RANDOM SAMPLES

edited by CONSTANCE HOLDEN

New Director for MBL

After a year-long search for a new director, the trustees of the Woods Hole Marine Biological Laboratory (MBL) this week named marine biologist John Burris to the post. The 43-year-old Burris, executive director of the National Research Council's (NRC) Commission on Life Sciences, comes on board at a time when the lab is hoping to expand its year-round research, yet is having trouble balancing the budget for its renowned summer research and education programs.

Burris may have what it takes to take over the helm at MBL. During his 8 years at the NRC, he directed—and raised the money to finance—studies on human genome mapping, the use of animals in biomedical research, biology education, and the future of U.S. biological research. He also has research credentials: After earning his Ph.D. in marine biology at the Scripps Institution of Oceanography, he was on the faculty at Pennsylvania State University.

Burris

Burris declines to talk about his plans for MBL until he has met with the scientific staff. But his skills will be put to the test at the 104-year-old lab. Some of its 75 year-round scientists have been clamoring for more say in the lab's governance, and they complain that a disproportionate amount of funds have been spent on summer programs at the expense of year-round programs. But endocrinologist Sheldon Segal, chairman of the MBL board of trustees, insists that the mood is "upbeat": A new push will be made to expand the year-round program by building specialized "centers of excellence." "It's time for a new generation of scientists to take over this place from us old-timers," says Segal. Burris will succeed retiring director Harlyn Halvorson on 1 September.

D.C. MCINTOSH

Room to fill. Slice of a wood cell following removal of lignin.

Save a Tree With Chalk

Human craving for printed information may not be easily sated, but the paper industry's voracious consumption of trees might at least be slowed with a newly discovered trick. Finished paper—if you look at it closely enough—is actually a riotous mesh of tiny cellulosic fibers riddled with inorganic particles of calcium carbonate, the stuff of chalk and clam shells. Inorganic fillers like calcium carbonate, clays, and titanium dioxide improve a paper's opacity, brightness, and printing properties.

Increased use of that same cheap filler could also lead to the use of at least 20% fewer trees in the paper-making process, says University of Washington chemical engineer G. Graham Allan. It's just a matter of stuffing the pulp fibers comprising the bulk of paper with more filler.

But there's a catch: Industry will have to desist from a standard practice, says Allan. When making paper with filler, wood pulp fibers—from which gooey carbohydrates, mainly lignin, have been removed—are mixed in a water slurry with the filler, which settles around the fibers. A drying step then locks the filler in the mesh of fibrous cells by causing the cellulose to collapse like a car in a crusher.

That's the part Allan says has to change. He explains that when the lignin is removed from the wood pulp, an enormous amount of space is created inside each fiber's cell wall, only to be later flattened during the drying step. This is a waste of the space, and it could be avoided by stuffing the voids with filler. This could be accomplished, he says, by immersing the wet pulp in a solution of calcium chloride and then a solution of sodium carbonate. This process would fill much of the multilayered cell wall with a precipitate of calcium carbonate.

Indeed, in a lab experiment Allan found that he could replace as much as 30% of pulp with filler before interfering with the interfiber bonding that makes paper strong. Currently, only about 10% to 15% of the pulp gets replaced by filler, says Allan. He obtained a patent for the process last March, and the paper industry is interested. Jim Winters of Weyerhaeuser, in Tacoma, Washington, says that since pulp costs plenty, "paper companies would love to be able to increase the filler level."

Canine Compulsions

Proving that science can do more than perform experiments on man's best friend, that it can contribute to his psyche, child psychiatrist Judith Rapoport, a researcher at the National Institute of Mental Health (NIMH), has addressed a problem plaguing not only canines but their human companions. Many owners of large dogs—labrador retrievers in particular—have been frustrated by their animals' repetitive, nonstop licking of their paws or flanks, a behavior that causes hair loss and lesions known as acral lick dermatitis. While veterinarians in the past have postulated that excessive licking is a response to anxiety or boredom, recent research suggests, rather, that it's "excess grooming" behavior, rather like repetitive hand-washing in humans—which is a hallmark of obsessive-compulsive disorder (OCD).

Rapoport had long suspected such a link—which, if valid, would mean that drugs used to treat OCD might also be effective for acral lick. Now, following a small pilot study, Rapoport has published in this month's *Archives of General Psychiatry* a study showing that (1) drugs effective for OCD also work for a compulsive behavior in dogs; and (2) canine acral lick shows promise as an animal model for OCD, thus adding to what is now a very short list of animal models for human psychopathology.

The drug that has been found effective for OCD is the antidepressant clomipramine, a serotonin uptake inhibitor. In the study, Rapoport and her colleagues compared the responses of three groups of dogs (37 in all) to clomipramine and two other serotonin uptake inhibitors, fluoxetine (Prozac—which is also known to curb obsessional thinking), and sertraline. Within each group, these drugs were pitted against antidepressants (or a placebo) that do not act by blocking serotonin uptake. The results: both clomipramine and fluoxetine led to a reduction of about 50% in compulsive licking, and sertraline caused a significant reduction compared with the placebo.

Researchers have yet to determine the precise brain regions involved in OCD. Rapoport and her colleagues have started a canine brain bank, and already they have the brains of three of their subjects (who had to be euthanized for unrelated problems) for neuropathological examination.

Enzymes of the Night

Why is a jet-lagged traveler like a photosynthetic bacterium? No, this is not a riddle; it's a scientific puzzle. Here's the answer: Both contain enzymes that work harder in the dark. And the enzymes in these two disparate organisms are surprisingly similar, according to endocrinologist David Klein of the National Institute of Child Health and Human Development (NICHD). The version in vertebrates helps synthesize melatonin, a hormone that synchronizes the brain's internal clock with external light cues. In the bacterium *Rhodobacter capsulatus*, it plays a role in photosynthesis—by increasing the activity of photopigments in dim conditions, thereby boosting the organism's ability to capture energy from light.

The surprising structural similarities between the two enzymes—along with the fact that both have little in common with amino acid sequences of any other known vertebrate proteins—points to a common ancestor, and may help explain how melatonin evolved as a light-synchronized hormone, according to Klein and colleagues at NICHD and DuPont, who published their findings in the June issue of *Molecular and Cellular Neurosciences*. "Such an adaptation is an obvious advantage to a photosynthetic organism, especially several billion years ago when light was the primary source of energy," says Klein. But what is "truly remarkable" is that the relationship between darkness and enzyme activity seems to have been preserved since the emergence of early life.

And what about that jet-lagged passenger? Although findings such as Klein's are chiefly of scientific interest, research on melatonin may be nearing a practical payoff. Endocrinologist Josephine Arendt and colleagues at the University of Surrey have developed a melatonin pill that Arendt says may help reduce jet lag and shift work fatigue by "speeding up the rate at which the internal biological rhythm adjusts to the new time zone." Indeed, a study conducted in 1988 with 61 subjects showed that during the first few days of administration, melatonin pills reduced jet lag symptoms by as much as 50%. Arendt is hoping a pill can be made available to travelers within a couple of years.

Cell Damage Seen From Chernobyl

The 30 kilometer radius "forbidden zone" around the Chernobyl atomic plant serves as a sobering reminder of the world's worst nuclear accident. But for former Soviet biologists, it's also a unique natural laboratory. And one scientist, Nadejda Gulaya of Kiev's Pallaguine Institute of Biochemistry, has been doing studies that she claims offer surprising evidence of Chernobyl's after-effects. Prolonged exposure to radioactive fallout from the 1986 accident, she says, has caused damage to cell membranes in both animals and humans.

For the past year, Gulaya has been comparing tissues from animals such as mink, pigs, and rodents inhabiting the Chernobyl area with those from other parts of Ukraine. Her conclusion: Exposure to radiation has, in many cases, caused alterations to membrane phospholipids. These changes, she says, are similar to those that disrupt cellular metabolism following exposure to oxidizing free radicals.

Gulaya also has preliminary data from human studies. She claims to have found similar alterations in the neurons of people who have died since being exposed to Chernobyl radiation. That leads her to speculate that the frequent psychiatric disorders found among Chernobyl's erstwhile neighbors may not just be from mental stress or "radiophobia," but might reflect actual damage to the central nervous system.

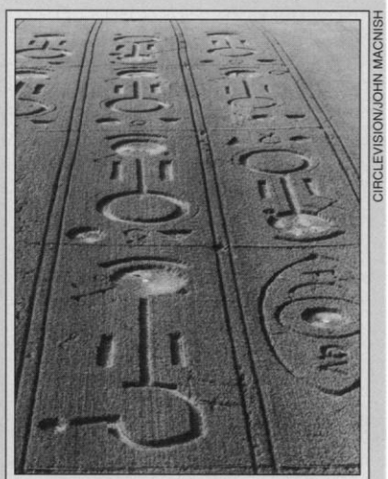
The results have so far been presented only at a May meeting at Chernobyl—and the claims have received a mixed reaction from the few Western scientists who've learned of the research. John Little of the Harvard School of Public Health, for instance, is skeptical, as he believes membrane damage is likely to result only from very high doses of radiation. Jacques Coppey of the Curie Institute in Paris maintains, on the other hand, that sustained doses of low-level radiation can cause phospholipid peroxidation.

Gulaya knows her results would be more convincing if she'd been able to compare the changes with baseline data from immediately after the accident. But this was impossible under a Soviet regime determined to downplay Chernobyl's consequences.

Circle Hoax Contest

This field of barley at West Wycombe, in the Buckinghamshire countryside, contains the results of a unique "crop circle"-making competition, held in the dead of night on 11-12 July. Organizers were *The Cerealogist*—"the journal for crop circle studies"—and sometime plant physiologist Rupert Sheldrake, famous in Britain for his controversial theory of "formative causation," which supposes that there are no physical laws but merely "habits."

The stated purpose: to see if people, when put to the test, can produce a result that is indistinguishable from the crop formations that have become the darlings of the mass media in recent years. Crop circle theories range from UFOlogy, through the invocation of undiscovered meteorological phenomena, to the belief that it's all a hoax. The Wessex Skeptics, scientists belonging to the last camp, declined to join the fun despite the attractive bait: a $5200 first prize, supplied by the Koestler Foundation and the German *Omni*-style magazine *PM*.



CIRCLEVISION/JOHN MACNISH

Cerealogists dream. Ridley's rule-breaking oval appears at lower right in this aerial view of contest entries.

Organizers say they were impressed with the quality of the 12 contributions—although the chairman of the judging panel, Jurgen Krönig, a political correspondent for *Die Zeit*, maintains that even the winner lacked the "flow" evident in many of the circles he has seen.

First prize was taken by a team of three design engineers from the Westland helicopter company in Somerset, who used rope and plastic piping—and a ladder suspended from a trestle—to achieve the pattern prescribed by the competition. But judges were particularly impressed with the narrowly defeated runner-up: American Jim Schnabel, who's working on a Ph.D. in the sociology of science at the University of Bath. Schnabel, unlike the other entrants, worked alone, armed only with a plank, some lengths of rope, and a small garden roller. Says he: "It's pretty clear to me that the phenomenon we've seen in England in the last 10 years is the result of people like me going out into the fields."

One of the more unusual losing entrants, former science editor of *The Economist* Matt Ridley, made a similar point by deviating from the rules to create a mysterious oval pattern, as shown in the photo.