RANDOM SAMPLES

edited by CONSTANCE HOLDEN

Botulism Guilty of Fowl Play

Wildlife biologists are pondering what to do after several major outbreaks of botulism felled millions of waterfowl this summer. The disease, caused by an aquatic microbe, brought the largest bird die-off in North America in recent memory.

Water birds pick up the disease, which peaks in summer months, by eating insect larvae and other invertebrates that carry the *Clostridium botulinum* neurotoxin. Paralyzed, they often suffocate or drown. Avian botulism has probably been around for at least a century in western regions, but now it's popping up "in almost every state," says Tonie Rocke of the National Wildlife Health Center in Madison, Wisconsin. Among the hardest hit are northern pintail ducks. Included in the summer toll—as revealed by tests on carcasses—are more than 5000 ducks and other birds at a refuge in Illinois; close to 100,000 birds at Great Salt Lake in Utah; and perhaps half a million birds at Old Wives Lake in Saskatchewan. This type of botulism is not known to harm people.

Some outbreaks of avian botulism are inevitable, because spores of *C. botulinum* are present in most wetlands. The microbe turns deadly when it has a good protein supply—decaying organic matter, dead bugs, or bird carcasses. Outbreaks spread when birds eat toxin-drenched maggots feeding on dead birds, explains wildlife pathologist Gary Wobeser of the University of Saskatchewan. Factors like temperature, pH, and salinity also matter. Wetter weather in the past few years as well as water that contains more pesticides (which create masses of dead invertebrates) and sewage may help explain the recent rise. But finding the source of a particular outbreak is "like trying to go back to a forest fire to find the spark," Wobeser says.

GARY WOBESER/CCWHC

Dead duck. Female pintail shows "limberneck" from nerve poison.

Wildlife managers are moving to minimize future botulism episodes. Rocke's group will soon publish a set of "predictive models" based on a study of U.S. wetlands that would point managers to susceptible wetlands and enable them to take steps, such as altering water flows, to avoid outbreaks. Wobeser hopes to convene a dozen U.S. and Canadian experts next month to discuss research needs and strategies such as altering water flows to change the pH or salinity.

Didactics of *Gattaca*

The end of the science fiction movie *Gattaca*, which portrays a world obsessed with genetic perfection, left some film critics unimpressed. But it left at least one geneticist downright crestfallen: French Anderson of the University of Southern California in Los Angeles says his favorite scene from the original version of the film was eliminated.

Anderson served as a "volunteer science consultant" to the flick to "make sure the science wasn't absurd," he says. The gene therapy researcher says he found no major flaws and was very impressed with the movie. He was especially taken with the final segment, which showed images of notables such as John F. Kennedy Jr., Albert Einstein, Ray Charles, and Jackie Joyner-Kersee. The on-screen message was that if information from the human genome had been available at the time, these heroes might never have been allowed to be born because they carried, respectively, Addison's disease, dyslexia, primary glaucoma, and asthma—all of which are at least partially inherited. The final screen got personal: "Of course, the other birth that may never have taken place is your own."

Almost all the scientists who saw a screening at a mammalian cloning meeting last June "really liked" the segment, Anderson claims, which he said was "the most powerful part of the movie." Test audiences of laypeople, however, panned it. They complained that the segment was overkill, says *Gattaca* co-producer Gail Lyon. What's more, she says, the final frame left them feeling "personally attacked" as presumed genetic defectives.

Rattling audiences would have been fine by Anderson. "You make your point by creating a controversy," he says.

New IOM Members

The Institute of Medicine (IOM) has elected 60 new members, bringing total active membership to 558. Members are chosen for "major contributions" to health and medicine or related fields; one-fourth are from nonhealth professions.

Members are listed at the Web site of the National Academy of Sciences, www.nas.edu.

Ariane 5 Lifts Off, Misses Ideal Orbit

Europe's new heavy-lift rocket, Ariane 5, was launched without a hitch on 30 October from Kourou, French Guiana. The success ends 17 months of anxiety following the catastrophic failure of the first test flight, which destroyed the $500 million Cluster mission to map Earth's magnetosphere. This time around, space officials hedged their bets by loading Ariane 5 with two dummy satellites and a low-cost scientific payload.

Disaster struck the previous test flight when software controlling the rocket's inertial guidance system choked on the large data flow; the rocket veered off course and self-destructed. Last week, the countdown was interrupted 48 seconds before lift-off because of an electrical problem with the payload. "We had a few moments of tension," Frederik Engström, the European Space Agency's (ESA's) launch director, said at a press conference. "It was a minor glitch, and after that everything went very smoothly."

But not entirely. The first-stage engine shut down too soon after the launcher rolled and reported falsely that it was out of fuel. The premature shutdown put Ariane into orbit at 524 kilometers above Earth, 57 km lower than it was supposed to be. "Although the orbit is slightly different than planned, it will be able to carry out its mission," says Daniel Mugnier, launch director at CNES, France's space agency. The TEAMSAT satellite, built by ESA's technology center in the Netherlands, contains several experiments, including instruments to measure atomic oxygen at high altitude. It will also try to receive global positioning signals from GPS satellites in lower orbits, which might provide an additional way to locate satellites in space.

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The next test launch, planned for March, will carry more ambitious cargo: the Atmospheric Reentry Demonstrator, a model of a vehicle to return from a future space station, and possibly a 3-ton communications satellite from Intelsat. The first full-scale payload, its weight not yet finalized, is expected to fly next summer.

Gray Matter on a Chip

Scientists have built the first "neurochip," a silicon chip equipped with living nerve cells. It could be a precursor to bionic devices made from silicon and living neurons. But for now, neurobiologists want to use the device for understanding how nerve cells grow and talk to each other.

Biologists have studied individual neurons for years, by inserting electrodes into living brains. But that's kind of like trying to learn electronics by taking apart a computer: In both cases, the student might do better by first constructing simple circuits.

Early efforts to link living neurons in the lab have damaged or killed the cells. But Jerome Pine, a neurophysicist at the California Institute of Technology in Pasadena, has managed to pull the trick off. At the meeting of the Society for Neuroscience in New Orleans last week, he described how his team of electrical engineers and biologists created a microscopic neural landscape on a 4-centimeter-wide silicon rectangle. The chip, immersed in a petri dish, had 16 tiny wells with short tunnels leading to the surface. The researchers placed an embryonic rat brain cell in each well. As the cells grew, they sent out dendrites that eventually wound their way through the tunnels (which kept the cells clamped in place) and contacted other dendrites, establishing normal electrical activity. Wires in the underlying silicon listened in on the chatter.

"Now," Pine says, "the biggest challenge is maintaining a healthy network." So far the researchers have been able to keep cells alive for only 2 weeks at a time. Once they can sustain cells longer, they hope to study, for example, how small groups of neurons "learn" after being stimulated repeatedly.

"The work will certainly be important for future medical applications," says Peter Fromherz, a neurophysicist at the Max Planck Institute for Biochemistry in Munich, Germany, who is also trying to marry neurons and silicon. The retina, because it's flat like a silicon chip, "may be the best system" to start with, he says. But it's not time yet to get excited about bionic chips, warns Pine: "You shouldn't expect anything in our lifetime."

Linking Trees to Tsunamis

Scientists have strong new evidence that a major earthquake shook the northwest coast of the United States around 1700, causing a tidal wave that hit the Japanese island of Honshu on 26 January 1700.

Many experts have believed since the late 1980s that signs of earth subsidence point to a big earthquake or series of quakes occurring around the end of the 17th century at the plate boundary for the Cascadia subduction zone. This area extends some 1000 kilometers from Vancouver to California, where the ocean floor is sliding under Earth's mantle toward North America. Others, however, have argued that the ocean crust is too young and hot for the fault to stick and store the energy needed for a quake. Then in 1994 Japanese scientists located a record of the tsunami of 1700 and deduced that it had to have been generated by a big one—of at least magnitude 8—in Cascadia (*Science*, 23 September 1994, p. 1802).

The latest studies bolster this scenario. One team, led by Gordon Jacoby of the Lamont-Doherty Earth Observatory in Palisades, New York, took core samples from 33 old sitka spruce trees that stand along a 100-km stretch of Washington and Oregon coastline. In the November issue of *Geology*, the researchers report finding signs of waterlogging or trauma disrupting many of the trees' rings around 1699. These signs include changes in ring width; the presence of "traumatic resin canals" (sap-conducting tubes formed by altered cells); and "reaction wood" (dense cells formed in response to tilting).

GORDON JACOBY

Quake survivor. Sitka spruce.

In the other study, David Yamaguchi of the University of Washington, Seattle, and Brian Atwater of the U.S. Geological Survey found that dead cedar trees still standing in what are now salt marshes breathed their last in the growing season of 1699. The analysis, reported in the 30 October *Nature*, compared the ring patterns in cedar trunks and roots with those in a reference sample of old trees.

Until now, says Atwater, scientists knew about the quake "only from geological inference." But with these studies, the link with the tsunami records "is so strong that those village records become written proof that the earthquake happened."

TOP 10 AUTHORS OF HOT PHYSICAL SCIENCE PAPERS (1990–1996)

	Name	Affiliation	# Papers	Total
1	François Diederich	Swiss Fed. Inst. Tech.	10	2864
2	Robert L. Whetten	Georgia Inst. Tech.	9	2677
3	Donald S. Bethune	IBM Almaden Research Ctr.	9	2040
4	Robert C. Haddon	Bell Labs Innovations	8	3309
5	Ad Bax	NIH kidney institute	7	1547
6	Stuart S.P. Parkin	IBM Almaden Research Ctr.	6	2328
7	Yves Rubin	U. Calif. Los Angeles	6	1893
8	Marcos M. Alvarez	Jet Propulsion Lab	6	1886
9	John A. Pople	Northwestern U.	6	1872
10	Edward Witten	Inst. for Advanced Study	6	1825

But can they jam? While the Final Four tournament showcases college basketball's crème de la crème, the Top Four in physical sciences excel at an entirely different game: buckyball. In an analysis of 944 often-cited papers published between 1990 and 1996, the Institute of Scientific Information (ISI) in Philadelphia found that the top four authors with the most hot papers all study buckyballs, or fullerenes, the soccerball-shaped carbon molecules that scientists are finding more and more uses for. Other hot papers of the '90s are on superconductivity, nuclear magnetic resonance, and computer programs for determining molecular structures.

The institution with the most hot-paper citations in the physical sciences is Bell Labs Innovations, the former AT&T Bell Labs now owned by Lucent Technologies, in Murray Hill, New Jersey, with 18,840 cites. IBM Corp. pulls up second (13,020), followed by Cambridge University (9131). Cambridge led on "impact," or cites per highly cited paper, with a score of 415, followed by NEC Corp., Ltd., of Tsukuba, Japan (348), and Lawrence Berkeley National Lab (309).

Material from the survey is available in exquisite detail from ISI (e-mail: dpendle@isinet.com) for $495.