**HIGHLIGHTS OF THE RECENT LITERATURE**

**CHEMISTRY**

Mimicking Chlorophyll Assembly

Natural photosynthesis relies on precisely organized groups of dye molecules for the absorption of light energy and its conversion into charge separation. It would be desirable to be able to use these kinds of assemblies in electronic devices built on organic molecules, but it has been difficult to fabricate the sort of complex structures seen in nature.

Würthner et al. describe a structure based on highly polarizable merocyanine dyes. By attaching nonpolar substituents to the dyes, the authors increased the solubility of the dyes in low-polarity solvents; in these solvents, electrostatic interactions between the dye portions of the molecules are favored, leading to dimer formation. Joining two dye moieties with one bridging substituent leads to the formation of stable polymeric aggregates. As the dye concentration is increased further, a complex hierarchical assembly ensues. First, the supramolecular polymer adopts a helical shape. Second, these polymers aggregate into a rod-like bundle of six helical strands. Finally, at high concentrations, these rods or columns form a hexagonal arrangement, which resembles that of chlorophyll dye molecules in some bacteria. — JFU


**CLIMATE SCIENCE**

Snowy Blanket

One characteristic of the global warming that is currently under way—and which is expected to continue as the atmospheric burden of anthropogenic greenhouse gases increases—is that the magnitude of warming at high latitudes is greater than that at low latitudes. Areas of permafrost, therefore, are particularly susceptible to melting, with the potential consequence that they will become large sources of carbon dioxide, intensifying the buildup of greenhouse gases. Stiglitz et al. discuss a rarely considered aspect of predicting the amount of warming that will occur in these areas: the role of snow cover. Their models indicate that the sharp rise of borehole temperatures over the past decade in these regions may have been as much a function of snow cover and depth as of air temperature. They suggest that a better understanding of this effect and of changes in winter precipitation and snow are needed to understand how permafrost regions will be affected in a warmer world. — HJS


**CELL BIOLOGY**

Staged Transport

When an influenza virus infects a cell, it enters via endocytosis at clathrin-coated pits. After these pits pinch off from the plasma membrane, the clathrin-coated vesicles lose their coats in the cytoplasm and then fuse with each other to form early endosomes, which subsequently mature into late endosomes. During these stages, the pH in the lumen of the endosome falls from about 7.0 to about 5.5, at which point the influenza hemagglutinin protein initiates fusion of the viral envelope with the endosomal membrane, thereby releasing the viral capsid into the cytosol where it can establish a productive infection. Lakadamyali et al. have been able to track the characteristics of single viral particles in real time by first fluorescently labeling them. After internalization, individual viruses appear to undergo an early active transport process that precedes viral fusion. The first stage of movement is actin-mediated, whereas subsequent stages involve the microtubule motor dynein and end with the virally loaded endosome in the perinuclear region, where the pH-triggered fusion occurs. — SMH


**PSYCHOLOGY**

A Mouse IQ Test

General cognitive ability has been the focus of heated debate over its measurement, its significance, and the degree to which innate and learned components contribute. Proficiency on standardized functional tests has been incorporated into a metric commonly referred to as the intelligence quotient (IQ). Matzel et al. have developed a similar performance-based approach to quantifying learning ability and applied it to a sample of 56 genetically heterogeneous mice. They chose five dissimilar tasks (whose acquisition would not transfer between tasks) in order to impose demands on sensory and motor skills and on the processing of information and motivation. The relative rankings of individual mice across the battery of tests were consistent (and replicated on a second test series); that is, an efficient learner of the Lashley maze also learned to associate tone and electrical shock quickly. Compilation of the data yielded a bell-shaped distribution in learning ability, and a principal component analysis revealed a factor that accounted for 38% of the variance between individual mice. This is comparable to the contribution of general intelligence (the g factor) to the range of human performance on IQ tests (which probe verbal, spatial, and other domains). — GJC


CONTINUED ON PAGE 737
Controlling Death in Biofilms

Biofilms are not just a smear of slime and bacteria; they are complex and differentiated communities with a definite structure of columns and channels. *Pseudomonas aeruginosa* is a bacterium of considerable clinical notoriety and experimental interest that produces a lot of extracellular polysaccharide and alginate and that forms well-defined biofilms. Once attached to a surface, the bacteria often show a developmental sequence involving cell-cell signaling and the production of rhamnolipid surfactants that help to maintain free-flowing water channels.

Webb et al. have dissected the multicellular nature of biofilm development and discovered that a key component of biofilm architecture is programmed cell death, or autolysis. After a week in a glass flow cell reactor, patches of dead cells became apparent within the microcolonies lying in the biofilm. Like the events in fruiting body formation in social bacteria, such as *Myxococcus*, the transcription factor RpoN also controls cell death in *P. aeruginosa*. Death occurs via a combination of the las and rhl cell-signaling circuits, which use acylated homoserine lactones, and by flagellum-mediated bacteriophage infection. — CA


Losing Data in the Ozone

Data collected from DNA microarrays can vary quite a bit, and Fare et al. have tracked down one potential problem that can produce uneven deterioration of the red and green fluorescent signals. During posthybridization stringency washes, cyanine dyes are exposed to and can be degraded by low levels of ozone exposure in the lab. The fluorescence of some dyes diminished at ozone levels as low 10 parts per billion (ppb), whereas others were stable at 100 ppb (just below the level at which ozone alerts would be issued for outside air quality). The loss of signal resulted in single spots appearing as a red center with a green surround. The authors suggest that air filtering within labs, which can keep ozone levels below 2 ppb, should suffice to minimize variation caused by this effect. — PDS


A Signal Deficit in Schizophrenia?

Schizophrenia, a form of mental illness that affects about 1% of the population, is believed to depend on a complex interplay of genetic and environmental factors. Two related articles provide evidence suggesting that alterations in pathways involving the serine-threonine phosphatase calcineurin may contribute to the pathogenesis of this severe and disabling disease.

Miyakawa et al. examined a strain of mutant mice that lacked forebrain calcineurin and observed a spectrum of behavioral abnormalities reminiscent of those found in individuals with schizophrenia. In addition to previously noted deficits in working memory in these mice, the authors describe decreased social interaction, impaired attention, and impaired nesting behavior. The mice also displayed increased hyperactivity, which is characteristic of other animal models of schizophrenia, and enhanced susceptibility to *N*-methyl-D-aspartate receptor blockade.

In an accompanying article, Gerber et al. demonstrate that the *PPP3CC* gene, which encodes the calcineurin γ catalytic subunit, maps to a chromosomal locus previously associated with susceptibility to schizophrenia and displays a polymorphism that resulted in a nonconservative change in amino acid sequence. Genetic analysis of families affected with schizophrenia suggested that variations in *PPP3CC* could increase susceptibility to the disease. — EMA