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▶ Program

Oral Presentation

Introduction : 5 min

Invited talks : 25 min (20 min presentation and 5 min discussion)

Poster talks : 15 min (12 min presentation and 3 min discussion)

Poster Presentation

Poster size is 90 cm in width and 180 cm in height.

October 5 (Sunday)

15:00 - 19:00 Registration

19:00 - 21:00 Reception

October 6 (Monday)

~ Breakfast ~

Opening Remarks

8:20 - 8:30 **Yoshinori Shichida** (Kyoto University)

I. Theory for retinal proteins (Chair: Massimo Olivucci and Shigehiko Hayashi)

8:30 - 8:35 Introduction by **Massimo Olivucci** (Bowling Green State University, USA)

S1-1 **Shigehiko Hayashi** (Kyoto University, Japan)

8:35 - 9:00 Understanding and designing color variants of retinal binding proteins by molecular simulations

S1-2 **Sivakumar Sekharan** (Yale University, USA)

9:00 - 9:25 Computational studies of retinal proteins and olfactory receptors

S1-3 **Hiroshi C. Watanabe** (Tokyo Institute of Technology, Japan)

9:25 - 9:40 Theoretical approach toward an understanding of molecular functions of channelrhodopsin

S1-4 **James H. Geiger** (Michigan State University, USA)

9:40 - 10:05 Decoding color vision: Understanding protein/chromophore interactions using a rhodopsin mimic and developing novel protein fusion tags

S1-5 **Massimo Olivucci** (Bowling Green State University, USA)

10:05 - 10:30 Comparison of the isomerization mechanisms of microbial, invertebrate and vertebrate light-sensing rhodopsins

~ Coffee Break ~

II. New and extended techniques (Chair: Mordechai Sheves and Yuji Furutani)

- 11:00 - 11:05 Introduction by **Mordechai Sheves** (The Weizmann Institute of Science, Israel)
- S2-1** **Tahei Tahara** (RIKEN, Japan)
11:05 - 11:30 Femtosecond time-resolved impulsive stimulated Raman study of photoactive yellow protein
- S2-2** **Philipp Kukura** (University of Oxford, UK)
11:30 - 11:55 Unravelling the origin of retinal reactivity in rhodopsins: A combined synthetic and ultrafast approach
- S2-3** **Tom Resler** (Freie Universitaet Berlin, Germany)
11:55 - 12:10 Deuterium isotope effects on channelrhodopsin-2
- S2-4** **Yuji Furutani** (Institute for Molecular Science, Japan)
12:10 - 12:35 Structural changes of membrane proteins studied by difference FTIR spectroscopy; microbial rhodopsins and potassium ion channels
- S2-5** **Takayuki Uchihashi** (Kanazawa University, Japan)
12:35 - 13:00 Single-molecule imaging of proteins at work with high-speed atomic force microscopy

~ Lunch ~

III. Structure of animal rhodopsins and GPCRs (Chair: Gebhard Schertler and Midori Murakami)

- 14:30 - 14:35 Introduction by **Gebhard F. X. Schertler** (Paul Scherrer Institut, Switzerland)
- S3-1** **Jörg Standfuss** (Paul Scherrer Institut, Switzerland)
14:35 - 15:00 Structures of rhodopsin mutants that cause night blindness and retina degeneration
- S3-2** **Blake Mertz** (West Virginia University, USA)
15:00 - 15:15 Validating the retinal flip of rhodopsin using molecular dynamics
- S3-3** **Martha E. Sommer** (Charité-Universitätsmedizin Berlin, Germany)
15:15 - 15:40 The functional versatility of arrestin in the visual system
- S3-4** **Ichio Shimada** (The University of Tokyo, Japan)
15:40 - 16:05 Functional equilibrium of membrane proteins by NMR
- S3-5** **Yoshinori Fujiyoshi** (Nagoya University, Japan)
16:05 - 16:30 Structures of cell adhesive-channels

~ Coffee Break ~

IV. Structure of microbial rhodopsins (Chair: Leonid S. Brown and Tsutomu Kouyama)

- 17:00 - 17:05 Introduction by **Leonid S. Brown** (University of Guelph, Canada)
- S4-1** **Tsutomu Kouyama** (Nagoya University, Japan)
17:05 - 17:30 Conformational changes in helices C and F of pharaonis halorhodopsin during the ion pumping cycle
- S4-2** **Valentin I. Gordeliy** (Institut de Biologie Structurale, France)
17:30 - 17:55 New insights on molecular mechanisms of ion pumping and signal transduction in retinal proteins
- S4-3** **Osamu Nureki** (The University of Tokyo, Japan)
17:55 - 18:20 Molecular processes underlying the early stages of channel opening in channelrhodopsin and its structure-based engineering
- S4-4** **Takeshi Murata** (Chiba University, Japan)
18:20 - 18:35 X-ray crystal structure of the proton pumping rhodopsin TR from the hyperthermophile *Thermus thermophilus*
- S4-5** **Vladimir Ladizhansky** (University of Guelph, Canada)
18:35 - 19:00 Structure, oligomerization and dynamics of Anabaena sensory rhodopsin in the lipid environments

~ Dinner ~

21:00 - 23:00 Poster

23:00 - Free Discussion

October 7 (Tuesday)

~ Breakfast ~

V. Pump rhodopsin (Chair: Klaus Gerwert and Hideki Kandori)

8:30 - 8:35 Introduction by **Hideki Kandori** (Nagoya Institute of Technology, Japan)

S5-1 Klaus Gerwert (Ruhr-Universität Bochum, Germany)

8:35 - 9:00 Bacteriorhodopsin and channelrhodopsin: E90 makes the difference between a pump and a channel

S5-2 Ana-Nicoleta Bondar (Free University of Berlin, Germany)

9:00 - 9:25 Hydrogen bond dynamics and directional proton transfers in microbial rhodopsins

S5-3 Sergei P. Balashov (University of California, Irvine, USA)

9:25 - 9:40 Novel properties of the proton pump from *Exiguobacterium sibiricum*

S5-4 Keiichi Inoue (Nagoya Institute of Technology, Japan)

9:40 - 10:05 Function and molecular mechanism of sodium pump rhodopsin

S5-5 Janos K. Lanyi (University of California, Irvine, USA)

10:05 - 10:30 Na⁺ transport in a light-driven pump from *Gillisia limnaea*

~ Coffee Break ~

VI. Signal rhodopsin (Chair: Joachim Heberle and Makoto Demura)

11:00 - 11:05 Introduction by **Joachim Heberle** (Freie Universität Berlin, Germany)

S6-1 Leonid S. Brown (University of Guelph, Canada)

11:05 - 11:30 New insights into eubacterial rhodopsins - from bioinformatics to spectroscopy

S6-2 Akira Naito (Yokohama National University, Japan)

11:30 - 11:55 Detection of photo-intermediates of microbial sensory rhodopsins by in situ photo-irradiation solid-state NMR

S6-3 Hideki Kandori (Nagoya Institute of Technology, Japan)

11:55 - 12:20 FTIR study of signaling microbial rhodopsins

S6-4 Víctor A. Lórenz-Fonfría (Freie Universität Berlin, Germany)

12:20 - 12:45 Protonation and conformation changes in channelrhodopsin-2 and their relevance in channel gating

S6-5 Kirstin Eisenhauer (Ruhr-University Bochum, Germany)(br> Homology models of channelrhodopsin-2: The

12:45 - 13:00 closed and open form of the channel

~ Lunch ~

VII. New aspects in microbial rhodopsins (Chair: Janos Lanyi and Akira Naito)

14:30 - 14:35 Introduction by **Akira Naito** (Yokohama National University, Japan)

S7-1 Sandy Ruhman (Hebrew University, Israel)

14:35 - 15:00 Ultrafast studies of light harvesting and photochemistry in microbial retinal proteins

S7-2 Yasuhisa Mizutani (Osaka University, Japan)

15:00 - 15:25 Structure changes of microbial rhodopsins in their photocycles as revealed by time-resolved visible and ultraviolet resonance Raman spectroscopy

S7-3 Christian Bamann (Max-Planck-Institut für Biophysik, Germany)

15:25 - 15:50 Structural and mechanistic aspects of channelrhodopsins

S7-4 Makoto Demura (Hokkaido University, Japan)

15:50 - 16:15 Analyses of Cl⁻-pumping photocycle of halorhodopsin

S7-5 **Li-Kang Chu** (National Tsing Hua University, Taiwan)
16:15 - 16:30 Photochemistry of a dual-bacteriorhodopsin system in *Haloarcula marismortui*: HmbRI and HmbRII

~ Coffee Break ~

VIII. Animal rhodopsins (Chair: Klaus-Peter Hofmann and Shuji Tachibanaki)

17:00 - 17:05 Introduction by **Klaus-Peter Hofmann** (Charité-Universitätsmedizin Berlin, Germany)

S8-1 **Elsa Yan** (Yale University, USA)
17:05 - 17:30 Role of rhodopsin's unusual kinetics of thermal reactions in dim-light vision

S8-2 **Yasushi Imamoto** (Kyoto University, Japan)
17:30 - 17:55 Single-molecule observation of the ligand-induced population shift of rhodopsin, a G-protein coupled receptor

S8-3 **Shuji Tachibanaki** (Osaka University, Japan)
17:55 - 18:20 Different efficiencies of enzymatic reactions in the phototransduction cascade between carp rods and cones

S8-4 **Oliver Ernst** (University of Toronto, Canada)
18:20 - 18:45 Rhodopsin conformational states in solution and their phospholipid scramblase activity

S8-5 **Hisao Tsukamoto** (Institute of Molecular Science, Japan)
18:45 - 19:00 Energetics and conformational dynamics underlying the activation of the G protein-coupled receptor opsin assessed by site-directed fluorescence labeling and nanodisc techniques

~ Dinner ~

21:00 - 23:00 Poster

23:00 - Free Discussion

October 8 (Wednesday)

~ Breakfast ~

IX. Non-visual opsins (Chair: Yoshitaka Fukada and Michael Do)

8:30 - 8:35 Introduction by **Yoshitaka Fukada** (The University of Tokyo, Japan)

S9-1 **Kristin Tessmar-Raible** (University of Vienna, Austria) More than meets the eye: Non-visual photoreceptors in vertebrates and moonstruck bristle worms
8:35 - 9:00

S9-2 **Daisuke Kojima** (The University of Tokyo, Japan)
9:00 - 9:25 Photoreceptors regulating background adaptation in zebrafish

S9-3 **Akihisa Terakita** (Osaka City University, Japan)
9:25 - 9:50 Molecular basis of wavelength discrimination in the pineal organs of lower vertebrates

S9-4 **Michael Do** (Harvard University, USA)
9:50 - 10:15 Melanopsin tristability for sustained and broadband phototransduction

S9-5 **Take Matsuyama** (Kyoto University, Japan)
10:15 - 10:30 Signaling of melanopsin, a tristable pigment

~ Coffee Break ~

X. New aspects of opsins and GPCRs (Chair: Thomas P. Sakmar and Yasushi Imamoto)

11:00 - 11:05 Introduction by **Thomas P. Sakmar** (The Rockefeller University, USA)

S10-1 **Thomas P. Sakmar** (The Rockefeller University, USA)
11:05 - 11:30 Bioorthogonal labeling of rhodopsin to facilitate functional studies

- S10-2** **Takahiro Yamashita** (Kyoto University, Japan)
11:30 - 11:55 Molecular properties of vertebrate non-visual opsin, Opn5
- S10-3** **Mitsumasa Koyanagi** (Osaka City University, Japan)
11:55 - 12:20 Molecular properties of diverse and engineered bistable pigments and their optogenetic potential
- S10-4** **David M. Hunt** (University of Western Australia, Australia)
12:20 - 12:45 Vision in ancient vertebrates: Evolution of visual pigments and associated components of phototransduction
- S10-5** **Toshiyuki Okano** (Waseda University, Japan)
12:45 - 13:00 Ocular clock in the light: Photic induction and circadian oscillation of mRNAs in the fish ocular cells

~ Lunch ~

Excursion

Lunch (Bento)

[Hikone Castle](#)

[Sake \(Japanese rice wine\) cellar and brewery](#) [\(Movie\)](#)

~ Dinner ~

21:00 - 23:00 Poster

23:00 - Free Discussion

October 9 (Thursday)

~ Breakfast ~

XI. PYP and flavin proteins (Chair: Joachim Heberle and Mikio Kataoka)

8:30 - 8:35 Introduction by **Joachim Heberle** (Freie Universität Berlin, Germany)

S11-1 **Mikio Kataoka** (Nara Institute of Science and Technology, Japan)
8:35 - 9:00 Structure and photoreaction of photoactive yellow protein

S11-2 **Andrew Woolley** (University of Toronto, Canada)
9:00 - 9:25 Engineering photoactive yellow protein

S11-3 **Wouter D. Hoff** (Oklahoma State University, USA)
9:25 - 9:50 Using photoactive yellow protein as a model system for obtaining generally applicable insights into protein biophysics

S11-4 **Masahide Terazima** (Kyoto University, Japan)
9:50 - 10:15 Photosensing reaction dynamics of flavin proteins: Phototropin

S11-5 **Osamu Hisatomi** (Osaka University, Japan)
10:15 - 10:30 A photo-activated basic-leucine zipper module, opZL

~ Coffee Break ~

XII. Tools for optogenetics (Chair: Peter Hegemann and Yuki Sudo)

11:00 - 11:05 Introduction by **Peter Hegemann** (Humboldt-University, Germany)

S12-1 **Peter Hegemann** (Humboldt-University, Germany)
11:05 - 11:30 Biophysics of channelrhodopsin

- S12-2** **Yuki Sudo** (Okayama University, Japan)
11:30 - 11:55 Molecular-based rational design and engineering of microbial retinal proteins for optogenetics
- S12-3** **Michel Vivaudou** (Centre National de la Recherche Scientifique, France)
11:55 - 12:20 Natural and artificial coupling of opsin to potassium channels
- S12-4** **Takeharu Nagai** (Osaka University, Japan)
12:20 - 12:45 Genetically-encoded tools to optically control and image Ca²⁺ dynamics
- S12-5** **Shoko Hososhima** (Tohoku University, Japan)
12:45 - 13:00 Bi-stable variants of chimeric channelrhodopsins - kinetics-dependent activation of neurons

13:00 - 13:10 Group Photo

~ Lunch ~

XIII. Controlling animal behavior (Chair: Robert J. Lucas and Akihisa Terakita)

- 14:30 - 14:35 Introduction by **Akihisa Terakita** (Osaka City University, Japan)
- S13-1** **Robert J. Lucas** (University of Manchester, UK)
14:35 - 15:00 Optogenetic application of animal opsins
- S13-2** **Hiromu Yawo** (Tohoku University, Japan)
15:00 - 15:25 Optogenetic patterning of touch perception-sensing light by skin
- S13-3** **Narasimhan Gautam** (Washington University, USA)
15:25 - 15:50 Subcellular optogenetics: Controlling signaling and cell behavior
- S13-4** **Akihiro Yamanaka** (Nagoya University, Japan)
15:50 - 16:15 Regulatory mechanism of sleep/wakefulness revealed by using optogenetics
- S13-5** **Satoshi Tsunoda** (Goethe-University, Germany)
16:15 - 16:30 Optogenetic manipulation of behavior by newly engineered channelrhodopsin variants in *C. elegans*

~ Coffee Break ~

XIV. Visual cycle (Chair: Rosalie Crouch and Satoru Kawamura)

- 17:00 - 17:05 Introduction by **Satoru Kawamura** (Osaka University, Japan)
- S14-1** **Satoru Kawamura** (Osaka University, Japan)
17:05 - 17:30 AL-OL coupling reaction, a possible mechanism of visual pigment regeneration in carp cones
- S14-2** **Yiannis Koutalos** (Medical University of South Carolina, USA)
17:30 - 17:55 Following vitamin A metabolites in single photoreceptor cells
- S14-3** **Vladimir Kefalov** (Washington University in St. Louis, USA)
17:55 - 18:20 Can rods regenerate their pigment without the RPE?
- S14-4** **Minghao Jin** (Louisiana State University Health Sciences Center, USA)
18:20 - 18:35 The 26S proteasome non-ATPase regulatory subunit 13 (PSMD13) mediates rapid degradation of disease-associated mutant RPE65 proteins via the ubiquitin-proteasome pathway
- S14-5** **Rosalie Crouch** (Medical University of South Carolina, USA)
18:35 - 19:00 Lack of correlation of A2E and other bis-retinoids with lipofuscin in the human RPE

Closing Remarks

- 19:00 - 19:10 **Yoshinori Shichida** (Kyoto University)
Peter Hegemann (Humboldt-University, Germany)

19:30 - 21:30 Banquet

21:30 - 23:00 Poster

23:00 - Free Discussion

October 10 (Friday)

~ Breakfast ~

Free Discussion & Closing

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16th International Conference on Retinal Proteins
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