RANDOM SAMPLES

edited by CONSTANCE HOLDEN

Sperm Factories

Researchers at the University of Pennsylvania have achieved what is being hailed as a major advance in reproduction research: They have transferred sperm-making cells from male mice into infertile male mice, and recipients have sired offspring from the donor sperm.

Ralph Brinster of the Penn School of Veterinary Medicine and colleagues report the accomplishments in two papers in the November *Proceedings of the National Academy of Sciences*. The scientists say this opens the way for a host of experimental genetic manipulations.

Brinster's experiments involved removing stem cells—called spermatogonia—from young mice and injecting them into the testes of infertile mice. The stem cells developed into mature spermatozoa in 70% of the recipients, and some of the mice went on to sire progeny from the donor sperm.

Brinster says the next step is to develop a culture system for stem cell spermatogonia that will make it possible to do a variety of genetic modifications of the cells. The scientists' achievement may offer a more efficient way to make transgenic animals, which usually involves injecting DNA into eggs. Brinster also says you could "use mice like a test tube" to generate spermatozoa from the stem cells of other species. The owner of a champion racehorse, for example, might arrange for an inexhaustible supply of fresh sperm.

Cell biologist Martin Dym of Georgetown University Medical Center, in a commentary accompanying the papers, calls the experiments "novel and exciting" ones that, among other things, offer "enormous potential" for correcting human genetic diseases—by collecting sperm stem cells, correcting them in vitro, and returning them to their owner. Embryologist George Seidel of Colorado State University says the Pennsylvania scientists' "remarkable" feat "may rank with in vitro fertilization" in terms of the new experimental possibilities it opens up.

THE BETTMAN ARCHIVE

Selective survival? Former slaves Aunt Decie Hill, 80, and Hebry Williams, 105, in the early 1900s.

African-American Longevity

Throughout this century, African Americans in their late 70s and beyond have had lower recorded death rates than whites. That's led to a theory that although blacks have higher death rates at most ages, at very old ages a "survival of the fittest" effect kicks in.

But demographer Samuel Preston of the University of Pennsylvania says this "crossover" phenomenon—a point where black and white mortality rates switch places—is probably a myth. Speaking at a 21 October symposium in Washington, D.C., sponsored by the National Institute on Aging, he said it doesn't make sense "because typically people exposed to bad health conditions manifest the results throughout the life-span." He and colleague Irma Elo have been exploring an alternative explanation: bad data.

They took death certificates for 5262 blacks over 65 who died in 1985 and compared the recorded ages with data from the 1900, 1910, and 1920 censuses, when those people were children. They matched 57% of the group and found that the ages on the death certificates were inconsistent with census data in 52% of the cases. In 36% of the cases they were lower. Thus, the death data reflect disproportionately low death rates for people in their 80s and 90s. The researchers verified the census numbers by comparisons with a third source: Social Security data.

The result: The crossover effect has "disappeared for both sexes," said Preston, suggesting that "the black population is not an exception to the conventional finding that a population subjected to high mortality early in life also has high mortality late in life." University of Chicago demographer Jay Olshansky says this issue has been tough to address because of poor data, but "it looks as though Sam and his colleagues ... have provided a resolution to the question." Duke University demographer Kenneth Manton, however, says he wishes Preston had been able to match a higher proportion of his sample. He says he is not yet convinced that adverse circumstances, in effect, accelerate the "age clock" for the black population.

Less Hot Air From Indian Rice

India's rice paddies may have been getting a bum rap: They release only about one-tenth as much of the greenhouse gas methane into the atmosphere as global climate models had assumed, according to the findings of a 3-year study from the National Physical Laboratory in New Delhi.

Rice paddies furnish about 12% of the world's annual atmospheric methane budget, and it's been estimated that India contributes more than half of that, or 37.8 million tons. But the new study, reported in the Indian journal *Current Science*, pegs India's output at a modest 4.3 million tons a year. The new figures come from actual measurements taken at 14 sites throughout India. Unlike earlier estimates, says Suresh Sinha, head of the Indian Agricultural Research Institute in New Delhi, the new figures take into account the relative dryness of Indian rice paddies (dry soil holds more oxygen, which means more methane gets oxidized into carbon dioxide) and the fact that Indian soils are low on carbon (which means there is less carbon on hand to form methane).

The data could help flesh out what the U.S. Environmental Protection Agency calls "very uncertain" estimates about rice as a source of methane. But while experts accept the accuracy of the new figures, they also note the political ramifications. "It's hard for India to reduce CO_2 emissions because they are already relatively low, so it's in their interest to be as low as possible on methane," says atmospheric chemist Ralph Cicerone of the University of California, Irvine.

The new data show how poorly understood the variables are in the methane picture, adds biogeochemist Ron Sass of Rice University. "We know how much is emitted from all sources," he says. "So if rice goes down, something else must be going up."

Productive Work For Tobacco

Scientists at the University of Florida have found an unlikely host for growing a potential anticancer compound: the tobacco plant.

Scientists have long dreamed of harnessing a toxic protein called ricin to kill cancer cells. Found in castor beans, ricin kills cells by interfering with their ribosomes, the machinery for making proteins. But because ricin sticks to the sugar groups found on most cells, it kills healthy cells along with cancerous ones. Blocking ricin's sugar-binding capability doesn't help: That prevents it from crossing cell membranes and makes it far less toxic.

Some scientists think they can keep ricin toxic and make it cancer-specific by merely reducing the sugar binding with a mutation and then linking the genes for ricin with a tumor-specific antibody in a "fusion protein." But this theory hasn't yet been tested because no ricin-tolerant organism could be found to produce such a mutant.

In the 9 September *Journal of Biological Chemistry*, however, biochemist Paul Sehnke and plant biologist Robert Ferl report that they have transferred the ricin gene into tobacco plants, which withstand the toxin. The result is "a testbed for producing mutants of ricin," says Ferl. Microbiologist David Fitzgerald of the National Cancer Institute calls the work "interesting," but notes that the targeting of ricin to cancer cells "remains to be demonstrated." If it can be, tobacco harvests may someday yield not only carcinogens but the drugs to counter their effects.

Superconductivity: A Third Route?

Ever since 1986, when scientists discovered materials that can conduct electricity without resistance up to 135 kelvins (–138 degrees Celsius), theorists have been struggling to explain how high-temperature superconductivity works.

There are two competing theories about why electrons in superconducting materials travel in pairs, which enables them to move without losing energy (*Science*, 12 August, p. 860). Now Stanford researchers report in the 24 October issue of *Physical Review Letters* on an experiment that supports yet a third explanation.

The team, led by physicist William Little, used a variation of a technique called optical reflectivity. They directed light beams at a high-temperature superconductor and gauged the changes in optical reflectivity in the sample 5 degrees above and below the temperature where it becomes superconducting. The resulting numbers—showing the difference in reflectivity between the normal and superconducting states—were plugged into a series of equations to produce an optical signature of the mechanism of superconductivity.

The scientists say they expected to see support for the theory that electrons stay paired because of magnetic-like interactions. Instead, they saw signs of the competing explanation: the optical signature of phonons (vibrations in the lattice structure of the material). But it was not strong enough to explain the superconductivity. The scientists, however, saw signs of an additional energy signature, corresponding to that of nonsuperconducting electrons jumping back and forth between oxygen and copper atoms in the sample. The group believes that this is what encourages the electron pairing.

Argonne National Laboratory physicist Richard Klemm says the experiment is "interesting," but cautions that it's hard to tell whether the phenomenon creating the energy signatures is a cause or a result of the superconducting behavior. But if the experiment holds up, it's clear that theorists will have a lot more explaining to do.

Madness and Creativity Revisited

The 17th century poet Dryden wrote that "Great Wits are sure to Madness near ally'd." And in recent years, scientists have done studies showing that, indeed, male creative writers in particular show very high rates of mood disorders and alcoholism.

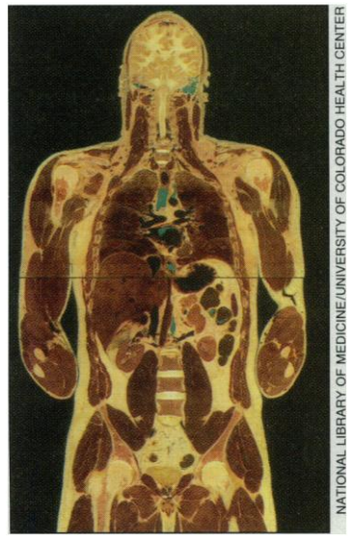
Psychiatrist Arnold Ludwig of the University of Kentucky Medical Center has now refined the picture with a study of women writers. He finds that a range of psychopathologies—as well as a history of childhood sexual abuse—seem to go with being creative. Ludwig reports in the November *American Journal of Psychiatry* that he compared 59 participants at the University of Kentucky's annual Women Writers Conference with a group of nonwriters matched on social, demographic, and family variables. Psychiatric problems and creativity were evaluated through questionnaires and interviews, which also elicited information about parents and siblings.

PSYCHOPATHOLOGY AND THE FEMALE WRITER

Diagnosis	Writers (n = 59) %	Non-writers (n = 59) %
Depression	56	14
Mania	19	3
Panic attacks	22	5
Eating disorders	12	2
Drug abuse	17	5
Childhood sexual/phys. abuse	39	12

About twice as many writers as nonwriters had some form of mental disorder (see chart). But, Ludwig says, the pattern differed from that found in males: Many of the writers had histories of physical or sexual abuse; many had eating disorders; and although many were drug abusers, they did not have a high rate of alcoholism (in contrast, University of Iowa psychiatrist Nancy Andreasen found 30% of a group of male writers to be alcoholics).

Johns Hopkins University psychologist Kay Jamison says the research fits with her finding that many creative artists are manic-depressives: "If you look at the correlations, the really staggering ones are with mood disorders," she says. Ludwig, though, thinks the link is less specific. He says that the variety of problems in the women writers suggests that a state of general "unease" and "tension" is conducive to creative activity. But being weird doesn't make you creative, notes Ludwig—it only acts as a spur in those with a creative bent.



Visible Man. Available by the slice on Internet.

Anatomy On-line

Scientists have just sent the first human being into space ... er, cyberspace. This week, the National Library of Medicine (NLM) put on the Internet a set of thousands of digitized images made by scanning, slicing, and photographing every inch of a male cadaver. The Visible Man, as the project is called, is the first detailed computerized atlas of the human body, says NLM director Donald Lindberg.

The 15 gigabytes of data, which take 2 weeks to download, are intended for use by medical researchers, clinicians, and anatomy students. Conceived 5 years ago, the project involved finding a suitable cadaver—of average size and undamaged—and putting it through a battery of medical imaging machines. Workers then froze the body, sawed it into 1800 slices, and made fine-grained photographs of each cut. On a computer, these stacked images can be taken apart and viewed from any angle. Users can access the set by contacting project director Michael Ackerman of NLM at ackerman@hpcc.gov.

Coming soon: The Visible Woman, a 59-year-old who died of a heart attack, will be available in late 1995.