

# 18 OPTOGENETICS

# Light Switch in the Brain

#### 18 Single-celled Organisms Shed Light on Neurobiology

The discovery of a visual pigment in the cell membrane of an archaebacterium in the early 1970s is owed solely to a researcher's curiosity. Now, four decades after Dieter Oesterhelt's pioneering work at the Max Planck Institute of Biochemistry, bacteriorhodopsin and channelrhodopsin are gaining ground as new tools in neurobiology.

#### **26** Custom-Tailored Molecules

Chlamydomonas reinhardtii, a single-celled green alga, can't see much at all with its eye composed solely of photosensitive rhodopsin molecules. Yet there is more to algal rhodopsin than one would expect. In recent years, it has triggered a revolution in neurobiology. Ernst Bamberg from the Max Planck Institute of Biophysics helped make it famous.

#### **32** Guided by Light

A zebrafish larva that is only a few days old isn't yet very mobile - at this age, it is capable of a few vigorous tail movements and not much else. For Herwig Baier at the Max Planck Institute of Neurobiology, however, that's enough. He wants to discover how the brain controls movement and behavior.

ON THE COVER Beyond specialist circles, the discovery of light-sensitive channel proteins in the 1970s and 1980s hardly made a ripple. Initially, no one suspected that these ion channels would become a popular tool for neurobiologists. Today, neuroscientists can use light to switch individual neurons on and off and, in this way, investigate their role in the brain's networks.

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Unfair: The view of women in the Bavarian legal education system is anything but balanced.

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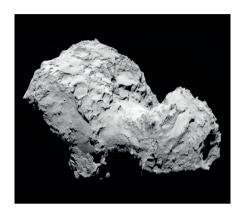
#### **VIEWPOINT**

#### 10 Marginalized in the Name of the Law

The Bavarian legal education system likes to see itself as one of the best in the country. However, it has shortcomings in one particular area: its view of women. A story of Gucci handbags, hairdos and childlessness.

## **FOCUS**

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Unshapely: The nucleus of Rosetta's target comet appears to have two parts and is reminiscent of a rubber duck.

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Uneven: Energy supply from solar arrays and wind turbines fluctuates and must be regulated accordingly.



Unsettled: As a paleogeneticist, Johannes Krause travels through time to thousands of years in the past.

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Rendezvous with a Primordial Rock For the first time in history, a probe is accompanying a comet on its orbit around the Sun - and in mid-November. it set down a lander on its surface: the incredible story of Rosetta and Philae.

#### MATERIAL & TECHNOLOGY

#### **Machines in Dialog**

Cyber-physical systems are in strong demand for their ability to optimize electricity consumption from renewable sources. They link sensors and actuators, such as power plants, with controls. Computer science specialists are developing mathematical methods for ensuring the reliability of these systems.

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#### 62 The Sun - A Mercurial Star

The Sun is the Earth's principal source of energy and climate driver. Yet sometimes it sends more light to the Earth than other times. Astronomers take these fluctuations in solar radiation into account in models to find out whether they contribute to global warming or counteract it.

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