

CLIMATE SCIENCE
CONVOCATION

HONORARY DOCTORATE OF SCIENCE
PRESENTED TO

Dr. André Berger

Dr. Dominique Raynaud

Dr. Warren M. Washington

FRIDAY, OCTOBER 18, 2013

UNIVERSITY OF MASSACHUSETTS AMHERST

UMassAmherst

PROGRAM

PROCESSIONAL

Members of the Faculty

Bearer of the Mace:

George R. Richason Jr., '37, '39G, '91H

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Recipients of Doctor of Science honoris causa:

Dr. André Berger

Université catholique de Louvain,
Louvain-la-Neuve, Belgium

Dr. Dominique Raynaud

Laboratoire de Glaciologie et Géophysique de l'Environnement,
Grenoble, France

Dr. Warren M. Washington

National Center for Atmospheric Research,
Boulder, Colorado

The Chancellor's Party

Chancellor

Musical performance by UMass Amherst alumni musicians.

Michael Brignolo '11, *clarinet* • Tina Brounsuzian '11, *flute*

Michelle Huddy '01, *bassoon* • Aaron Lakota '12, *oboe*

Christine Mortensen '88, *French horn*

THE NATIONAL ANTHEM

WELCOME

Chancellor Kumble R. Subbaswamy

REMARKS

The Honorable Stanley C. Rosenberg
Massachusetts Senate Majority Leader

Steven Goodwin
Dean, College of Natural Sciences

INTRODUCTION OF HONOREES

Michael Malone
Vice Chancellor for Research and Engagement

**PRESENTATIONS BY HONOREES AND AWARDING
OF HONORARY DEGREES**

André Berger • *The astronomical theory of climate change*

The constantly changing position of the earth in relation to the sun and the motion of its axis of rotation have been the major driving forces of climate change over millions of years. With our understanding of these driving forces, we can place our current climate in the context of the past and the future.

Dominique Raynaud • *Environmental history from ice cores*

Ice cores provide unique archives of environmental changes in the past that enable us to put the present changes in climate and greenhouse gases in a long-term perspective. They have helped us to understand how the climate system operates and what factors have been important in causing the climate to vary over time.

Warren M. Washington • *The future of earth climate system modeling*

We have made major advances in computer modeling the atmosphere, oceans, sea ice, chemistry, and land/vegetation components of Earth's system. We are now including anthropogenic factors in more detail.

CONCLUDING REMARKS

Chancellor Kumble R. Subbaswamy

RECESSIONAL

Musical performance by UMass Amherst alumni musicians.

**HONORARY DEGREES AWARDED BY
THE UNIVERSITY OF MASSACHUSETTS**

Candidates for honorary degrees shall be persons of great accomplishment and high ethical standards who exemplify the ideals of the University of Massachusetts. Each year the names of nominees may be submitted by faculty, staff, and students on campus. The Honorary Degree Advisory Committee is composed of members representing Faculty Senate, Alumni Association, graduate students named by the dean of the graduate school and undergraduate students named by the vice chancellor for student affairs and campus life. The chancellor may nominate members as well, and makes the final selection of members on the advisory committee.

The 2013 Honorary Degree Advisory Committee included the following members.

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André Berger

A N EMERITUS PROFESSOR and senior researcher at the Georges Lemaitre Center for Earth and Climate Research in Belgium, André Berger is best known for his contributions to the development of the astronomical theory of paleoclimates and his nearly four decades of research on global warming. He is a pioneer of the interdisciplinary study of climate

dynamics and long-term climate history.

In 1973 he made a major contribution to paleoclimatic studies by providing the first precise computation of long-term variation in Earth's astronomical parameters during the past million years. It accorded with geological data from various sources and was subsequently extended to provide precise forcing parameters for climatic simulations during the past five million years—work that has since been the basis for most paleoclimate reconstructions or simulations.

Subsequently Berger established a multidisciplinary modeling group to study the climate system as a whole, including the atmosphere, ocean, sea ice, ice sheets, and the carbon cycle. His two-dimensional (latitude/height) version of that model provided the first simulation of the transient response of the climate system to astronomical forcing over the last glacial-interglacial cycle and is acknowledged to have been the first earth model of intermediate complexity.

Berger has edited 17 books on climatic variations and more than 300 of his papers on the subject have been published in international journals and books. He has devotedly trained young scientists and promoted collaboration among geophysicists and has long been involved in international boards that define international scientific policy on climate research.

Berger has served as chairman of the International Climate Commission of the International Union of Geodesy and Geophysics, chairman of the Paleoclimate Commission of the International Union of Quaternary Research, and president of the European Geophysical Society. He was a co-creator of the European Geosciences Union (of which he is honorary president) and served on the first Scientific Steering Committee of the International Geosphere-Biosphere Program on Global Changes of the Past.

Knighted by His Majesty Albert II, King of the Belgians, and named an Officier de la Légion d'Honneur by the president of France, Berger is a member of the Royal Academy of Belgium, the Académie des Sciences de Paris, the Serbian Academy of Sciences and Arts, and the Academy of Science of the Royal Society of Canada. His other honors include the five-yearly Prize of the Belgian National Fund for Scientific Research, the European Latsis Prize, the Prix Georges Lemaître of Amis et Anciens de Louvain, an Advanced Investigator Grant from the European Research Council, and numerous international honorary degrees. Berger holds a master of science degree in meteorology from the Massachusetts Institute of Technology and a doctorate of science from the Université catholique de Louvain.

Professor Berger's early work has been the basis for most paleoclimate reconstructions or simulations.



Dominique Raynaud

DOMINIQUE RAYNAUD, emeritus research director (senior scientist) at the French National Center for Scientific Research (CNRS), has been internationally acclaimed for his research on Antarctic climate change and greenhouse gas effects. By extracting and analyzing gases from polar ice cores, he and his collaborators have demonstrated that current greenhouse-gas

concentrations greatly exceed those from any period during the past hundreds of thousands of years. Their findings have significantly altered our understanding of human-induced effects on the atmosphere.

Raynaud began his career more than four decades ago by producing a Ph.D. dissertation on total air content in ice cores, which is influenced by air pressure and ice-sheet elevation. It is now recognized as being modulated by local insolation and as providing a means of establishing ice-core chronologies. Raynaud was also involved in studies dealing with the isotopic composition (^{15}N , ^{18}O , and ^{13}C) and N_2/O_2 ratio of these air bubbles.

In the 1980s, studies performed on the Vostok ice—a collaboration between French and Russian scientists, later expanded to include teams from the U.S.—demonstrated the close correlation between CO_2 and, later, CH_4 concentrations in the air and the Antarctic climate over the last glacial-interglacial cycle (150 ka) and suggested that those greenhouse gases have strongly contributed to glacial-interglacial changes by amplifying astronomical forcing. In the 1990s these Vostok records were extended to four climatic cycles (420 ka) and, thanks

to the EPICA Dome C ice core and a close collaboration between teams from Bern and Grenoble universities, those for CO₂ and CH₄ were extended back to 650 ka. They now cover the last 800 ka.

Raynaud served for seven years as director of the Laboratoire de Glaciologie et Géophysique de l'Environnement (LGGE). He has been coordinator of several international ice-drilling projects, including the sixth MIS framework project for the European Project for Ice Coring in Antarctica (EPICA), which is dedicated to paleo-reconstruction and integrated climate analysis through marine and ice-core studies. Al Gore's *An Inconvenient Truth*, a film on the human contribution to global warming, drew from the work of Raynaud and his collaborators.

Raynaud has written many much-cited publications, including more than 30 articles in *Science* or *Nature*. He holds two degrees from Paris University and received a Ph.D. in geophysics from Grenoble University in 1976. Raynaud is a member of the

Russian Academy of Sciences, has received the Hans Oeschger Medal,

the Descartes Prize in Science, and the Grand Prize of the French Academy of Sciences, and in 2007 was a co-recipient of the Nobel Peace Prize as a member of the Intergovernmental Panel on Climate Change (IPCC).

***Al Gore's An
Inconvenient Truth
drew from the work
of Dr. Raynaud and
his collaborators.***



Warren M. Washington

WARREN M. WASHINGTON is a world-renowned expert in atmospheric science and climate research, and more specifically on computer modeling of Earth's climate. He is a senior scientist at the Climate Change Research Section of the Climate and Global Dynamics Division of the National Center for Atmospheric Research (NCAR) and is the chief

scientist of the cooperative agreement between the U.S. Department of Energy and the University Corporation for Atmospheric Research. His current research involves using the Community Earth System Model (CESM) to study the impacts of contemporary climate change.

At NCAR in the early 1960s, in collaboration with Akira Kasahara, Washington became a pioneer in the development of atmospheric and climate computer models, which use fundamental laws of physics to predict states of the atmosphere and climate system and have helped scientists understand climate change. Over time Washington incorporated the oceans and sea ice into climate models, the latest of which include components depicting surface hydrology and vegetation as well as the atmosphere, oceans, and sea ice. During the 1990s Washington's research concentrated on the development of the Parallel Climate Model (PCM), which took advantage of massively parallel computer systems. He currently uses the CESM. Both models were used in the 2007 Intergovernmental Panel on Climate Change assessment, whose members collectively shared the 2007 Nobel Peace Prize.

Washington has written more than 200 papers in professional journals. His *Introduction to Three-Dimensional Climate Modeling*, a book written with Clair Parkinson, is a standard reference in the field. Washington served as a science advisor to former presidents Carter, Reagan, Bush, and Clinton, and by presidential appointment served from 1994 to 2006 as a member and chairman of the U.S. National Science Board. He is the recipient of the National Medal of Science (presented to him by President Barack Obama), the James E. Steward Award from the American Association of Blacks in Energy, and a Lifetime Achievement Award from the U.S. Department of Energy.

Washington earned bachelor of science and master of science degrees from Oregon State University in 1958 and 1960, respectively, and a doctor of philosophy degree from Pennsylvania State University in 1964. He was only the second African American to earn a doctorate in atmospheric sciences and has consistently worked to promote diversity in the field. In 1999 the American Meteorological Society presented Washington with its Dr. Charles Anderson Award “for pioneering efforts as a mentor and passionate support of individuals, educational programs, and outreach initiatives designed to foster a diverse population of atmospheric scientists.”

***Dr. Washington
became a pioneer in
the development of
atmospheric and
climate computer
models.***

ACKNOWLEDGEMENTS

The campus community is indebted to the following individuals and departments whose contributions were essential to the success of this event.

Raymond S. Bradley, Ph.D.

University Distinguished Professor,
Director of the Climate System Research Center

Julie Brigham-Grette, Ph.D.

Professor and Department Head, Geosciences



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