HIGHLIGHTS

HIGHLIGHT ADVISORS

ALLAN BASBAUM

UNIVERSITY OF CALIFORNIA
SAN FRANCISCO, CA, USA

RANDY BUCKNER

WASHINGTON UNIVERSITY,
MO, USA

DAVID CLAPHAM

HARVARD MEDICAL SCHOOL,
MA, USA

PIETRO DE CAMILLI

YALE UNIVERSITY SCHOOL OF
MEDICINE, CT, USA

BARRY EVERITT

UNIVERSITY OF CAMBRIDGE,
UK

GORDON FISHELL

SKIRBALL INSTITUTE, NY, USA

MARY KENNEDY

CALIFORNIA INSTITUTE OF
TECHNOLOGY, CA, USA

LYNN NADEL

UNIVERSITY OF ARIZONA,
AZ, USA

DENNIS O'LEARY

THE SALK INSTITUTE FOR
BIOLOGICAL STUDIES, CA, USA

TERRY SEJNOWSKI

THE SALK INSTITUTE FOR
BIOLOGICAL STUDIES, CA, USA

WOLF SINGER

MAX-PLANCK-INSTITUT FÜR
HIRNFORSCHUNG, GERMANY

CLAUDIO STERN

COLUMBIA UNIVERSITY, NY,
USA

PATRICK TAM

CHILDREN'S MEDICAL
RESEARCH INSTITUTE, SYDNEY,
AUSTRALIA

RICHARD W. TSJEN

STANFORD UNIVERSITY
SCHOOL OF MEDICINE, CA, USA

RAFAEL YUSTE

COLUMBIA UNIVERSITY, NY,
USA

VISUAL SYSTEM

More than meets the eye

Most of us have known since our schooldays that the mammalian retina contains just two types of photoreceptor cell — rods and cones. Also, despite occasional suggestions to the contrary (such as the controversial claim that illumination of the skin behind the knee can influence the human circadian clock), it is generally accepted that entrainment of mammalian circadian rhythms to the light/dark cycle requires retinal sensory input. It is somewhat surprising, then, to discover that mice lacking both rods and cones retain a strict circadian rhythm. As Lucas *et al.* have now shown in a study published in *Nature Neuroscience*, these mice also retain another non-image-forming response to light, namely the pupillary light reflex (PLR).

Lucas *et al.* generated mice containing the retinal degeneration (*rd*) mutation, which abolishes rod cell phototransduction and ultimately leads to total rod degeneration, and a diphtheria-toxin-based transgene (*cl*), which ablates cone cells. They measured the PLR in response to a monochromatic light stimulus across a range of wavelengths (420–625 nm) and showed that in *rd/rd cl* mice, the PLR response peaked at a wavelength of 479 nm. This observation, combined with the shape of the action spectrum curve, implied that the photopigment mediating the response was of the opsin: vitamin A class, and the authors designated this molecule OP⁴⁷⁹. Importantly, the action spectrum did not correlate with the ab-

sorption characteristics of any known photoreceptors, ruling out the possibility that the PLR was being mediated by rods or cones that had somehow survived ablation.

It is known that fish and amphibians possess retinal photopigments other than those found in rods and cones, and this new study provides the most compelling evidence yet that such molecules also exist in mammals. The next steps will be to elucidate the molecular identity of OP⁴⁷⁹ and to identify the cells in which it functions. It also remains to be seen whether OP⁴⁷⁹ has a significant role in the

wild-type eye, or whether it is recruited only in response to rod and cone loss. Just when we thought that it was time to start looking beyond the eyes for new photoreceptors, it seems that the retina is still capable of providing a few surprises.

Heather Wood

References and links

ORIGINAL RESEARCH PAPER Lucas, R. J. *et al.* Characterization of a novel ocular photopigment capable of driving pupillary constriction in mice. *Nature Neurosci.* **4**, 621–626 (2001)

FURTHER READING Foster R. G. Shedding light on the biological clock. *Neuron* **20**, 829–832 (1998) | Livesey, F. J. & Cepko, C. L. Vertebrate neural cell-fate determination: lessons from the retina. *Nature Rev. Neurosci.* **2**, 109–118 (2001)