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Crystallographers in the News

The Protein Society has announced the recipients of the 2012 Protein Society Awards, to be conferred at the 26th Annual Symposium of The Protein Society (August 5-8, 2012) in San Diego, CA, USA. The 2012 Carl Brändén Award, sponsored each year by Rigaku, will be awarded to Professor Helen M. Berman of Rutgers University.

Prof. Helen M. Berman

Crystallography in the news

February 1, 2012. Nexomics Biosciences Inc., a drug discovery and contract research company, unveiled its next phase of growth with the dedication and official opening of a new headquarters in state-of-the-art laboratory space at the Commercialization Center for Innovative Technologies (CCIT) in North Brunswick, New Jersey.

February 9, 2012. Biochemists at Heidelberg University, led by Irmgard Sinning and Gert Banghav, gained fundamental insights into the mechanics of G protein FlhF switches. The work not only offers an explanation for the FlhF effector complex, it also integrates this knowledge into a general concept of SRP-GTPase activation through RNA or proteins.

February 16, 2012. A team of scientists from the Scripps Research Institute, collaborating with members of the drug discovery company Receptos, created the first high-resolution virtual image of cellular structures called S1P1 receptors, which are critical in controlling the onset and progression of multiple sclerosis and other diseases.

February 13, 2012. Emerald BioSystems announced strategic changes including new leadership and a new company name. Emerald BioSystems, known for its protein purification instruments, will now be known as Emerald Bio. The new management changes include the appointment of CEO, George Abe, and the promotion of Dr. Peter Nollert to Chief Technologist.

February 16, 2012. A team, led by Scripp professor Ian Wilson and Sanford-Burnham professor Andrei Osterman, described the interaction between a bacterial protein and an infection-fighting molecule called Toll Like Receptor 5, or TLR5. Scripps researchers took advantage of the molecule’s evolutionarily conserved status and studied it in zebrafish using X-ray crystallography. The Sanford-Burnham researchers studied how the molecule interacts with flagellin, using biochemical and protein engineering methods.

February 21, 2012. John C. H. Spence, a Regents' Professor in physics at Arizona State University, joined forces with Henry Chapman's (University of California, Davis) group and many collaborators recently to demonstrate serial snapshot femtosecond (10^-15 of a second) diffraction (SFX) from nanocrystals using the world's first hard X-ray laser. The photosystem I (PSI) nanocrystals came from Professor Petra Fromme’s lab in ASU’s Department of Chemistry and Biochemistry.

February 23, 2012. Instruct began its operational phase on signing an accession agreement between the existing participant Instruct members and the coordination company (Instruct Academic Services Limited) at a ceremony. Instruct brings together an unparalleled consortium of major structural biology centers in Europe, representing all major infrastructure technologies that enable structure determination from macromolecular to atomic resolution of proteins, protein complexes and single particles.

February 23, 2012. Researchers at Sanford-Burnham Medical Research Institute, led by Prof. Rongsheng Jin, and collaborators at the Medical School of Hannover in Germany recently discovered how the botulinum neurotoxin, a potential bioterrorism agent, survives the hostile environment in the stomach on its journey through the human body.

February 23, 2012. Applications are invited for a structural biology postdoctoral position in the lab of Ho Leung Ng, Department of Chemistry, University of Hawaii at Manoa, Honolulu, Hawaii, USA. Multiple projects are available involving receptor tyrosine kinases, GPCRs, structure based drug design, protein engineering, and developing methods for membrane protein crystallization.

February 24, 2012. A team of researchers led by Petr Leiman, a biophysicist at the École Polytechnique Fédérale de Lausanne in Switzerland, partially reverse engineered The 2012 Dorothy Crowfoot Hodgkin Award will be awarded to Professor Mark Lemmon, University of Wisconsin-Madison.

The 2012 Dorothy Crowfoot Hodgkin Award will be awarded to Professor Mark Lemmon, University of Wisconsin-Madison.
Meetings of Interest

The 15th International Small-Angle Scattering (SAS2012) Conference will be held in Sydney, Australia from 18-23 November 2012. The conference promises to be an intellectually stimulating and socially memorable occasion and will cover all fields of Small Angle Scattering. Talent from the next generation of small angle scatterers will be showcased as well as highlighting emerging areas of research.

Videos of the Month

Chemical Party

http://www.youtube.com/watch?v=eu4qcXmsJKE

The Structural Biology Rap

http://www.youtube.com/watch?v=LVZJsBNLjV0

Survey of the Month

PSI Structural Biology Knowledgebase: This site keeps you informed about advances in structural biology and structural genomics. You can discover how protein sequences, three-dimensional structures and models relate to biological function. It allows you to stay up to date with the latest protocols, materials and technologies.

Lab in the spotlight: Lemmon Lab

Professor Mark A. Lemmon, Ph.D. Chair, Department of Biochemistry and Biophysics Perelman School of Medicine, University of Pennsylvania

The research interests of the Lemmon lab include signaling by receptor tyrosine kinases from the erbB/HER family. They are specifically interested in understanding how growth factor receptors from the epidermal growth factor (EGF) receptor family signal across the membrane. A second line of research involves signal-dependent membrane recruitment by small domains. In particular they focus on small (100 aa or so) domains in signaling, cytoskeletal, and other proteins that recognize membrane components, and target their host proteins to cellular membranes.

The Lemmon lab currently has seven Ph.D. students, three postdoctoral fellows and an assortment of research associates, undergraduate students, and research specialists.

Saturn 944 HG and why CCDs will be around for awhile

The Saturn 944 HG is a 94 mm x 94 mm CCD detector optimized for fast data collection for macromolecular crystallography. The Saturn 944 HG is ideal for high-throughput screening and ligand binding studies when coupled with an ACTOR™ automatic sample changer. Eighteen bit digitization provides maximum signal to noise and dynamic range. The detector is cooled by a single Joule-Thompson cooler for low maintenance. The detector provides diagnostics and warnings via an LCD panel on the rear. Readout is less than 1 second for an unbinned image.

There has been a lot of discussion about the debut of CMOS detectors as replacements for CCD detectors. In short we do not think that this is likely because CCDs are more efficient at collecting weaker data than CMOS detectors. Simulations suggest that the DQE and normalized DQE (XDCE) for a CMOS detector are significantly lower for most of the operational range compared to those of a conventional CCD detector. This means you will collect data more reliably and faster with a CCD than with a CMOS detector. As a final comment, unless all your samples present reflections on the order of 10000 photons per reflection, you are simply better off with a CCD detector for data collection. A White Paper supporting these conclusions is available upon request.
Selected recent crystallographic papers


How a single residue in individual β-thymosin/WH2 domains controls their functions in actin assembly. Didry, Dominique; Cantrelle, Francois-Xavier; Hussin, Clotilde; Roblin, Pierre; Moothy, Anna M Esvara; Perez, Javier; Le Clainche, Christophe; Hertzog, Maud; Guittet, Eric; Carlier, Marie-France; van Heijenoort, Carine; Renault, Louis. EMBO Journal, 2/15/2012, Vol. 31 Issue 4, p1000-1013. http://dx.doi.org/10.1038/emboj.2011.461


Crystal structures of the coil 2B fragment and the globular tail domain of human lamin B1. Ruan, Jianbin; Xu, Chao; Bian, Chuanbing; Lam, Robert; Wang, Jia-Pey; Kania, Joanna; Min, Jinrong; Zang, Jianye. Febs Letters, Feb2012, Vol. 586 Issue 4, p314-318. http://dx.doi.org/10.1016/j.febslet.2012.01.007

Unusual NADPH conformation in the crystal structure of a cinnamyl alcohol dehydrogenase from Helicobacter pylorin complex with NADP(H) and substrate docking analysis. Seo, Kyung Hye; Zhuang, Ningning; Chen, Cong; Song, Jae-Young; Kang, Hyung-Lyun; Rhee, Kwang-Ho; Lee, Kon Ho. Febs Letters, Feb2012, Vol. 586 Issue 4, p337-343. http://dx.doi.org/10.1016/j.febslet.2012.01.020

Substrate selectivity of drug-metabolizing cytochrome P450s predicted from crystal structures and in silico modeling. Dong, Dong; Wu, Baojian. Drug Metabolism Reviews, Feb2012, Vol. 44 Issue 1, p1-17. http://dx.doi.org/10.3109/03602532.2011.645581


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January Survey Results

Graduate school, postdoctoral fellowships, and sabbaticals are excellent times to live in a different country. If you had your choice, which of the following countries would you choose to visit as part of one of these activities:

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>4.0%</td>
</tr>
<tr>
<td>Japan</td>
<td>4.0%</td>
</tr>
<tr>
<td>UK</td>
<td>12.0%</td>
</tr>
<tr>
<td>US</td>
<td>4.0%</td>
</tr>
<tr>
<td>Germany</td>
<td>20.0%</td>
</tr>
<tr>
<td>China</td>
<td>16.0%</td>
</tr>
<tr>
<td>Canada</td>
<td>4.0%</td>
</tr>
<tr>
<td>Sweden</td>
<td>20.0%</td>
</tr>
<tr>
<td>Other</td>
<td>16.0%</td>
</tr>
</tbody>
</table>


Book review:

Knocking on Heaven’s Door: How Physics and Scientific Thinking Illuminate the Universe and the Modern World by Lisa Randall, Ecco Press, 2011
ISBN: 978-0061723728

Lisa Randall provides an illuminative and enthusiastic argument in defense of the importance of scientific exploration and discovery in the modern world in her new book, Knocking on Heaven’s Door. She details the importance of scaling and methodology in particle and modern physics, as well as the history of the Large Hadron Collider (LHC) at CERN in Switzerland, her predictions for the potential discoveries that might be made through the research conducted at the LHC, and she also manages to debunk a number of myths currently circulating the non-academic community concerning science and its effects on modern society.

Randall begins by discussing the significance of scaling in particle physics. The principles and “laws” of modern physics do not necessarily apply at the quantum mechanical level. Though Newton’s classical laws work well in the relative sphere of the physical world, it is unrealistic to expect them to apply at the quantum level. Developing and maintaining a comprehensive understanding of the universe and its structural composition require an acceptance of the dynamic nature of scientific discovery. Since many phenomena are difficult or impossible to observe directly, models are frequently used to postulate and test hypotheses about the machinations of said phenomena. This is not only true for the microsphere of particle physics, but for the macrosphere of astrophysics. The examination and interpretation of phenomena that are, quite literally, out of this world, require a broadened perspective on the applicability of classical laws and theories.

The LHC is the pinnacle of modern experimentation and exploration in the world of particle physics; it is not only the world’s largest and highest-energy particle accelerator, but it lies at the heart of an international scientific community dedicated to solving the mysteries of the quantum world and filling in the current gaps in the Standard Model of particle physics. Located near the Alps outside of Geneva,
Lisa Randall

Standard Model of particle physics. Located near the Alps outside of Geneva, Switzerland, the LHC is an incredible feat of engineering, architecture and science. The inaugural run was conducted on September 10, 2008, with great success and tremendous publicity generated about the project. An unfortunate setback occurred a little over a week later; repairs took over a year, but the system is back on line and has delivered some incredible results in the past two years. Randall expresses her animated hopes that over the next few years, further research and experimentation will result in advances concerning the postulated Higgs boson, a somewhat elusive particle in quantum mechanics. She also debunks a number of myths concerning fears voiced by the public about the project, including an apprehension that should something disastrous occur at the LHC, a black hole would be formed that would envelop Earth and all of its inhabitants.

Randall’s newest work is a fast-paced and enjoyable read. As someone with a very limited understanding of the complex arena of quantum mechanics, I was able to comprehend a sizable portion of the science and the history was fascinating and addressed in a manner that was neither dry nor drawn-out. I highly recommend this book to anyone who wants to brush up on the current developments in the world of particle physics or be reassured that scientific discovery is important in the modern world.

Jeanette S. Ferrara
Princeton, Class of 2015