Life Sciences Division

E-Newsletter June 1, 2007

Highlights

Gulliver Highly Successful

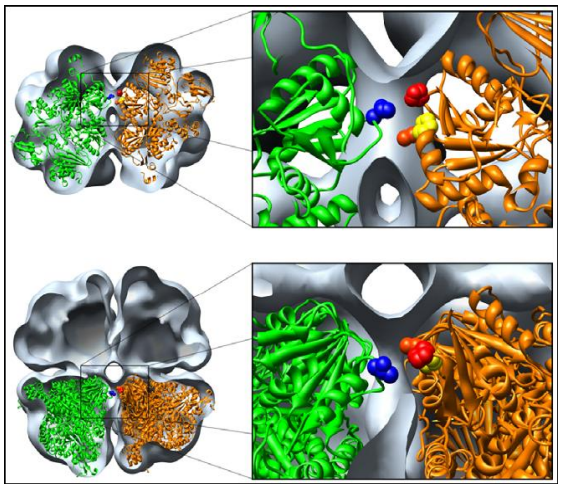
As announced in the previous newsletter, the Gulliver Multiscale Bioimaging Workshop took place on May 17-19, 2007. The purpose of the workshop was to disseminate new ideas and approaches in biological imaging that will catalyze advances in research areas of critical importance to the Lab, including bioenergy development, bioremediation, cancer biology, and neurosciences. Speakers included many imaging pioneers from LBNL and the international research community. The workshop was highly successful, with over 140 registered attendees (limited by the size of the auditorium) and additional participants following the proceedings via webcast. Following the first two days of presentations on Thursday and Friday, LBNL bioscientists and other interested parties convened for a planning session on Saturday, May 19 to initiate discussion about long-term development of a Multiscale Bioimaging Initiative at the Lab. A white paper outlining priorities for this Initiative will be forthcoming from this group. A more detailed report on the workshop will appear in Berkeley Lab View and will be included in the next newsletter. The video recorded presentations and most PowerPoint files are accessible through the Gulliver website at: http://www.lbl.gov/gulliver/program_schedule.htm, where you can also find a list of speakers.

Protein Complex Explains a Secret in the Genome

A paper by **Garczarek et al.** clearly illustrates the scientific justification for the Genomics:GTL initiative to characterize multiprotein complexes in microbes of interest to DOE. Comparative DNA sequence analysis of the gene coding for pyruvate:ferredoxin oxidoreductase (PFOR) had already turned up an unexplained insertion of a valine residue in a surface loop of the enzyme from *Desulfovibrio vulgaris* Hildenborough (*Dv*H), a microbe that is of interest to DOE due to its ability to reduce toxic metals; this residue is not present in the sequence of the same enzyme from a closely related microbe, *Desulfovibrio africanus* (*Da*). Sequence data alone do not explain why such an insertion occurs, of course, and indeed the simplest explanation might be that it is simply a genomic accident, something with no biochemical significance. That this insertion might be more than a meaningless accident began to be hinted at when biochemical purification of PFOR by the group of **Mark Biggin** showed that the enzyme from *Dv*H assembles into a much larger complex than the homodimer that exists in *Da*. When the atomic model of the homodimer, taken from the Protein Data Bank (PDB), was fitted into an intermediate-resolution EM structure, it was further discovered that the position of this single-residue insertion coincides precisely with the strongest points of contact between adjacent dimers in the octomeric complex. Structural characterization of the purified protein complex thus explains what the consequences are of inserting

this hydrophobic amino acid into an exposed surface loop, a secret that had previously remained unexplained in both the gene-sequence and in the PDB structure.

The paper is currently available online in the Journal of Structural Biology:
http://www.sciencedirect.com/science/journal/10478477/



Interaction between two *Dv*H PFOR dimers. Side and top view of the *Dv*H PFOR isosurface cropped at the position of closest contact between adjacent dimers. The interaction region is occupied by Val383 (blue), Pro267 (red), Pro318 (yellow) and Ala319 (orange).

Life Scientists Author Book on Cryo-Microscopy

A book by Berkeley Lab life scientists **Robert Glaeser** and **Ken Downing**, along with three other colleagues, on "Electron Crystallography of Biological Macromolecules," has been published by Oxford University Press. The book provides a complete introduction to both the practical details and the theoretical foundations required to use electron microscopy as a research tool in structural biology. More information about the book is available here:
http://www.oup.com/us/catalog/general/subject/LifeSciences/MolecularCellBiology/StructuralBiology/?view=usa&ci=9780195088717.
Today at Berkeley Lab, 5/31/07

Bissell Joins American Philosophical Society

Mina Bissell, with Berkeley Lab's Life Sciences Division, has been elected to the American Philosophical Society, one of only six new members chosen this year for the biological sciences section. Founded in 1743 by Benjamin Franklin, the APS is the oldest scholarly society in the United States. It recognized Bissell for her pioneering work on the relationship between cancer genetics and the three-dimensional structure of cells and tissues. In a letter of congratulations, UC Berkeley Chancellor Robert Birgeneau, himself elected to the APS last year, said Bissell exemplifies Franklin's charge to "promote useful knowledge" for the public interest. APS: http://www.amphilsoc.org/
Today at Berkeley Lab, 5/30/07

Lab Invention Wins 'Emerging ' Award

A Berkeley Lab nanocrystal inorganic solar cell technology invented by Associate Lab Director and materials scientist Paul Alivisatos and two non-Lab colleagues has won a 2007 TechConnect Emerging Technology Award. Lab life scientist **Fanqing Chen** was also selected to present his invention, "Predictive Methodology and Tools for Nanotoxicology," to the TechConnect/CleanTech Summit taking place this week in Santa Clara. The Lab's Technology Transfer Department will have a booth in the exhibit hall tomorrow showcasing Lab inventions for industry and investment leaders. More information on these technologies and the summit's agenda: http://www.lbl.gov/today/2007/May/22-Tue/techtransfer-jump.html

Today at Berkeley Lab, 5/22/07

Life Sciences Gets Grants for Model Organism Studies

Life Sciences Division researchers **Susan Celniker** and **Gary Karpen** are principal investigators on two grants announced yesterday by the National Institutes of Health's National Human Genome Research Institute (NHGRI), among the first in the modENCODE program, a four-year, $57 million effort. Roger Hoskins, Abby Dernburg, and Suzanne Lewis, also of Life Sciences, are co-PIs of related projects in the same program. Part of NHGRI's Encyclopedia of DNA Elements (ENCODE), modENCODE will study functional elements in the genomes of the model organisms D. melanogaster (fruit fly) and Caenorhabditis elegans (nematode).

Today at Berkeley Lab, 5/16/07

Full story: Berkeley Lab Life Sciences Division Awarded NIH Grants for Fruit Fly, Nematode Studies
http://www.lbl.gov/Science-Articles/Archive/LSD-modENCODE.html

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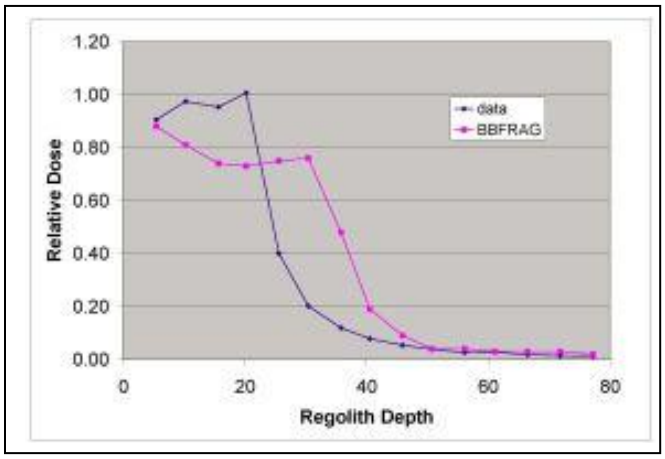
Novel Radiation Shielding from the Moon

L. Heilbronn, J. Miller, and C. Zeitlin, in collaboration with Brookhaven National Laboratory (A. Rusek, M. Sivertz), The University of Tennessee (L. Taylor, B. Eimer), and Northrup-Grumman Corporation (M. DiGiuseppe), recently obtained data at the NASA Space Radiation Laboratory on the radiation transport properties of lunar regolith (soil). Samples of regolith returned by Apollo 17 were exposed to 1000 MeV/u iron ions, and the average energy deposited by charged particles before and after passing through the samples was used to estimate radiation dose reduction as a function of regolith thickness. Analysis is under way; preliminary data are shown in the adjacent figure. Studies of this type will help mission planners determine the efficacy of lunar soil as shielding against galactic cosmic ray heavy ions for astronauts on future lunar missions.



Recent publications (selected)

Andarawewa, K.L., Kirshner, J., Mott, J.D., and Barcellos-Hoff, M.H.: TGFb: Roles in DNA Damage Responses in Transforming Growth Factor-Beta in Cancer Therapy, Volume 1 Basic and Clinical Biology. Edited by S. Jakowlew, Human Press, Totowa, NJ, 2007. (Book Chapter)