NEUROBIOLOGY

Shocktopus

Curr. Biol. doi: 10.1016/j.cub.2009.07.067 (2009)

Octopuses have the peculiar challenge of controlling eight appendages that can assume an almost limitless number of positions. They seem to accomplish this by consolidating the control of complex, coordinated movements into specific areas of their nervous system — rather than having a one-to-one relationship between a body part and a specific brain area.

Letizia Zullo, now at the Italian Institute of Technology in Genova, and her colleagues placed electrodes in 35 parts of the animal's nervous system. Low-voltage stimulation of different areas evoked simple responses, such as a change in skin colour or small eyelid movements. Higher voltages elicited more complex responses, such as inking and jet-propelled swimming.

GENE THERAPY

Panning for phage

Nature Medicine doi:10.1038/nm.2025 (2009)

Viruses can be modified to deliver therapeutic genes directly to the blood vessels feeding diseased brains, according to research by Beverly Davidson and her colleagues at the University of Iowa in Iowa City. To identify address labels for the diseased blood vessels, the team used the technique of 'phage panning'. Millions of particles of a bacterial virus — phage — displaying different mouse proteins on their surface were injected into the blood of mice with a lysosomal storage disease. Phages that stuck to diseased-brain blood vessels were isolated and the protein sequences responsible for binding were identified.

When these sequences were engineered into the outer shell of an adeno-associated virus, AAV2, they enabled AAV2 to target brain blood-vessel cells in the diseased mice and deliver a gene coding for an enzyme that helps to reverse the effects of the storage defect.

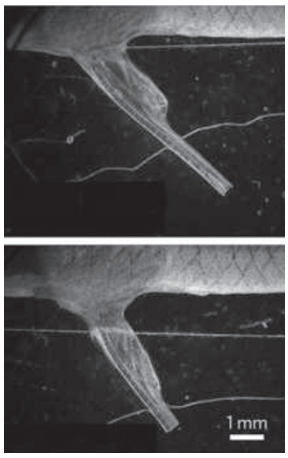
EVOLUTIONARY BIOLOGY

Well endowed

Biol. Lett. doi:10.1098/rsbl.2009.0637 (2009)

The wide variation in male genitalia size in animals is thought to have evolved mostly in response to selection pressures that come into play during or after copulation and increase the male's share of paternity.

But it seems that females of the mosquito-fish *Gambusia holbrooki* choose mates before copulation on the basis of the size of their genitalia — and for them, bigger is better. Andrew Kahn and his team at the Australian National University in Canberra tested female preference for males that had had their genitalia considerably reduced in size by surgery (pictured, bottom) compared with those with only a minor reduction (pictured, top). They found that females spent, on average, around one-and-a-half times longer associating with the better-endowed males.



ANALYTICAL CHEMISTRY

Evaporating flesh

Angew. Chem. Int. Ed. doi:10.1002/anie.200902546 (2009)

Cancer surgeons cutting out tumours in the operating theatre can find it hard to spot the difference between malignant and healthy tissue. But Hungarian scientists say it should be possible to identify tissue types in real time during surgery, using a mass spectrometer to analyse the ions sprayed up by a standard surgical electrode as its electric current evaporates living flesh.

Zoltán Takáts at Semmelweis University, Budapest, and his colleagues discovered that different tissues yield characteristic sets of gaseous molecular ions as they are being dissected — and that the ions can be pumped to a mass spectrometer and analysed in less than a second to distinguish various grades of cancerous tissue.

AQUATIC TOXICOLOGY

Mixed-up fish

Aquatic Toxicol. doi:10.1016/j.aquatox.2009.08.001 (2009)

Pollutants such as effluent wastewater, pesticides and pharmaceuticals in rivers are suspected to cause the intersex condition in fish, in which reproductive tissues are mismatched: most often, female germ cells are present in the testes.

To assess the incidence of the condition in river fish throughout the United States, Jo Ellen Hinck, a US Geological Survey scientist in Columbia, Missouri, and her team sampled 111 sites spread across the country. Intersex fish were found in 31% of the sites, with the greatest prevalence in the south-east. Small and largemouth bass were the species most commonly affected.

Correction

The Research Highlight 'Aluminium arches' (*Nature* **461,** 318; 2009) incorrectly referred to an aluminium powder used in the experiment. In fact, an aluminium oxide powder, alumina, was used.

JOURNAL CLUB

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A biologist praises a mouse model of autism inheritance.

Autism, a neurodevelopmental disorder that affects people's social abilities, has both genetic and non-genetic causes. Chromosomal abnormalities account for 10–20% of autism cases, with duplication of a long stretch of chromosome 15 being the most common. I was excited to read that a mouse model with a similar chromosomal duplication has been generated (J. Nakatani *et al. Cell* **137,** 1235–1246; 2009). These mice exhibit the inflexible behaviour, social abnormalities and increased anxiety often observed in people with autism. However, whereas the engineered mice inherit the duplication from their fathers, human autism cases caused by such a duplication are usually inherited maternally. Further genomic analysis in the mice should find the reason for this discrepancy.

This model deserves special attention as the chromosomal duplication is stably maintained between generations. Also, genes in the duplicated regions seem to work; that is, the expression levels of genes — including *HBII52*, which affects the function of serotonin, a molecule that has cognitive roles in mood, memory and learning — are higher in the mice, as would be expected with a gene duplication.

Accumulated evidence shows that variations in gene-copy number, such as the chromosomal duplication in this model, are associated with susceptibility to various human diseases; cancer cells, for example, tend to have high gene-copy numbers. Thus, this mammalian model may help us to understand the molecular basis of autism and to investigate the contribution of gene duplication in other genetic diseases. This should encourage many researchers to produce other model systems for copy-number variation using similar techniques; systems that may clarify the contribution of chromosomal duplication, or even the lack of it, in common diseases such as diabetes.

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