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Hazy Hints of

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Does methane point to bacteria
on **Mars and Titan?**

Brains beyond Coma

Mysteries of the
vegetative state

Prevent Blackouts

Smart power grids
reroute themselves

Nanotube Nets

Better than wires
for flexible electronics

may 2007
contents
features

SCIENTIFIC AMERICAN Volume 296 Number 5

COVER STORY: SPACE SCIENCE

42 The Mystery of Methane on Mars and Titan

BY SUSHIL K. ATREYA

Could the methane in the atmospheres of Mars and Titan be caused by unusual geologic activity—or life?

MEDICINE

52 Chromosomal Chaos and Cancer

BY PETER DUESBERG

Current wisdom on the role of genes in malignancy may not explain some of the features of cancer, but stepping back to look at the bigger picture inside cells reveals a view that just might.

ENERGY

60 Preventing Blackouts

BY MASSOUD AMIN AND PHILLIP F. SCHEWE

A smarter power grid that automatically responds to problems could reduce the rising number of debilitating blackouts.

PALEONTOLOGY

68 South America's Missing Mammals

BY JOHN J. FLYNN, ANDRÉ R. WYSS AND REYNALDO CHARRIER

An unexpected menagerie of unique mammal fossils is overturning long-held ideas about South America's geologic history.

INFORMATION TECHNOLOGY

76 Carbon Nanonets Spark New Electronics

BY GEORGE GRUNER

Random networks of tiny carbon tubes could make possible low-cost, flexible devices such as "electronic paper" and printable solar cells.

NEUROSCIENCE

84 Eyes Open, Brain Shut

BY STEVEN LAUREYS

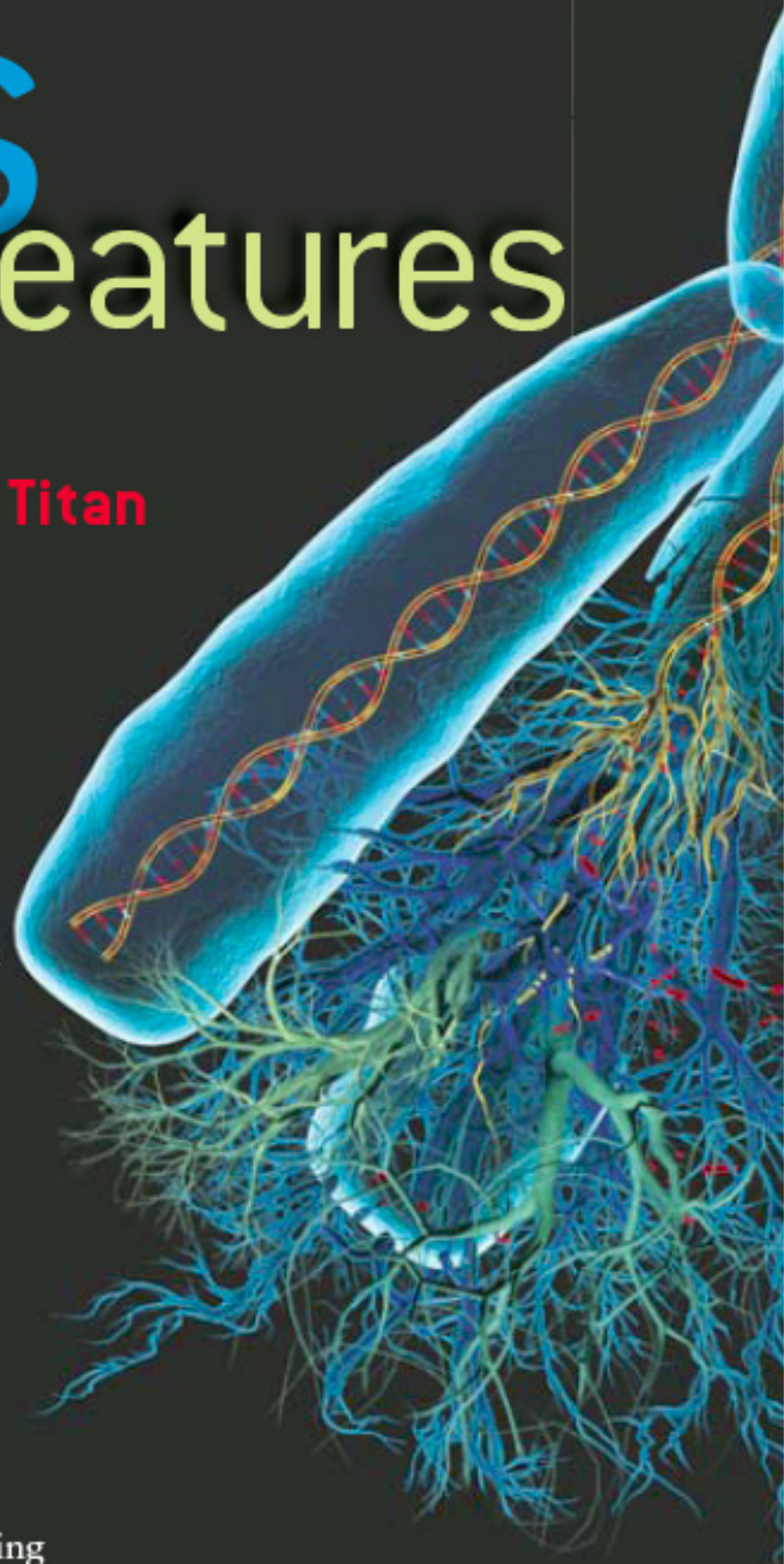
Brain-imaging techniques yield a better understanding of patients in the vegetative state.

PHYSICS

90 A Do-It-Yourself Quantum Eraser

BY RACHEL HILLMER AND PAUL KWIAT

Carry out a home experiment to illustrate one of the weirdest effects in quantum mechanics.



52 Do faulty chromosomes trigger cancer?



The Mystery of Methane on Mars & Titan

By Sushil K. Atreya

MARS has long been thought of as a possible abode of life. The discovery of methane in its atmosphere has rekindled those visions. The visible face of Mars looks nearly static, apart from a few wispy clouds (*white*). But the methane hints at a beehive of biological or geochemical activity underground.

Of all the planets in the solar system other than Earth, Mars has arguably the greatest potential for life, either extinct or extant. It resembles Earth in so many ways: its formation process, its early climate history, its reservoirs of water, its volcanoes and other geologic processes. Microorganisms would fit right in. Another planetary body, Saturn's largest moon Titan, also routinely comes up in discussions of extraterrestrial biology. In its primordial past, Titan possessed conditions conducive to the formation of molecular precursors of life, and some scientists believe it may have been alive then and might even be alive now.

To add intrigue to these possibilities, astronomers studying both these worlds have detected a gas that is often associated with living things: methane. It exists in small but significant quantities on Mars, and Titan is literally awash with it. A biological source is at least as plausible as a geologic one, for Mars if not for Titan. Either explanation would be fascinating in its

own way, revealing either that we are not alone in the universe or that both Mars and Titan harbor large underground bodies of water together with unexpected levels of geochemical activity. Understanding the origin and fate of methane on these bodies will provide crucial clues to the processes that shape the formation, evolution and habitability of terrestrial worlds in this solar system and possibly in others.

Methane (CH_4) is abundant on the giant planets—Jupiter, Saturn, Uranus and Neptune—where it was the product of chemical processing of primordial solar nebula material. On Earth, though, methane is special. Of the 1,750 parts per billion by volume (ppbv) of methane in Earth's atmosphere, 90 to 95 percent is biological in origin. Grass-eating ungulates such as cows, goats and yaks belch out one fifth of the annual global methane release; the gas is a metabolic by-product of the bacteria in their guts. Other significant sources include termites, rice paddies, swamps,

It might mean life,

it might mean unusual geologic activity; whichever it is, the

presence of methane in the atmospheres

of Mars and Titan is one of the most tantalizing puzzles in our solar system

TITAN, technically a satellite of Saturn but for all intents and purposes a full-fledged planet, has a nitrogen atmosphere denser than Earth's and a surface sculpted by tectonic activity and rivers of liquid methane. Where the methane comes from, no one knows for sure. The Cassini space probe took this composite infrared image last year.

