modification of human behavior.

Using examples from prisons and mental institutions, Harvard psychologist B. F. Skinner described his behavior control methods. These methods have been used to induce prisoners to learn and work toward rehabilitation and to teach retardates to behave in socially acceptable ways. The end result is desirable, but are the means? Ethical questions arise because the persons are not always aware of the controls imposed on them and they can not always consent to these controls.

José M. R. Delgado of Yale has also developed methods of behavior control. His methods are physical rather than purely behavorial. Psychoactive drugs, psychosurgery and direct chemical or electrical stimulation of the brain are among the techniques. And stimulation of the brain is Delgado's speciality. In one case, electrical excitation of the second temporal convolution elicited an eight-fold increase in friendly manifestations and in the verbal output of the patient. These results and other research introduce questions that require more experimentation. "But the results obtained in animals and humans show that we have the necessary tools for investigation of the neuronal basis of emotional and behavioral reactions, and also that we can influence psychic functions by direct stimulation of the brain," says Delgado.

These controls, together with Skinner's operant conditioning, represent powerful tools for shaping human behavior. But who is to decide what shape behavior is to take? Who is to decide what is normal? These questions were asked by other members of the panel. "The history of man is marked by attempts of one group to impose its values on another," said Jerome Kegan, professor of psychology at Harvard. "The Spaniards tried to make the Mayan Indians Catholic, the Americans tried to make the Vietnamese democratic. . . . Uninvited intervention into the personal space of another is one of man's cardinal traits." But electrical stimulation and behaviorial conditioning add to the list of potential manipulations. Therefore, we must "search for a set of rules—or moral prescriptions—that might inform us as to which of these intrusions are likely to be beneficial."

Roger L. Shinn, professor of Christian Ethics at Union Theological Seminary in New York City, put the question differently. "How much conformity is necessary for social life?" He points out that man must voluntary accept many facts of life that control his behavior for his own good (highway speed limits, airplane seat belts, etc.) and this "makes it all the more important that we maintain freedom, initiative, and spontaneity somewhere near the heart of self. . . . A sensitive ethic for our time will beware of activities that are subversive of human purpose."

Warnings of the panel, emphasizing the importance of man's freedom, were accompanied by a general agreement that behavior control already exists in many ways and that it is often beneficial. And research along these lines will continue. But even Delgado proposed that some institution must adopt "a strategy for mental planning."

"There will be many questions raised today, and probably not many answers," said Sen. Edward M. Kennedy (D-Mass.). But at least the questions were asked. Engineers and physicists developed the atom bomb. Are they to decide where and when to use it? Medical researchers have developed procedures for prolonging life. Are they qualified to decide when to use and when to withhold these procedures? Amniocentesis can tell expectant parents that their child will be genetically defective. Who is to make the decision to terminate the pregnancy? Western civilization has been developing an ethical code for the past 4,000 years. Is this code equipped to answer today's questions? □

Transfer of bacterial genes to human cells

It is possible to make genetic changes in a mammalian or human cell by using a bacterial virus to introduce a specific gene, report scientists at the National Institute of Mental Health.

Carl R. Merril of NIMH, Mark R. Geier of George Washington University and John C. Petricciani of the National Institutes of Health used cells from a person with galactosemia as a model system to test for such a possibility. They chose those particular cells because galactosemia, a hereditary disease, is caused by a known genetic defect. (In the disease, the gene necessary to produce the enzyme used in breaking down galactose, the sugar found in milk, does not function.) The researchers exposed the cells to a bacterial virus known to contain the specific gene. They report in the Oct. 8 NATURE that the human cells took up and used genetic material from the bacteria. The cells began producing the previously absent enzyme and passed the ability to do so on to succeeding generations of cells.

Six years ago, taking a course on viruses, Merril began to wonder if the bacteria he was studying could have any effect on him. He found no satisfactory answers from the literature or from fellow scientists so he looked into the problem himself, and has now found the answer. Another group at NIH is also working along the same lines. They are using different viruses and different cells and if they run into no difficulties, they will help to confirm Merril's work.

In the beginning, however, Merril's ideas were met with prejudice. Other scientists intuitionally refused to believe that bacterial viruses could be effective in human cells. "Scientists had a dangerous gut reaction," to his hypothesis, he says, "with no real reason." But now that the experiments have been successful, he is receiving congratulations from all sides. "This is, of course, a claim little short of the revolutionary," comments NATURE.

In Merril's view the revolutionary aspect of the advance is not in its eventual possibilities for correction of genetic deficiencies in humans but in its contribution to basic understanding of cellular mechanisms. "I personally think this will play a big role in understanding how cells work," he says. Such research should advance knowledge of how genes control cells and how suppressor mechanisms work and answer many general questions in the field of molecular biology. The next step in Merril's work is to attempt to repeat the experiment in a whole organism.

NIPCC meetings still closed

Despite conservationist and Congressional criticism, the Commerce Department's National Industrial Pollution Control Council is still meeting behind closed doors. The NIPCC, made up of high-ranking industrialists (SN: 7/31/71, p. 82), met Oct. 14 to discuss Phase II of President Nixon's economic policy. Representatives of the National Wildlife Federation and Friends of the Earth asked to be admitted when they learned of the meeting, but were refused.

The NIPCC was created by Mr. Nixon as part of his environmental program so that he could receive the advice of industrialists on pollution control matters. Hearings before Sen. Lee Metcalf (D-Mont.) earlier this year indicated a large part of the NIPCC's function is public relations aimed at convincing the public that industry is doing something about pollution.

Chairman Russell Train of the President's Council on Environmental Quality and Commerce Secretary Maurice Stans attended the Oct. 14 meeting. □