



DATA POINTS: SHORT-STAFFED

The chronic shortage of hospital nurses is affecting U.S. health care. A May 2002 report found increased stays and infection rates among patients when nursing help is scarce. A more recent survey of 168 Pennsylvania hospitals finds that patient deaths become more likely.

Daily amount of nursing care per patient: 11.4 hours Percent of nurses saying they

feel burned out: 43.2 Percent dissatisfied with current

job: 41.5 Percent who plan to quit current job within one year: 20 Average number of patients per nurse: 4 to 8

If workload increases by one patient per nurse ... Percent increase in patient mortality in 30 days: 7 Percent increase in the odds of a nurse burning out: 23 Percent increase in job dissatisfaction: 15

Estimated number of deaths over the 20 months of the survey, if the patient-per-nurse ratio doubled: 1,000

SOURCES: Journal of the American Medical Association, October 23–30, 2002; workload hours per patient from New England Journal of Medicine, May 30, 2002.

NEAR-EARTH OBJECTS Nuclear Close Call?

An asteroid 15 to 30 miles wide could easily wipe out most of the human race. So might a space rock only 15 to 30 feet in diameter, if trigger-happy nations mistake its fall for a nuclear first strike. That long-standing worry was echoed by U.S. Air Force Brigadier General Simon P. Worden during testimony before a congressional subcommittee last October. He revealed that such a meteoroid burned up over the Mediterranean Sea on June 6, 2002, just as tensions between nuclear powers India and Pakistan were at their highest. U.S. early-warning satellites detected the flash from the rock's entry, which generated an explosion comparable to the Hiroshima burst. Had the meteor entered the atmosphere at the same latitude a few hours earlier, Worden stated, then it could have fallen near the Pakistan-India border and been mistaken for a nuclear detonation. Scientists analyzing U.S. federal satellite data reveal in the November 21, 2002, *Nature* that some 300 three- to 30-foot-wide meteoroids exploded in the upper atmosphere in the past eight years and that once a year a meteoroid burst with the force of five kilotons. —*Charles Choi*

NEUROSCIENCE Sonic Boon

Sonic the Hedgehog is not just a video game. The gene named after the game triggers a molecular pathway that determines which cells emerge in the central nervous system during

embryonic development. Curis, a Cambridge, Mass., biotechnology company, has devised a strategy for creating drugs that mimic the activity of *sonic hedgehog*. It has crafted small molecules that cross the blood-brain barrier in adult mice and activate the signaling pathway to either defend against damage or restore neural function in an area of the brain that has been altered to mimic Parkinson's disease. The molecules also protected nerve cells in models of stroke and Huntington's dis-



HUNTINGTON-LIKE LESION (*white circular patch*) develops less markedly in a rat's brain if a preventive molecule is administered (*right*).

ease. Any drug development effort to combat neurodegenerative disorders will have to examine carefully whether such pivotal signaling molecules adversely affect untargeted cell populations. Curis presented its results at the Society for Neuroscience meeting last November and in the *Journal of Biology*. It is also one of two research groups that have developed synthetic small molecules to block the *sonic hedgehog* pathway for potential anticancer treatments. —*Gary Stix*

FALLING STAR could be mistaken for an exploding warhead.

Flipper Flip-Flop

During the Mesozoic era, long before whales came to preside over the ocean realm, marine reptiles called plesiosaurs were the giants that patrolled the seas. Paleontologists have long sought to understand how these enigmatic beasts, which looked like an ungainly cross between a giraffe and a turtle, captured their prey. Previous work focusing on neck length suggested that the shorter-necked, large-headed plesiosaurs, a group called the pliosauromorphs, were built for high-speed pursuits on the open ocean. The longer-necked, small-headed plesiosauromorphs, on the other hand, were deemed better suited to ambush hunting.

F. Robin O'Keefe of the New York College of Osteopathic Medicine studied the geometry of plesiosaur flippers. Pliosauromorphs, he determined, had low-aspect-ratio flippers op-

timized for maneuverability and attack—like the short, stout wings of falcons and fighter planes—good for chasing fleet-finned quarry. But plesiosauromorphs had high-aspect-ratio flippers, comparable to the longer, thinner wings of seagulls and bomber planes—fliers built for efficiency and range. Thus, O'Keefe argues that rather than lurking, plesiosauromorphs probably cruised leisurely over long distances in search of smaller, less elusive prey. He presented his findings at the Society of Vertebrate Paleontology meeting held in October 2002. —*Kate Wong*

MATERIALS SCIENCE

A Stretch for Strong Copper

The harder a material is, the less ductile it tends to be. That trade-off holds true for copper: when composed of tiny crystal domains (or grains) less than 100 nanometers in size, it becomes stronger than the usual coarser-grained copper. Unfortunately, nanocrystalline copper is also usually brittle, which makes practical application difficult. Researchers at Johns Hopkins University have found a way to incorporate both desirable qualities in pure copper. The scientists first cool the metal down with liquid nitrogen and then roll it to a millimeter thickness, thereby breaking up the crystal structure. Careful heat-treating then produces an ultrafine grain structure whose many boundaries make the metal strong, yet it permits about a quarter of the grains to grow coarse, which imparts ductility. The strong but pliable copper, described in the October 31, 2002, Nature, could find use in microelectromechanical and biomedical devices. -Steven Ashley



PLESIOSAURS reigned over the Mesozoic seas.

PHYSICS Ice That Sinks

Imagine ice cubes that, when dropped into a glass of water, sink like stones instead of bobbing up to the top. High pressures and temperatures near -200 degrees Celsius can form such ice, which is 25 percent denser than liquid water (ordinary ice is about 8 percent less dense than water). Scientists in the U.K. and Austria used neutron beams to determine that, unlike normal ice, in which molecules line up in crystalline arrays, this very dense ice is amorphous, just like glass and most of the frozen water in the universe. The discovery is the fifth form of amorphous ice (there are 13 kinds of crystalline water ice). A better understanding of how the molecules lock into these structures may explain the behavior of disordered systems in general and of water in life-bearing systems in extreme cold. It might even support a hypothesis that a second form of liquid H₂O exists. The researchers describe their findings in the November 11, 2002, Physical Review Letters. -Charles Choi

BRIEF POINTS

Downloads in a blink: fiber-optic systems commonly rely on lithium niobate crystals to encode electrical signals as light pulses; a new and potentially cheaper polymer sandwich replacement for the crystal can boost signal speed by a factor of 20.

Science, November 15, 2002

A meta-analysis found that homocysteine levels in the blood are not so strongly correlated with heart attacks as was once thought. A better indicator may be ill will: being hostile predicted future heart disease better than high cholesterol, cigarette smoking or body-mass index.

Journal of the American Medical Association, October 23, 2002; Health Psychology, November 2002

If adults who received childhood smallpox shots (last regularly given in the U.S. in 1972) have residual immunity, then targeted vaccination after a smallpox outbreak could be just as effective as mass vaccinations in preventing the spread of the virus.

Science, November 15, 2002

Better to give than to receive: elderly people who helped with housework, child care, errands and other tasks reduced their risk of dying by almost 60 percent compared with those who did not help.

Psychological Science (in press); www.umich.edu/~newsinfo/