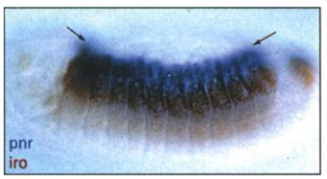
EDITORS' CHOICE

edited by Stella Hurtley

DEVELOPMENT

Master of the Subdomain

The body of the fruit fly *Drosophila* can be viewed as a series of compartments. First described over 25 years ago, compartments are spatially discrete groups of cells, typically derived from the same cell lineage, that do not functionally intermingle with cells in neighboring compartments. Compartments and the boundaries that separate them play a critical role in pattern formation during development.



***Drosophila* embryo subdomains marked by pnr (blue) and iro (brown) RNA.**

Compartments can be further subdivided, and a new example of this is provided by Calleja *et al.*, who find that the dorsal region of each segment in the thorax and abdomen consists of two subdomains, a medial (MED) subdomain and a lateral (LAT) subdomain. This subdivision appears to be specified by the activity of the *pannier* gene (*pnr*) which encodes a GATA transcription factor and is expressed only in the MED subdomain. The LAT subdomain is characterized by expression of the homeobox gene *iroquois* (*iro*). The MED and LAT subdivision is distinctive in that it is specified by a mechanism not based on cell lineage, yet it appears to be a general feature of the *Drosophila* body plan, affecting the embryo, larva, and adult. — PAK

Development **127**, 3971 (2000).

GEOCHEMISTRY

Eating Their Crusts

Seawater circulates through new oceanic crust formed at mid-ocean ridges, and the subsequent reactions can add or remove elements from the oceans. Bacteria may also mitigate crustal alteration at low temperatures (<120°C)—microscopic observations have revealed small, micrometer-sized channels or tubes extending into rocks at the alteration front even deep in the crust, as well as the nearby presence of organic matter and DNA.

A detailed examination of an alteration front by Alt *et al.* with transmission electron microscopy now reveals that many of the small tubes are mostly filled with clay minerals produced by the divitrification of the volcanic basaltic glass (an ion exchange process in which potassium is leached from seawater). Thus, the available room in many tubes would seem to present a tight squeeze for most bacteria. In addition, the amount of potassium consumed would have required the circulation of large volumes of seawater. — BH

Earth Planet Sci. Lett. **181**, 301 (2000).

IMMUNOLOGY

A Mixed Blessing

Hepatitis B virus (HBV) and the parasite that causes malaria, both remain health concerns of immense proportion. In certain parts of the world individuals frequently become infected with both pathogens, raising the question of how each disease might influence the course of the other.

In an established mouse model of HBV infection, Pasquetto *et al.* show that the presence of malarial parasites can profoundly influence the course of HBV infection. Expression of HBV genes in the liver was considerably diminished upon co-infection with the malarial parasite *Plasmodium yoeli*. Infection with both the liver and blood stages of the malaria parasite resulted in this anti-viral effect, which was closely associated with intrahepatic inflammation. Although the induction of several proinflammatory genes was detected within the liver, only interferons α/β and γ were identified as being critical for inhibiting HBV replication. This study may help to explain some of the protective effects of malaria on the course of HBV infection in man. — SJS

J. Exp. Med. **192**, 529 (2000).

PHYSICS

Single-Spin Memory

The ultimate limit for controlling electronic logic would be to use the spin state of a single electron. Recher *et al.* address the problem of controlling the spin dynamics in nanostructures by proposing a quantum dot as the basic building block for single-electron controlled-spin systems. In the presence of a magnetic field and in the Coulomb-blockade regime, the highest, singly occupied energy level of

ECOLOGY AND EVOLUTION

The Battle of the Sexes

Ritualized displays between the sexes are widespread in animals, especially in monogamous species. Evolutionary explanations have centered on such displays as a means for females to assess male quality, for both sexes to maintain cooperation and mutual stimulation, and/or to coordinate reproductive physiology.

Courting wolves.

Wachtermeister and Enquist now propose a new explanation in which sexual conflict plays a role. According to this hypothesis, asymmetry between the sexes in their eagerness to mate leads to the evolution of complex rituals as a male tries to lure a female into reproducing earlier than is optimal. They simulate this process using a neural network model, run over 60,000 generations. 'Male' signals are fed into the 'female' network, which contains internal feedback loops that can react to a sequence of stimuli.

When new male sequences of signals were allowed to evolve, females started to reproduce earlier than optimal, but in response the females then evolved increased resistance to the new displays. This model co-evolutionary process, which entails no female choice or mutual co-operation, appears to operate regardless of the costs of the signal or the quality of the male. — AMS

Behav. Ecol. **11**, 405 (2000).

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SOURCE: (LEFT) CALLEJA *ET AL.*, *DEVELOPMENT* **127**, 3971 (2000). COMPANY OF BIOLOGISTS LTD. (RIGHT) PICTUREQUEST.

the dot is spin polarized, so that only electrons with opposite spin to that of the dot can pass through it, thus creating an efficient single-spin filter. The dot can function as a single-spin memory when its electrical contacts are also spin-polarized—the electron occupancy being detected with electron spin resonance techniques. — ISO

Phys. Rev. Lett. **85**, 1962 (2000).

CLIMATOLOGY

Strategies for Slowing Global Warming

The large and rapid atmospheric warming of the twentieth century, which few now doubt can be explained without invoking anthropogenic forcing, is thought to be mostly the result of the buildup of trace greenhouse gases in the atmosphere. Although carbon dioxide has received the most attention, an equal amount of heat is trapped in the atmosphere by the combined effect of the other four principal trace greenhouse gases: Methane, chlorofluorocarbons (CFCs), tropospheric ozone, and nitrous oxide.

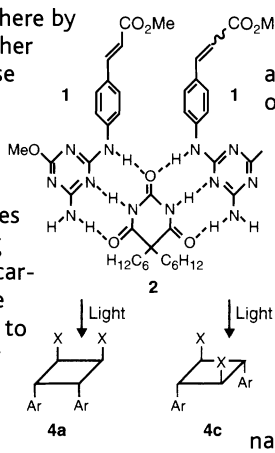
Hansen *et al.* argue that instead of constructing strategies for mitigating global warming that rely mostly on reducing carbon dioxide emissions, a more expedient approach would be to reduce emissions of the other greenhouse gases and black soot (a product of coal and diesel fuel combustion). Methane emissions could be reduced by modifications in agriculture, animal husbandry, coal mining, oil drilling, and waste management. Decreasing soot and ozone would confer large positive benefits for human health. None of these actions would imperil economies that depend on energy use, and their adoption would allow more time for the development of more fuel-efficient technology and renewable energy sources. Significantly slowing the trend of global warming probably will require burning less fossil fuel, although these other methods should help slow the rate of anthropogenic climate change over the next half century until the better energy technology has been developed. — HJS

Proc. Natl. Acad. Sci. U.S.A., in press.

CHEMISTRY

The Tie that Switches the Bond

Just as enzymes can bring reacting groups together, reversible supramolecular assembly can catalyze reactions in solution. Bassani *et al.* have used such an assembly to redirect the outcome of a photochemical reaction, in this case the dimerization of a molecule containing a double bond to form a cyclobutane ring. The cinnamic acid derivative **1** (where Me is methyl) can bind through hydrogen bonds to both sides of the scaffold **2** and increase the yield of photoproducts. In the absence of **2**, the predominant product is the "head to head" isomer **4a** (where X is CO_2Me and Ar is aryl), but in the presence of **2** the yield of the "head to tail" isomer **4c** increases substantially. — PDS



J. Am. Chem. Soc., in press.

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Looking Frazzled?

In *Drosophila*, Netrins and their receptors DCC and Unc-5 are known to be important for proper axon guidance. However, Hiramoto *et al.* demonstrate that photoreceptors adopt an unusual mechanism of target guidance involving Netrin and Frazzled, a protein orthologous to DCC. In the developing fly embryo nerve cord the Netrin messenger RNA and Netrin protein do not colocalize. Instead Netrin protein localizes to the dorsolateral region, highly overlapping with the distribution of Frazzled. The *Drosophila* pioneer neuron dMP2 requires proper localization of Netrin and Frazzled for its migration, but Frazzled does not act as a sensor for Netrin but as an attractant (with Netrin) to guide migrating neurons. Because the dMP2 neuron does not express Frazzled protein, this suggests that another, uncharacterized receptor is expressed by dMP2 neurons which would bind to Frazzled-captured Netrin and send migratory signals inside the dMP2 axon.—JN

Nature **406**, 886 (2000).

CREDITS: BASSANI ET AL., J. AM. CHEM. SOC. 122, 3 (2000).