Crossroads: The pharmaceutical industry must advance the development of new drugs.

Contents

MATERIALS SCIENCE

18 Nanoelectronics

Calculating with Carbon
Flexible, printable and affordable – these are the properties molecular electronics promise. Scientists at the Max Planck Institute for Polymer Research are paving the way to optimizing organic substances for use in solar cells, light-emitting diodes and memory chips, and are using molecular materials to develop electronic components for the future.

Quantum World in a Cube
Nanostructures surprise scientists again and again with exotic quantum effects. Using ultrasensitive instruments, experts at the Max Planck Institute for Solid State Research explore the peculiar properties of electrons in the tiniest dimensions. They are interested in, for example, current transport without resistance in superconducting nanostructures, and the fundamentals of spintronics.

Chips from a Sheet
Graphene is considered a versatile superhero of materials science. With a thickness of just one atomic layer, these carbon layers have extraordinary mechanical and electronic properties. How the chemical structure determines the material’s physical behavior is one of the questions scientists at the Max Planck Institutes for Polymer Research and for Solid State Research are investigating.

PERSPECTIVES

08 Partners in Research
08 Tailwind for Free Knowledge on the Net
09 “The Arctic Sunrise is no isolated case”
10 Breaking New Ground in Latin America
10 Wonders of Youthful Research
11 Black Holes and Gravitational Waves
11 On the Net

VIEWPOINT

12 A Prescription for New Drugs
The pharmaceutical industry is shy- ing away from the development of new drugs – especially when it comes to diseases affecting people in developing countries. Peter H. Seeberger analyzes the reasons for this and presents some approaches to solving the problem.

FOCUS

18 Calculating with Carbon
26 Quantum World in a Cube
34 Chips from a Sheet
Middle way: Sandra Kortner manages to reconcile family life with her career as a nuclear physicist.

Solution path: Mathematics helps resolve the conflict surrounding herbicides used in Colombia.

Trade route: Traditional traders profit from Vietnam’s economic boom only to a limited extent.

We Understand that We Don’t Understand
Light Observed in Transit
Gas Station in Space
Music from the Rain Forest
The Geometry of Cancer Cells
Lonely in Space
Bacteria and Rare Earths
The World’s Smallest Memory
Pit of Bones
Cracking Wood
Flies Prefer Oranges
More Greenhouse Gas than Ever
Europa’s Ocean Heat Pump
Working to the Beat
Cosmic Oddball

Sculpin Liaisons
The sculpins at the Max Planck Institute for Evolutionary Biology are no beauties. Nevertheless, these fish, which were first discovered in the Lower Rhine in the 1990s, fascinate researchers.

Mathematics in the Borderlands
It was difficult to determine whether the government of Colombia harmed Ecuadorian farmers by spraying herbicides on coca plantations near the border. Scientists at the Max Planck Institute for Dynamics of Complex Technical Systems simulated how the substances drift.

No Network, No Business
Vietnamese markets aren’t just places for goods to change hands; they also comprise complex webs of social relationships and political structures. These aspects are a key focus of researchers at the Max Planck Institute for Social Anthropology in Halle.

Middle way: Sandra Kortner manages to reconcile family life with her career as a nuclear physicist.

Solution path: Mathematics helps resolve the conflict surrounding herbicides used in Colombia.

Trade route: Traditional traders profit from Vietnam’s economic boom only to a limited extent.

We Understand that We Don’t Understand
Light Observed in Transit
Gas Station in Space
Music from the Rain Forest
The Geometry of Cancer Cells
Lonely in Space
Bacteria and Rare Earths
The World’s Smallest Memory
Pit of Bones
Cracking Wood
Flies Prefer Oranges
More Greenhouse Gas than Ever
Europa’s Ocean Heat Pump
Working to the Beat
Cosmic Oddball

Sculpin Liaisons
The sculpins at the Max Planck Institute for Evolutionary Biology are no beauties. Nevertheless, these fish, which were first discovered in the Lower Rhine in the 1990s, fascinate researchers.

Mathematics in the Borderlands
It was difficult to determine whether the government of Colombia harmed Ecuadorian farmers by spraying herbicides on coca plantations near the border. Scientists at the Max Planck Institute for Dynamics of Complex Technical Systems simulated how the substances drift.

No Network, No Business
Vietnamese markets aren’t just places for goods to change hands; they also comprise complex webs of social relationships and political structures. These aspects are a key focus of researchers at the Max Planck Institute for Social Anthropology in Halle.