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Discovering The Folding Rules That Proteins Obey FY08 LDRD Final Report

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Disclaimer

Auspices Statement

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LDRD Project Tracking Code: 05-ERD-078
Olgica Bakajin, Principal Investigator

This project's objective was to study protein folding using a combination of experimental, theoretical and simulation methods. Our study was enabled by a robust microfluidic mixing devices and by long time simulations on supercomputers. The project partially funded research for 7 published articles and we anticipate one more publication for which some of the data was taken using LDRD funds. The publications describe development of new instrumentation for studies of protein folding (2, 3, 4, 5, 6) and new measurements of protein folding kinetics (1, 4, 5, 8) that contribute to furthering of our understanding of the complex folding phenomena. The LDRD project also supported Dr. Bakajin's work on a review article (7).

PUBLICATIONS
Published:

1. SA Waldauer, O. Bakajin, T. Ball, et al. *Ruggedness in the folding landscape of protein L*, **HFSP Journal (**2008) 2 **(**6**):** 388-395 **(LLNL-JRNL-408426)**
2. A. Kane, A. Hoffmann, P. Baumgärtel, R. Seckler,G. Reichardt, D. A. Horsley, B. Schuler, and, O. Bakajin , *Microfluidic Mixers for the Investigation of Rapid Protein Folding Kinetics Using Synchrotron Radiation Circular Dichroism Spectroscopy***,** **Analytical Chemistry** (2008)**,** 80**(** 24) **:** 9534-9541 **(LLNL-JRNL-406914)**
3. S. Yao & O. Bakajin, *Improvements in mixing time and mixing uniformity in devices designed for studies of protein folding kinetics,* **Analytical Chemistry** (2007)**,** 79:5753-5759 (UCRL-JRNL-229290)
4. L.J. Lapidus, S. Yao, K. S. McGarrity, D.E. Hertzog, E. Tubman, O. Bakajin, *Protein Hydrophobic Collapse and Early Folding Steps Observed in a Microfluidic Mixer,* **Biophysical Journal** (2007), 93:218-224 (**UCRL-JRNL-217804**)
5. A. Hoffmann, A. Kane, D. Nettels, D. E. Hertzog, P. Baumgärtel, J. Lengefeld , G. Reichardt, D. A. Horsley, R. Seckler, O. Bakajin, and B. Schuler, *Mapping protein collapse with single molecule fluorescence and kinetic synchrotron radiation circular dichroism spectroscopy***, Proc. Nat. Acad. Sci**. 104(1) (2007)105-110 (**UCRL-JRNL-225980**)
6. D. E. Hertzog, B. Ivorra, Bijan Mohammadi, Olgica Bakajin, Juan G. Santiago, *Optimization of a Fast Microfluidic Mixer for Studying Protein Folding Kinetics*, **Analytical Chemistry** 78(13) (2006); 4299-4306 (**UCRL-JRNL-217805**)
7. O. Bakajin, E. Fountain, K. Morton, S. Y Chou, J. Sturm & RH Austin, *Materials Aspects in Micro- and Nanofluidic Systems Applied to Biology* , **MRS Bulletin**, v31, ***invited article*** in the Special Issue on Materials for Micro and Nanofluidics, February 2006, 108-113 (**UCRL-JRNL-217803**)

In preparation:

8. Bakajin, Weiss, Swope et al. *Hydrophobic Collapse studied by FRET and MD simulations,* in preparation

AWARDS
Davis Hertzog, I2CAM travel award, 2005
Avinash Kane, multiple I2CAM travel awards 2005-2008

PRESENTATIONS

Selected Conferences (contributed presentations)
APS March Meeting 2006
APS DFD Meeting 2007
Solid State Sensor, Actuator and Microsystems Workshop, Hilton Head, NC 2006
Berkeley Sensors and Actuators Conference 2007
Biophysical Society Annual Meetings 2007 & 2008

Invited Presentations
Michigan State University, Science at the Edge Seminar, April 2008
Gordon Conference "Microfluidics", July 1007
Stanford University Dept. of Electrical Engineering, April 2007
UC Berkeley, Physics Department, January 2007
Princeton University Physics Department, Colloquium, Princeton, NJ, October 2006