

1st Annual National Academies Keck *Futures Initiative* Conference
"Signals, Decisions, and Meaning in Biology, Chemistry, Physics, and Engineering"
Arnold & Mabel Beckman Center, Irvine, California
November 14 - 16, 2003

AGENDA

Thursday, November 13, 2003

6:00 – 9:00 p.m. Informal Get-Together / Buffet - Hyatt Regency Irvine, Pool Area

Friday, November 14, 2003

Breakfast on your own

8:15 – 11:30 a.m. Optional Tour - Ocean Institute (www.oceaninstitute.org)
Transportation provided – Bus leaves at 8:15 a.m. and will return people to the Beckman Center by 11:45 a.m.

11:15 & 11:45 a.m. Bus pick-up from the Hyatt Regency Irvine to the Beckman Center

12:00 p.m. Lunch and Registration

1:00 p.m. **Opening Ceremony - *Welcome and Opening Remarks***
Bruce Alberts, President, National Academy of Sciences
Wm. Wulf, President, National Academy of Engineering
Harvey Fineberg, President, Institute of Medicine
Dick Foster, Board Member, W.M. Keck Foundation
Marc Kirschner, Chair, Signaling Steering Committee

1:30 p.m. **Early Sensory Processing**
ORGANIZER:
Terrence Sejnowski, Professor and Head of the Computational Neurobiology Laboratory, The Salk Institute

MODERATOR:
Linda Buck, Full Member, Fred Hutchinson Cancer Research Center, Investigator, Howard Hughes Medical Institute, and Affiliate Professor, University of Washington

SPEAKERS:
Network Dynamics and Olfaction
Gilles Laurent, Professor, Department of Biology, California Institute of Technology

Principles of Image Representation in Visual Cortex
Bruno Olshausen, Associate Professor, Department of Neurobiology, Physiology and Behavior, University of California at Davis/Redwood Neuroscience Institute

3:30 p.m. Break

4:00 p.m.

Funding Interdisciplinary Research

ORGANIZER / MODERATOR:

Ellie Ehrenfeld, Chief, Picornavirus Replication Section, National Institutes of Health

SPEAKERS:

Enriqueta Bond, President, Burroughs Wellcome Fund

John Linehan, Vice President, Whitaker Foundation

Bruce Hamilton, Division Director, Bioengineering and Environmental Systems, The National Science Foundation

5:15 p.m.

Communication Awards Presentation and Panel

MODERATOR:

William Skane, Executive Director, Office of News and Public Information, The National Academies

AWARDS PRESENTERS:

Bruce Alberts, President, National Academy of Sciences

Wm. Wulf, President, National Academy of Engineering

Harvey Fineberg, President, Institute of Medicine

AWARD RECIPIENTS AND PANELISTS:

Joe Palca, Correspondent, National Public Radio

Andrew Revkin, Science Reporter, *The New York Times*

Carl Safina, Ph.D., Author of *Eye of the Albatross: Visions of Hope and Survival*

PANELISTS AND MEMBERS OF THE AWARDS SELECTION COMMITTEE:

Marcia Bartusiak, Author and Visiting Professor, Massachusetts Institute of Technology

Peggy Girshman, Assistant Managing Editor, National Public Radio

6:30 p.m.

Cocktails

7:30 p.m.

Dinner and Speaker

Functional Genomics: Getting Beyond Descriptive Studies

ORGANIZER:

John Doyle, Professor, Department of Computer Science, California Institute of Technology

SPEAKER:

David Botstein, Professor, Lewis-Sigler Institute for Integrative Genomics, Princeton University

8:45 p.m.

Buses depart Beckman Center for Hyatt Regency Irvine

9:00 – 11:00 p.m.

Informal discussions / Hospitality Room

Hyatt Regency Irvine, Crystal Cove Room

Saturday, November 15, 2003

7:15 and 7:45 a.m. Bus pick-up from the Hyatt Regency Irvine to the Beckman Center

7:30 a.m. Breakfast

8:30 a.m. **Feedback Control and the Generation of Oscillatory and Bistable Behavior**

ORGANIZER:

Erin O'Shea, Professor, Department of Biochemistry & Biophysics, University of California at San Francisco

MODERATOR:

Jim Ferrell, Professor, School of Medicine, Stanford University

SPEAKERS:

Regulatory Mechanisms Underlying Cellular Rhythms

Albert Goldbeter, Professor, Unit of Theoretical Chronobiology, University of Brussels, Belgium

Engineered Gene Circuits - A Closet Reductionist's Approach to Systems Biology

Jeff Hasty, Assistant Professor, Department of Bioengineering, University of California at San Diego

10:30 a.m. Break

Futures Grant and Conference Application Informal Q&A Huntington Room - Steering Committee members will be available during the break to answer application questions.

11:00 a.m. **Temporal Organization in Living Systems**

ORGANIZER:

Claire Tomlin, Assistant Professor, Department of Aeronautics and Astronautics, Stanford University

MODERATOR:

Temporal Organization in Living Cells

John Tyson, University Distinguished Professor of Molecular Cell Biology, Department of Biology, Virginia Polytechnic Institute & State University

SPEAKERS:

The Cell Cycle

Fred Cross, Professor, Molecular, Cell, and Developmental Biology, The Rockefeller University

Genetic and Molecular Dissection of Eukaryotic Circadian Systems

Jay C. Dunlap, Chairman, Department of Genetics, Dartmouth Medical School

1:00 p.m. Lunch

Facilitating Interdisciplinary Research Focus Groups

Crystal Cove, Newport and Balboa Rooms (Luncheon buffet for focus group participants served in Palm Court II)

(sign up in advance – space is limited)

2:15 p.m.

Distributed Decision Making with Limited Information

ORGANIZER/MODERATOR:

Small Talk: Cell-to-Cell Communication in Bacteria

Bonnie Bassler, Associate Professor, Department of Molecular Biology, Princeton University

SPEAKERS:

Gene Noise and Regulation in Single Cells

Michael Elowitz, Assistant Professor, Biology and Applied Physics, California Institute of Technology

Survivor: Bacterial and Viral Strategies for Survival in Uncertain Environments

Adam Arkin, Assistant Professor, Departments of Bioengineering and Chemistry, University of California at Berkeley

4:15 p.m.

Break

4:45 p.m.

Monitoring Temporal and Spatial Sensing in Living Cells

ORGANIZER:

David Tank, Professor, Department of Molecular Biology, Princeton University

MODERATOR:

How Cells Sense Chemoattractant Gradients

Peter Devreotes, Professor, Department of Cell Biology, John Hopkins University

SPEAKERS:

Genetic Schemes and Schemata in Neurophysiology

Gero Miesenbock, Assistant Professor, Cellular Biochemistry and Biophysics Program, Sloan-Kettering Institute

Klaus Hahn, Department of Cell Biology, The Scripps Research Institute

6:45 p.m.

Cocktails

7:30 p.m.

Dinner and Speaker

Evolvability

ORGANIZER:

Marc Kirschner, Professor and Chairman, Department of Cell Biology, Harvard Medical School

SPEAKER:

John Gerhart, Professor, Graduate School of Cell Development and Cell Biology, University of California at Berkeley

8:45 p.m.

Buses depart Beckman Center for Hyatt Regency Irvine

9:00 – 11:00 p.m.

Informal discussions / Hospitality Room
Hyatt Regency Irvine, Crystal Cove Room

Sunday, November 16, 2003

- 7:15 and 7:45 a.m. Bus pick-up from the Hyatt Regency Irvine to the Beckman Center
- 7:30 a.m. Breakfast
- 8:30 a.m. **Spontaneous Evolution of Modularity in Evolved and Engineered Systems**
ORGANIZER:
Michael Elowitz, Assistant Professor, Biology and Applied Physics, California Institute of Technology

MODERATOR:
Uri Alon, Principal Investigator, Department of Molecular Cell Biology, Weizmann University

SPEAKERS:
Patterns, Specificity, and Evolvability in Software Systems and Biochemical Networks
Chris Myers, Senior Research Associate, Cornell Theory Center, Cornell University

Modularity, Regularity, and Hierarchy in Evolved Engineering Systems
Hod Lipson, Assistant Professor, Mechanical and Aerospace Engineering, Cornell University
- 10:30 a.m. Break
- 11:00 a.m. **Information Theory**
ORGANIZER / MODERATOR:
Oliver Collins, Professor, Department of Electrical Engineering, University of Notre Dame

SPEAKERS:
Real Neural Networks Modeled as Finite-State Channels with Feedback Operate Robustly Near the Energy-Capacity Curve
Toby Berger, Professor, Department of Electrical and Computer Engineering, Cornell University

Information and Functionality in Biological Systems
William Bialek, Professor, Department of Physics, Princeton University
- 1:00 p.m. Lunch
- 2:00 p.m. **Stochastic Fluctuations in Biological Signal Processing and Genetics**
ORGANIZER / MODERATOR:
Adam Arkin, Assistant Professor, Departments of Bioengineering and Chemistry, University of California at Berkeley

SPEAKERS:
Stochastic Computing in Dendritic Spines
Terrence Sejnowski, Professor and Head of the Computational Neurobiology Laboratory, The Salk Institute

Environmental Stresses Can Alleviate the Average Deleterious Effect of Mutations
Roy Kishony, Fellow, Bauer Center for Genomics Research, Harvard University
- 4:00 p.m. Buses depart for Hyatt Regency Irvine and John Wayne Airport