

preparation. In general, the attrition rate among Black and Chicano students in the program was high. Three years ago UC launched a new outreach program designed to start at the junior high school level and carry through high school. The idea was to motivate minority students to aim for a 4-year college education and acquire the academic skills necessary to succeed. The first students in the program pipeline are still 2 years from the college admissions stage so the evaluation cannot really begin until then. Expenditure on the program has reached \$4 million a year, with the state taking over a major share of the funding, but the future is uncertain, the program being viewed as vulnerable because of uncertainties about state support.

For UC, the problem of deficits in academic skills is not limited to minorities. A report from a joint planning commission noted "there has been a marked and general decline in the basic skills and academic preparation of students graduating from high school." Not only is the

decline indicated by the scores on standardized tests by entering students, but achievement by graduating students as measured by scores on the Graduate Record Examination also slumped.

Providing greater access to UC for minorities while at the same time preserving academic standards will not be easy, particularly in a period when resources are certain to be short. And the minorities issue, is, of course, not the only problem facing UC in the coming decade. A principal question is whether the state can afford to continue to finance a nine-campus system which is competitive in terms of faculty salaries and general resources with top private and public research universities. The case for paying salary differentials to faculty in high-demand fields such as computer science and some engineering specialties is one touchy matter now being explored. These and other potentially divisive issues are unlikely to go away. Nevertheless, dealing with the ethnic shift is an urgent matter for the universi-

ty because of the potential political power of the Chicanos.

On these prospects Martinez is one of those who takes the pragmatic view that "numbers do not guarantee political power." For many years, she says, Chicanos were kept out of the voting booth. After such experience, she says, "it's not easy to educate people." The political learning process involves making mistakes. She says, for example, that Chicano's "have got to stop running 15 different people for an office." Another factor is that Chicano's are a young population with an average age 10 years below that of the general population, and young voters are hard to get to the polls. But, in time, growing numbers and increasing political sophistication are likely to convert ethnic pride to political power. So for UC, faced with the problems of the minorities in the altered financial and political environment of California in the 1980's, social responsibility and institutional self-interest will certainly coincide.—JOHN WALSH

NIH Shaken by Death of Research Volunteer

A lawsuit is threatened, but spokesmen say the NIH is not responsible for the death

At 5:15 in the morning of Saturday, 12 April, Bernadette Gillcrisp died, presumably from a cardiac arrest. She was a volunteer participating in a sleep experiment at the National Institutes of Health (NIH)—an experiment considered so safe that no nurse or trained medical personnel were even on duty. A 23-year-old nursing student at nearby Catholic University, Gillcrisp seemed healthy and her death was a shock to NIH and the medical research community. "It never would have occurred to me in my wildest dreams that a 23-year-old girl would die in that experiment," says Mortimer Lipsett, director of the NIH Clinical Center.

NIH administrators are worried about the legal and political ramifications of the death. "Everyone around here is getting a little paranoid," says one NIH official. Gordon Forester, an attorney retained by the Gillcrisp family, says he will recommend that the family sue NIH for negligence and that it be a substantial suit, "in the millions." After seeing an NIH committee's report on the death, he concludes that the normal volunteer pro-

gram "adds up to a pretty beastly operation."

These are strong words, and NIH officials feel they are unjust. The normal volunteer program, begun in 1954, has enrolled about 7000 subjects. Until Gillcrisp's death, there were no serious incidents. And the Gillcrisp case was exceptional. As the NIH committee found, she was by no means a "normal" volunteer. She lied about her medical history and, had that history been known, she would never have been admitted to the volunteer program. What especially bothers NIH officials is the likelihood that the entire volunteer program will be under attack as a result of the incident. "To act on this single event is to take one piece of evidence and blow it out of all proportion," says Griff Ross, deputy director of the NIH Clinical Center.

Still, a lot of little things went wrong in the experiment during which Gillcrisp died. These are the events that Forester is referring to when he charges negligence. But none of these things, by themselves, could have caused her

death. Ultimately, it appears that the person responsible for the death is Gillcrisp herself.

The history Gillcrisp concealed is that she suffered from anorexia nervosa and self-induced vomiting. On two previous occasions she had experienced cardiac arrest, and she was in a coma for 2 days on the first occasion. Her doctors believed that her cardiac arrests were a direct result of her vomiting, which causes loss of hydrochloric acid from the stomach and leads to a compensatory loss of intracellular potassium. This can result in a potassium imbalance, which can cause cardiac arrest. According to Ross, about 10 percent of anorexia nervosa victims die, and those who die are not necessarily the emaciated ones—they are the ones who vomit.

Gillcrisp's history of vomiting was especially ominous because she was given lithium as part of the NIH experiment. Lithium further depletes cells of potassium, but not to an extent that is dangerous to normal people. But in Gillcrisp's case, says D. Lynn Loriaux, act-

ing clinical director of the National Institute of Child Health and Human Development, "the stage was set for disaster."

At the time of her death, Gillcrist was a participant in a sleep experiment designed to examine the effects of lithium, which is commonly given to manic-depressives, and alpha-methyl-para-tyrosine (AMPT), an experimental drug that blocks catecholamine synthesis. The study was being performed to test the hypothesis that the manic-depressive state is caused by catecholamine imbalances.

Gillcrist arrived at the sleep lab at about 9:30 p.m. on the night of 11 April.



Bernadette Gillcrist

She had been taking lithium for 9 days and on that day was given AMPT to take as well. At about 10:30, electrodes were connected to Gillcrist's head so that her sleep pattern could be monitored by an electroencephalograph (EEG). She fell asleep immediately. All was normal until about 5:15 a.m., when the EEG technician heard Gillcrist cough or moan. The technician went into Gillcrist's room, spoke her name, and heard what sounded like an acknowledgment.

When she returned to the EEG console, the technician noticed that Gillcrist's EEG tracing had gone flat, indicating either equipment failure or death. The technician spent the next 50 minutes trying to determine what was wrong. She entered Gillcrist's room several times and finally decided that the problem was with the attachment of the electrodes to Gillcrist's head. She did not try to arouse Gillcrist because she had been told that if the equipment failed

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Industrial Productivity and the "Soft Sciences"

In its report last March, the House of Representatives Budget Committee acknowledged that basic research and science are fundamental to increased industrial productivity and economic well-being. But it added that, in this respect, some kinds of research are of lower priority than other kinds and, in particular, that this might be true of the "soft sciences," referring presumably to fields such as sociology and psychology.

This judgment perhaps squares well enough with the conventional wisdom, but it is far off the mark if it is true, as some sociologists are now saying, that the remarkable success of the Japanese in increasing productivity is due partly to the adoption of techniques to motivate workers to work hard and help solve production problems.

A few weeks ago, the House Committee on Science and Technology held a seminar on the role of research in economic performance, and among the panelists was Robert E. Cole, a sociologist at the University of Michigan who has been studying Japanese business and industrial organizations for some 15 years. There were some leading people from industry present, notably William Baker of Bell Telephone Laboratories and Thomas Vanderslice of General Telephone and Electronics, but Cole clearly was the one who had come with a fresh new message.

"If we look at the United States," Cole said, "there is a very strong tendency among industrial engineers, economists, and management and government officials to underestimate the potential of harnessing worker cooperation to raise productivity and to improve quality. In so doing, I think we underestimate the contribution to be made by the social sciences."

Cole observed that to measure such variables as "human effort or commitment is notoriously difficult." Economists, he added, prefer to concentrate on "harder, more measurable variables," and government officials and politicians want to justify decisions with hard numbers. In Cole's view, moreover, American management is "so locked into an adversary

mentality that for the most part they tend to write off mobilizing worker cooperation and increased motivation as a means of raising productivity and improving product quality."

Labor unions are locked into the adversary mentality, too, Cole said. "Management finds it easier to invest millions to make machines idiot proof, to use the quaint phrase that I sometimes hear engineers using, than to figure out how to get workers to take responsibility for quality."

Japanese managers, on the other hand, are encouraging workers to approach their jobs with ingenuity and commitment and are getting excellent results, Cole indicated. Every year, for instance, Toyota Motors is getting about nine suggestions for improvements per employee and is adopting more than 80 percent of them. By contrast, General Motors gets less than one suggestion per employee per year and adopts less than a fourth of those received. "Not only are [Japanese companies] getting a hell of a lot more suggestions, but they are getting better ones," Cole said.

How is this accomplished? One widely employed technique, Cole indicated, is use of "quality control circles." These circles, composed primarily of hourly employees from the same workshop, meet maybe once a week for about an hour to hear and discuss suggestions for reducing defects, lowering costs, increasing productivity, and the like. "Workers typically are provided training in various methods of problem-solving, especially statistical methods," Cole said.

According to Cole, development of quality control circles and other techniques to motivate workers reflects the fact that Japanese managers recognize social science and organizational research as relevant to their needs.

In applying the social sciences to problems of industrial management, the Japanese are drawing substantially on the work of scholars in the United States and other western countries, Cole indicated. Of the 1000 or so new books on management published each year in Japan, nearly a tenth of them are translations.

Cole sees signs that American industry is now at last catching on. He noted that some 100 companies, including General Motors, Ford, General Electric, and other major enter-

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after 5:00 a.m., enough data would already have been obtained and the volunteer should not be awakened. At 7:00 a.m., the technician entered Gillcrisp's room to wake her up and discovered that she was dead.

Immediately after the death, Robert Cohen, clinical director of the National Institute of Mental Health, under whose auspices the sleep study was conducted, set up an investigatory committee. The committee consisted of Donald Calne, clinical director of the National Institute of Neurological and Communicative Disorders and Stroke, John Decker, clinical director of the National Institute of Arthritis, Metabolism, and Digestive Diseases, and Loriaux.

The presumption at NIH, based on the investigatory committee's findings, is that Gillcrisp died of a cardiac arrest brought on by self-induced vomiting. Autopsy results were inconclusive. The effects of vomiting on Gillcrisp's intracellular potassium concentrations may have been exacerbated by the lithium she took.

Several lines of evidence indicate that Gillcrisp was vomiting prior to her death. Although of normal weight when she died, she had been trying to lose weight in preparation for her sister's wedding and had lost about 10 to 15 pounds in the preceding 2 months, according to the NIH committee. The committee also reported that there was dried vomitus in her handbag. More important, when her blood samples, which had been drawn for lithium determinations, were rechecked for potassium, it was discovered that her serum potassium was below the normal range at the time of her death.

When Gillcrisp was accepted into the normal volunteer program, she was given a thorough physical examination and her blood was checked for electrolyte imbalances. At that time, she apparently had her vomiting under control and her electrolyte concentrations were normal. Her blood was not tested again for electrolytes because, says Ross, "you don't expect electrolytes to change in a normal person in a few months."

When asked about her medical history, Gillcrisp repeatedly denied that she had had any serious medical problems. She had been seeing a psychiatrist three times a week in individual therapy and once a week in group therapy ever since her second cardiac arrest, but she had not told him of her participation in the NIH experiment and had not told the NIH researchers that she saw him. In fact, Gillcrisp saw her psychiatrist on the

night she died. After arriving at the sleep lab at 8:30, the scheduled time, she left for an hour for a therapy session. She told the NIH staff that she had to leave to get a change of clothes.

Gillcrisp was almost caught in her deceptions. The NIH investigatory committee reported that she had been an NIH patient after her second cardiac arrest. This was discovered by the medical records department after some sleuthing. (Gillcrisp gave a different middle initial and a different address when she entered the sleep study.) But the discovery of her previous record was never communicated to the researchers conducting the sleep experiment. The medical records department phoned the sleep laboratory to report the discovery of Gillcrisp's NIH record, but no one at the sleep lab admits to taking the phone call and the message was lost. Forester says this communication failure is an example of NIH negligence. Loriaux disagrees. "It's an oversight," he says. But he admits that if the oversight had not occurred, "it conceivably could have made a difference."

Another kind of error discovered by the committee was in the experimental protocol. Gillcrisp had participated in a study in January in which she was to have received a placebo and AMPT. Instead, she was given lithium and AMPT. Also, in the January experiment, lithium was administered for 13 rather than 10 days and AMPT was given for 3 days rather than 1. These deviations from protocol almost certainly had nothing to do

Gillcrisp's motivation for participating in the experiment probably was not purely humanitarian. Several tablets of AMPT were found in her handbag after her death and, according to the protocol, she should have taken them.

Money certainly could have been an inducement to participate, especially for a college student with the time available for such an experiment. By participating in sleep experiments, Gillcrisp had earned \$1300.

But in Gillcrisp's case there may have been more involved than money. As Ross explains, "Gillcrisp had one important attribute. She was a brilliant woman. I will die believing she knew lithium was bad for her, being a nurse and being as intelligent as she was. There is an element of self-destructiveness in her behavior. She was irrational." Loriaux agrees. "After a cardiac arrest happens once, if you vomit again it must be viewed as a self-destructive act." Forester admits that Gillcrisp knew all about anorexia nervosa. Her room at school was full of books about the disease, he says. So it is nearly certain that she knew about the danger of potassium imbalances and quite possible that she knew of lithium's effects.

A key question that has arisen in the aftermath of Gillcrisp's death is whether her admittance to the normal volunteer program could have been prevented. One way may have been to pay her less. Yet Jay Shapiro, associate director of the Clinical Center and head of a com-

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with Gillcrisp's death because they occurred 3 months before it. Still, they are worrisome. Forester cites them as further evidence of negligence; if, in fact, the error in giving Gillcrisp lithium rather than a placebo had occurred in April rather than in January, it conceivably could have contributed to her death.

It may never be known why Gillcrisp lied to NIH researchers in order to participate in the experiment. Forester speculates that she lied because she knew "the only way to get over anorexia nervosa is to put it all behind you and to deny you ever had it." Loriaux, an expert in that disease, says Forester's statement is nonsense.

mittee formed to study the volunteer programs, thinks the NIH fees are not out of line compared to what research volunteers are paid elsewhere. "I don't think our payment is excessive," he remarks. He has discovered that NIH is competing for volunteers with other organizations that do research on a contract basis. This competition may limit the amount that NIH could lower its fees and still attract volunteers.

NIH investigators also considered the possibility of screening untruthful people out of the volunteer program. But they learned that no psychological tests can be guaranteed to detect even pathological liars, although some interview tech-

niques may help. "There is no question that patients can deceive you. The hospitals are full of patients deceiving their physicians. It's a very tough problem and no one knows what to do about it," says Loriaux.

Other likely changes at NIH are procedures to ensure that patients' previous medical records are not overlooked and periodic audits of randomly selected experiments to guard against protocol violations.

Whether these will make the volunteer program safer is hard to say. "I'm baffled by what we ought to do. I'm not sure we should jump around and try to do something. There is no easy solution," says Lipsett.—GINA BARI KOLATA

Behavioral Medicine: An Emergent Field

Using systems theory as a model, researchers are working toward a synthesis of knowledge from biological and behavioral sciences

"Behavioral medicine" is a term that is yet unfamiliar to most people, including many who practice medicine. To some it connotes preoccupation with physical fitness and stopping smoking. To others it is indistinguishable from psychosomatic medicine.

Behavioral medicine is an emerging field which treats mind and body as two ends of the same continuum. The core of basic research in this field is an attempt to locate the specific neurochemical mechanisms by which subjective states—specifically those associated with emotional stress—lead to disease. Ultimately, it is an approach to disease and health that spans everything from research through etiology, diagnosis, treatment, rehabilitation, and prevention.

Behavioral medicine got its formal send-off at a conference held at Yale University in 1977. It was there that participants made their first stab at defining the field, one later refined at a conference at the Institute of Medicine the following year. The early definition talked of applying knowledge from behavioral sciences to research and treatment of disease; the later definition embodies what they really meant, which is the integration of biological and behavioral knowledge in a multidisciplinary approach to the questions. The disciplines include anthropology, sociology, and epidemiology as well as psychology, psychiatry, medicine, and basic biological disciplines.

A result of the Yale conference was the launching of a new journal, the *Journal of Behavioral Medicine* in March 1978. In the same year was created the Behavioral Medicine branch of the National Heart, Lung, and Blood Institute, headed by psychologist Stephen M. Weiss, and the founding of the Academy

of Behavioral Medicine Research, whose president is psychiatrist David Hamburg, the outgoing president of the Institute of Medicine. Weiss, Hamburg, and Neal Miller of Rockefeller University (called by some the father of biofeedback) were the prime movers in the formation of the society.

The most direct precursor of behavioral medicine is psychosomatic medicine, a field based on psychoanalytic theories about disease etiology which grew up in the 1950's and 1960's.

Psychosomatic medicine has made crude but perhaps crucial contributions to acceptance of the notion that the activities of mind and body are inseparable. For example, observers have tentatively identified "disease personalities"—constellations of traits that seem to have a high correspondence with such varied disorders as cancer, multiple sclerosis, arthritis, migraine headaches, diabetes, and heart disease. But correlation tells nothing about causation, and a schism developed in the field between those who were psychoanalytically oriented and the basic scientists whose roots were in psychobiology. It was the latter group that broke off to define the field called behavioral medicine.

This development was the natural result of new findings in biochemistry, which, as Weiss says, "prompted new ways of thinking about mind and body interactions." In traditional medicine, he points out, mind and body had to be dealt with separately "because no one knew enough about how the brain works." But findings in neuroendocrinology have offered some little windows into the mystery. They are linked to the discovery that the central nervous system and the endocrine system are connected in more complex ways than hith-

erto believed, as evidenced by the fact that some hormones have also turned out to be neurotransmitters. Such findings offer tangible links between brain activity and body functions which justify, in the opinion of behavioral medicine advocates, the defining of a new field. They felt that no one discipline was in a position to further explore these mysteries because of the bewildering interconnectedness of systems that is beginning to be revealed. As John Lacey of the Fels Research Institute said at a recent meeting of the academy, "psycho-neuroimmunology could never have emerged from the field of immunology."

Behavioral medicine researchers like to talk about being on the verge of a "new paradigm" in medicine, a paradigm based on systems theory, which entails looking at everything in terms of feedback loops rather than chains of cause and effect. Whether or not the shift is as revolutionary as that expression implies, establishing the field marks a departure from the philosophy that underlies traditional medicine. Cartesian mind/body dualism still influences the practice of medicine as it also "plagued the early development of psychosomatic medicine" according to Weiss and Gary Schwartz of Yale University. Recognizing that all behavior is subject to the limitations of the organism and mediated by its biological substrate is hard for some people to accept, for taken to its extreme it implies biological determinism. But behavioral medicine also advances an expanded idea of individual freedom, which is supported by discoveries that the autonomic and voluntary nervous systems are entwined and that autonomic processes are far more susceptible to voluntary control than was hitherto believed.