

ARRIVAL DAY, TUESDAY, AUGUST 20

Registration at Terry-Lander Hall
Reception/Buffer Dinner at the Faculty Club

1:00 pm - 5:30 pm
6:00 pm - 8:00 pm

FIRST DAY, WEDNESDAY, AUGUST 21

- 7:00 - 8:30 **BREAKFAST**
- 9:00 - 9:10 **Meeting opening**
- 9:10 - 12:15 Session I: **Regulation of the Chromophore's Absorption Spectrum in Retinal Proteins**
Chair - *Daniel Oprian/David Hunt*
- 9:10 - 9:20 *Daniel Oprian*. Introduction.
- 9:20 - 9:45 **L-1: Shozo Yokoyama**. Molecular genetics and evolution of ultraviolet vision in vertebrates.
- 9:45 - 10:10 **L-2: Jeffry Fasick**. Spectral tuning in the mammalian short-wavelength sensitive cone pigments.
- 10:10 - 10:35 **L-3: Robert Birge**. Wavelength regulation in the blue & UV cone pigments and sensory rhodopsin II.
- 10:35 - 11:00 **COFFEE BREAK**
- 11:00 - 11:25 **L-4: Phyllis Robinson**. Molecular characterization of opsins from aquatic mammals: Insights into spectral tuning mechanisms and the evolution of mammalian color vision.
- 11:25 - 11:50 **L-5: Mordechai Sheves**. Factors controlling color regulation and light-induced dipole in retinal proteins.
- 11:50 - 12:15 **L-6: Klaus Schulten**. Spectral tuning and photodynamics in visual receptors.
- 12:15 - 2:20 **LUNCH AND POSTER MOUNTING**
- 2:20 - 5:30 Session II: **Photocycle and Proton Movements in Bacteriorhodopsin**
Chairs - *Pál Ormos/Hemi Gutman*
- 2:20 - 2:30 *Pál Ormos*. Introduction.

- 2:30 - 2:55 **L-7: László Zimányi.** The bacteriorhodopsin photocycle revisited.
- 2:55 - 3:20 **L-8: Judith Herzfeld.** Solid state NMR studies of the proton transport mechanism in bacteriorhodopsin.
- 3:20 - 3:45 COFEE BREAK
- 3:45 - 4:10 **L-9: György Váró.** Comparing different photocycle models.
- 4:10 - 4:35 **L-10: Sergei Balashov.** Changing the pK_a 's in the photocycle of bacteriorhodopsin (BR); participation of Thr205 and Ser193 in light-driven proton transport.
- 4:35 - 4:50 **L-11: Esther Nachliel.** The effect of surface mutation on 'proton hole' propagation dynamics in photo activated bacteriorhodopsin.
- Creation and Destruction of Bacteriorhodopsin**
- 4:50 - 5:15 **L-12: Mark Krebs.** Cellular and structural determinants of bacteriorhodopsin biogenesis.
- 5:15 - 5:30 **L-13: Norbert Dencher.** Bacteriorhodopsin and oxidative stress: examining the membrane theory of aging.
- 5:30 - 7:30 DINNER
- 7:30 - 8:55 Session III: **Primary Photochemical Events in Retinal Pigments**
Chair - **Johan Lugtenburg**
- 7:30 - 7:40 **Johan Lugtenburg.** Introduction.
- 7:40 - 8:05 **L-14: Toshiaki Kakitani.** Twist-sharing one-bond rotation (TSOR) mechanism in the *cis-trans* photoisomerization of rhodopsin.
- 7:05 - 8:30 **L-15: Sandy Ruhman.** Unraveling the primary events in photoexcited bacteriorhodopsin using stimulated emission pumping.
- 8:30 - 8:55 **L-16: Richard Mathies.** Molecular mechanism of rhodopsin isomerization and protein activation from resonance Raman spectroscopy.
- 9:00 - 11:00 KOJI NAKANISHI'S MAGIC TRICKS. BEER/WINE/SOFT DRINKS BY POSTERS.

SECOND DAY, THURSDAY, AUGUST 22

- 7:00 - 8:30 BREAKFAST
- 9:00 - 11:40 Session IV: Origin, Evolution and Diversity of Visual Pigments
Chair - **Tom Ebrey**
- 9:00 - 9:10 **Tom Ebrey**. Introduction.
- 9:10 - 9:35 **L-17: Thomas Sakmar**. Recreating functional ancestral archosaur visual pigments.
- 9:35 - 10:00 **L-18: Motoyuki Tsuda**. Three distinct retinal proteins expressed in the brain of the primitive chordate, ascidian.
- 10:00 - 10:25 **L-19: Akihisa Terakita**. Comparative study on the diversity in rhodopsin family.
- 10:25 - 10:50 COFFEE BREAK
- 10:50 - 11:15. **L-20: Osamu Hisatomi**. Diversity and evolution of vertebrate phototransduction systems.
- 11:15 - 11:40 **L-21: Yoshinori Shichida**. The difference in molecular properties between rod and cone visual pigments.
- 11.40 - 12.00 PICTURE TAKING
- 12:00 - 2:00 LUNCH AND POSTERS
- 2:00 - 5:30 Session V: Structure of Halobacterial Retinal Proteins and their Photointermediates
Chair - **Tsutomu Kouyama/Robert Glaeser**
- 2:00 - 2:10 **Tsutomu Kouyama**. Introduction.
- 2:10 - 2:35 **L-22: Joerg Tittor**. Why does nature form a purple membrane?
- 2:35 - 3:00 **L-23: Ehud Landau**. Structural dynamics of retinal proteins: lessons from X-ray crystallography and microspectrophotometry.
- 3:00 - 3:25 **L-24: Sriram Subramaniam**. Electrons vs. X-rays in the analysis of protein conformational changes in bacteriorhodopsin.
- 3:25 - 3:50 COFFEE BREAK

- 3:50 - 4:15 **L-25: Mikio Kataoka.** Structure and properties of photo-intermediate and relationship to the photoreaction.
- 4:15 - 4:40 **L-26: Georg Bueldt.** High resolution structures of intermediate states of bacteriorhodopsin.
- 4:40 - 5:05 **L-27: Janos Lanyi.** Crystallographic description of the photointermediates of bacteriorhodopsin.
- 5:05 - 5:30 **L-28: Hudel Luecke.** Light-driven ion pumping and signaling in bacterial rhodopsins.
- 5:30 - 7:30 DINNER AT THE FACULTY CLUB
- 7:30 - 8:55 Session VI: **Photoactive Yellow Protein (PYP)**
Chair - **Roberto Bogomolni**
- 7:30 - 7:40 **Roberto Bogomolni.** Introduction.
- 7:40 - 8:05 **L-29: Klaas Hellingwerf.** The mechanism of photoactivation of yellow proteins.
- 8:05 - 8:30 **L-30: Jun Sasaki.** What triggers the protein folding in PYP_M-to-PYP_{dark} conversion: Investigations using Met100 mutants.
- 8:30 - 8:55 **L-31: Aihua Xie.** Electrostatic interactions in photoreceptor activation.
- 9:00 - 10:30 BEER/WINE/SOFT DRINKS BY POSTERS

THIRD DAY, FRIDAY, AUGUST 23

- 7:00 - 8:30 BREAKFAST
- 9:00 - 10:50 Session VII: Rhodopsin Structure
Chair – *Ron Stenkamp/Ehud Landau*
- 9:00 - 9:10 *Ron Stenkamp*. Introduction.
- 9:10 - 9:35 **L-32: David Teller**. Three dimensional structure of rhodopsin.
- 9:35 - 10:00 **L-33: Gebhard Schertler**. Structure of native bovine rhodopsin in a P3(1) crystal form.
- 10:00 - 10:25 **L-34: Philip Yeagle**. Three dimensional structure and activation of rhodopsin.
- 10:25 - 10:50 **L-35: Willem DeGrip**. Studies on structure and mechanism of rhodopsin by FT-IR and solid state NMR spectroscopy.
- 10:50 - 11:15 COFFEE BREAK
- 11:15 - 3:35 Session VIII: Retinal Processing for Visual Pigment Regeneration
Chair - *Jack Saari*
- 11:15 - 11:25 *Jack Saari*. Introduction.
- 11:25 - 11:50 **L-36: Kris Palczewski/Yoshikazu Imanishi**. Flow of retinoids in the vertebrate retina.
- 11:50 - 12:15 **L-37: Carter Cornwall**. Vitamin A, the visual cycle, and dark adaptation.
- 12:15 - 2:00 LUNCH AND POSTERS
- 2:00 - 2:25 **L-38: Henry Fong**. Interactions of the RGR opsin with a retinal chromophore.
- 2:25 - 2:50 **L-39: Jian-xing Ma**. A novel all-*trans* retinol dehydrogenase in the photic visual cycle of retinoid metabolism.
- 2:50 - 3:15 **L-40: Koji Nakanishi**. Rhodopsin and age-related macular degeneration pigments.

- 3:15 - 3:40 **L-41: Rosalie Crouch.** Chromophore interactions with rod and cone opsins.
- 3:40- 4:05 COFFEE BREAK
- 4:05 - 5:30 Session IX: **Vibrational Spectroscopy of Retinal Proteins I**
Chair - **Akio Maeda**
- 4:05 - 4:15 **Akio Maeda.** Introduction.
- 4:15 - 4:40 **L-42: Hideki Kandori.** Internal water molecules of rhodopsins in action.
- 4:40 - 5:05 **L-43: Klaus Gerwert.** Proton transfer in bacteriorhodopsin via protonated H-bonded networks of internal water molecules.
- 5:05 - 5:30 **L-44: Friedrich Siebert.** Activation and photocycling of 11-*cis*-locked rhodopsin.
- 5:30 - 7:30 DINNER
- 7:30 - 8:55 Session X: **Vibrational Spectroscopy of Retinal Proteins II**
Chair - **Andrei K. Dioumaev**
- 7:30 - 7:40 **Andrei K. Dioumaev.** Introduction.
- 7:40 - 8:05 **L-45: Esteve Padrós.** Structure-function relationships in the extracellular domain of bacteriorhodopsin.
- 8:05 - 8:30 **L-46: Mark Braiman.** Proteorhodopsin and bacteriorhodopsin: similarities and differences in structure and function.
- 8:30 - 8:55 **L-47: Joachin Heberle.** Time-resolved vibrational analysis of the photoreaction of proteorhodopsin from marine bacterioplankton.
- 9:00 - 10:30 BEER/WINE/SOFT DRINKS BY POSTERS. REMOVAL OF THE POSTERS.

FOURTH DAY, SATURDAY, AUGUST 24

- 7:00 - 8:30 BREAKFAST
- 9:00 - 11:40 Session XI: Microbial Rhodopsins: Diversity and Mechanisms
Chairs - *John Spudich/Naoki Kamo*
- 9:00 - 9:10 *John Spudich*. Introduction.
- 9:10 - 9:35 **L-48: *John Spudich***. Microbial rhodopsins: genome-mining, diversity, and structure/function relationships.
- 9:35 - 10:00 **L-49: *Martin Engelhard***. Structural insight into the early steps of receptor-transducer signal transfer.
- 10:00 - 10:25 **L-50: *Leonid Brown***. Photochemical transformations of *Neurospora* rhodopsin, an eucaryotic homologue of halobacterial photosensors.
- 10:25 - 10:50 COFFEE BREAK
- 10:50 - 11:15 **L-51: *Oleg Sineshchekov***. Two rhodopsins mediate motility responses at low and high intensity light in green flagellated algae.
- 11:15 - 11:40 **L-52: *Ernst Bamberg***. Proteorhodopsin and channelopsin I: vectoriality and light activated channel function.
- 11:40 - 12:40 LUNCH
- 12:40 - 4:35 Session XII: Activation by Rhodopsin
Chair - *Jim Hurley/Nadik Abdulaev*
- 12:40 - 12:50 *Nadik Abdulaev*. Introduction.
- 12:50 - 1:15 **L-53: *David Kliger***. The mechanism of rhodopsin activation as revealed by time-resolved absorption studies.
- 1:15 - 1:40 **L-54: *Jack Sullivan***. Rhodopsin activation as seen through the eye of a microelectrode.
- 1:40 - 2:05 **L-55: *Klaus Peter Hofmann***. Metabolic versus light-dependent deactivation of vertebrate rhodopsin.
- 2:05 - 2:30 **L-56: *Paul Liebman***. Biochemistry underlying uniformity of rod single photon responses.

- 2:30 - 2:55 **L-57: *Kevin Ridge***. Mapping interactions between carboxyl-terminal peptides of the alpha-subunit of transducin and a functional mimic of light-activated rhodopsin.
- 2:55 - 3:20 COFFEE BREAK
- 3:20 - 3:45 **L-58: *Ulrike Alexiev***. Conformational changes in rhodopsins: An investigation with time-resolved fluorescence depolarization and absorption spectroscopy.
- 3:45 - 4:10 **L-59: *David Farrens***. Insights into the role of the "retinal plug".
- 4:10 - 4:35 **L-60: *Gobind Khorana***. A structural basis for a common mechanism of activation in G-protein coupled receptors.
- 4:35 - 5:00 **Closing of the conference**
- 5:30 - 10:00 **EXCURSION AND BANQUET** (boat trip to Tillicum Village on Blake Island, harbor tour, wine reception, traditional Indian style salmon dinner and Native American Dance show).

SUNDAY, AUGUST 25

DEPARTURE