sions on the expansion or contraction of teaching and research programs, and it must be dealt with in the same terms.

The next few years will be crucial ones for colleges and universities generally, and for their computing resources in particular. The advent of computer networking raises a host of academic, economic, technological, and organizational problems. In spite of these problems, I believe that distributive networking will have a significant and positive effect on campus computing services.

References and Notes

1. M. Greenberger, J. Aronofsky, J. L. McKenney, W. F. Massy, Eds., *Networks for Research and Education: Sharing Computer and Information Resources Nationwide* (MIT Press, Cambridge, Mass., 1974); *Science* **182**, 29 (1973).
2. Computer systems are often given acronyms: ILLIAC, Illinois Automatic Computer; SPIRES, Stanford Public Information Retrieval System; ACME, A Computer for Medical Research; TOD, Time Oriented Data (System); OASIS, On-line Administrative Information System; BALLOTS, Bibliographic Automation of Large Library Operations using a Time-sharing System; PDP, Programmable Data Processor. Systems called ORVYL and WYLBUR are also mentioned in the text, but these are directly coined names rather than acronyms.
3. The systems at the Stanford Linear Accelerator Center (SLAC) are not considered in this example, although they are part of the same overall computing organization.
4. See M. Greenberger *et al.* (*1*) for a definition and discussion of the facilitating network concept.

NEWS AND COMMENT

Grave-Robbing: The Charge against Four from Boston City Hospital

Violation of Sepulture. Whoever, not being lawfully authorized by the proper authorities, wilfully digs up, disinters, removes or conveys away a human body, or the remains thereof . . . shall be punished by imprisonment in the state prison for not more than three years or in jail for not more than two and one half years or by a fine of not more than two thousand dollars.—MASSACHUSETTS GRAVE-ROBBING STATUTE, 1814.

Boston, Massachusetts. When, in 1971, four doctors at Boston City Hospital (BCH) began a study of the way pregnant women metabolize common antibiotics, it never occurred to them that 3 years later they would be accused of grave-robbing for studying dead fetuses as part of their experiment. But then, it never occurred to them that, by 1974, the "right-to-life" movement would have gained the political influence it now wields. They never imagined that antiabortionists could put the brakes on fetal research. And, they did not anticipate the way in which "rights" movements in general—women's rights, patients' rights, and so on—would shape the public consciousness.

For complex social reasons, a criminal case that would have been unheard of a couple of years ago is today quite real. On 11 April, a Boston grand jury indicted Leonard Berman, David Charles, Agneta Philipson, and Leon Sabath for an alleged violation of an 1814 Massachusetts grave-robbing law. The accused did nothing, however, that violated standard practice at the hospital, then run jointly by Harvard, Tufts, and Boston universities.*

The charge itself is quite simple; the circumstances that led to it and its potential legal resolution are anything but simple. According to Assistant District Attorney Newman A. Flanagan, who is prosecuting the case for the Commonwealth, the defendants did not have legal authority to examine the fetuses used in their study and are, therefore, guilty of illegally "removing and conveying away" human bodies—grave-robbing. Had the researchers asked each woman in their study for permission to perform what amounts to the legal equivalent of an autopsy on her dead, aborted fetus, there would be no case, Flanagan says. But they did not ask the mothers' consent; at the time, it was not hospital practice at BCH—or at most other hospitals, for that matter—to do so. In fact, no one even thought of it. The fetuses were going to be incinerated anyway.

Recent advances in biomedical science are raising important problems of ethics and public policy. This is one of a series of occasional articles planned for News and Comment on the conflicts involved.

Now, four scientists are in serious legal trouble for performing experiments that were perfectly consistent with standard research practice. Philipson, a Swedish citizen, was not in the United States when the indictment was handed up in April and, according to attorneys in the case, no attempt has been made so far to bring her back. But the police arrested the other three defendants and carted them off to be fingerprinted and photographed for police files. They are now out on bond, waiting to see what will happen next.

It is a strange case. One might think that the nation's researchers would have rallied to their beleaguered colleagues, offering moral support if nothing else and musing relievedly, "There but for the grace of God go I." Apparently, however, scientists, like everyone else, tend to shy away from other people's trouble.

"The indictment has been very hard on the defendants' professional as well as personal lives," says one of the many attorneys for the defense, who include specialists in both medical and criminal law. "Some of it is subtle, but there is no doubt it's there, that it enters people's minds when they are thinking about appointing one of these guys to an important committee, that sort of thing."

Sabath, who was the senior investigator on the antibiotic study, admits that he is disappointed by his friends' response. He says that a few colleagues have said, in private, that they are behind him, but only a handful have been willing to speak out in public. "Most of them just feel that they shouldn't say anything," Sabath concedes. A leader of one of the country's major biomedical research societies told Sabath that the organization could not say anything, lest it lose its credibility. That was not much comfort.

Sabath is, however, very grateful to Harvard University for its official, if

* Today, Boston University has sole responsibility for the hospital.

low-profile, support. Harvard is paying for his defense.

At the time Sabath was working at BCH, he was an associate professor of medicine at Harvard Medical School. Philipson also had a Harvard appointment. Charles, who is now at St. John's University in Newfoundland,† was then affiliated with Boston University, as is Berman, a BCH pathologist. Although the details of the universities' financial support of the defendants is still being negotiated, it seems likely that none of the four will have to use personal funds to pay the lawyers.

The matter of the legal bill is touchy, something Harvard officials do not want to talk about. Apparently, BU is reluctant to commit itself unconditionally to support the defense, and its share of the kitty is a sensitive issue. But the greater reason for official hesitancy about Harvard's role is a fear that the defendants' association with Harvard could work against them if the case goes to a jury trial. In neither Cambridge nor Boston, from which the jurors would come, is Harvard University uniformly revered, quite the contrary. Said one university official, "If this goes to a local jury, the Harvard connection may not do these people much good. And we want to get them acquitted."

There is, on the part of attorneys involved in this case, a desire that there be no more like it. "We don't want any more criminal indictments here," said one. They have observed the doubt and fear that the case has engendered among people in fetal research and worry that important studies may now never be done.

The experiment with antibiotics that started this controversy was conceived by Agneta Philipson, out of her own experience. In a telephone interview with *Science*, Sabath recalled how it came about.

Philipson was in Sweden, pregnant with her fourth child, when she got bronchitis and began taking an antibiotic to cure it. It did not seem to be working as well as she expected it to and, curious about the possibility that pregnancy had affected her ability to metabolize the drug, she decided to find out how much of it was circulating in her blood. Very little, it turned out; the concentrations of circulating antibiotic were much lower than they should have been. Philipson's curiosity about the phenomenon persisted and, after her baby was born, she took another round of the antibiotic in the same dose as before. This time, her blood concentrations of drug were as high as they were supposed to be. Being pregnant had obviously altered her ability to metabolize the antibiotic.

Later, when Philipson took a year's leave from the Karolinska hospital to work at Harvard, she discussed her observations with Sabath, an antibiotic specialist. "Agneta was suggesting that pregnant women may not be getting proper drug therapy," he recounts. "It was a very important question and one about which very little was known." The two of them agreed to explore the matter.

Philipson and Sabath decided to look at the behavior of two very common antibiotics, erythromycin and clindamycin, each of which might be used instead of penicillin to treat in utero syphilis in the fetuses of women with penicillin allergies. They wrote up a protocol, calling for pregnant and nonpregnant subjects (the latter as a control group), and submitted it to BCH's human studies committee which approved the plan.

"As we thought about it," Sabath remembers, "we realized the safest course would be to get pregnant women who were going to have an abortion anyway. There was no reason to think that either antibiotic would be harmful to a fetus—each is widely used—but it seemed wrong to take any chance." So, they agreed to experiment only on pregnant women who were going to have abortions. That is where David Charles came into the picture. He performed abortions at BCH, and Philipson and Sabath asked him to cooperate, which he did.

Philipson and Sabath approached Charles' patients after they had already been admitted to BCH for abortions and asked them to participate in the study, which meant agreeing to take one of a variety of doses of either erythromycin or clindamycin and subsequently letting the doctors take blood samples. In every case, the women gave written consent to their participation in the experiment.

From the study of the women, a study of the fetuses was a logical step because the investigators wanted to know not only how the mothers handled the antibiotics but also whether the drugs crossed the placenta and entered fetal tissues. That is where Leonard Berman came into the picture. As a hospital pathologist, he was in a position to help investigators obtain tissues for study. Philipson and Sabath asked him to cooperate by seeing that they got the aborted fetuses to study. Berman was glad to help out.

Body snatching in the 18th century. Pen and ink drawing by Barney Moore after a sketch by Cruickshank. [*The Bettman Archive, Inc.*]

The experiment verified the idea that pregnant women metabolize antibiotics differently than nonpregnant women, and it showed that clindamycin is more effective in crossing the placenta and getting into the fetus than is erythromycin. These were important observations and were published in the *New England Journal of Medicine*, 7 June 1973. Berman was not listed as an author of the paper, but he was given credit for his help in one of those familiar "We are indebted to . . ." footnotes. As Sabath says now, "He should have said, 'Thanks, but don't mention it.'" The case against them reads, "Commonwealth of Massachusetts *v.* Leonard Berman, . . . ," and, says Sabath, "Berman was a bystander."

The journal's paper inflamed Boston "right-to-lifers" who, apparently, were more concerned about the fact that the experiment had depended on the cooperation of women having abortions than they were about the ultimate social benefits of the research. In July 1973, Massachusetts State Representative Raymond L. Flynn wrote to Boston City Councilman Albert "Dapper" O'Neil, complaining about inhumane procedures at BCH and other hospitals. He said he spoke for all "right-thinking" people who believe that no abortion should be permitted, regardless of what the Supreme Court says.

O'Neil held hearings on the matter a couple of months later. As a result, the district attorney's office was called in to investigate BCH, and a planned outpatient abortion clinic at the hospital, which would have cost the city about $98,000, was scrapped. Even now, the power of antiabortionists is felt at BCH. The hospital used to perform 25 to 30 first-trimester abortions a week. Since the trouble began, there

† Sabath is now at the University of Minnesota, having accepted a job there long before the criminal charges were filed. Charles, too, had previously planned to leave.

have not been any. At present, according to Ernest Lowe, who is chief resident in obstetrics and gynecology, most of the abortions at BCH are for "medical" reasons only. Women seeking an "abortion on demand" are referred to private clinics.

The "right-to-lifers" have succeeded not only in blocking abortions at BCH; they also have managed to put a stop to the kind of experiment that Sabath and his colleagues were doing. A new Massachusetts law, unrelated to the BCH situation but also initiated by "right-to-life" groups, bans all research on live fetuses.

The grave-robbing case raises many of the same legal and social questions that are brought up by the manslaughter case against Kenneth Edelin, another BCH doctor (*Science*, 25 October). The Edelin case is a by-product of the district attorney's investigation of BCH that followed the city council hearings. Edelin is accused of killing a fetus during the course of a legal second-trimester abortion. In each case, the question of whether a fetus is a "legal person" entitled to the protection of the 14th Amendment to the Constitution is at issue.

Assistant District Attorney Flanagan contends that a dead fetus is not just a hunk of tissue but is a human body that must be treated like any other. In the grave-robbing case, that means the researchers should have had permission from the next of kin to perform their analyses. (The new state law on fetal research requires maternal consent for any experimentation on a dead fetus.)

Neil Chayet, one of the attorneys for the defense, maintains that a fetus is not a person until at least the third trimester and, therefore, the defendants must be acquitted. Chayet believes, as do the lawyers defending Edelin against the manslaughter charge, that the Supreme Court answered the question of fetal personhood in Roe *v.* Wade, its historic 1973 ruling legalizing abortion. Some legal experts argue that the court effectively resolved the question in that case, saying that a fetus is not a person. Other legal authorities reply that the court's ruling is subject to interpretation on that point.

Chayet has argued successfully in court that a fetus is not a person. In Doe *v.* Doe, a case in which an estranged husband tried to prevent his wife from having an abortion, the court appointed Chayet to represent the unborn fetus. Drawing support from Roe *v.* Wade, and other cases, Chayet concluded that the fetus is not a "legal person" and that he, therefore, had no client. The court was persuaded by his reasoning and the woman had the abortion. Whether this approach will prevail in the grave-robbing case, which has not yet gone to trial, is not at all certain.

What is certain is that the unprecedented BCH cases are already putting restraints on research. And scientists are intimidated. If one asks researchers here whether they or their colleagues have abandoned or modified experiments as a result of what is happening in the statehouse and the courthouse, a majority will answer, "Yes." But when it comes to specifics, they clam up. As one of them said, "In the current climate, we're all afraid we may have committed an indictable offense."

—BARBARA J. CULLITON

A third article will discuss the Massachusetts fetal research law and the way the Boston research community reacted to its passage.

National Health Insurance: Will It Promote Costly Technology?

Like a perennial flower, discussion of national health insurance has kept cropping up in Congress year after year. But, despite varying approaches to the problem among the legislators, a consensus of sorts seems to be emerging that Congress will pass some form of health insurance legislation in the next year or so—perhaps even before the end of 1974. Such passage would revolutionize the financing of health care for the 220 million Americans now benefiting from private health insurance and the 50 million people now covered by the Medicare and Medicaid programs. But there is an important, little-discussed question of side effects: What impact would national health insurance have on medical practice and medical research? Indeed, a number of experts are afraid that the side effects of a national plan may be highly undesirable.

Some university economists, and some medical analysts at the Institute of Medicine (IOM) of the National Academy of Sciences, have been predicting that national health insurance will induce more and more people to opt for highly expensive and elaborate forms of treatment such as extra tests, unnecessary surgery, and elaborate terminal care. In time, this would create more demand for such services and encourage doctors and hospital administrators to construct facilities, train specialists, and conduct related research. The trend, in the long run, would be to bias medical care in favor of technology-intensive procedures. And, since resources are finite, these activities would drain away funds and manpower from lower-cost care.

This discussion has been going on for some time as a sideshow to the center-ring debate in Congress over national health insurance. In that debate, the most publicized issues have been what benefits should be made available to the average citizen, whether the program should be administered by the private insurance industry or the federal government, and how to finance it—the last being especially troublesome since estimates of the ultimate annual cost of the program range from $30 billion to $100 billion!

Two separate theories are being advanced as to how a needlessly high technology–oriented medical establishment could emerge on the future American health scene. One theory, put forward by an IOM panel chaired by Princeton economist Herman M. Somers, holds that the automatic inclusion of some highly expensive types of treatment, such as kidney dialysis, under national health insurance could, without proper restraints, encourage more