

Unlocking Human Vision

Lausanne (Switzerland), 9 to 10 April 1999

Bacteriorhodopsin (bR) is a stable and easy-to-handle analogue of the visual protein rhodopsin that harvests light and is at the origin of the complex chemophysical processes of human vision. It is found in salt lakes in the primitive bacterium called *halobacterium salinarum*—here bR sucks protons from the inside of its host cell releasing the charge outside, thereby triggering the synthesis of specific bacterial enzymes.

The use of bR in bio-photonics devices (biomemories, saturable absorbers, etc), which is currently being explored, necessitates a detailed understanding of the fundamental light-induced processes down to a femtosecond timescale. Given the tremendous development that this trans-disciplinary research has witnessed lately, all participants—biochemists, physical chemists and physicists—agreed on the timeliness of the workshop.

We heard about advances in the crystallization of bR, nucleating in a structured three-dimensional membrane environment made up of fatty lipids, or alter-

natively on crystals of benzamide in different crystallographic forms. Thanks to these macroscopic crystals, the structure of bR has been determined by crystallographic studies done at the European Synchrotron Radiation Facility in Grenoble. A record resolution of 1.9 Å revealed new information on the exact way the protons follow inside the protein. Different avenues tried for time-resolved crystallography were presented (eg time-resolved X-ray diffraction), all of them using synchrotron sources with X-ray pulse durations typically of 100 ps.

Since the early 1980s it has been known that the protein's chromophore—called "retinal", a polyene with 20 carbon atoms chemically similar to vitamin A₁—undergoes a photo-induced isomerization which was believed to be one of the fastest bio-physical processes ever observed. A new twist has now arisen regarding the exact timing of this energy-supplying event. It is of outmost importance for understanding the biological functions—time-resolved absorption

shows that 40 per cent of the optically absorbed energy is dissipated within 200 fs. Thanks to advances in femtosecond spectroscopy and to the synthesis of mutants with structurally blocked retinals, the seemingly well-established idea of an instantaneous torsion of the retinal molecules within 30 fs is being questioned today. Recently discovered spectral features in the near-IR or high-frequency oscillations occurring in time-resolved absorption at earliest times point to vibrational motions along the retinal, as predicted by simulation.

In addition, results reported for non-isomerizing retinals (structurally blocked mutants) demonstrate that the initial ultrafast changes in time-resolved absorption are not due to torsional motion, and the origin of the first photo-induced events needs still to be identified.

We hope that the synergy of different areas brought together, as they were here in Lausanne, will enable bR to become one of the first bio-physical model systems for retinal proteins, and for functional photosensitive membrane proteins at large. The direct relevance for bio-devices needs to be demonstrated in the future.

The authors are Stefan Haacke and Majed Chergui of the University of Lausanne

are you going to...?

EPS 11: Trends In Physics

6 to 10 September

London, United Kingdom

The general conference of the European Physical Society is held every three years. The next one, this summer, will be in central London—where will you be on the 9/9/99?

the subject

The general conference is meant to provide something for all: plenary lectures cover a range of contemporary topics and are accessible to even the youngest physicist—older ones can head for the more specialist symposia. Subjects covered this year by plenary lectures include quantum information, global warming, nuclear waste, medical applications of cyclotrons, and the likelihood of comets impacting on the Earth. Nobel Laureate Claude Cohen-Tannoudji will be describing his subject: laser cooling of atoms. The specialist symposia are organized by EPS divisions. A tip from current EPS President Sir Arnold Wolfendale is Sam Ting's talk on positrons in space.

On Wednesday 8th there will be the EPS general meeting (the governing council, see page 113) and a talk by the winners of the poster competition for young physicists.

registration

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email eps11@iop.org
Website www.iop.org/IOP/Confs/EPS/
registration deadline 30 July



the place

A multitude of London's landmarks—Westminster Abbey, Houses of Parliament, Buckingham Palace—are within walking distance of the conference. The Tate Gallery (south) or Covent Garden (north) are a short bus ride away. Conference events themselves will be held in landmark buildings: Church House (above, site of the first UN meeting), the Royal Institution (Faraday's lecture room) and Glaziers Hall.

where to buy your bus ticket

The Tube (underground train) is good if it's raining (buy your ticket from a machine before travelling). Try an old London bus if it's not raining (you get on at the back and buy your ticket from an inspector after having sat down; on newer buses you buy your ticket as you get on at the front).

Arrival: from Heathrow airport take the Heathrow Express to Paddington (£10, 15 mins)—the Tube is cheaper but is 40 mins.