

THIS PROGRAM IS DEDICATED TO THE DISTINGUISHED FACULTY WHO HAVE SERVED THE MATHEMATICS DEPARTMENT

*Janak Batra Chopra, Harold F. Carney, *Phillip W. Caverly, Ray W. Cleveland, *George Daneluk, *Gerald Derman, Alna M. De Winter, *Ernest Duncan, *Foster E. Grossnickle, Matthew Haines, May Hamden, *Catherine L. Hughes, Ralph Lewis, Richard MacLaren, Priscilla Putman, *John Raines, *John K. Reckzeh, Guy W. Ricker, *Herman Rosenberg, Howard Schulte, Howard J. Wendt, Prentice E. Whitlock *deceased

NJCU MATHEMATICS DEPARTMENT FACULTY

Deborah Bennett, James Camacho, Sandra Caravella, Zhixiong Chen, Yi Ding, Julio Guillén, Karen D. Ivy, Theresa C. Michnowicz, Das Misir, Richard F. Riggs (chair), Freda Wasserstein Robbins, Beimnet Teclezghi; Regina Sims, Department Secretary

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PRENTICE E. WHITLOCK SCHOLARSHIP COMMITTEE

Yi Ding (co-chair), Theresa C. Michnowicz (co-chair), Das Misir

MATHEMATICS DEPARTMENT SCHOLARSHIP COMMITTEE

Deborah Bennett, Sandra Caravella, Karen D. Ivy (chair)

MATHEMATICS AWARENESS MONTH COVER IMAGE

Image: www.mathaware.org

ACKNOWLEDGEMENTS

The Organizing Committee of the Mathematics Department Lecture Series thanks John Grew, Interim Dean of the William J. Maxwell College of Arts and Sciences, and Richard Riggs, Chair of the Mathematics Department, for supporting our Mathematics Awareness program.

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ORGANIZING COMMITTEE

Sandra Caravella, Zhixiong Chen, Yi Ding (co-chair), Karen D. Ivy, Theresa C. Michnowicz (co-chair), Beimnet Teclezghi



**NEW JERSEY CITY UNIVERSITY
celebrates
MATHEMATICS AWARENESS MONTH**

**MATHEMATICS DEPARTMENT
LECTURE SERIES**



**Mathematics and Climate
April 23, 2009
Gothic Lounge, Hepburn Hall, Room 202**

MATHEMATICS AND CLIMATE

Opening Remarks: John Grew, Interim Dean of the William J. Maxwell College of Arts and Sciences, NJCU

The 10 a.m. Session Presider: Elizabeth Manfrede, Math Club President, NJCU

10:10 a.m. The First Numerical Weather Forecast

Walter Kaczetow, Graduate Student in Mathematics Education, NJCU; Mentor-Professor Sandra Caravella

The first numerical weather forecast was attempted by Lewis Fry Richardson in 1922. This presentation relates the story of this historic forecast, as well as biographical items of interest from Richardson's life. Included is a description of the method of finite differences, which was used by Richardson to solve the equations of weather.

10:20 a.m. Presentation of Prentice E. Whitlock Award: Das Misir, Department of Mathematics, NJCU

10:30 a.m. Global Warming and Mathematics

Hector Herrera, Francisco Mutate*, Senior Mathematics and Physics Major, NJCU; Mentor-Professor Yi Ding

Mathematics plays an important role in Global Warming. With the help of mathematical equations such as the Global Warming equation, researchers can determine the rate of pollution and determine whether a change in temperature occurs. Furthermore, pollution models such as the Rapoport pollution model, which was developed by Anatol Rapoport, aid researchers in their study of the growth of pollution and its effect on human population and the quality of life. * Presenter

10:40 a.m. The Melting Arctic Ice

Denise M. Condi, Babita M. Rambaran, Laurel Hanns*, Senior Mathematics Major, NJCU; Mentor-Prof. Yi Ding

Because of global warming, the summer sea ice cover has been disappearing at approximately 70,000 km² per year. There have been indications that the ice has grown thinner by at least 40% over the last two decades. This presentation will introduce Peter Wadham's Model. This model is from a physics point of view and is used to analyze how pollution effects the change of sea water and atmosphere temperatures which cause the melting of arctic ice. * Presenter

The 11 a.m. Session Presider: Deborah Bennett, Department of Mathematics, NJCU, dbennett@njcu.edu

11:00 a.m. Visualization of Output from Eulerian Transport and Transformation Model (CTM) for Atmospheric Sulphur

Thomas Liu, Department of Computer Science, NJCU, tliu@njcu.edu

Simulation models describe worldwide phenomena such as the transport and transformation of trace species in the Earth's atmosphere. The speaker will show how to use computer visualization software, Vis5D, which processes five-dimensional (longitude, latitude, altitude, physical species variable and time) environmental data. A triangle strip algorithm is adopted from the Vis5D application to view large volumes of these data, either as snapshots or as animations over time. A graphical software model that is based on OpenGL is developed to capture views of the data on irregular three-dimensional grids. This will allow users to perform multidirectional visual analyses, formulate hypotheses, and draw conclusions.

11:15 a.m. Presentation of Mathematics Scholarships: Karen D. Ivy, Department of Mathematics, NJCU

11:30 a.m. Internal Waves in the Ocean

Ricardo Barros, Department of Mathematical Sciences, New Jersey Institute of Technology, rbarros@njit.edu

Large amplitude oceanic internal waves are ubiquitous phenomena that despite being known for centuries, have only been recently the subject of scientific studies. They manifest on the surface of the sea by long isolated stripes of highly agitated features that are defined as audibly breaking waves and white water. These waves have amplitudes that can exceed 80 m, wavelengths of order of km, and move with speeds of order of 1 m/s. They are believed to be responsible for a significant fraction of the mixing that must exist to maintain the observed ocean circulation, and might even contribute to the shaping of the continental slopes. We will show how analytical models can be used to understand this phenomenon.

The 12 p.m. Session Presider: Zhixiong Chen, Department of Mathematics, NJCU, zchen@njcu.edu

12:00 p.m. Hurricanes and Climate**

Timothy Hall, NASA Goddard Institute for Space Studies, tmh1@columbia.edu

The possibility of more and more intense hurricanes is one of the most alarming impacts of global warming. It is also one of the most contentiously debated impacts. I present the basic arguments for increased storminess in a warmer climate, and the data that point to increased storminess with warmer seawater. How other factors influencing hurricanes (e.g., wind shear) will change with climate is poorly known, however, and there is therefore large uncertainty about hurricane trends. I also discuss hurricane landfall risk assessment, its relationship to climate, and its impact on the insurance industry.

Timothy Hall is an applied physicist who works in the broad area of climatology. He received a Ph.D. in physics from Cornell University in 1991, and followed with post-doctoral fellowships at Columbia University and research centers in France and Australia. Dr. Hall joined NASA's Goddard Institute for Space Studies (GISS) in New York City in 1997, becoming a permanent staff scientist in 2001 and a senior scientist in 2006. He is also an adjunct professor in the Department of Applied Physics, Columbia University, currently advising two Ph.D. students.

Dr. Hall has several areas of research interest. One is geophysical transport, the study of how fluid motions in the atmosphere and ocean distribute natural trace gases and industrial pollutants. His recent application of this work addresses the uptake and storage of industrial carbon by the ocean. Another application is intercontinental transport of industrial pollution. In the past two years an increasingly large fraction of Dr. Hall's research has focused on tropical cyclones and climate, and he works closely with Risk Management Solutions (RMS), a private-sector catastrophe modeling firm. He and his RMS colleagues have built novel statistical models of hurricanes and their relationship to climate. One application currently in development is the quantification of changes in hurricane landfall risk along the North American coastline. Dr. Hall has more than 40 publications in peer-reviewed scientific journals, and gives frequent presentations on global climate change to non-specialists and the general public. He lives with his wife and three children in Cold Spring, NY.

Remarks: Richard Riggs, Chair of the Department of Mathematics, NJCU

The 1:00 p.m. Session Presider: Sandra Caravella, Department of Mathematics, NJCU, scaravella@njcu.edu

1:00 p.m. Mathematical Modeling, Global Warming, and Public Policy**

Frank Wattenberg, United States Military Academy, West Point, Frank.Wattenberg@usma.edu

If I was giving this talk three years ago, I would have talked about a perfect storm -- the confluence of the energy crisis, global warming, and rapid economic growth. Although the severe recession that developed during the Bush years has hurt the global economy, it has bought us some time both for the energy crisis and global warming. But we cannot relax. These problems are imminent and momentum is carrying us in the wrong direction. Mathematical modeling is absolutely essential to understanding these problems and to formulating public policy. This is a time when we as mathematicians have major responsibilities in this area as well as tremendous opportunities. This is our time.

Frank Wattenberg is a professor in the Department of Mathematical Sciences at the United States Military Academy (West Point). He is primarily interested in Mathematical Modeling and Computer- and Internet-based Simulations and using them to inform public policy decisions in areas like Global Warming, the Current Economic Crisis, and the Energy Crisis. He received his PhD from the University of Wisconsin, Madison and has also taught at Harvard University, the University of Massachusetts, Amherst, the University of Wisconsin, Madison, the University of Illinois, Urbana, Warwick University, and the University of Paris (VII and X). He spent two years as a program officer at the National Science Foundation.

Closing Remarks: Joanne Z. Bruno, Interim Vice President for Academic Affairs, NJCU

**** Invited Speaker**