Bending Light in Air

When ultra-intense laser pulses are shot into a dielectric, a plasma can be created with the light ionizing a channel as it travels. Under the right conditions, the light pulses can be self-focused, creating a "light bullet." Propagating in air, this effect has been used to control lighting. So far, the trigger pulses used have resulted in the generation of plasma channels and filaments that propagate in a straight line as, perhaps, you would expect and form filaments that propagate in a straight line resulting in the generation of plasma channels. Bending Light in Air, this effect has been used to control lighting. So far, the trigger pulses used have resulted in the generation of plasma channels and filaments that propagate in a straight line as, perhaps, you would expect and form filaments that propagate in a straight line.

Fourfold Oxidation

Biosynthetic pathways often rely on enzymes to append hydroxyl and thiol groups in specific locations on an already-assembled complex molecular framework, thereby preventing interference from these reactive groups at earlier stages. Inspired by this propensity, Kim et al. (p. 238; see the Perspective by Miller) adopted an analogous strategy in chemical synthesis of the fungal metabolite (+)-11,11'-dideoxyverticillin A, a dimer of alanine-tryptophan dipeptide derivatives with a sensitive bridging disulfide motif. The authors prepared the dimer framework first, and then relied on its stereochemistry to direct the simultaneous introduction of four OH groups using an experimentally optimized oxidant. The next step stereoselectively replaced all four hydroxyls with sulfur, yielding an intermediate that was easily oxidized to the final product. The efficient 10-step synthesis yielded sufficient product for crystallographic characterization.

Regulated Responses to Irregular Signals

Experiments on the effects of hormones or cytokines often compare responses of cells which the motion of the droplets would cease, with an increase in velocity both above and below this temperature. The motion results from the interplay between surface evaporation effects and the motion of the droplets, which prevent the evaporation of the regions they are covering.
incubated in the presence or absence of the activating compound. But in vivo, cells experience variations in the amount of stimulus that may be irregular or pulsatile. Ashall et al. (p. 242) explored the response of the transcription factor NF-κB (a major mediator of transcriptional responses in immune function) to short pulses of exposure to the cytokine tumor necrosis factor-α (TNFα). Oscillations in the movement of the transcription factor into and out of the nucleus could be synchronized by exposure of cells to pulses of TNFα. Furthermore, whether transcription of particular genes was activated or not, depended on the frequency of stimulation and consequent timing of NFκB translocation. Cells in inflammatory tissues may experience similar changes in stimulation by TNFα, and thus respond in distinct ways, depending on the timing of the signals received in the cells.

**Flight Plan**

To fly with precision, flying animals need to be able to maneuver and stabilize their course and orientation immediately following a change of direction. However, the dynamics of turning are poorly understood. Hedrick et al. (p. 252; see the Perspective by Tobalske) develop a framework for predicting maneuverability and stability in flying animals, then use it to predict turning dynamics of seven very different flying animals (including insects, bats, and birds). Geometrically similar animals have turning dynamics in “wingbeat time” regardless of size; fruit flies and hummingbirds both require the same number of wingbeats to finish a turn. An increase in wingbeat frequency allows animals to enhance both maneuverability and stability, two properties previously thought to be in opposition.

**Synonymous, Not the Same**

The genetic code is redundant—many of the 20 common amino acids can be coded for by more than one codon, known as synonymous codons—which means that different DNA sequences can code for the same protein sequence. Synonymous codon usage has been thought to be determined by the abundances of iso-accepting transfer RNAs, which can play an important role in either increasing the efficiency or the accuracy of protein synthesis by the ribosome. To test this idea, Kudla et al. (p. 255) created 154 synonymous variants of the green fluorescent protein gene. Rather than synonymous codon usage playing a dominant role in overall translational efficiency, instead, the secondary structure of the messenger RNA, especially at its 5’-end, was most critical. Thus, with regard to protein synthesis, initiation of translation rather than elongation, is limiting for gene expression.

**Mosquito Immune Mediation**

Mosquitoes are vectors of numerous human and animal diseases, including malaria. Approaches that enhance or otherwise alter the natural defense mechanisms of mosquitoes could help to reduce or eliminate their competence as vectors of disease. Proteins containing leucine-rich repeats (LRIM1 and APL1C) are known to mediate immune responses in the mosquito, *Anopheles gambiae*, against the malaria parasite, *Plasmodium berghei*. Povelones et al. (p. 258, published online 5 March) used gene silencing to show that these proteins produce an immune cascade together with a complement-like protein, binding to the surface of the parasite targeting it for destruction. LRIM1 and APL1C are members of an extensive family of secreted leucine-rich repeat containing proteins that are unique to mosquitoes.

**The Enzymology of Brain Cancer**

Many human gliomas (a type of brain tumor) harbor somatic mutations in two genes encoding isocitrate dehydrogenases (IDHs). By structural modeling and biochemical analyses, Zhao et al. (p. 261; see the Perspective by Pollard and Ratcliffe) show that tumor-associated mutations in IDH1 lead to a loss of enzyme activity in a dominant manner through the formation of catalytically inactive heterodimers. Expression of mutant IDH1 reduces formation of the enzyme product, α-ketoglutarate, and enhances the expression of hypoxia-inducible factor–1α (HIF-1α), a subunit of a transcription factor that helps cells to survive and grow when oxygen levels are low. Thus, the IDH1 gene is likely to function as a tumor suppressor that, when inactivated by mutation, facilitates tumor growth through effects on the HIF-1 pathway.