Seth Field of the University of California, San Diego, and his colleagues screened proteins to find ones that bind to a particular phosphoinositide that resides in the Golgi membrane and is unique to the organelle. They turned up GOLPH3 and, through a search of its partners, MYO18A. One end of GOLPH3 binds to the Golgi, whereas the other binds to MYO18A, which, in turn, binds to the cell's cytoskeleton. This complex generates tension that keeps the organelle functioning properly and its stretched shape intact.

CANCER BIOLOGY

Metastatic mayhem

Nature Cell Biol. doi:10.1038/ncb1973 (2009)

Motility is crucial for cancer cells to spread and seed new tumours. To learn more about what drives this movement, Erik Sahai of Cancer Research UK's London Research Institute and his colleagues used multiphoton confocal microscopy to follow metastatic breast-cancer cells in live mice.

They found that the cells could travel in groups or individually. Blocking a growth factor called TGFβ meant that cells could only move in a group and by means of the lymphatic system. Cells moving alone exhibited activated TGFβ signalling and were able to enter the bloodstream. However, TGFβ signalling in these cells was transient — although required for single-cell motility, it needed to be shut down to enable the tumour to grow in its new home.

IMMUNOLOGY

Gut response

Immunity **31**, 677–689 (2009); *Cell* doi:10.1016/j.cell.2009.09.033 (2009)

Hundreds of beneficial bacterial species live in the human gut and help balance the immune system, but which species provide the benefit and how are not well known. Two research groups have pinpointed only a few select species that seem to do much of the work in boosting immune responses.

The groups measured levels of intestinal T cells in mice after challenging them with various microbes. They found that the most potent immune stimulators were segmented filamentous bacteria. Valérie Gaboriau-Routhiau of INSERM in Paris and her colleagues found that, on their own, these bacteria triggered the same broad T-cell response normally caused by the entire mouse intestinal flora.

Dan Littman of New York University School of Medicine, Kenya Honda at Osaka University in Japan and their colleagues showed that the bacteria induced accumulation of helper T cells, which produce cytokines that mediate a variety of immune responses.

ECOLOGY

Digging diversity

Proc. Natl Acad. Sci. USA doi:10.1073/pnas.092685106 (2009)

Ant colonies can build large nests with a range of architectures. But what contributes to this diversity? Etienne Toffin and his colleagues at the Free University of Brussels photographed groups of *Lasius niger* ants every 10 minutes for 90 hours as the insects built a nest in a thin layer of sand sandwiched between two glass plates.

The pictures revealed that nest building occurs in two stages. At first, the nest grows quickly in a circular shape. Later, it begins to branch, with buds appearing along the nest wall, some of which go on to become additional chambers. Ant group size affected nest shape; 40% of the 50-ant groups never transitioned to the second stage during the experiment, whereas only 12% of the 300-ant groups remained in the first stage.

PALAEONTOLOGY

Transition fossil

Proc R. Soc. B doi:10.1098/rspb.2009.1603 (2009)

In the early Jurassic period, about 200 million years ago, the most common flying vertebrates were primitive long-tailed pterosaurs. One hundred million years or so later, the more advanced, short-tailed pterodactyloids came to dominate. How the pterodactyloids evolved from the earlier pterosaurs has been a mystery, but the discovery of a fossil (pictured below)


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in China by Junchang Lü of the Chinese Academy of Geological Sciences in Beijing and his collaborators goes some way towards filling in the blanks.

Darwinopterus modularis has the long skull and neck characteristic of pterodactyloids but the rest of the body, including the long tail, is near-identical to that of more primitive forms. The fossil shows the key steps in the evolutionary transition between the two types of organism. It also demonstrates how natural selection acted on groups or 'modules' of characteristics, such as the head and neck, rather than on individual traits.

JOURNAL CLUB

Corinne Le Quéré
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An oceanographer marvels at the good timing of shrimp.

For many marine organisms, the timing of egg hatching is key to species survival because the time window in which larvae can survive is very short. If eggs hatch too early, they starve before their food source — the spring phytoplankton — blooms. If they hatch too late, they also miss the bloom.

I'm amazed by how often nature gets things right. In most of the North Atlantic, shrimp eggs hatch just a few days before the spring bloom. Peter Koeller of the Bedford Institute of Oceanography in Dartmouth, Nova Scotia, showed that the development and hatching time of shrimp are influenced by local deep-ocean temperature (P. Koeller *et al. Science* **324,** 791–793, 2009). This is not surprising, because eggs develop in the deep ocean and their growth rate depends on temperature.

What is surprising is that the shrimp spawn on the right day of the year across the North Atlantic, even though temperatures in the deep ocean vary from one area to the next and do not influence the timing of the spring bloom. Through evolution, the shrimp have adapted to local temperature patterns to spawn at just the right time.

However, this could prove to be a problem for shrimp and the many other zooplankton, fish and shellfish species that have adapted their spawning habits to local conditions. What will the survival rate of larvae be if deep-ocean temperatures rise, or if the spring bloom occurs earlier? How much time do organisms need to sense and adapt to such changes? These new data will help us to understand the complex interdependence of marine ecosystems, and possibly help to detect potential mismatches between egg hatching and food-source availability.

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