

RESEARCH HIGHLIGHTS

Night vision

Cell 137, 356–368 (2009)

In most mammalian cells, densely packed DNA is situated near the perimeter of the nucleus, whereas looser regions containing more active genes cluster towards the centre. Jochen Guck of the University of Cambridge, UK, Boris Joffe at Ludwig-Maximilian University in Munich, Germany, and their colleagues found that in mouse rod cells — light-receptor cells of the eye — this arrangement is reversed.

An analysis of 38 other mammalian species, including the colugo *Galeopterus variegatus* (pictured), revealed that the inverted arrangement is associated with a nocturnal lifestyle. In mouse rod cells, the arrangement seems to reduce light scattering.



T. LAMAN/NATIONAL GEOGRAPHIC/GETTY

BIOCHEMISTRY

Hushing the flush

J. Clin. Invest. doi:10.1172/JCI36806 (2009)

Niacin lowers disease-causing triglycerides and boosts 'good' high-density lipoproteins. But it also triggers a burning 'flush' sensation in humans. Robert Lefkowitz and his colleagues at Duke University Medical Center in Durham, North Carolina, now report that niacin's benefits and side effects may occur through different pathways mediated by the same G-protein-coupled receptor, GPR109A.

When the team exposed human cells expressing GPR109A to niacin, a protein called β -arrestin 1 flocked to the receptor, triggering a downstream flood of the molecule arachidonate, which causes the flushing response. In mice lacking β -arrestin 1, niacin improved fatty acid levels with minimal flushing. Lefkowitz, founder of a company seeking drugs targeting G-protein-coupled receptors, suggests the results could help scientists to find treatments with niacin's benefits but no flush.

CLIMATE CHANGE

Network effects

Ecol. Lett. 12, 420–431 (2009)

Networks of protected areas have become a key conservation tool, but little is known about how climate change will affect them.

A team led by Stephen Willis of Durham University, UK, modelled the distribution of all of sub-Saharan Africa's breeding birds with respect to the Important Bird Areas network. The researchers calculated species' climate envelopes under

the predictions of the 2001 third assessment report of the Intergovernmental Panel on Climate Change.

They found that species distributions will change drastically in the network's areas, which make up 7% of the continent and cover 42 countries. However, most of the 815 birds considered 'priority species' will still find a home somewhere within the network. Only seven or eight such species are predicted to lose all suitable climate from the network.

POPULATION STUDIES

China needs women

Br. Med. J. 338, b1211 (2009)

Analysis of a 2005 census suggests that, in China's under-20 age group, there are almost 33 million more males than there are females.

Therese Hesketh of University College London and her colleagues pin the heightened sex ratio (the number of boys in each age group for every 100 girls) on sex-selected abortions starting with the introduction of low-cost ultrasound in the late 1980s.

The study extrapolates from a survey of

nearly 4.8 million people in the under-20 set — covering 1% of this population across all of China's provinces. The authors show the nationwide sex ratio rising from 108 in the late 1980s to 124 in the 2000–2004 period. Male-biased births were highest for rural families who were allowed a second child after having a girl.

NEUROSCIENCE

Connecting dementias

Neuron 62, 42–52 (2009)

Neurodegenerative diseases do not sow destruction randomly in the brain, but progress along defined and predictable neuronal networks, according to new imaging work.

William Seeley of the University of California, San Francisco, and his colleagues imaged the brains of patients with five different clinical dementias — including Alzheimer's disease — which can arise from different molecular pathologies.

The researchers traced intrinsic connectivity networks — such as that involved in episodic memory — in the brains of healthy controls, and compared them with data from each patient group. They found that each type of dementia targets a different neural network.

J. XU/REUTERS



CIRCADIAN RHYTHMS

Magnetic clocks

PLoS Biol. 7, e1000086 (2009)

Earth's magnetic field can influence animals' circadian clocks, surprisingly enough through the photoreceptor cryptochrome, which is activated by blue light.

Because this photoreceptor is known to occur in the fruitfly *Drosophila*, Charlotte Helfrich-Förster of the University of Regensburg in Germany and her colleagues subjected flies to applied magnetic fields under both red and blue light. The static magnetic fields slowed the flies' circadian clocks, but only in the presence of blue light. Flies under red light showed no response. Mutant flies overexpressing cryptochrome had an even more pronounced response.

Thus the authors suggest the fly could be a model system for cryptochrome-dependent magnetic sensitivity — which may be used, for example, by migratory birds for compass orientation.

COGNITIVE PSYCHOLOGY

Bilingual baby talk

Proc. Natl Acad. Sci. USA **106**, 6556–6560 (2009)

How do babies in bilingual households cope with life in two languages? New work suggests that the challenging environment may enhance infants' cognitive abilities before they even begin to speak.

Ágnes Melinda Kovács and Jacques Mehler of the International School for Advanced Studies in Trieste, Italy, trained 40 infants aged 7 months from monolingual or bilingual households to anticipate a visual reward after a spoken cue. When the visual reward — a picture of a puppet — was shifted from one side of the computer screen to the other, bilingual infants were better able to adapt to the change and shift their gaze.

The research indicates an enhancement in executive function, a cognitive control mechanism that may aid the simultaneous acquisition of two languages.

CLIMATE MODELLING

Soot and warming

Nature Geosci. **2**, 294–300 (2009)

Aerosols such as soot and sulphates have a significant influence on climate at northern mid-latitudes and in the Arctic.

Drew Shindell and Greg Faluvegi of NASA's Goddard Institute for Space Studies in New York quantified regional climate sensitivity to carbon dioxide, ozone, sulphate and black carbon, or soot, using a coupled ocean–atmosphere climate model.

Comparing their results to observed twentieth-century temperature trends, they calculated that greenhouse gases and ozone

alone cannot explain rapid warming in the north. Declining levels of sulphates, which cool temperatures by reflecting sunlight, and rising levels of soot, which absorb solar radiation, probably account for as much as 45% of the observed Arctic warming over the past three decades, they say.

EVOLUTION

Bitter apple

Proc. R. Soc. B doi:10.1098/rspb.2009.0355 (2009)

In spring, aphid larvae emerge from eggs laid on host plants and head for the leaves to feed. But, for at least one aphid species (*Dysaphis plantaginea*), those whose parents laid eggs on apple tree (*Malus pumila*) hosts with red leaves in the autumn do less well than those laid on trees with yellow or green leaves.

Marco Archetti of the University of Oxford, UK, says that this supports the

theory that red leaves serve as an 'honest' signal to insects warning against such factors as robust chemical defences.

Domesticated apple trees were selected for nice fruit, not insect resistance, and as such should not advertise defences they have not retained. Accordingly, Archetti finds that

domesticated apples rarely have red leaves in autumn. There might even be a direct trade-off; red-leaved trees make smaller, less palatable apples.

MICROBIOLOGY

Colony collapse cured?

Environ. Microbiol. Rep. **1**, 110–113 (2009)

Bee-keepers and the crop producers they serve have been plagued worldwide by the mysterious disappearance of the European honeybee *Apis mellifera*. Various causes have been touted for this 'colony collapse disorder', including pesticide use, viruses and mites. Mariano Higes of the Regional Apiculture Center in Marchamalo, Spain, and his collaborators had previously fingered a gut-infecting fungus, *Nosema ceranae*, as a suspect. More recently, while studying two embattled Spanish apiaries 750 kilometres apart, they found *N. ceranae* to be the only likely suspect. Moreover, at these apiaries, the fungicide fumagillin halted colony collapse and cleared the infection from existing colonies. Although these results are promising, *N. ceranae* may not be to blame for all cases of colony collapse.



A. WHITE / NATUREPL.COM

JOURNAL CLUB

Dave Featherstone
University of Illinois at Chicago

A neuroscientist argues for a broader approach to brain mapping.

Efforts to map all of the connections between the brain's neurons — known as synapses — are gathering momentum. Neural 'wiring diagrams' have even garnered a label: the 'connectome'. But I worry that the connectome will be a waste of time and money, and that we'll eventually need to redo the whole thing.

Why am I so negative? Although the connectome is ambitious, it's not ambitious enough. As currently envisioned, it ignores most brain cells as well as possible functional connections between those cells.

Although you wouldn't know it from all the attention they receive, neurons are a relatively minor type of brain cell, making up less than 10% of the human brain. And synapses between neurons make up only a small subset of all possible functional connections in the brain. Most brain cells are actually glia, which have long been neglected by neuroscientists owing to their lack of electrical signalling. But glia are increasingly being recognized as having important roles in brain function.

For example, consider the recent study of adenosine and sleep led by Philip Haydon and Marcos Frank at the University of Pennsylvania in Philadelphia (M. M. Halassa *et al. Neuron* **61**, 213–219; 2009). Adenosine binds to receptors on neurons, thereby regulating neuronal signalling. Interestingly, adenosine seems to represent 'sleepiness': it accumulates during wakefulness and dissipates during sleep. Where does it come from? It is generated from adenosine triphosphate (ATP), which is secreted by astrocytes — a major type of glia.

Therefore, if we want to map the functional brain connections controlling sleep, we need to include glia and the extracellular space between glia and neurons. If we're going to understand brain function by mapping the brain, we need to include most of the brain in our map.

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