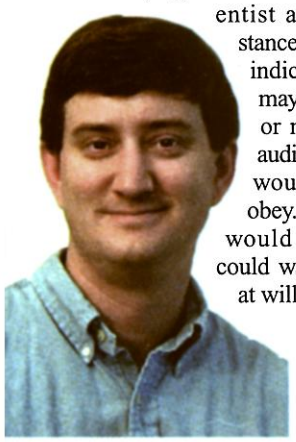
can scan for a watermark, detect the watermark, and make a decision based upon whether the watermark is there," says Scott Craver, a graduate student and computer scientist at Princeton. For instance, the watermark might indicate that an audio file may be copied only once, or not at all—orders that audio players and recorders would be constructed to obey. But such instructions would be moot if hackers could wash off the watermark at will.



Skeptic. Ed Felten says audio watermarks will fail.

SDMI's quest for a secure digital watermark went public in September, when the consortium posted four proposed watermarking schemes and two supplementary technologies on one of its Web sites (www.hacksdmi.org). An accompanying letter offered $10,000 to anyone who could hack any of the security schemes within 3 weeks. "Attack the proposed technologies," read the letter. "Crack them."

Many computer-security experts flatly refused. Don Marti, the technology editor of *Linux Journal*, arguing that SDMI's scheme is a unilateral attempt by the music industry to recast intellectual property rights in its favor, called for a boycott of the HackSDMI effort. "I wanted to call people's attention to the legal rights SDMI is planning to take away," Marti says. Others dismissed the competition as a waste of time. "Challenges and contests are stupid ways of assessing security," says Bruce Schneier, chief technology officer of Counterpane Internet Security in San Jose, California. "If I challenge people to break into my house and it's not robbed in a week, can I conclude that my house is secure? It's bizarre." Craver agrees: "A 3-week challenge could not be taken seriously in the cryptographic community." Nevertheless, Felten, Craver, and others ignored the boycott and attacked the watermarks.

Last week, Felten and Craver's team declared that it had defeated all four watermarking schemes. "Basically, for each of the technologies, we figured out where in the signal each watermark was put and then washed it out," Felten says. "For instance, if it's all stored in a narrow frequency band, you can add a bit of noise in that frequency band." Felten claims that removing the watermarks didn't damage the quality of the music. The SDMI consortium agreed that Felten's sample had no watermark and sounded just fine, at least in a preliminary inspection.

The result proves that "watermarking technology is not mature enough to do what SDMI wants it to do," Felten says. But SDMI isn't convinced. "The word we received was that all 153 attacks have failed to meet the criteria," says David Leibowitz, chair of San Diego–based Verance, which provided one of the four watermarking schemes. SDMI officials say the Princeton team did not submit technical information showing that it had devised a general strategy for defeating watermarks. As Leonardo Chiariglione, SDMI's executive director, explains, "If every bit of new music is a new challenge, if repeatability is not guaranteed, it is not considered a successful attack."

Some experts, though, see Felten's attack as a confirmation that copy-protection schemes will never deter any but the most inept would-be pirate. "Digital bits can be copied; it's the natural way, and any procedure that tries to go against the tide will fail," Schneier says. "Watermarks can't possibly work. Copy protection can't possibly work. Get over it. Accept the inevitable, and figure out how to make money anyway."

—CHARLES SEIFE

CREDITS: (TOP TO BOTTOM) FELTEN CONSULTING INC.; P. BAGLA

INDIA

New Guidelines Promise Stronger Bioethics

NEW DELHI—The Indian government has issued new guidelines for conducting medical research on humans that would raise standards and tighten oversight at most institutions. The voluntary guidelines, released on 18 October, are also expected to bolster international collaborations by putting Indian practices on a par with standards in the West.

Although the guidelines will mean more paperwork for an already clogged bureaucracy, most scientists say that they are an important step toward ensuring ethical research. "It is expected that all institutions that carry out any form of biomedical research involving human beings should follow these guidelines," says Nirmal Kumar Ganguly, director-general of the Indian Council of Medical Research (ICMR) in New Delhi.

Four years in the making, the new guidelines would create a network of institutional review boards. That in itself would be a major change: An ICMR survey last year of 30 leading research institutions found that most had no ethical committees overseeing experiments involving humans. The few committees that did exist were generally moribund, meeting rarely and having little influence on major research decisions.

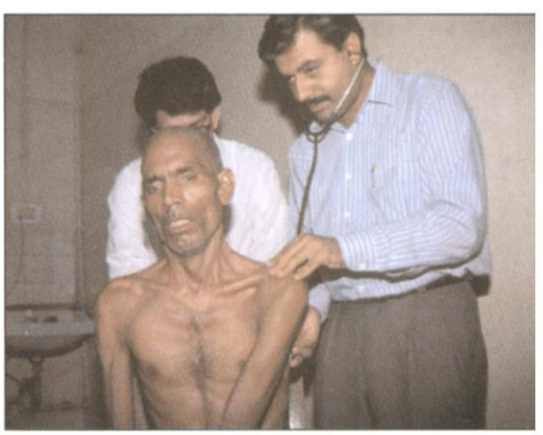
The new guidelines, titled "Ethical Guidelines for Biomedical Research on Human Subjects," stipulate that each research proposal that involves human testing will be vetted by an institutional ethics committee. Its five to seven members must include a legal expert, a social scientist, a philosopher, and a community representative in addition to researchers. All committee decisions will be made at a "formal meeting" and not "through the circulation of a proposal." Once cleared, the protocols would receive no further ethical review.

In addition to enshrining the principles of informed consent and confidentiality, the guidelines specify the nonexploitation of vulnerable groups such as the poor and mentally challenged people. It also says that anyone in a trial who has an adverse reaction should receive the "best possible nationally available care."

The guidelines were unveiled at a meeting here of the Indo–U.S. Biomedical Research Policy Forum, which seeks to resolve obstacles to collaborative biomedical research between the two countries. Gerald Keusch, director of the Fogarty International Center of the U.S. National Institutes of Health, who attended the meeting, called the guidelines "comprehensive." He said they "have the same philosophic context" as those that federally funded researchers and their U.S. institutions must follow.

Absent binding legislation and additional resources, the success of the voluntary guidelines will depend on the response of the scientific community. "There is no way the ICMR can be the policing agency," says Vasantha Muthuswamy, chief of basic biomedical research at ICMR and secretary of the Central Ethics Committee on Human Research, which formulated the guidelines. And that puts the burden on those who fund the research, as well as those who carry it out. "Now that a strong ethical framework has been put in place, it is up to the grant-giving agencies to ensure that funding is not given in instances where ethical violations are noticed," says Prakash Narain Tandon, a neurosurgeon and professor emeritus at the All Indian Institute of Medical Sciences in New Delhi.

—PALLAVA BAGLA



Standard of care. Indian doctors examine a tuberculosis patient being recruited for a drug trial.