Chemistry

Attractive development for male moths

Green Chem. **6,** 305–307 (2004)

The larva of the cabbage moth (*Mamestra brassicae*) is a voracious creature that feeds on a wide variety of vegetable leaves and is a serious pest for farmers in North America and Europe. Sex pheromones are used by the ton to control these and numerous other insect pests by luring male moths into traps at the edges of fields, thus stopping them from breeding.

Petra Nešněrová *et al.* now report a greatly simplified synthesis of a moth sex pheromone that may also be applicable to other lepidopteran pheromones. The authors genetically modified tobacco plants (*Nicotiana tabacum*) so that they produced a molecular precursor to the pheromone, bypassing most of the chemical steps required during conventional synthesis. They claim that this is the first synthesis of a sex pheromone that exploits such 'molecular farming' techniques.

The pheromone precursor, an ester, made up 6.5% of the total lipids extracted from the plant. Two simple chemical steps then delivered the final pheromone, which performed well in tests in the cabbage fields of Bohemia.

The authors are now working on a genetic-modification strategy that could produce the pheromones directly in the tobacco plants. **Mark Peplow**

Molecular biology

Codons and gene expression

Proc. Natl Acad. Sci. USA **101,** 12588–12591 (2004)

In the genetic code, three bases make up a codon, and a codon instructs the cellular machinery to insert a particular amino acid into a protein. Most amino acids can be encoded by more than one codon, and Joshua B. Plotkin *et al.* have found hints that different human tissues preferentially use different types of codon.

The researchers analysed the sequences of genes that are selectively expressed in the brain, liver, uterus, testis, ovary or vulva. In most cases, they found that each tissue uses a characteristic set of codons for a particular amino acid. For example, a testis-specific gene uses the codon GCC for the amino acid alanine only 20% of the time, whereas a uterus-specific gene uses the same codon nearly 60% of the time.

The authors suggest that the differing patterns of codon usage may help determine which genes will be efficiently converted into proteins in different tissues. This could be the case if, for example, the different tissues contain different pools of transfer RNAs — the molecules that recognize the codon and slot appropriate amino acids into the protein. The finding might be important to consider during gene therapy, so that a gene inserted into a target tissue can be translated as efficiently as possible. **Helen Pearson**

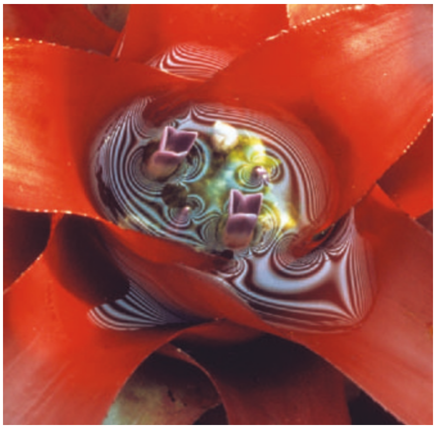
Biological chemistry

Bromeliad prospects

J. Natural Products doi: 10.1021/np0499766 (2004)

Bromeliads are common tropical plants that hold water in a pool, or tank (pictured), formed by the bases of their leaves. These tanks are home to a rich assortment of organisms, including many as yet uncultured bacteria that produce a host of unknown, but possibly useful, chemicals. Sean F. Brady and Jon Clardy now report the identification of an antibiotic produced by such a bacterium.

Brady and Clardy extracted DNA fragments from the tank water of Costa Rican bromeliads, and inserted them into



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the genome of *Escherichia coli* bacteria. One of the *E. coli* clones produced a compound with antibiotic activity, which the authors identify as palmitoylputrescine: they infer that this small, organic molecule is synthesized through a gene encoding an enzyme called palmitoylputrescine synthase.

The function of palmitoylputrescine in bromeliad bacteria is unclear, but similar molecules are involved in activating multiple receptors in animal tissues and inducing volatile defence signals in plants. The researchers hope that, with further refinement, the method they have used will help in testing DNA extracted from other environmental samples for genes that encode potentially valuable natural products. **Helen Pilcher**

Optics

Light takes a turn

Phys. Rev. Lett. **93,** 083901 (2004)

Electrons moving perpendicular to a magnetic field experience a force that pushes them off course. In a two-dimensional conductor they tend to pile up on one side, creating a potential difference. This phenomenon, called the Hall effect, is used to detect magnetic fields by means of the Hall voltage they generate in a suitable sensor. Masaru Onoda *et al.* show theoretically that something like the Hall effect operates for photons moving in a ray of light when they travel through a medium with a non-uniform refractive index.

For example, circularly polarized light passing across the interface between two materials with different refractive indices is shifted perpendicular to both the incident direction of the beam and the normal vector of the interface. Where does the force come from in this case? It is a consequence of the polarization, or spin, of a photon. The spin and angular momentum of a photon change as it encounters a change in refractive index, and in order to conserve total momentum this leads to a shift in the phase of the electromagnetic wave — it is a purely geometric effect.

The phase shift is known as the Berry phase, and it means that the trajectory of the photon alters. Onoda *et al.* say that the effect might be magnified, so as to be easily observed, in photonic crystals (regular, microscopic arrays of light-scatterers) with non-uniform spacings between the scatterers. **Philip Ball**

Aquaculture

Signs of escaped salmon

Ecol. Freshwater Fish **13,** 176–184 (2004)

Escapes of Atlantic salmon (*Salmo salar*) from fish farms are a concern for ecologists, who fear that they may interbreed with wild populations and reduce their genetic diversity. J. B. Dempson and M. Power now propose a non-lethal way to identify escapees by spotting the tell-tale signs of the diet they would have eaten while in captivity.

Dempson and Power took wild salmon from the Conne River in Newfoundland, Canada, and salmon from farms in the Bay d'Espoir at the river's mouth. They sampled adipose fin and muscle, and measured the concentrations of the stable isotopes carbon-13 and nitrogen-15 in these two tissues, after adjusting for fat content.

Tissues from farmed salmon contained 0.126% less carbon-13 than those from wild salmon, whereas levels of nitrogen-15 were 0.179% higher on average. There was no clear difference in isotopic signature between adipose fin and muscle. The isotopic contrast between the farmed and the wild fish is due to their differing diets. Although it is unclear how long escaped salmon would retain their characteristic signature in the wild, the authors believe that it should remain evident for an entire growth season. **Michael Hopkin**