RANDOM SAMPLES

edited by JOCELYN KAISER

Tuberculosis's Long, Slow Burn

Anti-tuberculosis measures taken at the end of last century are touted as one of the great public health success stories. Better nutrition, cleaner cities, and sequestering the infected in sanatoriums have been linked to a drop in tubercolosis (TB) rates in the United States and Europe—a drop that occurred long before TB antibiotics came along in the 1940s. But a team led by mathematical biologist Sally Blower of the University of California, San Francisco, now argues that TB was dying out on its own, with no help from the medical world.

The group developed a model to describe the course of a TB epidemic, based on TB's known transmission characteristics. For example, some people develop the disease within 2 years of infection, while others get it much later; and some will have a relapse late in life. The result, say Blower and her colleagues in this month's *Nature Medicine*, is that a TB epidemic occurs as three overlapping subepidemics. The first rises and falls quickly, and the second and third begin gradually, but taper off very slowly, resulting in an epidemic of 100 years or more. This suggests the developed world in the 1900s was in the tapering end of an epidemic. "It's sort of like having an epidemic running in molasses," Blower says. "It takes an enormous amount of time to decline."

Better living standards and other factors likely contributed as well, but they operated within the epidemic's own slow decline, Blower says. Mathematical biologist Robert May of the University of Oxford and Imperial College London agrees: "I believe [the dynamics are] likely to be part of the explanation," he says.

The model offers insight into the future of TB as well as the past. The disease, a major killer in the developing world, is resurging in the United States, spurred by AIDS, immigration, and drug-resistant strains of TB bacteria. As a result, a new epidemic has begun to overlay a mature one, Blower's group says. TB rates have fallen in the past 3 years, but latent cases mean "we're not out of the woods yet," says co-author Peter Small, a Stanford molecular epidemiologist. Because many cities have ended TB control programs, he adds, "we'll be mopping up for decades to come."

THE BETTMANN ARCHIVE

Quarantine. TB declined in the 1900s, but not only because of sanatoriums such as this one.

Epoch of Quasars

Like a generation of celebrities, the brightest denizens of the early universe flourished and faded at roughly the same time. That's the conclusion of a census of distant quasars—mysterious objects each pouring out the energy of a trillion suns—just completed by Maarten Schmidt of Caltech, Donald Schneider of Penn State, and James Gunn of Princeton. "There appears to be an era of quasars," says Schneider, "that occurred between redshifts of 2 and 3"—a measure of distance, and hence age, corresponding to 2 billion years after the big bang.

Larger redshifts mean older ages, and when Schmidt and his colleagues analyzed 90 quasars from an ongoing quasar survey at the 500-cm telescope on Mount Palomar, California, they found that as redshifts increased from 2.7 to 4.7, the density of quasars fell by a factor of 7. Earlier surveys had shown that the density increases sharply from lower redshifts up to a redshift of 2. And that means, the group concludes in last month's *Astronomical Journal*, that most quasars came and went in a single generation.

The synchronization "is a bit of a puzzle," says quasar expert Roger Blandford of Caltech. Because many theorists believe that quasars blazed within early galaxies, he says, it's possible that "this is an epoch of galaxy formation, and that quasars were most active then." The sad corollary, Schneider notes, is that searches for many more beacons that could light up even earlier phases of cosmic history will likely come up short.

Professor of Popular Science

One of the key figures of software giant Microsoft has invested $2 million of his personal fortune to help spread his love of science to a wider public, by funding a professorship in the public understanding of science at the University of Oxford. Its first holder, announced last week, will be evolutionary biologist and best-selling author Richard Dawkins.

Hungarian-born software specialist Charles Simonyi, who holds the title of Microsoft's chief architect, has donated enough to fund the position in perpetuity and specified that Dawkins have first crack at it. Dawkins has written several popular accounts of his work, such as *The Selfish Gene* and *The Blind Watchmaker*. His latest book, *River Out of Eden*, recently topped Britain's best-sellers list.

The biologist is currently a reader in the Department of Zoology at Oxford. His new position will be split between zoology and the Department of Continuing Education, so he will be able to continue his scientific work while also lecturing on science popularization.

Dawkins says the tenured position will allow him to spend more time writing for newspapers and working on books. He also has a personal mission to try to improve the quality of scientific writing, both in the popular press and in academic journals. "There is no reason why scholars shouldn't write intelligibly just because they are writing among themselves," he says.

CAREER MOVES

July 1995

"Caution, skepticism, scorn, distrust, and entitlement seem to be intrinsic to many of us because of our training as scientists. ... These qualities hinder your job search and career change."

—Former astrophysicist Stephen Rosen, now director, Scientific Career Transitions Program, New York City, giving job-hunting advice in an on-line career counseling session

Refining a Toxin Breaker

Sarin, the nerve gas unleashed this spring in Japan, has a natural enemy. An enzyme called phosphotriesterase, made by the bacterium *Pseudomonas diminuta*, breaks chemical bonds in this potent toxin and related pesticides, rendering them harmless.

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It's even more effective at this than synthetic catalysts, so chemists have long hoped to use it as a biodegrading agent.

One drawback, however, is that the enzyme isn't very specific—it attacks many compounds in a mixture, making it less efficient at cleaving its target. And the enzyme can itself be degraded by toxins. Now Frank Raushel and Jane Kuo of Texas A & M University, and Hazel Holden and Matthew Benning at the University of Wisconsin, have worked out the exact chemical structure of the active site in phosphotriesterase—the cleft that grabs a molecule and cleaves it. Knowing the structure should allow researchers to synthesize more effective versions of the protein.

This is "exciting and important," says Samuel Gellman, a protein expert also at Wisconsin. "Bio-organic chemists have been very interested in developing catalysts" that can break down these compounds, he says.

Last year, Benning and Holden determined the enzyme's structure using x-ray crystallography. But they found their crystals differed from the natural enzyme—they lacked zinc ions that help shape the active site. In the 27 June issue of *Biochemistry*, however, the researchers report that a version of the enzyme that uses cadmium ions instead of zinc has the same activity as the natural enzyme, indicating a similar structure.

Crystallography of this version shows the site contains a water molecule, or possibly a hydroxide ion. The enzyme, the group believes, splits its target molecule by replacing a carbon-phosphate or carbon-fluorine bond in that molecule with the water or hydroxide. Raushel and Kuo are now changing certain amino acids in the active site to see whether these mutant enzymes work better. If they succeed, stockpiles of obsolete nerve gas—for which the best option now is incineration—could someday be digested away.

Saturnian Satellites at Light Speed

NEWS FROM THE NET

News of the discovery of as many as four new satellites of Saturn flashed over the infobahn last week as astronomers' newsnet linked up to a slew of Internet outlets.

On 26 July, the Central Bureau for Astronomical Telegrams in Cambridge, Massachusetts, which gave up telegrams 2 years ago, e-mailed subscribers* a notice of the discovery, made by scientists examining an image taken by the Hubble Space Telescope on 22 May when Saturn's rings turned edge-on to Earth, reducing their blinding glare. Ronald Baalke of the Jet Propulsion Lab in Pasadena, California, picked up the notice, then posted the news to a newsgroup** and placed it on his World Wide Web home page***.

Astronomers have strained to pick up glimmers of yet-undiscovered objects orbiting Saturn as the bright glare of the rings winks out; the next time will be on 10 August. The four "probable" new satellites were found by Amanda Bosh and Andrew Rivkin of Lowell Observatory in Flagstaff, Arizona.

If all four discoveries are confirmed, they would boost Saturn's retinue of known satellites to 22, 17 of which would have been discovered during ring plane crossings. The firmest of the four new discoveries lies just outside the F ring discovered by the Voyager spacecraft. This "ring shepherd" probably helps put some of the kinks and twists in that most bizarre of planetary rings. Two of the other proposed moons lie suspiciously close to the orbits of two known moons, Atlas and Prometheus, suggesting that either orbital predictions for those two are wildly off or that a pair of moons share the same orbit. Stay tuned to the Net to see just how many of these new moons Bosh and Rivkin will get to name.

Planetary wink. Edge-on rings cut the glare to reveal two known moons.

TOP: R. BEEBE *ET AL.*; BOTTOM: A. BOSH AND A. RIVKIN

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AIDS From Vaccine?

Scientists have roundly dismissed the idea and the U.S. Food and Drug Administration (FDA) thinks there's no merit to it, but still a judge has ordered vaccine-maker American Cyanamid to participate in tests to determine whether a contaminated oral polio vaccine (OPV) caused AIDS.

The 19 June order resulted from a lawsuit alleging that American Cyanamid's OPV, when given to an Illinois girl in 1982, infected her with HIV. The girl, Whitney Williams, had no known risk factors for AIDS. U.S. Magistrate Judge Ronald Hedges ruled that American Cyanamid must allow the plaintiffs to test samples of those vaccines for HIV-1.

Williams's parents filed suit early last year after learning of a 1992 article in *The Lancet* by attorney Walter Kyle, in which he suggested HIV-1, HIV-2, or the simian form, SIV, might have contaminated monkey kidney cells used to make OPV. SIV or HIV-2 in the vaccine, the article implied, could mutate into HIV-1. But tests done by polio virologist David Wood of the National Institute for Biological Standards and Control in England for HIV and SIV in old batches of the vaccine have come up empty, and Wood says the notion that SIV or HIV-2 mutated into HIV-1 via OPV is "pretty outlandish." The judge denied the plaintiffs' request to test the vaccines for SIV or HIV-2, a decision the plaintiffs are now appealing.

The FDA shares Wood's misgivings. In a 1994 document prepared in response to other claims that OPV is linked to AIDS, the FDA stated there are no epidemiologic data supporting such a link. Data from the HIV-1 tests are expected to be revealed at a hearing scheduled for November.

A Better Mine Detector

In 64 countries, from Cambodia to El Salvador, 110 million antipersonnel mines lie waiting to blow at a footfall. Millions more are planted yearly and kill or maim thousands. Before the mines can be removed, they have to be found, and that's no easy task.

It may become easier with an experimental remote radar detection method described last month at the United Nations International Meeting on Mine Clearance in Geneva. The technique, eventually to be used from aircraft, sends microwaves into a minefield. The microwaves penetrate the ground cover and bounce back from objects in a way that reflects their shape. From these signals, a computer constructs images of the terrain's features, such as stones, twigs, shrapnel, and concealed mines. The computer then picks out the mines by comparing these images with stock images of various mine types.

RODGER BOSCH/IMPACT VISUALS

Minefield. New method could replace that used here by Angolans.

Tests last year at the European Microwave Signature Laboratory (EMSL) in Ispra, Italy, show that the technique effectively locates both buried and surface mines—even the widely used plastic butterfly mine, whose shape often attracts young children. "I expect we can field test [the method] within the next year," says physicist Alois Sieber of the EMSL.

Some hitches remain, Sieber notes; for example, a plastic mine lying in grass produced ambiguous results in early tests. And the technique may not work for all topographies, as some may cause too much interference. Still, Werner Weisbeck, who studies microwave technologies at the University of Karlsruhe, Germany, says the system—with refinements such as multiple radar sensors—has the potential "to achieve the 100% accuracy" necessary for mine detection.