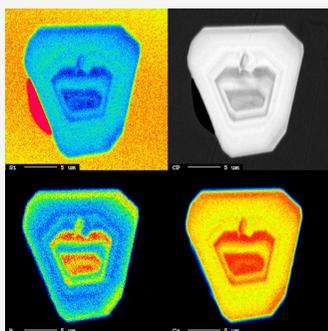


## In This Issue

New Materials from Coconuts  
M&M 2011 Wrapup  
UIC Installs ARM200F  
Hole-Free Phase Plates

## Extreme Image



## Coconut Waste Changes to Grace for Poor Farmers

*Developing New Materials from Fiber and Pith*



*Walter Bradley with coconut farming family.*

Dr. Walter Bradley says he may never retire, now that he's found a way to help people in poor countries while turning agricultural waste into useful materials. For two decades his work in materials

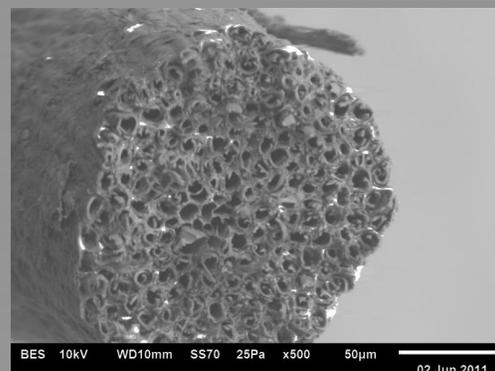
**No it's not a Warhol poster, it's a tiny "apple" in a britholite mineral grain found by JEOL's FE-EPMA (JXA-8500F) microprobe at Washington State (courtesy of Prof. John Wolff). This shows backscattered and X-ray maps. JEOL has delivered 150 field emission microprobes worldwide!**

science helped the defense and aerospace industries. Now, as [Distinguished Professor of Mechanical Engineering at Baylor University](#) in Waco, Texas, his [team](#) is exploring the uses of coconut fiber and pith milled from the coconut husk and the hard coconut shell - to ultimately help impoverished coconut farmers in equatorial countries.

Eleven million coconut farmers around the world make only 10 cents for each coconut, and typically sell only 5000 a year, giving an income of less than \$2 US/day. Demand for coconut oil plunged in the 90s due to health concerns, dramatically reducing the price for the white coconut meat from which the oil is pressed. While consumers only see the hard brown nut in the store, or bags of shredded coconut or cans of coconut milk, there are

actually many other parts we don't see that are mostly discarded, and that amounts to something on the order of 20 billion pounds a year of agricultural waste. There's a lot of it available, and it's a renewable resource.

"I said, 'Let's go figure out what the properties of the shell and the husk are and what we can use them for,'" he explained. "They have extremely interesting properties that make them very attractive for a wide variety of applications, which we're exploring. [Continue reading>>>](#)



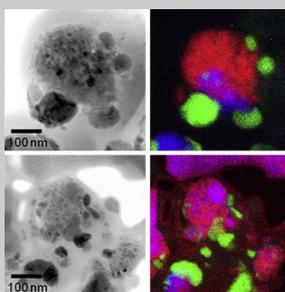
SEM image of coconut fiber.

## Microscopy & Microanalysis: 2011 M&M Wrap Up

### In Print and Online

[UIC Researchers Study Alternate Routes to Alternate Fuels](#)

[On the Origins of GEMS Grains](#)



[Microwave Nanodetectors and Nanogenerators Employ Ratchet Effect](#)

[Quaternary structures of HIV Env immunogen exhibit conformational vicissitudes and interface diminution elicited by ligand binding](#)

[JEOL News Magazine July 2011](#)



Tom Isabell and Masa Kawasaki during one of the remote demonstrations of the ARM200F TEM.

Nashville, Tennessee was home to the largest microscopy show of the year - M&M 2011 - in August. The JEOL booth was filled with activity, with a high volume of one-on-one demonstrations and a series of open demonstrations to introduce several new products and showcase accessories for the SEM and TEM.

Here's a summary of JEOL highlights during the show:

- Via remote demonstration from Japan, we introduced the new nanoanalysis TEM, the [JEM-2800](#) with the new [Centurio](#) large angle EDS. Dr. Tom Isabell describes this new system in a [video](#) taken at the tradeshow.
- Also via remote demonstration from Arizona State University, we showed the capabilities of the [JEM-ARM200F](#) atomic resolution TEM.
- In the Protochips booth, demonstrations of imaging fully hydrated specimens with the [Poseiden TEM holder](#) in the JEM-1400 TEM.

## Upcoming Events

### FEMMS

Frontiers of EM in Materials Science  
Sept 18-23 Sonoma, CA

### BACUS Photomask

Sept 19-22 Monterey, CA

### MAFS

Midwestern Assoc. of Forensic Scientists  
Sept 21-23 Lombard, IL

### SAFS

Southern Assoc. of Forensic Scientists  
Sept 26-28 Charlotte, NC  
[InTouchScope](#) demos

### Seminar: New EM Techniques and Customer Perspectives

Sept 27, Waltham, MA

### MS&T

Oct 18-19 Columbus, OH  
[JSM-6610LV](#) & [NeoScope](#) demos

### AReMS

Appalachian Regional Microscopy Society  
Oct 20-21 Boone, NC

### AAPS

American Assoc. of Pharmaceutical Scientists  
Oct 24-26 Washington, D.C.  
[InTouchScope](#) demos

### MAS

### Cathodoluminescence TC

Microbeam Analysis Society  
Oct 24-28 Gaithersburg, MD

### Midwest Microscopy Society

Nov 4 - Baxter Healthcare  
Deerfield, IL

### ISTFA

Nov 15-16 Booth #200  
San Jose, CA  
[InTouchScope](#) demos

Submit your best images for the [photo contest](#) by September 5!

- SEM users flocked to see the new [Oxford AZtec](#) and the on the JEOL field emission SEM, the [Thermo Noran System 7](#) installed on the JSM-7600F, the [Hysitron PicoIndenter](#) on the JSM-6610LV, and the new [InTouchScope SEM](#), the winner of the 2011 R&D 100 Award.



*Vern Robertson begins presentation on Oxford AzTech installed on FE SEM.*

## UIC Energy Research Enabled with New S/TEM

The University of Illinois at Chicago just became an epicenter for atomic resolution research with the installation of its new aberration-corrected S/TEM, the JEM-ARM200F with cold field emission gun. The ability to see atomic structures at this resolution will enhance energy-related research at the University, where the research team investigates catalysts for alternative fuel production, and alternative energy using thin film solar cell materials, oxide thin films, thermoelectric oxides, ceramics, nanotubes, and semiconductor thin films.

Dr. Robert Klie, associate professor of physics, was awarded a National Science Foundation (NSF) grant to purchase the S/TEM as part of the American Recovery and Reinvestment Act of 2009. Additionally, Dr. Klie and Dr. Randall Meyer, associate professor of chemical engineering, received a grant from the NSF to examine how individual atoms and atom clusters of the rare metal rhodium, manganese and vanadium interact at the atomic level to facilitate chemical reactions under various gas pressures and temperature conditions.



The research team is especially keen on making a catalyst that could reduce the costs involved in ethanol production, generate less waste, and use non-food biomass such as switchgrass -- rather than corn kernels -- as the source material.

The ARM200F arrived at UIC in July, and is housed in a refurbished room which previously was used for a JEOL JEM-2010F. The room has since been outfitted for temperature and airflow control with the JEOL Hydro Panel system.

The installation process and milestones have been posted on the University's [Research Resources Center web page](#). The UIC-RRC operates the TEM, which is available for use for an hourly user charge. "Currently, we have over 15 internal user groups who have expressed strong interest in using the new instrument, as well as outside industrial and academic users," said Dr. Klie.

## Fall MRS

Nov 29-Dec 1  
Boston, MA

To schedule a demo at any of the shows, or at any time, please [contact your local sales representative](#).

## Ernst Ruska Prize for Electron Microscopy 2011

JEOL USA would like to extend its congratulations to Dr. David Mastronarde, Professor at the [Boulder Lab for 3D Microscopy](#) (University of Colorado). Dr. Mastronarde, along with Dr. Johan Verbeeck, physicist at the University of Antwerp (Belgium) was awarded the Ernst Ruska Prize on August 31, 2011 at the Microscopy Conference in Kiel, Germany.

Dr. Mastronarde has been developing [SerialEM](#) for the acquisition of images for serial reconstructions as well as 3D reconstruction by tomography. SerialEM has gained wide acclaim in many labs all over the world. In addition, he has developed a suite of processing tools ([IMOD](#)) that has become the de facto standard in the field of electron tomography.

## Quick Guide to JEOL Microscopes

### SEM

[Portable InTouchScope](#)  
[LV/HV Tungsten and LaB6 SEMs](#)  
[Conventional FE SEM](#)  
[Semi-in-lens Cold Cathode FE](#)  
[Atmospheric SEM](#)  
[SEM-FIB](#)  
[Benchtop SEM](#)

### TEM

[100/120 kV](#)  
[200 kV](#)  
[300 kV](#)

### [EPMA/Auger](#)

## A New Take on the Phase Plate



*Marek Malac, Masa Kawasaki, Julie Qian, Hiromitsu Furukawa, Miyoko Shimizu, Brian Legg at Canada's National Institute for Nanotechnology.*

1953 for his work in this area. But phase plates are still evolving after a long history of trial and errors by many scientists. In the TEM, phase plates improve contrast transfer and lower the dose needed to acquire images, which has proved to be an important development for imaging of organic materials.

TEM phase plate development was extensively pursued by Prof. Nagayama's lab in Japan for over ten years. Prof. Chiu of Baylor College of Medicine has successfully applied the phase plate system on his Omega filtered TEM (JEM-2200FS) to the molecular structure characterization for proteins.

TEM phase plates are difficult to produce, however, as the fabrication process is rather complicated and delicate. Today, the most successful phase plate is made of a uniform and contamination-free carbon thin film of precise thickness with a one micron hole drilled into it. The most difficult aspect is the need to prevent charging of the carbon phase plate film while in use. Alternatively, a micro-machined electrostatic lens is being tested, potentially offering an additional degree of freedom of the contrast enhancement by controlling the amount of phase shift. Both designs require precise (less than one tenth of micrometer) mechanical alignment of the device in the back focal plane of the objective lens, a difficult requirement in practical alignment of the microscope electron optics.

A new approach offers a potential solution. Hole-free phase plates have been co-developed and patented by a team composed of Dr. Marek Malac, a Principal Investigator of [Canada's National Institute for Nanotechnology \(NINT\)](#), JEOL's own Dr. Masa Kawasaki, TEM applications scientist, Prof. Ray Egerton from NINT and Physics University of Alberta and Dr. Marco Beleggia from Denmark Technical University while visiting NINT. NINT is government lab, a partnership between Canada's National Research Council, the University of Alberta and the Government of Alberta. The research team is investigating hole-free phase plates with the [JEOL JEM-2200FS](#) Field Emission TEM with an Omega filter. [Continue reading >>>](#)

The idea of a microscope phase plate is not new - it was first developed and demonstrated for light microscopes around 1940 by a Dutch scientist Frits Zernike and rewarded with a Nobel Prize in Physics in



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