new program for Machine Learning in the Chemical Sciences and Engineering. This program is intended to further the applications of machine learning throughout the chemical sciences, thereby providing new opportunities. The deadline is April 2, 2020.

Richard Zare and Matthew Tirrell of the Dreyfus Scientific Affairs Committee stated, "In view of the increasing attention to and expectations for the profound impacts that

artificial intelligence and data science will have on physical science and engineering, the Dreyfus Foundation plans to make strategic investments in machine learning for the chemical sciences and engineering, both to advance the field in these areas, and to help position the chemical sciences field to best avail itself of the broad agency opportunities for research support that are emerging. We are enthusiastic about the potential for machine learning to produce useful fundamental and practical insights in chemical research." Further information is available at [dreyfus.org](http://dreyfus.org).

## Dreyfus Lectureship at University of Basel

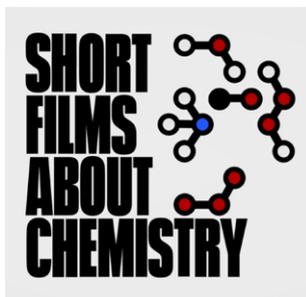
The Foundation honors the heritage of the Dreyfus brothers and promotes scientific exchange between U.S. and Swiss chemists through the annual Dreyfus Lectureship at the University of Basel, where Camille and Henry Dreyfus were awarded their Ph.D.s. Emily Carter of the University of California, Los Angeles, was the 2019 Lecturer. Her talks were *Artificial Photosynthesis Mechanisms and Materials Optimization from First Principles* and *Unconventional Quantum Mechanics Methods for Design of Materials for Sustainable Energy Technologies*.



Emily Carter at University of Basel

## Chemistry Shorts Film Series

Chemistry Shorts is a new series of brief films produced by the Dreyfus Foundation. Scott Walter, Vice President and Treasurer of the Dreyfus Board, stated, "We are experimenting with a film series highlighting chemistry's role in solving humankind's most important challenges. We hope to partner with other chemistry-related organizations to make many more." The first two films are *Rewriting Life*, which features David Liu of Harvard discussing CRISPR, and *Under the Skin*, which



spotlights Zhenan Bao of Stanford and her group's work on electronic skin. Each is accompanied by a lesson plan that offers ideas of how these films can be incorporated into the K-12 classroom. See them at [chemistryshorts.org](http://chemistryshorts.org).

## Dreyfus-Sponsored ACS Awards

Since 1995, the Dreyfus Foundation has sponsored two annual awards that are administered by the American Chemical Society: Encouraging Women into Careers in the



*Edward Alexander, Scott Walter, Ruth Baltus, Matthew Tirrell*

Chemical Sciences and Encouraging Disadvantaged Students into Careers in the Chemical Sciences. In 2019, these awards were made to Ruth Baltus, Clarkson University, and Edward Alexander, San Diego Mesa College, respectively.

Each award consists of \$5,000 to the awardee and a grant of \$10,000 to an eligible non-profit institution, designated by the recipient, to strengthen the objectives of the award. Baltus directed her grant to be used for programs at Clarkson that support female engineering students and girls in the community. Alexander designated his grant to be used for a scholarship fund for underrepresented students pursuing careers in the chemical sciences at San Diego Mesa College.

## Jean Dreyfus Lectureship for Undergraduate Institutions

Jean Dreyfus Lectureships provide funding to bring a leading researcher to a primarily undergraduate institution to give a technical lecture in the chemical sciences, a more general lecture that is open to the public, and to meet with students and faculty. The award also provides funding to support two undergraduates in summer research. These Lectureships were held in 2019:

- Karen Anderson** (Yale) at Montclair State University
- Matthew Disney** (Scripps Florida) at Mercer University
- Jennifer Doudna** (UC Berkeley) at Southern Illinois U. Edwardsville
- Catherine Drennan** (MIT) at Franklin & Marshall College
- Joseph Francisco** (Penn) at University of Tampa
- Christy Haynes** (U. of Minnesota) at Santa Clara University
- Steve Leone** (UC Berkeley) at SUNY Geneseo

**Christopher McCurdy** (U. of Florida) at Rowan University

**Amy Prieto** (Colorado State U.) at Ursinus College

**John Warner** (Warner Babcock Inst. for Green Chemistry) at California State University San Marcos



*Leah O'Brien, Jennifer Doudna, Chin-Chuan Wei*

## Board of Directors

Henry C. Walter  
*President*

H. Scott Walter  
*Vice President and Treasurer*

Dorothy Dinsmoor  
*Secretary*

Matthew V. Tirrell  
*Chair, Scientific Affairs Committee*

John R. H. Blum

Edward A. Reilly

Richard N. Zare

Paul Woitach

Mary Eileen Dowling Walter

## Directors Emeritus

H. Marshall Schwarz

Marye Anne Fox

John I. Brauman

## Past Presidents

Camille Dreyfus, 1946-1956

Jean Dreyfus, 1956-1991

Dorothy Dinsmoor, 1991-2009

## Advisors

Louis E. Brus

Arup Chakraborty

Daniel G. Nocera

John A. Rogers

## Honorary Advisors

James G. Anderson

Dudley R. Herschbach

Mario J. Molina

JoAnne Stubbe

John C. Tully

## Staff

Mark J. Cardillo  
*Executive Director*

Gerard Brandenstein  
*Associate Director*

Adam Lore  
*Operations Manager*

Heather Loza  
*Office Assistant*

The mission of the Camille and Henry Dreyfus Foundation is *to advance the science of chemistry, chemical engineering, and related sciences as a means of improving human relations and circumstances throughout the world.* Established in 1946 by chemist, inventor, and businessman Camille Dreyfus as a memorial to his brother Henry, the Foundation became a memorial to both men when Camille Dreyfus died in 1956. Throughout its history the Foundation has sought to take the lead in identifying and addressing needs and opportunities in the chemical sciences.



THE CAMILLE  
& HENRY DREYFUS  
FOUNDATION

555 Madison Avenue  
New York, New York 10022  
T: (212) 753-1760  
F: (212) 593-2256  
[www.dreyfus.org](http://www.dreyfus.org)

# 2019 Awards

---

## **Dreyfus Prize in the Chemical Sciences**

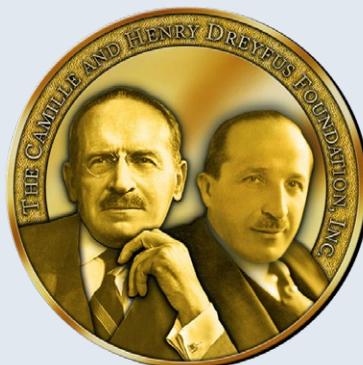
Robert S. Langer, *Massachusetts Institute of Technology*

## **Camille Dreyfus Teacher-Scholar Awards Program**

José L. Avalos, *Princeton University*  
Tianning Diao, *New York University*  
Bryan C. Dickinson, *The University of Chicago*  
Kearly M. Engle, *The Scripps Research Institute*  
Renee R. Frontiera, *University of Minnesota*  
Garret M. Miyake, *Colorado State University*  
Timothy R. Newhouse, *Yale University*  
Amish J. Patel, *University of Pennsylvania*  
Dipali J. Sashital, *Iowa State University*  
Natalia B. Shustova, *University of South Carolina*  
Christopher Uyeda, *Purdue University*  
Timothy A. Wencewicz, *Washington University in St. Louis*  
Jenny Y. Yang, *University of California, Irvine*

## **Henry Dreyfus Teacher-Scholar Awards Program**

Paul Abbyad, *Santa Clara University*  
Mary Elizabeth Anderson, *Furman University*  
Louise K. Charkoudian, *Haverford College*  
Lionel Cheruzel, *San Jose State University*  
Christopher R. Graves, *Swarthmore College*  
Amy L. Lane, *University of North Florida*  
William R. McNamara, *The College of William & Mary*  
Rachel H. R. Stanley, *Wellesley College*



## **Jean Dreyfus Lectureship for Undergraduate Institutions**

The College of New Jersey  
Georgia Southern University  
Rowan University  
University of San Diego  
Ursinus College

## **Dreyfus-Sponsored Awards**

### **ACS Award for Encouraging Women into Careers in the Chemical Sciences**

Ruth Baltus, *Clarkson University*

### **ACS Award for Encouraging Disadvantaged Students into Careers in the Chemical Sciences**

Edward Alexander, *San Diego Mesa College*

# Award Programs and 2020 Deadlines

---

## **The Dreyfus Prize in the Chemical Sciences,**

awarded biennially, consists of a monetary award of \$250,000, a medal, and a certificate. The prize, which is open to international nominations, is awarded to an individual in a selected area of chemistry to recognize exceptional and original research that has advanced the field in a major way. The topic of the 2021 Prize will be announced in the summer of 2020.

*New Deadline:* December 3, 2020

## **The Camille Dreyfus Teacher-Scholar Awards Program**

supports the research and teaching careers of talented young faculty in the chemical sciences at Ph.D.-granting institutions. Based on institutional nominations, the program provides discretionary funding to faculty prior to their sixth year of appointment. Criteria for selection include an independent body of scholarship attained as independent researchers and a demonstrated commitment to education. The award provides an unrestricted research grant of \$100,000.

*Deadline:* February 6, 2020

## **The Dreyfus program for Machine Learning in the Chemical Sciences and Engineering**

provides funding for innovative projects in any area of machine learning consistent with the Foundation's broad objective to advance the chemical sciences and engineering. The Foundation anticipates that these projects will contribute new fundamental chemical understanding, insight, and innovation in the field.

*Deadline:* April 2, 2020

## **The Henry Dreyfus Teacher-Scholar Awards Program**

supports the research and teaching careers of talented young faculty in the chemical sciences at primarily undergraduate institutions. Based on institutional nominations, the program provides discretionary funding to faculty who are within the fourth and twelfth years of their independent academic careers. The award is based on accomplishment in scholarly research with undergraduates, as well as a compelling commitment to teaching. The award provides an unrestricted research grant of \$75,000.

*New Deadline:* August 6, 2020

## **The Jean Dreyfus Lectureship for Undergraduate Institutions**

provides an \$18,500 grant to bring a leading researcher to a primarily undergraduate institution to give a series of lectures in the chemical sciences, at least one of which is promoted and accessible to the general public. The lecturer is expected to substantially interact with undergraduate students and faculty over the period of the visit. The program provides funds to host the speaker and to support summer research opportunities for two undergraduate students.

*New Deadline:* August 6, 2020

The Camille and Henry Dreyfus Foundation sponsors the American Chemical Society awards **for Encouraging Disadvantaged Students into Careers in the Chemical Sciences** and **for Encouraging Women into Careers in the Chemical Sciences**. The awards recognize significant accomplishments by individuals in stimulating these students to chose careers in the chemical sciences and engineering. Each award consists of \$5,000, a certificate, and a grant of \$10,000 to an eligible non-profit institution, designated by the recipient, to strengthen its activities in meeting the objectives of the award. See the American Chemical Society's website for additional information on these awards: <http://www.acs.org>

*Deadlines for both awards:* November 1, 2020