EARTH SCIENCE

30 Ocean Plant Life Feels the Heat

Balmy ocean waters are putting the squeeze on phytoplankton, tiny plants that collectively fix as much carbon dioxide as all terrestrial greenery combined. Their decline could threaten ocean ecosystems and contribute to global warming.

Daniel Boyce of Dalhousie University in Halifax, Nova Scotia, and his colleagues estimate that the global phytoplankton stock has plummeted 40 percent since 1950. They reported this finding in July after analyzing 50-plus years of data on light penetration of the ocean surface and plankton abundance in water samples. The die-off is due to a combination of rising sea surface temperatures and decreased ocean circulation between the higher and lower layers, Boyce says. Most phytoplankton dwell within 25 meters of the surface. The warmer this layer is, the more difficult it is for nutrients from the cold depths to mix in. As nutrients dwindle, so do the phytoplankton.

A continued decline would reverberate up the food chain and reduce atmospheric CO_2 absorption, potentially accelerating climate change. "I think that the 40 percent global decrease that they report is provocative but not yet fully demonstrated," says Michael Behrenfeld, an oceanographer at Oregon State University who studies phytoplankton. Analysis of satellite data and historical records could verify the numbers.

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GENETICS

31 Autism: One Label, Many Diseases

People with autism are regularly lumped together and treated as a single group. But the world's largest genetic study of the condition "shows that autism is many different diseases," says Stanley Nelson, a professor of genetics and psychiatry at UCLA who collaborated on the investigation. "That insight should greatly enlighten how we think about autism and attempt to treat it."

The study, conducted by a global consortium of 120 scientists, compared the genes of more than 1,000 autistic children with those of 1,300 youngsters unaffected by the disorder. As the researchers reported last July, the mutations associated with autism fall all over the map. "If 100 different kids with autism walked into a clinic," Nelson says, "chances are they'd have 100 different genetic aberrations."

Most of those aberrations occur in genes that affect the development and functioning of the brain. So far, about 10 percent of autism cases have been associated with genetic mutation, a figure Nelson predicts will rise as scientists study more genomes in greater detail.

The latest findings "move us closer to identifying underlying biochemical pathways involved in autism and set us up to develop better treatments," says Bryan King, director of the Autism Center at Seattle Children's Hospital. "We already have some candidate drugs that might potentially correct problems in these pathways."

KATHLEEN MCAULIFFE

A sleep switch may be flipped when work gets too tough at the Hotel Shanghai.

NEUROSCIENCE

32 Sleep Switch Found in the Brain

EVERY NIGHT WE ALL PARTICIPATE in a small biological miracle—the transition from wakefulness to sleep. Last September researchers at Washington State University made a notable advance in understanding the chemical trigger that allows that shift to happen.

The key to sleep turns out to be one of the body's most important molecules: ATP, the compound that stores energy for use in metabolism. Neurobiologist James Krueger and his colleagues discovered that repeated firing of neurons in the brain while we are awake causes them to release ATP into the spaces between the cells. As the molecule accumulates, it bonds to neighboring neurons and glial (support) cells; this allows the cells to absorb other chemicals—such as tumor necrosis factor and interleukin 1—that most likely put those cells into a sleep state.

This finding implies that sleep "is not a whole brain phenomenon," Krueger says. It occurs only in neural circuits that have been most active during the day and so have released the most ATP. Translation: Some parts of the brain can remain relatively alert even after we fall asleep. "This is an extremely important finding," says Mark Mahowald, a sleep expert at the University of Minnesota who was not involved in the research. "The notion that only part of the brain sleeps fits very well with our understanding of sleepwalking, when individuals have their eyes open and easily navigate around objects yet have no conscious awareness of doing this." A clearer picture of ATP's role in the process could point the way to new drugs for treating insomnia and other sleep disorders.

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