

Interfacial and Processing Sciences  
**News Notes**

April 21, 2000

**Environmental and Molecular Sciences Laboratory  
Pacific Northwest National Laboratory**

*News Notes, established to help keep our Users and others who have had a connection with us up-to-date on activities, events, capabilities, and interesting results, including short summaries of the work of users.*

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This issue includes:

- **EMSL2000 - Symposia and User Meeting**
  - ***Nanoscience and Nanotechnology Symposia***
- **New Staff Members**
  - ***Dan Gaspar-Responsible for TOF-SIMS***
  - ***Courtenay Turner-Administrative Assistant***
- **New Program: Women Faculty Sabbaticals**
- **Annual Report**

**EMSL2000 - Symposia, Tutorial and User Meeting, June 19-24, 2000**

EMSL2000, scheduled for June 2000, will feature four symposia, three tutorials, two poster sessions, and the second annual User meeting. In addition, there will be informational sessions to introduce new Users to the laboratory. Detailed information that is updated regularly and registration materials can be found at the EMSL web homepage [www.emsl.pnl.gov](http://www.emsl.pnl.gov)

***Symposia*** (Invited and Contributed Presentations)

- Nanoscience and Nanotechnology, June 21 (all day) and June 22 (morning)
- Physics and Chemistry of Liquid-Like Layers in the Environment, June 22 (morning) and June 23 (all day)
- The Science of Radiation-Resistant Organism *Deinococcus Radiodurans*, June 23 (morning)
- Magnetic Resonance Imaging of Biological Samples, June 23 (afternoon) and June 24 (morning)

***Poster Sessions***

Poster sessions will be held concurrently with receptions on the evenings of June 21 and 23

***Tutorials***

- Molecular Science Software Suite, June 19 and 20 (all day)
- Scanning Probe Microscopy and Other Nano-Dimensional Methods, June 20 (all day)
- EMSL's Computer and Instrument Network: electronic collaboration, Web-Enabled Instruments, Advanced Scientific Data Management, June 21 (afternoon)

**Nanoscience and Nanotechnology Symposium** - I&PS staff are responsible for helping organize the symposium, which is described below. The list of invited speakers is still being finalized and a few contributed presentations will be welcome.

The ability to model, manipulate, observe, understand and control materials structures and molecular order at nanometer dimensions offers "revolutionary" opportunities for science advancement and technology development in many areas. A major government nanoscience and nanoengineering initiative is planned to take advantage of and influence the development of this rapidly growing field. EMSL users as well as EMSL and PNNL staff members are actively pursuing many aspects of "nano" research, sometimes using critical or unique tools in the EMSL Nanoscience and Technology or Molecular Science Computing facilities. This symposium will bring together recognized world leaders in nanoscience and technology, EMSL Users (and potential Users) and PNNL researchers with the objective of stimulating new research ideas and opportunities. Major themes of the symposium will include nanoelectronics, nanosynthesis, and nanobiological systems.

Speakers include:

Dr. Lynn Boatner, Oak Ridge National Laboratory  
Dr. Bruce Bunker, Sandia National Laboratories  
Professor Tom Dickinson, Washington State University  
Professor James L. Gole, Georgia Institute of Technology  
Dr. Berry Jonker, Naval Research Laboratory  
Dr. Jun Liu, Pacific Northwest National Laboratory  
Dr. Joel Schnur, Naval Research Laboratory  
Professor Galen Stucky, University of California, Santa Barbara

#### **I&PS Staff**

- **Dan Gaspar taking responsibility for TOF-SIMS** - In early March Dr. Daniel J. Gaspar arrived at the laboratory to take responsibility for use of the TOF-SIMS instrument in the busy surface and interface analysis laboratory. Dan received his Ph.D. in Chemistry from the University of Chicago, working with Professor Steven Sibener in 1998. His thesis work involved helium atom scattering from nickel surfaces. From 1998 until March of 2000, he worked with Eltron Research in Boulder, Colorado and was involved in a variety of more applied projects, including the development of ion exchange resins for clean up of waste streams and electrocatalytic reduction of CO<sub>2</sub>. His strong basic research experience, combined with an interest in real-world problems, should enable him to apply the TOF-SIMS in many areas. Two areas of current development include analysis of atmospheric aerosols and examination of biological materials. We are pleased to welcome Dan to the I&PS team.
- **Courtenay Turner is new administrative assistant** - Those of you who visit the lab know that access is usually gained after some interaction with or assistance from our administrative staff. For any questions regarding badging, computer needs, and local accommodations, you may continue to contact Terry Law or you can contact Courtenay at [courtenay.turner@pnl.gov](mailto:courtenay.turner@pnl.gov)/ <<mailto:courtenay.turner@pnl.gov>> 509-376-2418. As an update, our previous administrative assistant Jodie Harper left the I&PS group at the end of March to join the Facilities and Operations division.

**New Program: Women Faculty Sabbaticals** - On December 1, DOE announced the "Institute for Natural Science and Engineering," a partnership between DOE, The Association for Women in Science, and the American Association of University Women. The Institute will provide financial support to non-tenured university faculty to work at DOE laboratories. Women will be particularly encouraged to apply. For more information, contact Michelle Nichols at 375-2476 or

michelle.nichols@pnl.gov.

**EMSL User Highlights** *To provide a method to share and track information about work done using EMSL capabilities, we request that Users and visitors write a short summary of what was done during visits. Many of these will appear in News Notes and will be used to provide a starting point for input to our annual report.*

- **Solar Cell Adsorbers** - Pete Eschbach is working on his doctorate with Larry Olson at WSU-Tri-Cities. He describes his January work as an EMSL User as follows:

P type absorber materials have a history of performing much better if they are exposed to KCN during the cleaning process prior to deposition of an N type partner. In fulfillment of my Ph.D. Dissertation, we are attempting to understand the chemical and or physical mechanism responsible for this phenomenon. Our previous results using an older Auger system indicated a reduction in surface oxidation on the absorber material treated with KCN compared with the control that received no KCN exposure. However, we needed a higher resolution technique to elucidate the chemical bonds that were occurring.

Using the Phi-Quantum 2000 with Mark Engelhard, we not only confirmed this prior Auger result, but found that the oxygen was chemisorbing to the Selenium to form  $\text{Se}_2\text{O}_3$  on the surface of the absorber. We also demonstrated for the first time ever, that KCN was removing this  $\text{Se}_2\text{O}_3$  selectively. This has great implications for the understanding of high efficiency polycrystalline solar cells composed of copper indium selenium gallium and sulfur (CIGSS) absorbers.

- **Quantifying and imaging N species at microbially meaningful scales using TOF-SIMS** - Graduate student John Cliff from Oregon State University visited the EMSL in January and February to conduct experiments to determine how time of flight secondary ion mass spectrometry (TOF-SIMS) can be used to examine the nitrogen cycle in soil. The focus of this work is to develop techniques with which to quantify and image N species in soil systems at sub-mm scale using the Phi TRIFT-II TOF-SIMS. This is not an easy task for several reasons including the nature of real and model soils, specimen handling effects and statistical variation of data. Three areas of current effort include  $^{15}\text{NH}_4^+$  quantification, imaging  $^{15}\text{NH}_4^+$  in soil systems and microbial N assimilation. The most recent experiments show that sample preparation is a limiting factor for quantification and methods of doing this better are being examined. Measurements of Kaolin clay dried in a  $^{15}\text{NH}_4^+$  containing solution suggest preferential absorption in Al rich areas that can be imaged by the TOF-SIMS. Finally, negative TOF-SIMS was able to identify  $\text{NH}_4^+$  and  $\text{NO}_3^-$  assimilation in Gram-negative bacteria as evidenced by the presence of mass 26 ( $\text{CN}^-$ ) or mass 27 ( $\text{C}^{15}\text{N}^-$ ) peaks corresponding to the N isotope available for growth. These results show both the power and complications in working with this instrument.

**Annual Reports** - The I&PS Annual Report is completed and ready for mailing. We plan to distribute copies to all of our external users and collaborators. If your mailing address has changed recently, please forward corrected information to Terry Law ([terry.law@pnl.gov](mailto:terry.law@pnl.gov)/<mailto:terry.law@pnl.gov>> 509-376-2418) as soon as possible.

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