# EDITORS' CHOICE

edited by Stella Hurtley

NEUROSCIENCE

## Predicting Memories

In the human brain, the medial temporal lobe is implicated in memory formation. The precise contribution of its different structures to memory formation, however, has been the subject of much controversy.

Strange *et al.* optimized functional magnetic resonance imaging for the scanning of the medial temporal lobe during a verbal encoding task. The activation strength of the left perirhinal cortex and the left hippocampal body during the task was significantly greater for words that the person subsequently remembered versus those that were forgotten, confirming earlier electrophysiological data obtained from patients with temporal lobe epilepsy. In the right anterior hippocampal, bilateral parahippocampal, and posterior fusiform gyrus regions, activation was observed that predicted subsequent memory for the initial two words of a list but not for later words. This phenomenon, the primacy effect, has been attributed to greater rehearsal or to the relative distinctiveness of initial items. These findings support a role for anterior hippocampal, parahippocampal, and posterior fusiform activation in the processing of novelty and distinctiveness. — PRS

*J. Neurosci.* **22**, 523 (2002).

POLYMER SCIENCE

## Just Add Water

In polymer and biological gels, water affects both the mechanical properties of the gel and the ordering of the macromolecules, which in turn affect properties such as solute diffusion. For a series of block copolymers, Miyazaki *et al.* show that the water can also cause a localized phase transition. The authors reacted *n*-alkyl acrylate, which is hydrophobic, with acrylic acid, which is hydrophilic, to form a block copolymer. In the dry state, the alkyl segments formed a disordered bilayered structure. The addition of even a small amount of water caused the alkyl segments to crystallize and increased the melting point of the copolymer. It is possible that the water preferentially hydrates the acrylic acid segments, which lowers the glass transition temperature of the copolymer and raises the mobility of the alkyl segments. Thus, when water was first added to the copolymer, the mechanical strength of the gel increased, although above 5% water content, the strength decreased, which is typical of most hydrogels when additional water is added. — MSL

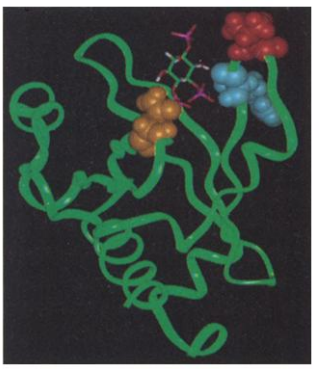
*Langmuir* 10.1021/la010922v.

CHEMISTRY

## Toward $IP_3$ Biosensors

Many cellular functions are regulated by the second messenger D-*myo*-inositol-1,4,5-trisphosphate ($IP_3$), which helps regulate intracellular $Ca^{2+}$ concentrations. The concentration of small ionic species such as $Ca^{2+}$ can be mapped in cells by using fluorescent sensors, but $IP_3$ must be assayed with ex situ methods such as high-performance liquid chromatography.

Morii *et al.* report on progress toward an $IP_3$ biosensor based on binding by the pleckstrin homology (PH) domain of rat phospholipase C d (PLCd). They mutated three amino acids ($Arg^{56}$, $Val^{58}$, and $Asn^{106}$) to cysteine and then labeled these sites with one of four thiol-reactive dyes. Several of the labeled PH domains showed large changes in fluorescence in response to micromolar solutions of $IP_3$. The labeled PH domains also showed greater selectivity for $IP_3$ as compared with other inositols. — PDS



**Schematic of fluorescently labeled PLCd (ribbon) with bound IP3 (wire-frame model).**

*J. Am. Chem. Soc.* 10.1021/ja016824d.

BIOCHEMISTRY

## New Kid on the Block

Cyclophilin was first identified as the cellular target of the immunosuppressive drug cyclosporin; it also possesses a prolyl isomerase activity and binds proline-containing peptides. However, the in vivo function of this family of proteins remains unclear: Are they needed to flip the prolyl peptide bonds, or do they serve as chaperones that stabilize particular protein conformations? Attempts to untangle these putative roles have been stymied by the inability to disable one activity without disrupting the other.

Horowitz *et al.* examined the catalytic and structural participation of the cyclophilin

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ECOLOGY

## The Eagle Has Landed

Introduction of alien species, especially to islands, often has dramatic effects on native ecosystems and their flora and fauna.

Roemer *et al.* report a case of wholesale restructuring of the predator community in the California Channel Islands, after the introduction of an exotic prey species—the pig. The ensuing abundance of feral piglets enabled a top predator species, the golden eagle, to colonize from the mainland. The eagles also preyed on the islands' native mammalian predators—foxes and skunks—and thereby altered the competitive dynamics of these two species. The island skunks, being mainly nocturnal, were less vulnerable than foxes to eagles. The fox populations declined rapidly, allowing the skunk population to increase as its dominant competitor became increasingly scarce. This case illustrates how the introduction of a prey species can indirectly cause the decline of a predator, probably leading to cascading effects down the rest of the food chain. — AMS

**Island wildlife.**

*Proc. Natl. Acad. Sci. U.S.A.* **99**, 791 (2002).

CREDITS: (TOP RIGHT) MORII *ET AL.*, *J. AM. CHEM. SOC.* 10.1021/JA016824D; (BOTTOM) GARY ROEMER, NMSU

USA-CyP in the splicing of pre–messenger RNA (pre-mRNA). USA-CyP binds to the human splicing factors hPrp4 and hPrp18. hPrP4 is required for assembly of the spliceosome complex that mediates the first half-reaction (separating the 5′ end of the intron from the pre-mRNA), and hPrP18 is required during the second half-reaction (removing the intron and joining exons). These structural interactions differ from those of cyclophilins and HIV capsid proteins, in that binding occurs at a site distinct from the catalytic center. Thus cyclophilin can be added to the list of choreographers who direct the sequential rearrangements of RNA and protein that occur during pre-mRNA splicing. — GJC

*EMBO J.* **21**, 470 (2002).

**Imprints of ancient jellyfish in sandstone beds.**

PALEONTOLOGY

## Beached Jelly Bellies

Scyphozoan medusae or jellyfish are pelagic organisms that tend to congregate in near-shore, shallow water environments for reproduction, hunting, or during stormy weather. During the ebb of tides, large groups can be stranded. When a medusa realizes it is stuck in the sand, it turns belly-up and pumps its bell to try to escape, but this response only aggravates the sticky situation by filling the medusa with sand. The deceased medusa leaves a mound of sand and decomposing internal organs surrounded by concentric concave rings where it tried to repeatedly pump to flee.

Now, Hagadorn *et al.* have found rare and unusual traces of several strandings of large medusae from the late Cambrian, exquisitely preserved in coarse-grained sandstone beds in Wisconsin. The concentric concave rings surrounding sandy mounds, which in some cases show possible traces of internal organs, are commonly preserved on rippled bedding planes. Together, these features suggest a shallow lagoon environment, possibly a sandy barrier island, where frequent tropical storms may have caused the multiple strandings. Thus, these ancient sands provide a rare glimpse of rarely preserved soft-bodied life in Cambrian seas. — LR

*Geology* **30**, 147 (2002).

HIGHLIGHTED IN *SCIENCE*'S SIGNAL TRANSDUCTION KNOWLEDGE ENVIRONMENT

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## Celebrating T Cell Diversity

The duration of signals emanating from the T cell receptor (TCR) is finely regulated; for example, by controlling TCR half-life, by posttranslational modification, and by the recruitment of inhibitory proteins.

Egen and Allison have found that the inhibitory protein cytotoxic T lymphocyte antigen-4 (CTLA-4) is recruited to the immunological synapse, in direct proportion to the strength of the TCR signal, where it acts to extinguish TCR-dependent signals. CTLA-4 in T cells that were cultured with antigen-presenting cells (APCs) bearing agonistic or weakly agonistic peptides moved toward microtubule-organizing centers close to the site of T cell–APC apposition. However, only T cells stimulated with the stronger agonist peptides moved CTLA-4 into the immune synapse at the plasma membrane. Thus the location of CTLA-4 depends on the strength of the TCR signal. Strong signals by a few T cells (that have high affinity for an antigen) could quickly lead to the proliferation of a subset of T cells at the expense of a diverse group of proliferating T cells with varied affinity for the antigen. By recruiting the inhibitor CTLA-4 to the immune synapse, the prolonged signaling that would be mediated by strongly agonistic antigens is attenuated, and weakly stimulated T cells can proliferate, maintaining the diversity of T cell–mediated responses. — JN

*Immunity* **16**, 23 (2002).





CREDITS: HAGADORN *ET AL.*, *GEOLOGY* 30, 147 (2002)