

Physics

The science of physics may be described as an attempt to elucidate the symmetries by which the structure of material nature is designed and its behavior constrained—and once these symmetries are found, where and how they may be broken. The 1980 Nobel prize in physics is shared by James Cronin of the University of Chicago and Val Fitch of Princeton University for the discovery of one such symmetry break, the violation of what is called CP symmetry.

This is part of the total symmetry of matter and antimatter. Physicists used to believe that the universe is balanced between matter and antimatter, and that the various processes of particle physics maintain the balance. This is called CPT symmetry, because it can be divided into three parts: balance of negative and positive electric charge (C), parity or equality of left-handed things and right-handed ones (P) and time reversal, the proposition that matter going forward in time is equivalent to antimatter going backward in time (T).

In 1957 C.S. Wu and co-workers showed that certain interactions involving neutrinos violated parity. This seemed to indicate that total or partial violations of CPT might be found in processes governed by the weak nuclear force. In 1964 Cronin and Fitch found that such a process, the radioactive decay of the neutral K meson, violates C and P together. The combined violation implies a complementary violation of the time reversal principle. "The discovery emphasizes, once again, that even almost self-evident principles in science cannot be regarded [as] fully valid until they have been examined in precise experiments," says the citation.

The work has inspired continuing ferment over the CPT theorem. One of the great excitements of 1980, the possibility of neutrino mass and neutrino oscillations, has a connection. Much of the reason for the peculiar behavior of neutral K decay is that the neutral K has oscillations of identity between a long-lived and a short-lived form that are analogous to the identity oscillations proposed for neutrinos. If neutrino oscillations are confirmed then it seems, according to discussions at recent meetings on the subject, that there should be a CP violating aspect to their behavior too.

A native of Merriman, Neb., Fitch got his doctoral degree at Columbia University in 1948. He has been a member of the Princeton faculty since 1954 and is now Cyrus Fogg Brackett Professor of Physics and chairman of the department. Cronin was born in Chicago. He earned his Ph.D. at the University of Chicago in 1955, and then went to Brookhaven National Laboratory. In 1958 he joined the Princeton faculty, where he remained until 1971, when he went to Chicago to become professor of physics there. □

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Genetic jump spawns inquiry

In what may be the first clinical use of human gene-splicing techniques, a University of California at Los Angeles researcher has attempted to place normal genes in the defective bone marrow cells of two patients suffering from a fatal blood disease. Martin J. Cline performed the experimental treatments on two women (one at the Hadassah Hospital in Jerusalem and the other at the University Poly Clinic in Naples) suffering from beta thalassemia major—a condition in which bone marrow produces red blood cells with abnormal hemoglobin, debilitating the blood's ability to carry the oxygen needed by all body tissues. Cline attempted to colonize the defective bone marrow with cells carrying genes for normal hemoglobin production and to beef up the cells' production of genetic material. The genes were produced in large quantities in bacteria by using gene-splicing techniques.

Cline and colleagues demonstrated the first successful use of genetic engineering in living animals this spring when they transplanted a gene from bone marrow cells of one set of mice into cells that subsequently populated the bone marrow of other mice (SN: 4/19/80, p. 244). While Cline then said he believed application of the technique to humans to be at least three years in the future, it now is evident that he was awaiting permission from a human subject protection committee at UCLA to do such human experiments; in fact, Cline proposed those experiments as early as the spring of 1979.

Eventually, after more than a year of deliberation, the UCLA committee refused to grant Cline permission to do the experiments he proposed without further animal research. But by the time the committee's decision was handed down in July, Cline already had performed the experiments on the two women overseas.

Enter the National Institutes of Health. Cline has four grants from NIH, and if these funds were used without the blessing of UCLA's human subject committee, he is in violation of federal and university rules. So officials at NIH and UCLA have begun an inquiry into the matter, despite Cline's claims that in addition to the fact that no NIH funds were used, at least in Israel, the experiment proposal was subjected to the same scrutiny required by U.S. guidelines. Still, as one NIH official explained, "Although on the basis of what we have now, I don't think we have a case against Cline, we asked for an inquiry, because it is unusual for someone turned down at their home institution to do the work overseas." Moreover, the UCLA committee may use the Cline case to identify the ambiguities in their own guidelines governing research with human subjects: Currently,

there is confusion as to the precise jurisdiction of those rules.

Meanwhile, Cline continues to analyze blood and marrow samples from his two thalassemia patients for signs of normal hemoglobin production that will signal success in his experimental treatment. □

HHS fund misuse: The bucks stop here

Just two days after a University of California at Los Angeles researcher found himself in the center of a controversy regarding his use of genetic engineering on human subjects, the U.S. Department of Health and Human Services issued new rules to deny HHS funds to unethical researchers. The timing was coincidental, but the case of UCLA researcher Martin J. Cline—who used gene manipulation techniques on two women overseas shortly before his own institution's committee for protection of human subjects refused to grant Cline permission to conduct the experiments without further animal work—is an example of the kind of case the new HHS rules could cover (see previous story).

The rules, published in the Oct. 9 FEDERAL REGISTER, "are designed to weed out in advance individuals and organizations who, on the basis of past performance, would be likely to misuse HHS funds," says HHS spokesman John Blamphin. Fund misuse occurs, for example, when faculty members request kickbacks from graduate students they select for work funded by training grants. Other cases include violations of the conditions of a previous award and a record of unsatisfactory performance while using HHS funds.

Whereas existing provisions allow HHS only to suspend or terminate ongoing grants in cases of fund misuse or to refuse suspect individuals or institutions grants on a case-by-case basis, the new rules, effective Nov. 10, allow HHS to refuse even to consider past offenders for grants for a certain "debarment" period. In other words, individuals or institutions guilty of fund abuse are debarred for an amount of time depending on the seriousness of the offense and ineligible for HHS financial assistance during the debarment. □

NASA head resigns

Robert A. Frosch, administrator of the National Aeronautics and Space Administration, will resign as of Jan. 20, 1981, from the agency that he has headed since June 21, 1977. He will become the first president of the newly formed American Association of Engineering Societies, a federation representing 39 professional societies in the United States. He will thus be leaving NASA before the oft-delayed space shuttle ever leaves its launch pad. □

245