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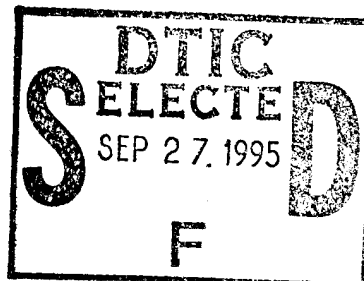
November 2, 1994

MICHAEL J. JACKSON  
*Executive Director*

JOHN R. RICE, C.P.A.  
*Comptroller*

OFFICE OF SCIENTIFIC MEETINGS  
AND CONFERENCES  
GERI GOODENOUGH  
*Director*

Dr. Joel L. Davis  
Scientific Officer Code: 342CN  
Office of Naval Research  
800 North Quincy Street  
Arlington, VA 22217-5000



Dear Dr. Davis:

Enclosed is the final report to the Department of Navy, Office of Naval Research, for Grant Number N00014-94-1-0701, in support of the FASEB Summer Research Conference, "Biology, Chemistry and Modelling of Vision: Visual Processing," for the budget period May 1, 1994 through September 30, 1994. This report includes the Chairman's Summary, the program, and the list of participants. The financial statement will be sent under separate cover.

The Federation and the scientists who participated in the conference sincerely appreciate the interest and support provided by the Office of Naval Research.

Sincerely,

A handwritten signature in cursive script, appearing to read "MJ Jackson".

Michael J. Jackson, Ph.D.  
Executive Director

MJJ:afh  
enc.

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**FINAL REPORT**

to the Department of Navy, Office of Naval Research

CONFERENCE GRANT: FASEB Summer Research Conference on  
"Biology, Chemistry and Modelling of Vision:  
Visual Processing"

GRANT NUMBER: N00014-94-1-0701

PERFORMANCE PERIOD: 5/1/94 through 9/30/94

GRANT AMOUNT: \$5,000

PRINCIPAL INVESTIGATOR: Richard Masland

GRANTEE INSTITUTION: Federation of American Societies for  
Experimental Biology  
9650 Rockville Pike  
Bethesda, MD 20814-3998

DATE OF REPORT: November 2, 1994

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FASEB Summer Conference on  
"The Biology, Chemistry and Modeling of Vision"

June 25-30, 1994 - Saxtons River, Vermont

This year's vision conference had 38 invited speakers. Sessions concentrated on:  
1) Retinal Cell Populations, 2) Mechanisms of Synaptic Communication, 3) Mechanisms of Lateral Conduction, 4) Parallel Information Flows, 5) Primate Color Vision,  
6) Retina-based Hardware, 7) Bipolar Cell Axon Terminals, and 8) The Control of Ganglion Cell Excitation.

The meeting was enlivened by several important break-throughs and interesting controversies. There was an excellent paper by Dr. Enrica Strettoi on the organization of the inner retina. She has found a way to determine finally the densities of the different retinal cell sub-populations. Elio Raviola presented exciting new methods combining molecular biology and anatomy for the study of cell populations. An exciting session organized by Denis Baylor had three presentations on the use of multi-electrode arrays for analyzing the retinal output. The technical part (using multi-electrode arrays) is now solved. The excitement lies in trying to decode the message sent to the brain. Markus Meister gave a particularly stimulating talk, in which he proposed that the action of amacrine cells is indirectly communicated to the brain via the cross-correlation between neighboring retinal ganglion cells.

The folks who study primate color vision are making big progress. The anatomists have reconstructed the pathway from individual color classes of cone to bipolar cells and then to ganglion cells. Although details remain to be solved, the algorithm appears to be in place. With nice symmetry, the electrophysiologists, notably Dennis Dacey, have learned to record from individual ganglion cells in isolated monkey retinas and then inject them with markers. Taken together, these two approaches should unravel the wiring of primate color vision.

Another highlight was a controversy about the activity of amacrine cell dendrites. Amacrine cells remain an enigma. Several groups, however, are succeeding in recording from them. There is some disagreement about whether or not amacrine cell dendrites make action potentials. The meeting was a useful focus for this discussion and left everyone buzzing. By the time of the next meeting, this too will probably be solved.

A number of presentations concerned the channels present in various classes of retinal neuron. Once again, steady progress is being made. Methods for studying single channels are now beginning to be applied in intact retinas. The consequence will be a much better description of the events that control the final retinal ganglion cell output.

The meeting was enthusiastically received and enrollment was 40% above the previous conference. Judging from the responses to this meeting, the next conference may be oversubscribed.

A number of people came from abroad: perhaps a dozen from Europe, a half-dozen from Australia, and about the same number from Japan. The remaining participants came from throughout the United States. There was some bias toward the east coast, but not a great one.

This year the co-chairmen systematically sought to invite younger workers to speak. Approximately one third of the presentations were by scientists aged under 35. This was extremely successful. The younger speakers worked harder at their talks, which were much better than those of the veterans. Having younger speakers also served to make all the younger members of the conference feel more welcome. I hope that this is a tradition that can be continued.

**FASEB Summer Research Conference on the  
Biology, Chemistry and Modeling of Vision: Visual Processing**

**Vermont Academy  
Saxtons River, Vermont  
June 25-30, 1994**

**Saturday**

**REGISTRATION**

|              |                                |
|--------------|--------------------------------|
| 2:00 - 12:00 | Office open for registration   |
| 2:30         | Bus leaves Logan Airport       |
| 5:00         | Bus arrives at Vermont Academy |
| 6:00         | Dinner                         |

**Sunday - 9:00 a.m.**

**INTRODUCTORY REMARKS**

**Sunday - 9:30 a.m.- noon**

**RETINAL CELL POPULATIONS**

**John Dowling, Chair**

|                 |                                                                  |
|-----------------|------------------------------------------------------------------|
| David Vaney     | Tracer Coupling: Use and Abuse                                   |
| Enrica Strettoi | The Organization of the Inner Nuclear Layer in the Rabbit Retina |
| Elio Raviola    | Retinal Cell Populations                                         |

**Sunday - 7:30 p.m.-10:00 p.m.**

**MECHANISMS OF SYNAPTIC COMMUNICATION**

**Eric Schwartz, Chair**

|               |                                                                                        |
|---------------|----------------------------------------------------------------------------------------|
| Eric Schwartz | Transport Mediated Transmitter Release                                                 |
| Fred Rieke    | Regulation of Exocytosis in Vertebrate Photoreceptors                                  |
| Ann Stuart    | Histamine: The Neurotransmitter at Sign-Reversing Photoreceptor Synapses in Arthropods |
| Robert Barlow | Brain Modulation of the Retina                                                         |

**Monday - 9:00 a.m.- noon**

**MECHANISMS OF LATERAL CONDUCTION**

**Gordon Fain, Chair**

- Paul Cook                      Change-Sensitive Inhibition in the Amphibian Retina
- Stewart Bloomfield        Active Propagation of Synaptic Currents in the Dendritic Arbors of Amacrine Cells and the Formation of Receptive Fields
- Bruce Peters                Receptive Field and Voltage Gated Currents of Starburst Amacrine Cells
- Jimmy Zhou                 Patch-Clamp Recordings from Starburst Amacrine Cells in Rabbit Retinal Slices

**Monday - 7:30 p.m.-10:00 p.m.**

**PARALLEL INFORMATION FLOWS**

**Denis Baylor, Chair**

- Steve DeVries              Spatial Sampling by Ganglion Cell Receptive Field Mosaics in Rabbit Retina
- Markus Meister             Concerted Signals from the Retina
- Rachel Wong                Multicellular Recording of Retinal Neurons Using Calcium Imaging Techniques

**Tuesday - 9:00 a.m.- noon**

**PRIMATE COLOR VISION I**

**Brian Boycott, Chair**

- Gerald Jacobs              Photopigments Underlying Primate Color Vision
- Ehud Kaplan                The Receptive Field of Primate Ganglion Cells: Space, Time and a Splash of Color
- Christine Curcio            Foveal Cones and their Outputs to Ganglion Cells
- Orin Packer                 Photopigment Transmittance Imaging of the Primate Photoreceptor Mosaic

**Tuesday - 7:30 p.m.-10:00 p.m. PRIMATE COLOR VISION II**

**Heinz Wässle, Chair**

- |               |                                                                                                                                     |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------|
| David Calkins | Circuitry for Spectral Coding in the Primate Fovea                                                                                  |
| Dennis Dacey  | Intracellular Responses of Morphologically Identified Ganglion Cells: Evidence for Cone-Type Specific Circuitry in the Inner Retina |
| Paul Martin   | Sources of Chromatic Specificity in Primate Retinal Ganglion Cells                                                                  |

**Wednesday - 9:00 a.m.- 12:30 p.m. RETINA-BASED HARDWARE**

**John Wyatt, Chair**

- |                 |                                                                                                             |
|-----------------|-------------------------------------------------------------------------------------------------------------|
| Misha Mahowald  | Common Principles in Retinal and Cortical Processing                                                        |
| Kwabena Boahen  | Speed Sensitivity in a Retinomorphic Chip: Modelling Spatiotemporal Behavior of OPL and Neuroanatomy of IPL |
| Andreas Andreou | 48,000 Pixels, 1/2 Million Transistors Contrast Sensitive Silicon Retina                                    |
| Frank Werblin   | Physiologically-Based Neuromorphic Retina                                                                   |
| John Wyatt      | Steps Toward the Development of a Silicon Retinal Implant                                                   |

**Wednesday - 7:00 p.m.-7:30 p.m. BUSINESS MEETING**

**Wednesday - 7:30 p.m.-10:00 p.m. BIPOLAR CELL AXON TERMINALS**

**Akimichi Kaneko, Chair**

- |                 |                                                                                            |
|-----------------|--------------------------------------------------------------------------------------------|
| Robert Marc     | Local Circuitry of Cyprinid Bipolar Cell Axon Terminals                                    |
| Masao Tachibana | Ca <sup>2+</sup> Regulation in the Presynaptic Terminals of Goldfish Retinal Bipolar Cells |
| Gary Matthews   | Exocytosis and Endocytosis in Bipolar Cell Synaptic Terminals                              |

**Thursday - 9:00 a.m.-11:30 a.m.    CONTROL OF GANGLION CELL EXCITATION**

**David Copenhagen, Chair**

- |                  |                                                                                                  |
|------------------|--------------------------------------------------------------------------------------------------|
| Akimichi Kaneko  | Fast and Slow Kinetics of Voltage-Dependent Na Channels in X and W cells of the Cat Retina       |
| Jeff Diamond     | The Relationship Between Light-Evoked Synaptic Excitation and Spiking Behavior of Ganglion Cells |
| Colin Barnstable | Cyclic Nucleotide Gated Cation Channels as Modulators of Ganglion Cell Function                  |

**Thursday**

- |              |                                                            |
|--------------|------------------------------------------------------------|
| 12:00 noon   | Bus departs for Logan Airport<br>(box lunch served on bus) |
| 12:00 - 1:00 | Lunch                                                      |
| 2:00         | Office closes                                              |
| 3:00         | Bus arrives at Logan Airport                               |

**POSTERS**

There will be two poster sessions. The first will be Sunday and Monday, the second Tuesday and Wednesday. The bar will be moved to the poster area from 4:00 to 6:00 on those days. Posters will be available for viewing throughout each day.

Supported by the National Science Foundation and the Office of Naval Research.

PARTICIPANT LIST \*\* Conference : 4 -- Biol/Chem/Modeling Vision  
FASEB SUMMER RESEARCH CONFERENCES

Dr. Alan R. Adolph  
Neuroscience  
Scheper's Eye Research Inst  
20 Staniford St  
Boston, MA 02114

Dr. Adelbert Ames, III  
Neurosurgery  
Massachusetts General Hospital  
Fruit Street  
Boston, MA 02114

Dr. Philip Anderton  
School of Optometry  
University of New South Wales  
Barker Street, P O Box 1  
Kensington NSW 2033 AUSTRALIA

Dr. Andreas Andreou  
Electrical & Computer Engineer  
John Hopkins University  
3400 N Charles Street  
Baltimore, MD 21218

Dr. G. B. Arden  
Dept of Electrodagnostic  
Moorfields Eye Hospital  
City Road  
London EC1V 2PD UK

Dr. William H. Baldrige  
VTHRC Physiology/Pharmacology  
University of Queensland  
Brisbane QLD 4072 AUSTRALIA

Dr. Alexander K. Ball  
Biomedical Sciences, HSC-1R1  
McMaster University  
1200 Main St West  
Hamilton ONT L8N 3Z5 CANADA

Dr. Robert B. Barlow  
Inst for Sensorv Research  
Syracuse University  
Syracuse, NY 13244-5290

Dr. Steven Barnes  
Medical Physiology  
University of Calgary  
3330 Hospital Dr NW  
Calgary AB T2N 4N1 CANADA

Dr. Colin Barnstable  
Ophthalmology & Visual Science  
Yale Univ School of Medicine  
PO Box 208061  
New Haven, CT 06520-8061

Dr. Denis A. Baylor  
Department of Neurobiology  
Stanford Univ Sch of Medicine  
300 Pasteur Drive Room D200  
Stanford, CA 94305

Dr. Stewart Bloomfield  
Department of Ophthalmology  
New York Univ Medical Center  
550 First Avenue  
New York, NY 10016

Dr. Kwabena Boahen  
Computational Neural Systems  
California Institute of Tech  
MS 139-74  
Pasadena, CA 91125

Dr. Brian Boycott  
Dept of Anatomy & Cell Biology  
Guy's Hospital Medical School  
London Bridge  
London SE1 9RT UNITED KINGDOM

PARTICIPANT LIST \*\* Conference : 4 -- Biol/Chem/Modeling Vision  
FASEB SUMMER RESEARCH CONFERENCES

Dr. Nicholas Brech  
Dept of Anatomy & Cell Biology  
UCLA School of Medicine  
Los Angeles, CA 90024

Iman Hemmati Brivanlou  
Biochemistry & Molecular Bio  
Harvard University  
7 Divinity Ave  
Cambridge, MA 02138

Solange P. Brown  
Neurosurgery Research  
Harvard Med Sch/Mass Gen Hosp  
74 Saint Paul St - Apt 5  
Brookline, MA 02146

Dr. Suzanne L Bruhn  
Dept of Genetics  
Harvard Medical School  
Alpert Bldg/200 Longwood Ave  
Boston, MA 02115

Dr. Ronald A. Bush  
Dept of Ophthalmology  
Univ Michigan, Kellogg Eye Ctr  
1000 Wall Street  
Ann Arbor, MI 48105

Dr. David J. Calkins  
Department of Neuroscience  
University of Pennsylvania  
123 Anatomy/Chemistry Bldg  
Philadelphia, PA 19104-6058

Dr. Richard L. Chappell  
Marine Biological Lab  
Box 21  
Woods Hole, MA 02543

Andrea Y.J. Chen  
Dept of Bio Labs  
Harvard University  
16 Divinity Avenue  
Cambridge, MA 02138

Dr. Ethan D. Cohen  
Dept of Ophthalmology  
Yale University  
330 Cedar St  
New Haven, CT 06520

Paul B. Cook  
Department of Physiology  
Univ of Michigan Medical Sch  
Ann Arbor, MI 48109-0622

Dr. David Copenhagen  
Department of Ophthalmology  
Univ California/San Francisco  
K-140 Box 0730  
San Francisco, CA 94143-0730

Dan Crevier  
Biophysics  
Harvard University  
16 Divinity Ave/Box 22  
Cambridge, MA 02138

Dr. Mark H. Criswell  
Cell Biology & Anatomy  
Chicago Medical School  
3333 Green Bay Rd  
North Chicago, IL 60064-3095

Dr. Christine A. Curcio  
Dept of Ophthalmology  
Univ of Alabama, Birmingham  
Birmingham, AL 35294-0009

PARTICIPANT LIST \*\* Conference : 4 -- Biol/Chem/Modeling Vision  
FASEB SUMMER RESEARCH CONFERENCES

Dr. Dennis M. Dacey  
Biological Structure  
University of Washington  
SM-20  
Seattle, WA 98195

Dr. Gislin Dagnelie  
Dept of Ophthalmology  
Johns Hopkins Univ Sch of Med  
Lions Vision Ctr, 550 N Broadway  
Baltimore, MD 21205-2020

Dr. Robert DeVoe  
School of Optometry  
Indiana University  
800 E Atwater  
Bloomington, IN 47405

Dr. Steven H. DeVries  
Dept of Neurobiology  
Stanford University  
Fairchild Science Bldg D238  
Stanford, CA 94305

Jeffrey Diamond  
Bioengineering  
Univ California/San Francisco  
10 Kirkham Street Box 0730  
San Francisco, CA 94143-0730

Dr. Donald B. Dixon  
Dept of Ophthalmology  
Univ Calif, San Francisco  
10 Kirkham St, Box 0730  
San Francisco, CA 94143-0730

Dr. John Dowling  
Department of Biology  
Harvard University  
16 Divinity Avenue  
Cambridge, MA 02138

Dr. Robert Duvoisin  
Ophthalmology/Dyson Institute  
Cornell Univ Medical College  
1300 York Avenue  
New York, NY 10021

Dr. Lisa Ebihara  
Dept of Pharmacology  
Columbia Univ  
630 W 168th Street  
New York, NY 10032

Dr. William D. Eldred  
Biology  
Boston University  
5 Cummington St  
Boston, MA 02215

Dr. Gordon Fain  
Ophthalmology & Physiology Sci  
Univ of California, Los Angeles  
100 Stein Plaza  
Los Angeles, CA 90024

Andreas Feidensohn  
Dept Neuroanatomy  
Max-Planck Inst For Brain Res  
Deutschordenstrasse 46  
D-60528 Frankfurt GERMANY

Dr. Marla Feller  
Molecular & Cell Biology  
Univ of California/Berkeley  
221 Life Sciences Addition #3200  
Berkeley, CA 94720

Dr. Kathleen M. Fitzgerald  
Vision Sciences Laboratory  
The Children's Mercy Hospital  
2401 Gillham Rd  
Kansas City, MO 64108-9898

PARTICIPANT LIST \*\* Conference : 4 -- Biol/Chem/Modeling Vision  
FASEB SUMMER RESEARCH CONFERENCES

Dr. Laura Frishman  
College of Optometry  
Univ of Houston  
4901 Calhoun Rd  
Houston, TX 77204-6052

Dr. Ann K. Goodchild  
Physiology  
University of Sydney  
Sydney 2006 NSW AUSTRALIA

Dr. Robert Greenberg  
Biomed Eng  
John's Hopkins Univ  
600 N Wolfe St  
Baltimore, MD 21287-9277

Dr. Andrew Grunet  
Electrical Engin & Compu Sci  
Massachusetts Inst of Technol  
77 Massachusetts Ave, Rm-36-576  
Cambridge, MA 02139

Dr. Ulrike Grunert  
Neuroanatomy  
Max-Planck-Inst For Brain Res  
Deutschordenstrasse 46  
D-60528 Frankfurt GERMANY

Dr. Stefano Gustincich  
Dept of Neurobiology  
Harvard Medical School  
220 Longwood Avenue  
Boston, MA 02115

Dr. Shi-Gang He  
Dept of Neurosurgery  
Massachusetts General Hospital  
Wellman 429, 50 Blossom Street  
Boston, MA 02114

Dr. Arlene Hirano  
Ophthalmology, Dyson Vision Res  
Cornell Univ Medical College  
1300 York Avenue  
New York, NY 10021

Dr. Thomas Hughes  
Ophthalmology & Visual Science  
Yale University  
PO Box 208061, 330 Cedar St  
New Haven, CT 06520

Dr. Gerald Jacobs  
Department of Psychology  
Univ California/Santa Barbara  
Santa Barbara, CA 93106

Dr. Z. Fei Jin  
Dept of Neurosurgery  
Massachusetts General Hospital  
Fruit Street  
Boston, MA 02114

Tom Jordan  
Neuroscience Program/Biolabs  
Harvard University  
16 Divinity Ave  
Cambridge, MA 02138

Dr. Maarten Kamermans  
Medical Physics  
University of Amsterdam  
Meibergdreef 15  
1105 A2 Amsterdam NETHERLANDS

Dr. Akimichi Kaneko  
Department of Physiology  
Keio University  
35 Shinanomachi Shinjuku  
Tokyo 160 JAPAN

PARTICIPANT LIST \*\* Conference : 4 -- Biol/Chem/Modeling Vision  
FASEB SUMMER RESEARCH CONFERENCES

Dr. Ehud Kaplan  
Laboratory of Biophysics  
Rockefeller University  
1230 York Avenue  
New York, NY 10021

Marv Kelly  
Institute For Surgery Research  
Syracuse Univ  
Merrill Lane  
Syracuse, NY 13244

David Krizai  
Physiology and Biophysics  
New York University Med Ctr  
550 1st Ave  
New York, NY 10016

Dr. Barbara A. Liepe  
Dept of Ophthalmology & Physiol  
Univ of Calif, San Francisco  
10 Kirkham St, K-140  
San Francisco, CA 94143

Dr. Peter D. Lukasiewicz  
Ophthalmology & Visual Science  
Washington Univ School of Med  
Campus Box 8096  
St Louis, MO 63110

Dr. Misha Mahowald  
MRC Anatomy Neuropharmacology  
Oxford University  
Mansfield Road  
Oxford OX1 3TH UNITED KINGDOM

Dr. Robert Paul Malchow  
Ophthalmology  
Univ of Illinois Col of Med  
1855 W Taylor St  
Chicago, IL 60612

Dr. Robert E. Marc  
Moran Eye Center  
Univ of Utah School of Med  
50 N Medical Dr  
Salt Lake City, UT 84132

Dr. David W. Marshak  
Neurobiology and Anatomy  
Univ of Texas Medical School  
P O Box 20708  
Houston, TX 77225

Dr. Paul R. Martin  
Department of Physiology F13  
University of Sydney  
2006 Sydney AUSTRALIA

Dr. Richard Masland  
Massachusetts General Hospital  
Wallman 429 Fruit Street  
Boston, MA 02114

Dr. Steve Mashev  
Sensory Sciences Center  
Univ of Texas Health Sci Ctr  
6420 Lamar Fleming Ave  
Houston, TX 77025

Dr. Gary G. Matthews  
Department of Neurobiology  
SUNY/Stony Brook  
Stony Brook, NY 11794-5230

Dr. James T. McIlwain  
Neuroscience  
Brown University  
Box G-M4  
Providence, RI 02912

PARTICIPANT LIST \*\* Conference : 4 -- Biol/Chem/Modeling Vision  
FASEB SUMMER RESEARCH CONFERENCES

Dr. John S. McReynolds  
Dept of Physiology  
University of Michigan  
7759 Medical Sciences II  
Ann Arbor, MI 48109-0622

Dr. Markus Meister  
Biological Laboratories  
Harvard University  
16 Divinity Avenue  
Cambridge, MA 02138

Dr. Stephen L. Mills  
Sensory Sciences Center  
Univ of Texas Health Sci Ctr  
6420 Lamar Fleming Ave  
Houston, TX 77030

Karen L. Mvhr  
Dept of Physiology  
University of Michigan  
7759 Med Sci II/1301 E Catheri  
Ann Arbor, MI 48109-0622

Dr. Ralph Nelson  
Lab of Neurophysiology  
Natl Inst Neurolog Dis/Stroke  
National Inst of Health  
Bethesda, MD 20892

Dr. Gunter Niemeier  
Ophthalmology  
University Hospital Zurich  
Frauenklinikstr 24  
8091 Zuerich SWITZERLAND

Dr. Sheila Nirenberg  
Cellular & Developmental Biol  
Harvard University  
16 Divinity Ave  
Cambridge, MA 02138

Dr. Orrin Packer  
Center for Visual Science  
University of Rochester  
274 Meliora Hall  
Rochester, NY 14627

Dr. Zhuo-Hua Pan  
Neurology  
Children's Hosp/Harvard Med Sc  
300 Longwood Ave/Enders 361  
Boston, MA 02115

Chris L. Passafiuma  
Institute For Sensory Research  
Syracuse Univ  
Merrill Lane  
Syracuse, NY 13244

Dr. Leo Peicni  
Neuroanatomy  
Max-Planck-Inst Hirnforschung  
Deutschordenstr 46  
D-60528 Frankfurt GERMANY

Bruce Peters  
Neurosurgery Research  
Massachusetts General Hospital  
Fruit Street Wellman 429  
Boston, MA 02146

Dr. Haohua Oian  
Biological Laboratories  
Harvard University  
16 Divinity Avenue  
Cambridge, MA 02138

Dr. Elio Raviola  
Department of Neurobiology  
Harvard Medical School  
220 Longwood Avenue  
Boston, MA 02115

PARTICIPANT LIST \*\* Conference : 4 -- Biol/Chem/Modeling Vision  
FASEB SUMMER RESEARCH CONFERENCES

Dr. Fred Rieke  
Pharmacology and Physiology  
University of Chicago  
947 E 58th Street  
Chicago, IL 60637

Dr. Cheryl L. Rowe-Rendleman  
Dept of Neurobiology & Anatomy  
Univ of Texas Med School  
P O Box 20708  
Houston, TX 77225

Cory M. Sakai  
Biomedical Sciences, MSC-1R15  
McMaster University  
1200 Main St West  
Hamilton ONT L8N 3Z5 CANADA

Dr. Stan Schein  
Psychology  
Univ of California/Los Angeles  
Franz Hall  
Los Angeles, CA 90024-1563

Dr. David Schneeweis  
Dept of Ophthalmology  
Univ of California, SF  
10 Kirkham St. Room-K230  
San Francisco, CA 94143-0730

Dr. Eric A. Schwartz  
Pharmacology and Physiology  
University of Chicago  
947 East 58th Street  
Chicago, IL 60637

Dr. David M. Sherry  
Physiology  
Cornell Univ Medical College  
1300 York Avenue  
New York, NY 10021

Dr. Paul Sieving  
Dept of Ophthalmology  
Univ of Michigan  
1000 Wall Street  
Ann Arbor, MI 48105

Dr. Edward R. Soucy  
Cellular and Molecular Biology  
Harvard University  
16 Divinity Ave  
Cambridge, MA 02138

Dr. Peter Sterling  
Dept of Neuroscience  
University of Pennsylvania  
36th and Hamilton Walk  
Philadelphia, PA 19104-6058

Dr. Enrica Strettoi  
Istituto de Neurofisiologia  
University of Pisa  
Via S. Zeno 51  
56 127 Pisa ITALY

Dr. Ann E. Stuart  
Department of Physiology  
University of North Carolina  
Chapel Hill, NC 27599-7545

Dr. Masao Tachibana  
Psychology  
University of Tokyo  
7-3-1 Honko, Bunkyo-ku  
Tokyo 113 JAPAN

Dr. W. Rowland Taylor  
Neuroanatomy  
Max-Planck-Inst for Brain Res  
Deutschordenstrasse 46  
D-60528 Frankfurt GERMANY

PARTICIPANT LIST \*\* Conference : 4 -- Biol/Chem/Modeling Vision  
FASEB SUMMER RESEARCH CONFERENCES

Dr. David Vanev  
Vision Touch & Hearing Research  
University of Queensland  
Brisbane QLD 4072 AUSTRALIA

Dr. David Warland  
Dept of Cellular & Molec Biolo  
Harvard University  
16 Divinity Avenue  
Cambridge, MA 02138

Dr. Heinz Wässle  
Neuroanatomy  
Max Planck Inst For Brain Res  
Deutschordenstrasse 46  
D-60528 Frankfurt GERMANY

Dr. Reto Weiler  
Neurobiology  
Univ of Oldenburg  
PO Box 2503  
2611 Oldenburg GERMANY

Dr. David P. Wellis  
Dept of Molecular & Cell Biolo  
Univ of California  
145 LSA  
Berkeley, CA 94720

Dr. Frank S. Werblin  
Department of Neurobiology  
Univ of California/Berkeley  
Berkeley, CA 94720

Dr. Martin Wilson  
Neurobiology Physiology  
Univ of California, Davis  
Davis, CA 95616

Dr. Rachel Wong  
Vision Touch & Hearing Res Ins  
University of Queensland  
Brisbane QLD 4072 AUSTRALIA

Dr. Samuel Wu  
Cullen Eye Inst  
Baylor College Of Med  
One Baylor Plaza  
Houston, TX 77030

Dr. John Wvatt  
Massachusetts Inst Technology  
Room 36-864  
Cambridge, MA 02139

Dr. Mengqing Xiang  
Molecular Biology & Genetics  
Johns Hopkins Univ Sch of Med  
PCTB 805, 725 N Wolfe Street  
Baltimore, MD 21205

Dr. Hiram Yazdankhan  
Dept of Electrical Engineering  
Univ of Maryland, College Park  
P O Box 2660  
Laurel, MD 20709

Dr. Stephen Yazulla  
Neurobiology and Behavior  
SUNY/Stony Brook  
Stony Brook, NY 11794-5230

David Zenisek  
Neurobiology and Behavior  
SUNY/Stony Brook  
College of Arts & Sciences  
Stony Brook, NY 11794-5230

PARTICIPANT LIST \*\* Conference : 4 -- Biol/Chem/Modeling Vision  
FASEB SUMMER RESEARCH CONFERENCES

Dr. Z. Jimmy Zhou  
Jules Stein Eye Institute  
UCLA School of Medicine  
100 Stein Plaza  
Los Angeles, CA 90024

Dr. Anita L. Zimmerman  
Dept of Physiology  
Brown University  
Box G-B329  
Providence, RI 02912

Dr. Charles L. Zucker  
Neuroscience  
Schepens Eye Research Inst  
20 Staniford St  
Boston, MA 02114

Dr. Henrique von Gersdorff  
Neurobiology and Behavior  
SUNY/Stony Brook  
College of Arts & Sciences  
Stony Brook, NY 11794-5230

Supplemental Participant List: Conference 4 : Biology,  
Chemistry and Modeling of Vision: Visual Processing  
FASEB SUMMER RESEARCH CONFERENCES

Dr. Lyle Borg-Graham  
IAF  
C.N.R.S.  
Ave de la Terrasse  
Gif-sur-Yvette, France

Adam Jacobs  
Molecular & Cell Biology  
U. of California, Berkeley  
145 LSA  
Berkeley, CA 94720 USA

Karl J. Klug  
Psychology Department  
U. of California - Los Angeles  
405 Hilgard Ave.  
Los Angeles, CA. 90024 USA

Joel Davis  
Office of Naval Research  
800 N. Quincy St.  
Arlington, VA.