

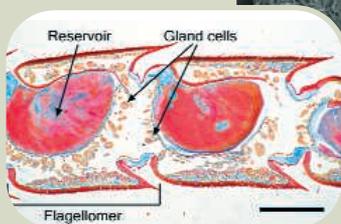
edited by Gilbert Chin

## ECOLOGY

## Food Preservative

Many solitary predatory wasps have to solve the problem of long-term storage of food items as provisions for developing offspring. The European beewolf (*Philanthus triangulum*) supplies its larvae with immobilized honeybees as nourishment. The beewolf larva spins a cocoon and overwinters in a brood chamber, snug and warm, which are ideal growth conditions for microbes wishing to share its food cache.

The female beewolf daubs the chamber with a white substance extruded from glands in its antennae, and Kaltenpoth *et al.* have discovered that this exudate is the source of a *Streptomyces* bacterium, which, predictably, produces antibiotics that prevent microbial infestation and deterioration of the food supply. This symbiosis is analogous to that found in leaf-cutting attine ants, and as in that relationship, the *Streptomyces* are transmitted from mother to daughter wasp. If brood cells were not inoculated with the bacterium, larval survival fell from over 80% to less than 7%. Likewise, if a female beewolf fails to acquire the *Streptomyces* preservative, then it appears incapable of breeding successfully. — CA



A reservoir of bacteria (red) in the antennal glands (left) and a close-up view of the white exudate (above).

*Curr. Biol.* 15, 475 (2005).

the two different catalytic sites are often difficult to predict and control. Takita *et al.* show that a single trivalent indium catalyst can activate both nucleophile and electrophile in the same reaction mixture under relatively mild conditions. The reaction involves the addition of terminal alkynes to aldehydes or to ketones, and it generally requires deprotonation of the alkyne with stoichiometric organometallic base. The catalytic In(III) salt assumes this role in the presence of an amine base, and, at the same time, it acts as a Lewis acid to activate the carbonyl electrophile. Evidence for this dual function comes from infrared and nuclear magnetic resonance spectroscopy. The reaction proceeds under solvent-free conditions and produces high yields from aromatic aldehydes, which have resisted alternative approaches. InBr<sub>3</sub> works best for aldehydes, whereas ketones require the triflate salt In(SO<sub>3</sub>CF<sub>3</sub>)<sub>3</sub>. — JSY

*Org. Lett.* 10.1021/ol050069h (2005).

## BIOMEDICINE

## Tales of Survival

*DJ-1* is an intensely studied but mysterious gene with links to two human diseases. Originally identified as a collaborator of the H-ras oncogene in conferring tumorigenic properties on normal cells in culture, *DJ-1* was subsequently found to be mutated in a hereditary form of Parkinson's disease. Although this discovery triggered a flurry of research on the mechanistic roles of *DJ-1* in neurodegenerative disease, progress on that front has been slow.

Kim *et al.* revisit the question of how *DJ-1* contributes to tumor formation and show

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## PLANT SCIENCES

## Enabling Traffic

KN1 is a transcription factor that moves from cell to cell in order to regulate, among other things, stem cell identity in the shoot apical meristem of maize. Another transcription factor, GL1, prefers to stay in its home cell, where it regulates the formation of tiny hairs (trichomes) in the leaf epidermis of *Arabidopsis*. Whether intercellular transport of KN1 is regulated is addressed by Kim *et al.* By making a chimeric construct of KN1 with GL1, the authors determined which portions of KN1 could drive intercellular transport of misexpressed GL1 and thus rescue trichome formation. A GL1-KN1 fusion using only the C-terminal portion of KN1 supported rescue through intercellular transport, whereas the fusion using the N-terminal portion of KN1 did not. The homeodomain included in that C-terminal portion of KN1

turned out to be critical.

Both the mRNA and the KN1 homeodomain protein seem to be required for intercellular trafficking. Thus, the KN1 homeodomain is required to transport both itself and its mRNA through plasmodesmata channels. — PJH

*Genes Dev.* 10.1101/gad.332805 (2005).

## GEOPHYSICS

## What Causes Sprites?

Sprites are transient luminous events in the mesosphere, at heights of about 50 to 90 km. They are associated with positive cloud-to-ground lightning, but may occur up to 50 km from the location of the lightning strike, with a delay of up to 100 ms. The mechanism



Images of sprites. by which

sprites are generated and evolve is not well understood.

Ohkubo *et al.* have analyzed 21 sprites detected on 15 December 2003 during thunderstorms above the coast of the Sea of Japan. By comparing optical measurements with data taken at very low radio frequencies, the authors show that low-frequency discharges occur within the cloud at the same time as the sprite. These intra-cloud discharges may generate the sprites and help to explain the long time delay between cloud-to-ground lightning and sprite formation. — JFU

*Geophys. Res. Lett.* 32, 10.1029/2004GL021943 (2005).

## CHEMISTRY

## Double Duty

Strategies for homogeneous catalysis of bimolecular reactions tend to focus on activating only one of the two reactants. Recently, several bimetallic systems have been developed for dual activation, but the interactions between

that the DJ-1 protein is expressed at aberrantly high levels in human breast and lung cancers and that the *DJ-1* gene negatively regulates an important tumor suppressor gene called *PTEN*. In so doing, *DJ-1* appears to activate a key cell survival pathway that is normally inhibited by *PTEN*, thereby preventing the death of tumor cells. Interestingly, another gene recently found to be mutated in hereditary Parkinson's disease, *PINK1* (Valente *et al.*, Reports, 21 May 2004, p. 1158), was originally identified as a gene induced by *PTEN*, raising the possibility that dysregulation of this critical cell survival pathway may underlie both diseases. — PAK

*Cancer Cell* 7, 263 (2005).

## GEOCHEMISTRY

### Night and Day, You Are the One

The hydroxyl (OH) radical is a highly reactive atmospheric component that is involved in many important chemical reactions in the troposphere, particularly the oxidation of organic compounds.

One important pathway for OH formation is the photolysis of nitrous acid (HONO), which accumulates in the lower troposphere at night and serves as a significant source of OH radicals in polluted air in the early morning. A daytime source of HONO has been proposed, on the basis of measurements showing higher-than-predicted HONO concentrations during the day.

Kleffmann *et al.* now report direct measurements of nitrous acid and hydroxyl radicals in the atmosphere at a forest site in Jülich, Germany. Their results establish the existence of an efficient daytime formation process for HONO, because they also measured the photolysis frequency of HONO, the other parameter needed to assess the size of the daytime HONO source. They conclude that HONO contributes substantially to the local primary OH production and that it may have an important influence on the oxidation of biogenic volatile organic compounds emitted by the forest. — HJS

*Geophys. Res. Lett.* 32, 10.1029/2005GL022524 (2005).

## HIGHLIGHTED IN SCIENCE'S SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT



### Creating Birds of a Feather

Although feather development is known to depend on reciprocal signaling between dermis and epidermis, the mechanisms that program the feather patterns of a pigeon differently than those of a peacock or a parakeet have been unclear. Eames and Schneider exploited the difference in embryonic origin of the dermis and epidermis of the head and neck by exchanging premigratory neural crest cells (destined to form dermis) between quail and duck embryos. The spatiotemporal patterning of feather bud appearance in the two species is distinct—for instance, quail feather placodes start as a medial and two lateral rows along the cranial epidermis, whereas duck feather placodes first appear as rows over each eye—as are the size and spacing of the feather buds. Quail neural crest cells transplanted into duck, creating a “quck,” accelerated feather development (consistent with the more rapid maturation of quail) and elicited feather buds with a quail-like pattern. The authors used *in situ* hybridization to investigate the timing of the expression of components and targets of the bone morphogenetic protein, Sonic Hedgehog, and Delta-Notch signaling pathways in these quail-duck chimeras and observed quail-like timing of gene expression in both quail-derived dermis and duck-derived epidermis. In contrast, duck neural crest delayed feather morphogenesis and the expression of signaling genes when transplanted into quail. The authors conclude that the plasticity with which host epidermis can respond to dermal instructions may promote the evolution of new patterns of feather development. — EMA



Quail-like (brown and black) and duck-like (white) feather development in the quck.

*Development* 132, 1499 (2005).

## CHEMISTRY: Double Duty

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