Immunology

Added piece for ‘bubble boy’ puzzle

J. Clin. Invest. **114,** 1512–1517 (2004)

Severe combined immunodeficiency (SCID) is a life-threatening disease characterized by a crippled immune system. It is often referred to as ‘bubble boy disease’, after David Vetter, a SCID sufferer who spent 12 years living inside a protective plastic bubble. The condition can be caused by numerous inherited mutations; geneticists have now identified another one.

Geneviève de Saint Basile *et al.* report that patients and affected fetuses from three families have mutations in one of the genes that encode subunits of the CD3 receptor. This protein complex is found on T cells, one arm of the immune response to intruders. In particular, mutations in either the *CD3E* or the *CD3D* gene cause a complete lack of T cells, showing that the products of these genes are required for a crucial step in T-cell development.

Researchers had previously identified other immune defects that cause the disease, including a lack of the γc chain of the interleukin-2 receptor, a protein essential for T cells and another immune-cell type, NK cells, to develop. The patients with CD3 mutations had normal NK cells, however, underlining the range of causes of this disease. Screening for these mutations might, the authors suggest, open up new possibilities for gene therapy. **Michael Hopkin**

Neurobiology

Cells take sides on vision

Cell **119,** 567–578 (2004)

Thanks to a carefully integrated set of neurons, we can combine what our two eyes see to form one picture. This binocular vision hinges on the pathfinding decisions made during development by the axons of ganglion cells in the retina that go on to form the optic nerve. But how do these cells choose between visual centres on the left or right side of the brain?

Winnie Pak *et al.* have tackled this question with genetics; they find that the gene-transcription factor Islet-2 is crucial in determining the laterality of retinal ganglion cells in mice. More specifically, they show that this protein directs the cells from one eye to project towards a region on the opposite side of the brain. In mice lacking Islet-2, an abnormally large number of retinal ganglion cells prefer to keep to their side of origin. The findings indicate that two genetically unique domains make up the retina — and that these domains decide the laterality of specific cells involved in sight.

Pak *et al.* emphasize that a genetic hierarchy is responsible for proper development of binocular vision. They suggest that, under normal circumstances, Islet-2 works by repressing Zic2, another transcription factor, which activates a one-sided axon pathfinding programme. **Roxanne Khamsi**

WOODFALL/THE KOBAL COLLECTION

Granular media

Why nuts come in pairs

Phys. Rev. Lett. **93,** 208002 (2004)

Everyone knows that Brazil nuts in a shaken box of muesli rise to the top. But large grains dispersed among smaller grains can also sink to the bottom when shaken: the ‘reverse Brazil-nut effect’. Which type of behaviour is observed depends on factors such as the relative sizes and densities of the particles.

Duncan A. Sanders *et al.* have found a third type of behaviour in a vibrated mixture of differently sized grains. If the large grains are neutrally buoyant — that is, have about the same density as the small grains — they neither rise nor sink, but aggregate into a cluster. In other words, the mixture separates out into regions of small and large grains. The researchers’ computer simulations show that there is effectively a force of attraction between the large grains, extending to about five large-grain diameters.

The attraction seems to result from the way the packing of smaller ‘host’ grains dilates during a vibration cycle, leading to more particle collisions on the outward-facing sides of the large grains than in the region between them. The large grains are thus gradually ‘ratcheted’ together by the vibrations, an effect that could occur during the industrial handling of powders. **Philip Ball**

Organic chemistry

Look, no metal

Angew. Chem. Int. Edn doi:10.1002/anie.200461816 (2004)

There are plenty of circumstances in which synthetic chemists need to modify an organic molecule at a specific position without affecting another part of that molecule. They can use a catalyst, but for some reactions catalysts can be expensive, contain environmentally harmful transition metals or require high temperatures.

One common chemical reaction requires conversion of a carbon–carbon double bond to a single bond in the presence of an adjacent carbon–oxygen double bond. Jung Woon Yang *et al.* report a simple way of carrying out this conversion without the metal catalyst or harsh reaction conditions that are usually required. Technically, this is an olefin reduction: in Yang and colleagues’ scheme it involves the use of an amine catalyst and a nicotinamide adenine dinucleotide-like hydrogen donor, an agent that certain enzymes employ in the natural world.

The authors say that the reaction is highly selective and more environmentally friendly than other methods. Furthermore, in another paper in press at the same journal, they describe how they have applied their procedure to selectively produce one of two possible stereoisomers of the same molecule — often a highly desirable end. **Joshua Finkelstein**

Applied physics

Transistor makes light work

Appl. Phys. Lett. **85,** 4768–4770 (2004)

Transistors are one of the fundamental components in any electronic circuit. They are essentially three-terminal switches: a current at one port controls the current between the others. G. Walter *et al.* have now created a transistor where the output is laser light as well as electrical current. This could speed up the conversion of electrical signals from a conventional circuit into light that can travel along a fibre-optic cable.

Their device sandwiches together indium gallium phosphide, gallium arsenide and indium gallium arsenide. This last material acts as a ‘quantum well’ that captures electrons, leading to the generation of coherent laser light.

Operating at about −73 °C, the device begins to emit infrared laser light when about 8 mA of current flows through it — although the authors note that the efficiency of the unit drops sharply when it switches from non-coherent light emission to lasing. They are now working to optimize this output. **Mark Peplow**