RANDOM SAMPLES

edited by CONSTANCE HOLDEN

Fetal Egg-Cell Research Scare

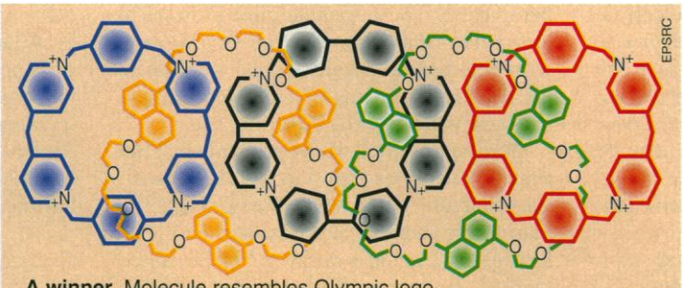
A recent string of British media stories has raised the specter of legions of test-tube babies whose biological mothers had never been born. That has caused concern in Parliament and anguish among British fertility researchers, who fear for the life of an emergent field of research using fetal ovarian tissue.

Now the researchers are breathing a sigh of relief. Research using the ova from aborted human female fetuses is ethically acceptable, according to the U.K. Human Fertilization and Embryology Authority (HFEA). Using those ova to treat infertility, however, is not.

The horror stories surfaced after news filtered out that two British teams—one headed by Roger Gosden at the University of Edinburgh and the other led by John Carroll of the U.K. Medical Research Council's embryology unit at St. George's Hospital in London—were taking egg cells from very young female mice and transplanting them into infertile adults, who then produced young.

Although the ovaries of aborted human fetuses are at about the same developmental stage as those from newborn mice, it would require many years more work before similar techniques could be applied in humans, says Carroll. But that didn't stop U.K. lawmakers from wading into the debate in April, when a Conservative Member of Parliament tagged an amendment onto an unrelated bill, banning infertility treatment using fetal ovarian tissue. The ban doesn't explicitly extend to research, but scientists feared that funding agencies would interpret it as a signal to abandon the field.

But the HFEA makes a clear distinction between research and treatment by backing the treatment ban but endorsing the research. Even with the ban, says Carroll, research on fetal ovaries may have important medical applications: Studies of the mechanisms that control cell division in immature egg cells, for instance, could yield valuable clues for researchers studying ovarian cancer.



A winner. Molecule resembles Olympic logo.

Another Gain in Self-Assembly

Two British chemists are celebrating a triumph of molecular synthesis: a molecule consisting of five interlocked rings, which, not surprisingly, they have dubbed "olympiadane." The new compound is the largest mechanically interlocked (as opposed to chemically bonded) molecule yet made through molecular self-assembly, where scientists mimic nature by exploiting the weak intermolecular attractions that drive the creation of biological molecules such as DNA (*Science*, 15 July, p. 316).

Officially, the purple compound described last month in the German edition of *Angewandte Chemie* by Fraser Stoddart and David Amabilino of the University of Birmingham is called a [5]catenane. Traditional organic synthesis, which involves forging new chemical bonds, can't do the trick. To activate the global electrostatic forces needed to create interlocking rings, the chemists have to arrange the rings much the way pieces of furniture are laid out from a self-assembly kit: Each piece must be oriented so it can connect properly. Then the molecules take it from there.

Chemist Julius Rebek of the Massachusetts Institute of Technology calls the five-ringed structure "a marvelous feat of molecular engineering. Just 5 years ago, its synthesis was unthinkable; now Stoddart makes it assemble itself seamlessly." The complexity of the new molecule leads researchers to hope they can soon devise even larger self-assembling structures, such as nanometer-scale molecular switches which store binary information by altering their electronic state. "At the moment, [five-ringed] molecules aren't useful in their own right," concedes Amabilino, "but they prove that the self-assembly is a powerful synthetic tool."

Currency Redesign

George Washington and Andrew Jackson are names readily associated with U.S. currency; Mitchell J. Feigenbaum is not—yet.

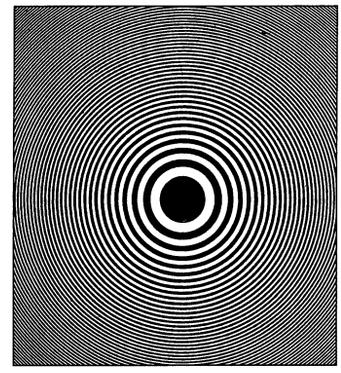
But a fractal pattern developed by Feigenbaum, a pioneer of chaos theory at Rockefeller University, is one of the security features being considered by the Treasury Department to foil counterfeiters armed with ever more powerful computers, color photocopiers, and electronic scanners.

In the United States' biggest currency redesign in 65 years, Treasury plans to incorporate some new features recommended by a panel of experts—including Feigenbaum—convened by the National Research Council in 1993. Some, such as watermarks and holograms, would be new to American currency. Others, such as tiny "microprinting" or subtly raised polyester threads visible only when bills are held up to bright light—are modifications of things added to high-denomination bills in 1990. Treasury is also weighing unannounced "covert" features.

New technologies under consideration are embellishments including fractals (patterns in which similar motifs are reiterated at various levels of magnification) that trick copiers and scanners into incorrectly reproducing the image. Feigenbaum's fractal includes lines spaced too closely together for current generation electronic machines to faithfully copy them. A photocopy would have strange streaks on it. Other possibilities include "color shifting" inks containing particles that refract different light wavelengths depending on the angle from which they are viewed. That would thwart copiers, which only reproduce an image from one angle. Then there are tiny bits of material embedded in the bill that can be made iridescent.

These may become outdated with improvements in the counterfeiters' machines. So further down the line are other schemes, such as one whereby a measurement, such as one describing the random pattern of particles on a bill, is encrypted and printed on the bill. Counter-top machines could verify that the fiber patterns match the code.

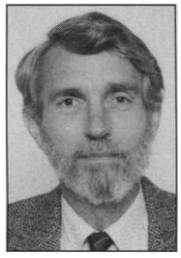
High-tech counterfeiting isn't a major problem at the moment, but, says special agent Gayle Moore of the Secret Service, which investigates such matters, "it is wise to look to the future," when terrorist groups are expected to try to generate large amounts of cash for weapons buys.



Foiling fakes. When this pattern is run through a digital scanner, "moiré" or ripplelike effects emerge.

Brain Drain at UCSF?

The path from the University of California, San Francisco, to Washington, D.C., is becoming a well-worn one. The latest UCSF faculty member to make the trek is neurobiologist Zach Hall, who was appointed last week to be the new head of the National Institute of Neurological Disorders and Stroke.



Zach Hall

Hall was preceded by Philip Lee, director of the UCSF Institute for Health Policy Studies, who left San Francisco last July to become assistant secretary of health and director of the Public Health Service; Bruce Alberts, chairman of biochemistry and biophysics at UCSF, who moved to Washington last summer to become president of the National Academy of Sciences; and, shortly thereafter, Harold Varmus, Nobel laureate and professor of microbiology and biochemistry, who is now director of NIH.

Hall, who like his friend Varmus also has a degree in English, is following the new style among top managers at NIH. He plans to keep up his research, on neuromuscular junctions, in a new lab at the National Institute of Mental Health.

Condoms Face Barrier At Japan Meeting

As the 7 August opening of the Tenth International Conference on AIDS in Yokohama, Japan, draws nigh, organizers and participants are running into the same red tape that has snarled foreign business people in Japan for decades. This time, it's red tape over latex: confusion about whether condoms can be imported for "educational" use.

A number of governmental and non-governmental groups have brought bulk quantities of condoms to past international AIDS conferences to be handed out at booths. But by Japanese law, bulk condom imports are restricted to licensed dealers to ensure that Japanese quality standards are met. Violators may face up to 3 years' imprisonment or fines of up to $20,000.

It is not clear that jail or fines are in the future for conference attendees. But a U.S. embassy official in Tokyo, concerned about U.S. Agency for International Development plans to bring a thousand or more condoms to the conference, says that Japanese customs officers would undoubtedly have seized any condoms brought in outside licensed channels.

Conference organizers hope, however, that the condoms will be allowed to slip through a loophole in the law: It restricts their import for commercial purposes —but fails to say anything about "educational" condoms.

Japan's Ministry of Health and Welfare, one of the chief sponsors of the conference, has been negotiating with the agency that would rule in this matter, its own Pharmaceutical Affairs Bureau, to reach an unofficial compromise. "We can't make any general statement," says Naoko Yamamoto, a ministry official who is also chief executive of the conference headquarters. "But if you go to the booths at the conference, I think you might find imported condoms."

Speeding Up Diamond Growth

Buckyballs may finally be coming of age—just not quite as expected. For years, researchers have been investigating these soccer ball–shaped carbon molecules for uses in everything from nonlinear optics to superconductivity. Now researchers at Argonne National Laboratory have figured out how to make them even more useful: smash them to bits.

Bits of buckyballs can easily be turned into diamond films, and if the technique can be scaled up, it promises to lower the cost of the films by as much as 75%. Diamond films are used in electronic circuits to remove heat and as a tough coating for machine tools, and the market for them is projected to soar to $4.5 billion by 2000.

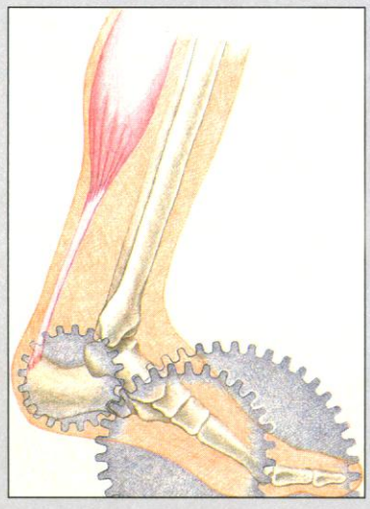
The traditional method for growing diamond films begins with a silicon wafer on which flecks of diamond powder—chains of carbons terminated by hydrogen atoms—are interspersed. These hydrogens must be replaced by carbons for the flecks to grow into a single lattice. Scientists do this by flowing vaporized hydrogen and methane, which contains isolated carbon atoms, across the wafer. At high temperatures, this vapor removes the hydrogen atom and inserts a carbon. The process is slow, taking up to 10 hours to produce a 10-micron-thick film.

Gruen's method, first published in the 1 February *Journal of Applied Physics*, is at least four times as fast. The diamond-pocked silicon surface is placed in a vacuum chamber along with vaporized fullerenes and argon gas. Heated argon atoms smash into the fullerenes, breaking them into carbon-carbon pairs, or dimers, which then bind to the diamond nuclei on the wafer, forming a single film.

Just how this happens is still a mystery, says Gruen. "If they have produced the diamond films without hydrogen," says James Butler, a research chemist at the Naval Research Laboratory in Washington, D.C., "then it's a new way to grow crystalline diamond that is counter to our understanding of how diamond grows." Gruen, who plans to present his latest research at the September Diamond Films '94 conference in Tuscany, Italy, agrees that "there's no way the hydrogen reactions required [in the traditional method] could possibly be operative here." That means the work may not only give companies access to cheaper diamond films, but it will also give researchers a lot to think about.

Foot Gears

What would life be like without toes? Kind of like having a bicycle with no gears. Or so report physiologist David R. Carrier and his co-workers at Brown University, in a step-by-step analysis on p. 651 of this issue. The researchers asked 5 people to take a running step on a force plate, an instrument much like a bathroom scale, while they videotaped the step. The analysis revealed that during a step, the foot is an anatomical "lever" which acts, in effect, as a system of variable gears. One lever arm, from the calf muscle to the ankle, transfers force to the second lever arm, which runs from the ankle to the point where the force is applied to the ground. When the heel of the foot lands and the calf muscles absorb the impact, the ratio of the two lever arms (the gear ratio) is low. As the weight on the foot moves forward to the toes, the ratio increases, because the second lever arm is getting longer. "Shifting to a higher gear ratio allows the calf muscles to contract more slowly and thereby produce greater power," says Carrier. "Without toes, you'd be more or less limited to one gear."



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