Immunology

Geared up for antibody production

Immunity **18,** 243–253 (2003)

When the B cells of our immune system detect unfamiliar items, they turn into plasma cells that are dedicated to producing and secreting antibodies that cleanse our body. Eelco van Anken *et al.* find that B cells meticulously plan this transformation.

Antibody production is an elaborate process. First, individual subunits are synthesized and dispatched to the endoplasmic reticulum. Inside this network of membranes, chaperone proteins help the subunits to fold into shape and assemble together. The antibodies are then transported to the cell surface and released — up to thousands per second.

Van Anken *et al.* used a dynamic proteomics approach to show that sequential waves of functionally related proteins are synthesized during B-cell transformation. For instance, the cells first stock up on mitochondrial and cytosolic chaperones, probably to sustain increased energy consumption and protein synthesis. Supplies of metabolic enzymes are boosted later, perhaps reflecting the need for expansion of the endoplasmic reticulum membrane. Meanwhile, the numbers of chaperones in the endoplasmic reticulum build up steadily. The production of antibodies increases exponentially, but only after a lag period — allowing the cell to build an efficient antibody production plant first. **Marie-Thérèse Heemels**

Chemistry

Levitation lights up crystals

Anal. Chem. doi:10.1021/ac020496y (2003)

Growing protein crystals for structure determination is a complex process, often achieved only through trial and error. But Sabina Santesson and colleagues hope, through filming protein precipitation in levitating liquid drops, to better understand and control crystal growth.

The team levitate a microlitre drop of supersaturated protein solution by trapping it in a standing acoustic wave. They then inject crystallization agents or water into the drop. Measurements of light-scattering indicate the onset of precipitation, while microscope imaging records the drop's volume and hence the concentration of its components.

With this set-up, minute quantities of protein are sufficient to rapidly screen different crystallizing agents and map out the limits beyond which supersaturated solutions become unstable and the protein precipitates. This information guides the choice of conditions for more detailed batch nucleation tests.

Santesson *et al.* show that their approach readily yields crystals of the binary complex formed between the enzyme D-serine dehydratase and pyridoxal-5′-phosphate. A crystallization screening kit apparently gave poorer results. **Magdalena Helmer**

Neurobiology

Quirks of memory

Curr. Biol. **13,** 286–296 (2003)

Quirky names are often given to mutant fruitflies. Even so, Tim Tully and his colleagues seem to have taken the off-beat practice to extremes by calling a fly with a memory problem *krasavietz* — Russian for 'male beauty'. History has informed their choice, however, for Krasavietz was one of Ivan Pavlov's dogs, with which the Russian physiologist established associative conditioning as a paradigm for learning and memory.

Tully and co-workers screened flies by using behavioural tests to identify mutants that had defects in their long-term memory (naming them all after Pavlov's dogs), and also carried out DNA-microarray analysis to identify the gene-transcription machinery associated with such memories. This impressive two-pronged attack enabled the authors to identify components of the localization and translational apparatus of the messenger RNAs involved: the *krasavietz* mutant, for instance, corresponds to damage to a translation-initiation factor known as *eIF-C*. In one follow-up example, Tully *et al.* used temperature-sensitive mutants of *staufen*, which influences the translocation of mRNA, to study the critical timing of this gene's expression in the formation of long-term memory. **Hemai Parthasarathy**

Astronomy

The long and the short of it

Astron. Astrophys. (in the press);
Preprint astro-ph/0301262 at <http:arXiv.org> (2003)

Depending on whether they are short or long, mysterious γ-ray bursts (GRBs) probably originate from different cosmic sources. GRBs are the most powerful explosions in the known Universe, presaging the formation of black holes. They may last only a few milliseconds, or up to 100 seconds; most last only about 10 seconds.

Previous work had hinted at separate physical sources for short and long bursts, a suspicion now reinforced by the results of L. G. Balázs and colleagues. They have analysed the light signatures of 1,972 GRBs, detected using NASA's Compton Gamma Ray Observatory. Balázs *et al.* find that for bursts lasting longer than two seconds the flow and energy — termed 'fluence' — of the γ-rays is directly proportional to the burst's duration. But for short bursts this relationship is less clear, suggesting perhaps that for these GRBs the source converts energy into γ-rays at a rate that falls with time.

Long bursts might be caused by the explosion of massive stars (more than 30 times heavier than our Sun), and short bursts by the merging of ultra-dense neutron stars. But improved models of GRBs are needed before these origins can be confirmed. **Tom Clarke**

Evolutionary biology

Species, more or less

J. Evol. Biol. **16,** 282–288 (2003)

Some groups of animals contain many more species than others. M. Cardillo and colleagues have investigated the reasons for this, taking Australian mammals as their study subjects. They conclude that, in this case at least, genera with many species seem to have features in their ecology that buffer them against extinction.

Cardillo *et al.* found that the distribution of species among genera can't be explained by a random distribution, or by the oldest groups containing the most species. Genera with many species, therefore, could possess traits that promote the formation of new species or help to avoid extinction (or both).

It turns out that the number of species in a genus correlates most closely with the geographical size of that group's range and with its litter size. The authors suggest that both of these characteristics make it less likely that a species will become extinct. A large range gives a widespread population that can recolonize particular sites from which a species has disappeared, and species with large litters have fast rates of population growth and so can bounce back from knocks. Body size seems to make no difference — a surprise, as larger animals seem to have suffered higher extinction rates over the past few millennia. Human hunting may be the explanation there. **John Whitfield**

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