Congress and the ethics of biomedical research

By signing into law one comprehensive bill President Nixon can set in motion machinery that could cure many of the problems that have been plaguing biomedical and behavioral research for the past few years. The specific problems have to do with ethics and money.

Psychosurgery, research on live aborted fetuses, sterilization of welfare recipients and the legal rights of children, prisoners and the mentally handicapped have all been subjects of public concern in recent years. And each of these problems has prompted the drafting of one or more pieces of legislation (SN: 5/12/73, p. 310). The other problem, money for basic research, became acute last year when the Administration slashed Federal funding for research training grants. This too prompted action in both the Senate and the House (SN: 9/24/73, p. 181). Now, after six weeks of compromise, Senate and House conferees have settled on one piece of legislation that attempts to address many of the problems facing the biomedical research community.

The compromise bill draws mainly from legislation submitted by Sen. Edward M. Kennedy (D–Mass.) and Rep. Paul G. Rogers (D–Fla.). It calls for the establishment of a national commission for the protection of human subjects of biomedical and behavioral research. The eleven members of the commission would be selected by the Secretary of the Department of Health, Education and Welfare from the fields of medicine, law, theology, ethics, philosophy, humanities, health administration and public affairs. Their first project would be a four-month study of the pros and cons of research on living fetuses. All federally funded research on human fetuses would be banned until the commission completes its study and recommends to the Secretary of HEW the circumstances under which such research should be conducted. This problem gets top priority because of the recent outcry raised in Boston where several researchers doing work on fetuses were charged with violating a 19th-century grave-robbing statute.

The commission would function for two years. During that time it would attempt to develop ethical guidelines for all federally funded clinical research and make recommendations to HEW. The commission would also do a study to determine whether some mechanism is needed to protect human subjects involved in research not funded by the Government. Controls on privately funded research would call for further legislation.

Other projects for the commission would be a study of the use of psychosurgery and the development of a definition of informed consent, especially where it applies to children, prisoners and the mentally incompetent. After two years the commission would be replaced by a national advisory council for the protection of research subjects. In the past the Administration has indicated that such a commission is unnecessary.

The other major portion of the bill has to do with reinstating research training grants and fellowships for young scientists. In the past, such grants have provided much of the impetus that has gotten predoctoral and postdoctoral students into basic research. The proposed legislation calls for the establishment of national research service awards to be funded at the rate of $208 million per year for the next two years. Recipients of such awards would be required to repay the Government by devoting subsequent equal time to research, teaching or work in the National Health Service Corps.

Final wording of this bill is being drafted this week, and the completed package is expected to be on President Nixon's desk by the end of the month.

Wrong cells being used in cancer labs?

A report on cancer cell cultures published last week could have dramatic implications for cancer research worldwide. Walter A. Nelson-Rees, Robert R. Flandermeyer and Paula K. Hawthorne, biologists at the University of California School of Public Health, studied cultures of cells presumably derived from many types of human cancers. In the June 7 SCIENCE they report that cancerous cells supposedly from the embryonic human kidney, and the adult human breast, prostate gland and fatty tissue, used for basic research in laboratories around the world, were all cells derived from one woman's cervical cancer.

If true, hundreds of cancer researchers may be studying the wrong cells, and much published data would be invalidated.

The single cell type they found is called HeLa, after Helen Lane, a woman who died of cancer of the cervix in 1951. HeLa cells were the first human cancer cells to be successfully cultured in the laboratory, and descendants of those original cells are still grown and used for basic cancer research. Scientists can now culture tumor cells from many other human organs, too, but the Nelson-Rees team found, through chromosomal and enzymatic analyses, that many of those "other" cells may actually be HeLa cells which have contaminated and overtaken the original cultures.

By chromosome staining, the team found two marker chromosomes present in three cell cultures from three different people. Two human breast cancer strains and one embryonic kidney strain all showed the presence of two chromosomes, demonstrating a similar genetic heritage where none was presumed to exist.

More important, four marker chromosomes previously shown by several researchers to be present in HeLa cells were also present in the breast, kidney, prostate and fatty tissue cancer cells. The probability of all four of these marker chromosomes appearing in genetically unrelated cell cultures would be one in 600 million, Nelson-Rees told SCIENCE NEWS.

The team turned up two other compelling pieces of evidence that the cultures are really HeLa-derived cells. They found no Y chromosomes (the sex determinant in human males) in cell cultures from male donors, including the prostate tumor cells, fatty tissue tumor cells and possibly the embryonic kidney cells (donor information was lacking.) HeLa cells lack Y chromosomes because of their female donor. And they found a rare, genetically determined enzyme (G6PD) present in all of the cells tested that is only found in blacks. Helen Lane was black, but some of the other cell donors were white.

The Nelson-Rees team theorizes that the various cell cultures have been contaminated with HeLa cells because of imprecise laboratory technique, mislabeling of culture bottles or cross-culturing errors. Because HeLa cells are so well adapted to growth in the laboratory, they can easily overtake a less hardy group of tumor cells. After

a period of time and many cell generations, mutations in the contaminating HeLa cells could occur, and result in cells with new characteristics. These mutants could then be mistaken for the original tumor cells they contaminated if extremely precise chromosomal and enzymatic analyses were not done to reveal the error.

These important results may be met with some skepticism. "Some people may try to disprove the results or point to differences between the cells, to prove separate genetic heritage," Nelson-Rees told SCIENCE NEWS. "Many people have spent hours, months, even years studying cell cultures in which the cells have been inadvertently contaminated. If it takes a prostate cell to perform a certain function in the body and you are zeroing-in on what made that cell stop performing that function and become malignant, then working on cervical cells will change your results." Many think their cultures couldn't be affected because they don't have HeLa cells in their laboratories, he said, but they may be using other suspect contaminants. New techniques have enabled Nelson-Rees and others to identify cultures that had been misidentified for years, including some presumably human cells that were actually hamster cells, and rabbit cells that were actually monkey cells.

"There is a good chance," Nelson-Rees says, "that an awful lot of work has been affected by these HeLa contaminations," including hundreds of studies over a number of years. □

Science on TV

The Ascent of Man is finally getting off the ground in the United States. This excellent 13-part television series on the scientific and cultural history of the human race (SN: 12/8/73, p. 362) has found a sponsor and will be shown to television audiences next winter. With funding from the Mobil Oil Corp. and the Arthur Vining Davis Foundations, the series will be telecast by the Public Broadcasting Service. An exact date has not been set, but the series will probably be shown weekly beginning in January. Written and narrated by Jacob Bronowski, *The Ascent of Man* was co-produced by BBC-TV and Time-Life Films. The series was also recently published as a book by Little, Brown and is being made available as a teaching aid in 16mm and video cassette formats.

PBS's other science series, NOVA (SN: 3/2/74, p. 147), is just winding up its first season and will be aired again next year as a regular Sunday night feature beginning Nov. 26. At least 18 new shows are in the works for the 26-week season. □

Ocean energy: New life for an old idea

Almost a century after the French physicist D'Arsonval first proposed the idea, the extraction of heat energy from the ocean to generate useful power is moving closer to practical application. A working model of such a generator was built in the 1930's, and recent experiments indicate that the operations could profitably be combined with mariculture to help provide power and food for countries near tropical seas (SN: 4/13/74, p. 243). Last week, hearings before the energy subcommittee of the House Science and Astronautics Committee brought the spectrum of schemes for making sea-thermal energy available into new focus.

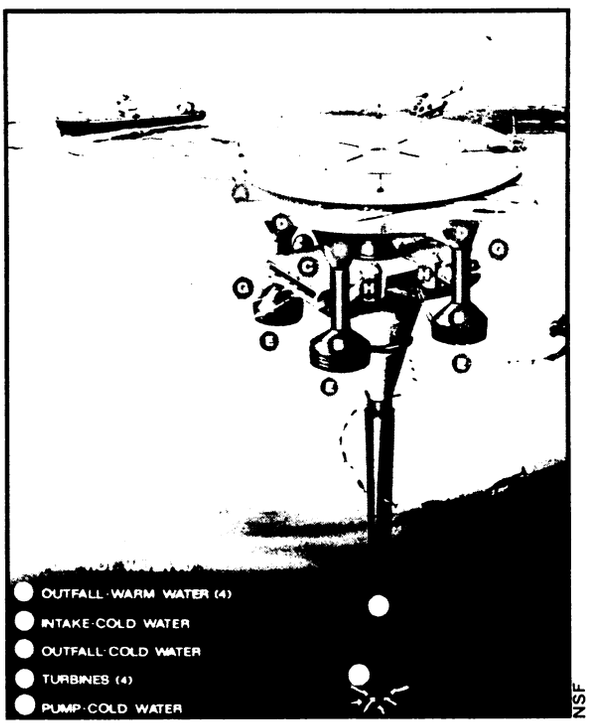
Electrical power from oceanic generators could potentially have the lowest cost of any solar-generated electricity, a panel of experts told the subcommittee, perhaps competing with conventional or nuclear sources. For a relatively modest investment, compared to R&D funds for nuclear power plants, commercial power plants could be in operation in a decade, they said.

"Successful implementation of the solar sea power concept can make the United States an exporter of fuel," predicted Clarence Zener, a physicist from Carnegie-Mellon University.

Some 45 percent of the total incoming solar energy falls on tropical seas, which form a heat reservoir whose stored energy is 10,000 times greater than present human demand. The problem that has delayed exploitation of this vast resource is its lack of concentration—temperature differences between the sea surface and the coldest depths are only about 40° F. Conventional power plants depend on heating various materials (steam or jet fuel) by hundreds or thousands of degrees. As these expand they drive turbines or pistons and thus convert heat into work. The greater the temperature differential, the more easily heat can be transformed.

Now designers believe they can efficiently convert the small oceanic temperature differences into useful energy by using them to boil and then recondense ammonia. Sea surface temperatures are above the boiling point of ammonia; temperatures at great depths, below. The expanding ammonia gas could then drive a turbine in much the same way boiling water is used to drive a steam turbine. But unlike steam engines, which must be constructed from heavy, cast metal to keep them from bursting, sea-thermal plants could be built from light-weight materials because of the surrounding inward pressure from the sea. Zener estimates that a neutrally bouyant, lightly constructed apparatus could be made from aluminum and suspended at 200 feet depth (where the external pressure is equal to the vapor pressure of ammonia) and the total energy cost of refining the aluminum would be recovered in the first few hours of the plant's operation.

But skeptics point out that several problems must be resolved before sea-thermal energy can be considered economically feasible. Because the operating temperature differential is so small to begin with, heat transfer through the thin walls of an apparatus might be cut to inoperable levels by even a thin



One concept of a partly submerged ocean-thermal power plant, making use of temperature differences between warm surface water and cold deep water.