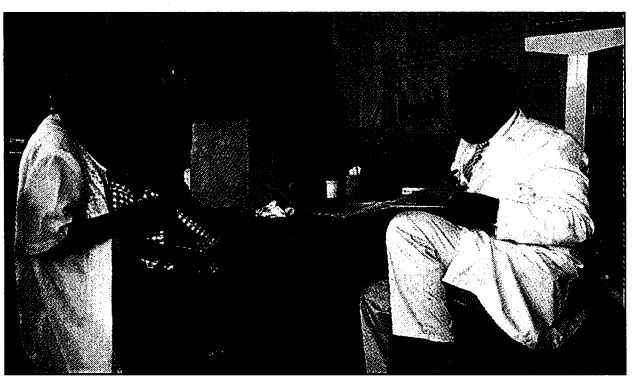
search and Development (LDRD) funds. Last year, Congress had slashed the decentralized accounts, which many labs use to seed promising research, after concerns that some labs were misusing the money (*Science*, 5 November 1999, p. 1064). But the new spending bill allows directors once again to channel up to 6% of their core budget to LDRD grants. At Livermore, that means a jump from $35 million to $52 million. "It's a big relief," says lab spokesperson Susan Houghton.

–DAVID MALAKOFF

CLINICAL TRIALS

Panel Proposes Rules For Research Abroad

Before scientists begin a clinical study in the developing world, they should make sure any successful treatment that results will be made available not just to trial participants but to the whole host country, according to a controversial recommendation from a presidential panel. The U.S. National Bioethics Advisory Commission (NBAC) on 29 September released draft guidelines* that would set this high bar for clinical research in foreign countries. NBAC took up the issue last year in response to controversies over placebo-controlled trials involving HIV-infected mothers and international trials of AIDS vaccines.



New criteria. Studying nevirapine, a drug that prevents mother-to-child HIV transmission, in Kampala, Uganda.

Ethicists and researchers have vigorously debated whether researchers from a wealthy country like the United States must provide the same standard of care to research subjects in foreign countries—even if they would otherwise have no access to such treatment. In the best known example, researchers came under attack for conducting studies that proved the effectiveness of a simple and cheap AZT therapy for HIV-infected pregnant women (*Science*, 27 February 1998, p. 1299). Some women received a placebo, even though AZT is effective and is standard treatment in the United States. The researchers considered this reasonable because the standard course of AZT is too expensive for most poor countries.

The NBAC panel acknowledges such dilemmas. The report says that researchers and sponsors should provide "established, effective treatment" to all study participants, whether or not it would usually be available. However, the guidelines allow exceptions. For example, if a researcher can explain to an ethical review board why providing treatment would render a study irrelevant to the host country, then a trial without standard therapy might be acceptable. Offering such flexibility is a step in the right direction, says physician and bioethicist Robert Levine of Yale University School of Medicine. The requirement that all studies provide the best known treatment is "out of touch with the realities."

The NBAC report would permit some flexibility on informed consent as well. Researchers have complained that a traditional U.S. requirement—that each volunteer must sign a written document that outlines possible risks and benefits—is meaningless in countries where few people read or write. Although individual informed consent is required, the report says, a written document may not be. In places where a request to sign a document may seem threatening, for example, ethics review boards could allow researchers to document verbal consent of some kind.

The panel's most controversial recommendation involves obligations both before and after a study takes place. Before work begins, the recommendations state, researchers and sponsors should explain how treatments that prove successful will be made available both to research participants and to the country as a whole. Although the principle is laudable, the guideline expects too much of researchers, says Francis Crawley of the European Forum for Good Clinical Practice in Brussels, Belgium. "These are enormously complex discussions," he says. "Often there is no way [a researcher] can tell how a treatment might be made available." Bioethicist Norman Fost of the University of Wisconsin, Madison, thinks such a requirement could slow down or prevent important trials. In the developing world, he says, participation in a trial is often a benefit, not a burden. In addition, he says, "there's no moral basis for the claim that individuals who aren't in the study are owed something."

NBAC will accept public comments on the draft through 13 November, says executive director Eric Meslin, and it aims to approve final guidelines in December.

–GRETCHEN VOGEL

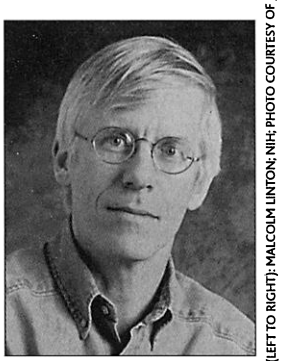
ETHICS

Epidemiologists Wary of Opening Up Their Data

ATLANTA—Epidemiologists, like journalists, have a tradition of protecting their sources, but now they're confronting demands that they open their files to the public. At the annual meeting of the American College of Epidemiology (ACE) here on 26 September, members debated how to comply with new federal rules that mandate data sharing. Finding a way to do that without jeopardizing subjects' privacy will be hard, many said. Indeed, some researchers warned that privacy concerns are already making it difficult, if not impossible, to recruit participants for some studies. Despite the sometimes heated discussions, Jonathan Samet, chair of epidemiology at Johns Hopkins University in Baltimore, Maryland, reminded the crowd that in reality, "there isn't a debate. There's a law."

Samet, ACE's president, was referring to a rule known as the "Shelby amendment," which passed Congress in 1998. As interpreted by the Office of Management and Budget, it requires federally funded researchers to make available raw data that support results that have been used "by the federal government in developing policy or rules" (*Science*, 12 February 1999, p. 914). Some researchers say that the best way to deal with potential requests for data is to routinely deposit material in an archive that can be opened to the public when results are published. But this idea was not popular in Atlanta, where, by a show of hands, the audience voted overwhelmingly against it.

Indeed, defenders of the public archive idea were hard to come by, says debate orga-



Data release. Christine Bachrach *(left)* argued for public archiving; Jonathan Samet warned of hard lessons ahead.

CREDITS (LEFT TO RIGHT): MALCOLM LINTON; NIH; PHOTO COURTESY OF JOHNS HOPKINS UNIVERSITY SCHOOL OF HYGIENE AND PUBLIC HEALTH

* Available at http://bioethics.gov

nizer Gina Etheredge, a clinical epidemiologist at Tulane University in New Orleans. She eventually recruited outside talent: Christine Bachrach, a demographer at the National Institute of Child Health and Human Development in Bethesda, Maryland. Bachrach said in a phone interview that researchers in her field routinely collect data with a plan to make them public. In Atlanta, she argued that public archiving "reinforces open scientific inquiry," promotes "timely use of information," encourages people to test new analytical methods and ideas, discourages repetition, and creates data sets that can be used for training. Bachrach warned the epidemiologists that, if someone does make a demand through the Freedom of Information Act, "your life is going to be a lot easier if you have put your data in a public archive."

Epidemiologist Manning Feinlieb of Johns Hopkins wasn't convinced. Feinlieb, like Samet, noted that a requirement for more data sharing is a "done deal," but he explained why many of his peers would prefer to share data in other ways. For one, he said, it's "too much trouble" to label and document every scrap of data that is collected in a way that would make sense to a stranger. Nor do epidemiologists want to give away their intellectual property: "They don't want to be scooped" on their work, he said, particularly if they're just beginning to exploit a database that's taken years to build. They're also leery of getting ensnared in long-running squabbles of minor significance—"a big pain"—which they see as more likely to happen if data are dumped onto the Internet. Mandatory data sharing also may mean that more money and time must be spent on paperwork, he argued. And although Feinlieb agreed that public archives would be useful in training Ph.D. candidates, he worried that they might also spawn more secondary analysis and less original field research.

Feinlieb also touched on a related subject—the privacy of medical records—that struck a nerve. Although everyone agrees that personal information should be kept anonymous and encrypted, he said, some panels that review and monitor clinical and epidemiological studies are requiring that individuals who join a study be warned that their privacy cannot be guaranteed. Such warnings and other requests for individual approval could become standard soon: The Department of Health and Human Services has published draft regulations, expected in final form next month, that may require individual consent before data from medical files can be screened and rendered anonymous for use in research.

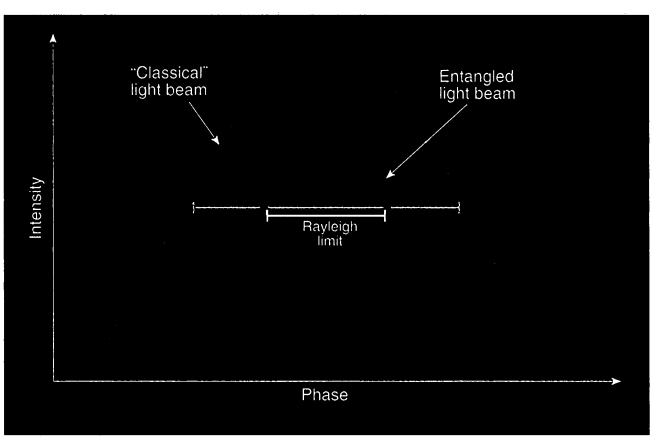
Imagine, said Etheredge, trying to recruit a subject and saying: "Tell me everything about yourself, and I promise to keep it secret—for a while. And then I'll put it on the Internet." Vickie Mays, an epidemiologist at the University of California, Los Angeles, who studies HIV and sexual behavior among African-American gay men, warned: "We're really going to regret" adopting mandatory data release and consent forms with scary warnings about privacy loss.

Observing that information technology is changing everyone's life, Samet said that epidemiologists may experience some especially "painful lessons." **–ELIOT MARSHALL**

PHYSICS

Yoked Photons Break The Light Barrier

It seems to flout the laws of physics, but scientists have found a loophole in the rules that govern diffraction. By exploiting entanglement, the quintessential "spooky" phenomenon in quantum mechanics, physicists at the Jet Propulsion Laboratory in Pasadena, California, have come up with a method for drawing tiny features on a microchip that would be impossible according to the classical theory of light. If it proves practical (always a big "if" where quantum effects are concerned), the technique—described in the 25 September issue of *Physical Review Letters*—could enable chip designers to circumvent the so-called Rayleigh limit, a physical barrier that plagues chip manufacturers much as the sound barrier used to bedevil aerospace engineers. As team member Jonathan Dowling puts it, "Murphy's Law has been repealed, at least in theory."



Sharper image. By halving photons' effective wavelengths, quantum entanglement may enable chipmakers to etch much smaller transistors.

If so, the reprieve comes in the nick of time. Although computer chips are growing ever smaller and more powerful—doubling in speed and halving in cost every 18 months or so—it's getting harder and harder to manufacture those chips. One reason is that most chips are made by photolithography, a process in which the manufacturer shines light through a patterned "mask" onto a chip slathered with a light-sensitive coating called photoresist. The light toughens the coating, allowing the manufacturer to etch away unexposed parts of the chip.

Unfortunately, as microcircuitry grows ever finer, chipmakers run smack into the Rayleigh limit, which dictates that the smallest feature a light beam can write on a chip is half the wavelength of the light. To etch smaller and smaller transistors, manufacturers must resort to shorter and shorter wavelengths—moving from red to blue to ultraviolet to extreme ultraviolet to x-rays. Short wavelengths, however, are both hard to control and tough on chips. The Rayleigh limit ensures that manufacturers pay dearly for smaller transistors.

To smash the barrier, Dowling and colleagues imagine "entangling" two photons so that when they are shot at a beam splitter from opposite directions, they will always wind up moving together in lockstep. Thus yoked, the photons will remain inseparable until they strike a target—in this case, the chip-in-progress. "This strange quantum-mechanical disembodiment allows them to conspire to arrive at the same atom at the same time," Dowling says.

If the entangled photons are made out of red light, the optics will bend them just as they bend red light, Dowling says. But when the two photons hit the target together, their combined energy might equal that of a single ultraviolet photon—a particle with a shorter wavelength. "It acts like UV for all intents and purposes," says Dowling. In fact, if you set up an interferometer, the interference pattern would look like one for ultraviolet photons rather than red ones: The fringes are twice as fine. That should make it possible to etch transistors twice as finely as the Rayleigh limit allows, Dowling says, provided that chipmakers can find photoresist that still hardens well when struck by photons with twice the usual angular momentum.

"Dowling had a very brilliant idea to use this for lithography," says Yan-hua Shih, an experimentalist at the University of Maryland, Baltimore County, who is trying to put the scheme into effect. Photoresist is his current stumbling block, he says. "Two-photon absorbing materials are not very sensitive; we're looking for a much better material."

Other scientists, however, think it will