Behavior

Melatonin lag for jet travelers

Many people whose long-distance flights leave them grounded with jet lag believe they can soar back into action by taking melatonin pills (5/13/95, p. 300) for a few days. Any dent in jet lag attributable to melatonin, however, may stem from a person's expectations that the hormone will provide relief, not from its physiological effects, a new study finds.

After taking a plane trip to Norway from New York City, people receiving melatonin experienced just as much jet lag as fellow travelers given placebos, says a group led by psychiatrist Robert L. Spitzer of Columbia University in New York City. The researchers' investigation represents the largest controlled trial to date of melatonin use for jet lag.

Several prior studies found that melatonin dampens jet lag more than placebos do, although each used a different jet lag measure. To gauge the severity of jet lag, Spitzer and his colleagues devised a self-report survey that they hope will catch on with other researchers. It focuses on fatigue, daytime sleepiness, loss of concentration and alertness, memory troubles, weakness, clumsiness, lethargy, and light-headedness.

Norwegian physicians who had visited New York City for 5 days filled out the jet-lag survey soon after their plane landed back in Oslo and again each day for the next 6 days. The time difference between Oslo and the Big Apple is 6 hours.

On their New York departure day and for the next 5 days, the 257 participants received capsules containing an inactive substance, a small melatonin dose, or a large melatonin dose. The men and women, average age 44, swallowed these capsules at bedtime, except for some in the low-dose group who took them 1 hour earlier each successive evening of the study.

To make it more difficult for volunteers to guess whether they were getting melatonin, they all took a placebo capsule a few hours before gulping down their assigned treatments.

Most of the volunteers in each treatment group endured a blast of jet lag on their first day home, followed by progressive improvement, the scientists report in the September American Journal of Psychiatry. Neither of the melatonin treatments eased the time transition better than placebo use.

It remains unclear whether jet lag arises primarily because of an out-of-sync biological clock, stress and sleep loss away from home, or other factors, Spitzer's group holds. —*B.B.*

Warning on elderly mental health

Cases of mental illness among the elderly will rise sharply over the next 30 years, and the current health-care system is ill-equipped to deal with this surge, according to a consensus statement of geriatric and mental-health professionals published in the September Archives of General Psychiatry.

The number of people in the United States older than 65 years with psychiatric disorders will reach 15 million in 2030, estimate the statement's authors, led by psychiatrist Dilip V. Jeste of the University of California, San Diego. About 6 million elderly people met criteria for mental disorders in 1990.

A number of trends point to "an upcoming crisis in geriatric mental health," Jeste and his colleagues assert. First, improved physical health among mentally ill young adults allows many more to reach old age than would have just a few decades ago. Second, a rapidly expanding population of elderly citizens will provide a growing number of candidates for late-life mental ailments. Third, researchers suspect that aging baby boomers will prove more susceptible to depression, anxiety disorders, and substance abuse than current elders do.

The consensus statement proposes that federal and private agencies jointly formulate a 15-to-25-year plan for conducting research on mental disorders among the elderly. It also recommends taking steps to improve the training of geriatric-mental-health workers. —*B.B.*

Physics

Maze-like ratchet sorts biomolecules

Small particles, such as proteins or dust specks suspended in a liquid, perform an erratic dance called Brownian motion. Liquid molecules induce the motion by bombarding the particles randomly, jolting them first one way, then another.

Now, a new device that transforms that jitterbugging into a graceful two-step promises to aid the study of certain biological molecules, researchers report. The device is a novel type of Brownian ratchet, a tiny machine that harnesses the energy of random jiggles to produce a one-way particle flow.

Although a Brownian ratchet powered only by erratic particle motion violates the second law of thermodynamics, researchers have come up with workable ratchets in recent years that use oscillating electric fields. The result is linear particle flow parallel to the applied field (SN: 5/10/97, p. 285).

Taking a step into a new dimension, Alexander van Oudenaarden and Steven G. Boxer of Stanford University have now built the first working version of a ratchet that directs particles to fan out across a plane. The device separates them into streams whose trajectories differ depending on how readily the particles diffuse and the strength of their electric charges. The researchers describe the device in the Aug. 13 Science.

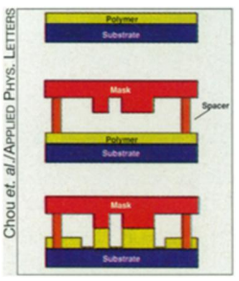
The new ratchet will ease the sorting of hard-to-separate cell-membrane proteins, such as receptors, the scientists predict. "Membrane proteins are notoriously difficult to work with but extremely important," especially in drug development, Boxer says.

In their invention, the experimenters employed semiconductor-processing methods to erect a maze of microscopic titanium-oxide barriers on a glass base. The shape and placement of the 25-nanometer-high barriers enable Brownian motion to nudge the proteins along in one direction, while a constant electric field gently pushes them along a perpendicular course.

Boxer explains that drug designers might use the ratchet to determine whether molecules of a candidate drug have docked with target receptors on a membrane. If the molecules have bonded, the stream bearing the particular receptor would dry up and a new stream containing the drug-receptor complex would appear. —*P.W.*

Plastic reaches to meet silicon guide

For cheap, flexible electronics made mainly from plastics to become feasible, scientists must find new ways to build integrated circuits. The methods used for today's semiconductor-and-metal components employ ultraviolet light, solvents, and other chemicals that destroy plastics.



An experimental means to print circuits copies a pattern by (top) coating a substrate with a polymer, (middle) suspending a mask face down, and (bottom) melting the polymer until it rises to meet the mask.

Stephen Y. Chou and his colleagues at Princeton University report a new technique, benign to polymers, that forms micrometer-scale patterns. The researchers enticed a flat, featureless coating of melted Plexiglas to grow upward to meet a silicon template, or mask. They found hints that the technique might also work for features smaller than a micrometer, Chou says.

The new, uplifting approach, described in the Aug. 16 Applied Physics Letters, differs radically from traditional circuit printing. There, semiconductor or metal atoms deposit except where a coating repels them.

Why the new technique works is "unclear," says Chou, and therefore he finds it "scientifically very intriguing." —*P.W.*