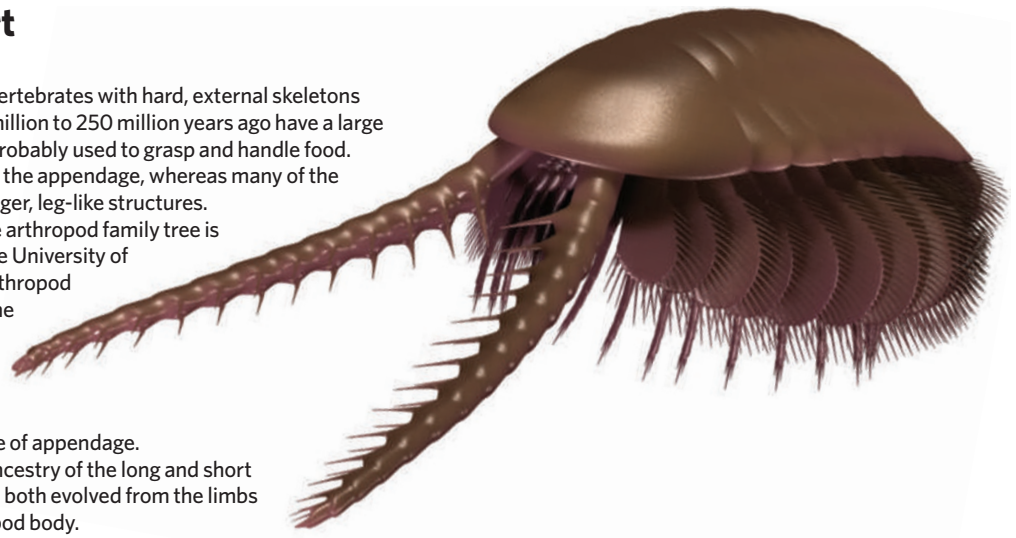
RESEARCH HIGHLIGHTS

The long and the short



M. STEIN

Zool. J. Linn. Soc. **158,** 477–500 (2010)

The fossils of many arthropods — invertebrates with hard, external skeletons and segmented bodies — from 540 million to 250 million years ago have a large pair of 'great appendages' that they probably used to grasp and handle food. Euarthropods had shorter versions of the appendage, whereas many of the now-extinct anomalocaridids had longer, leg-like structures.

The position of these animals in the arthropod family tree is controversial. Martin Stein, now at the University of Kansas in Lawrence, reports a new arthropod species that bridges a gap between the two groups.

The new species, *Kiisortoqia soperi* (reconstruction pictured), discovered in Greenland, was clearly a euarthropod but had the longer type of appendage.

Stein says this supports a shared ancestry of the long and short 'great appendages' and suggests that both evolved from the limbs of a particular segment of the arthropod body.

METABOLISM

Warm milk

Cell Metab. **11,** 206–212 (2010)

Mother's milk fires up a heat-generating metabolic pathway in newborn mice.

Newborns have to rapidly adjust to the comparatively chilly environment outside the womb. Francesc Villarroya of the University of Barcelona in Spain and his colleagues found that expression of a metabolic regulator gene called *Fgf21* increases immediately after birth. However, this increase was seen only when pups were allowed to suckle or were given a lipid-rich emulsion to drink. Pups fed a glucose solution — a diet similar to what they would have received *in utero* — did not activate *Fgf21*.

When the FGF21 protein was injected into newborns that were not allowed to nurse, genes associated with heat generation in brown fat, a tissue specialized in heat production, were activated in the pups.

CHEMISTRY

Cellulose busters

Proc. Natl Acad. Sci. USA doi:10.1073/pnas.0912073107 (2010)

Finding a safe, low-cost and high-yield way to break down cellulose — a major component of plant-fuel sources such as maize stalks — into fermentable sugars is a challenge in biofuel development. A mild mixture of acid and ionic solvent may prove quicker and cheaper than the enzymes commonly used.

Ronald Raines and Joseph Binder at the University of Wisconsin, Madison, improved an existing recipe by slowly adding water to a mixture of acid catalyst and ionic liquid as it attacked untreated cellulosic biomass. The process avoids the hazards of working with concentrated acids, and in a few hours produces sugar yields of 70–90%, which enzymes take days to achieve.

However, scaling this up for commercial use could be problematic because of the need to recycle ionic liquids, which are expensive relative to other solvents.

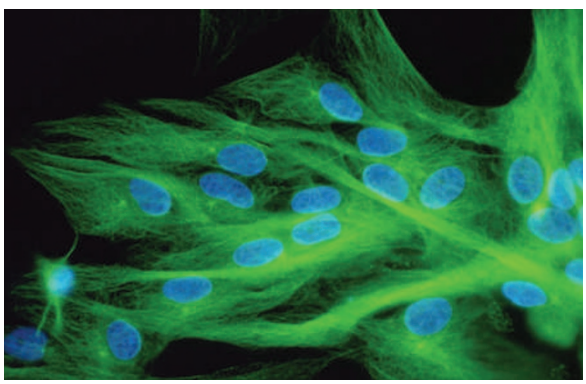
NEUROSCIENCE

Nerve cell talk

Science **327,** 1250–1254 (2010)

Neuroscientists had long believed that neural cells called astrocytes (pictured below) provide structural support and nutrients to the neurons they surround. But a debate has erupted over whether these cells also release signalling molecules that affect neuronal communication — and, if they do, how.

It is thought that an increase in astrocyte calcium-ion concentration might trigger the release of these signalling molecules. Cendra Agulhon at the University of North Carolina at Chapel Hill and her team engineered mice in which they could either stimulate or suppress calcium signalling. They showed that neither activating nor deactivating the calcium rise in astrocytes affected neurotransmission in the brain's hippocampus, suggesting that other mechanisms underlie astrocyte signalling.



A. TOUSSON/PHOTOLIBRARY

BIOMATERIALS

Squishy particles

Angew. Chem. Int. Edn doi:10.1002/anie.200906606 (2010)

Researchers have created tiny microgel particles that can squeeze through pores just one-tenth of their size. This makes them potentially useful as a biomaterial for tasks such as drug delivery — squishy nanoparticles can be easily filtered out by the kidneys, so don't need to be degradable by the body.

Grant Hendrickson and Andrew Lyon at the Georgia Institute of Technology in Atlanta found that 116-nanometre-wide microgel particles, when subject to pressure, can pass through a material with pores of 10 nanometres — similar in diameter to those of the kidneys.

CANCER BIOLOGY

Arsenic activation

Cancer Res. **70,** 1981–1988 (2010)

Arsenic, a carcinogen found at unsafe levels in drinking water in many parts of the world, may cause cancer by increasing the activity of the Hedgehog signalling pathway, which is known to promote cell proliferation.

David Robbins, now at the University of Miami, Florida, and his