

# Science News

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THE MONTHLY NEWSLETTER OF RENSSELAER POLYTECHNIC INSTITUTE'S SCHOOL OF SCIENCE

## THE eSCIENCE REVOLUTION

### Federal Stimulus Funding to Create Semantic Web Platforms for Massive Scientific Collaboration

Web scientists at Rensselaer Polytechnic Institute will use the World Wide Web to compile and share scientific data on a scale that has never been achieved. Their goal is to speed the age-old scientific process and share the possibility of new discovery and collaboration with scientists, educators, students, policy makers, and even “citizen scientists” around the world via the Web.

Funded by \$1.1 million in federal economic stimulus funding from the National Science Foundation (NSF) the research seeks to break science out of the hallowed halls of the individual laboratory and place it in the hands of the people.

“We want to provide a toolkit for scientists and educators that allows them to gain access to data from a variety of sources and, importantly, outside of their direct area of expertise,” said **Peter Fox** the principal investigator for the project and a Senior Constellation Professor in the Tetherless World Constellation at Rensselaer. “Right now there are many scientists, educators, and policy makers that want to use other’s scientific data, but they don’t know how to find it, how it was collected, and even how to read it.” Fox notes that with the increased specialization of most scientific research even people in closely related fields may now struggle to interpret the data of their contemporaries, and these scientific language barriers can hinder the pace of new discovery.

The toolkit that they will develop will have a foundation in Semantic Web technology. On the Web, semantic computer code (known as ontologies) provides underlying meaning and links to the information that is presented on a Web page to your computer, smart phone, or other Web-enabled device. Instead of flat words on the screen such as “climate change” that require a human to interpret them and then manually move on to another Web-site for additional information, Web technologies based on semantics enable the computer to provide its own underlying meaning to those words, providing links to related Web-sites, non-profit organizations, upcoming Senate bills, or even related photos stored on your computer. In the case of semantic data, the computer can configure, coalesce, and interpret data from millions of different sources instantly without the need for human intervention.

“Semantic technologies lower the barrier of entry to do science,” said co-principal investigator on the project and Senior Constellation Professor **Deborah McGuinness**. “With semantics, we can bridge the gap between the question that someone wants to ask in their limited scientific vocabulary and the extreme complexity of the underlying data.” Your vocabulary and scientific understanding will no longer have to correspond to the level of your scientific discovery according to Fox and McGuinness.

Fox, McGuinness and their counterpart on the project, Senior Constellation Professor **James Hender**, will use semantic ontologies to build customizable Web-sites. Each Web-site will be familiar, understandable, and navigable to its end user depending on their level and type of expertise. Behind the simple façade of the Web-site will rest billions of pages of data all semantically tagged and ready to be accessed and interpreted by the computer. The user needs only to type their question and it will be answered using data input by other users around world.

### **Sean O'Sullivan Donated an Additional One Million Dollars to Continue the Rensselaer Center for Open Software**

Sean O'Sullivan visited RPI on Thursday, October 1, 2009 to receive the Distinguished Service Award of the Rensselaer Alumni Association. He met with RCOS community and he was very impressed with the students' achievements and contributions and he wrote a one million dollar check for the next phase.

The Center for Open Software offers an entrepreneurial, creative, collaborative environment for Rensselaer students committed to investing their energy, time, and talent in creating enabling open source software and content to benefit society.

In an open source environment, the source code for particular software can be readily accessed, modified, and distributed by a programmer. The environment promotes adaptability to different applications, augmentation of what the original software was designed to accomplish, and the ability to correct problems present in a given version.

O'Sullivan funded the Rensselaer Center for Open Software to enable student developers to do work related to their academic pursuits during the summer months. Through this program, up to 100 Rensselaer students annually will be given stipends to develop software and content.

### **Architectural Photonics for Maximizing Solar Energy Conversion**

**Shawn Lin**, Constellation Professor of Physics, and **Toh-Ming Lu**, Ray Palmer Baker Professor of Physics, were awarded \$750 K for a three-year renewal of their grant from the Department of Energy. The long term objective of this program is to achieve a solar-to-electric conversion efficiency of 50-75% using a single photovoltaic (PV) cell. This study will elevate the technological efficiency gap, 45-100%, of solar conversion efficiency. For comparison, the next generation PV cell design for efficiency close to 50% has as many as 127 MOCVD grown layers (courtesy: Fraunhofer Institute, Germany). The efficiency is also lower, ~28%, for a single-crystal silicon photovoltaic cell, ~20% than for any thin film cell.

**Undergraduate Research during the Summer of 2009 supported by  
the School of Science**

The School of Science has three endowment accounts specifically designated to support undergraduate students doing research during the summers. Five students were awarded fellowships in the summer of 2009.

**JOHN L. MARSH '58 Fellowship**

Fellow: **Renuka Bhisetti**

Major: Biology

Title: *Optimizing the Enzymatic Synthesis of Heparin*

Advisor(s): Robert Linhardt and Jeff Martin

**CAROL D. AND SAMUEL C. WAIT, JR. '53 Fellowship**

Fellow: **Graham Cabrey**

Major: Biochemistry/Biophysics

Title: *Role of Tublin Carboxyl-Terminal Domains for Mitotic Kinesin Eg5 Function*

Advisor: Susan Gilbert

Fellow: **Dennis Goldfarb**

Major: Computer Science – Mathematics

Title: *Creating a Plotting Toolkit for Metamorphic Petrology Database*

Advisor: Sibel Adali

Fellow: **Hilary Hamer**

Major: Biochemistry/Biophysics – Chemistry

Title: *N-Terminal Specific Labeling of Proteins*

Advisor: Mark Platt

**MIRIAM AND MILTON A. PRINCE '34 Fellowship**

Fellow: **Dawei Li**

Major: Applied Physics – Electrical Engineering

Title: *Catalysis of "Naked" Gold Nanoparticles smaller than 3 nm*

Advisor: Sang-Kee Eah

**FACULTY NEWS and NOTES**

**Swastik Kar**, Research Assistant Professor of Physics, is the Principal Investigator on a grant entitled: Ultra-high Performance Carbon Nanotube "Parallel Nanotube Architectures" (PNAs) for On-chip Gigascale Local and Global Interconnects. Co-Principal Investigators are **Saroj Nayak**, Associate Professor of Physics, and **Morris Washington**, Clinical Professor and Associate Director of the Center for Integrated Electronics. The grant is for \$189 K.

**Patent Inventors and Patents Awarded to Science Faculty\***

(From the Office of Technology Commercialization)

Ken Vastola, **Boleslaw Szymanski**, Biplab Sikdar, Shivkumar Kalyanaraman

# 7,363,285 *Network Management and Control using Collaborative On-Line Solutions*

**Xi-Cheng Zhang**

# 7,368,280 *Detection of Biospecific Interactions using Amplified (DTDS-Hz) Signal*

**Wilfredo Colon**

# 7,393,443 *Methods of Identifying Kinetically Stable Proteins*

**James Crivello**

# 7,405,308 *Thianthrenium Salt Cationic Photoinitiators*

**Curtis Breneman**

# 7,446,777 *System and Method of Computing and Displaying Property-Encoded Surface Translator Descriptors*

**Toh-Ming Lu**

# 7,501,154 *Surface Modification of CVS Polymer Films*

**Jianming Dai, Xi-Cheng Zhang**

# 7,531,802 *Method of Analyzing a Remotely-Located Object Utilizing an Optical Technique to Detect Terahertz Radiation*

**James Crivello**

# 7,405,308 *Silicone Monomers and Oligomers*

**Mark P. Wentland**

# 7,557,119 *Large Substituent, Non-Phenolic Opioids*

**Xi-Cheng Zhang**

# 7,557,348 *Method and System For Imaging an Object Using Multiple Distinguishable Electromagnetic Waves Transmitted by a Source Array*

\*Only the names of individuals currently at Rensselaer are shown.

## **Metamorphic Petrology Data Base for iPhone**

**Sibel Adali, Frank Spear and Boleslaw Szymanski**

Our iPhone app for our metamorphic database (the mobile app for the database) has just been accepted by Apple's iPhone app store. It is now available (free) to the world.

APPLICATION DESCRIPTION: MetPetDB is an application for students, teachers, and researchers interested in Geosciences, especially Metamorphic Petrology. It is meant to provide tools needed for field work in Earth Sciences. It provides access to information contained in the MetPetDB system which contains information about rock samples, subsamples, images, and chemical analyses. Users can search for samples close to their location, at a specific latitude and longitude, or any specifically named geographic location. In addition, searches can be further refined by rock type, metamorphic grade, sample owner and minerals available in sample. For each sample, users can view all the relevant data available in the database.

LANGUAGES: English

REQUIREMENTS: Compatible with iPhone and iPod touch. Requires iPhone OS 3.1 or later.

**“A College on the Shores of Lake George”**

Taken from *The Lake George Mirror*

September 18, 2009

“RPI’s Darrin Fresh Water Institute has a global reputation for pathbreaking research on zebra mussels, acid rain, milfoil and water quality. But according to Chuck Boylen, the institute’s associate director, its mission has always included education and a focus on building relationships with the community as well. The Fresh Water Institute’s community outreach programs have encompassed not only a popular lecture series, but also a willingness to test local residents’ water and identify plants and animals that may or may not be invasive. And, of course, many of the institute’s research projects have been undertaken to support efforts to protect Lake George’s clarity and purity. And as of this fall, the Darrin Fresh Water Institute has the foundation for a strong and lasting education component. RPI undergraduates can now spend a semester at the Fresh Water Institute, which is located in Bolton Landing, overlooking Lake George. “We’ve wanted to offer undergraduates a Lake George experience ever since the 19th century Lodge was converted to a year-round facility in 2003,” said Sandra Nierzwicki-Bauer, the Darrin Fresh Water Institute’s executive director. With the support of the Darrin family, that onetime summer cottage became a year-round education and research facility, with a state-of-the-art computing center, space for lectures and films and rooms for visiting scientists and students. While some of the undergraduates participating in the semester on Lake George are commuting to Bolton Landing from RPI’s Troy campus, others are now occupying those rooms. “We feel as though we’ve expanded the RPI campus to include Bolton Landing,” said Nierzwicki-Bauer.”



### 2009 Autumn Seminar Series

**Rensselaer’s Darrin Fresh Water Institute, located on Route 9N in Bolton Landing, is pleased to host a series of distinguished scientific presentations on Monday mornings at 11:00 am.**

- October 19      **The Chemistry of Acidified Adirondack Lakes**  
*James Sutherland*, NYS Department of Environmental Conservation, Retired,  
Nantucket, MA
- October 26      **Food Web Interactions Requires Understanding Spatial Distributions -  
Examples from the Great Lakes and Lake Champlain**  
*Lars Rudstam*, Director, Cornell University Biological Field Station, Bridgeport, NY
- November 2      **The Limnology of Onondaga Lake – “America’s most polluted lake”**  
*Cliff Siegfried*, Director, NYS Museum, Albany, NY
- November 9      **Mesocosm and Enclosure Systems for the Exploration of Community  
Complexity and Responses to Environmental Perturbations: Examples from  
the Near Arctic and Lake George**  
*Marc Frischer*, Skidaway Institute of Oceanography, Savannah, GA
- November 9      **Abundance and Distribution of Native Mussels (*Bivalvia: Unionoida*) in Lake  
George: Implications for Needed Conservation and Potential Threats to  
Population Survival**  
*Dan Marelli*, Director, Scuba Educators International, Tallahassee, FL

- November 16 **Total Maximum Daily Load (TMDL) Analyses and Mercury**  
*Jay Bloomfield*, Chief, Inland Lakes & Freshwaters, NYSDEC, Albany, NY
- November 30 **Influence of Land-use on Stream Chemistry within the Lake George Watershed**  
*Mark Swinton*, Darrin Fresh Water Institute, RPI, Bolton Landing, NY
- December 7 **The Fishes of the Adirondacks**  
*Robert Daniels*, Acting Director, Biodiversity Research Institute, Curator of Ichthyology NYS Museum, Albany, NY

For more information visit our website [www.rpi.edu/dept/DFWI](http://www.rpi.edu/dept/DFWI) or phone 518-644-3541.