Is there really a fifth force after all?

The strange things that happen when K mesons decay radioactively have been a decade-long puzzle to particle physicists. Now from a many-faceted group of experiments at the CERN laboratory in Geneva comes evidence, so the CERN people believe, that in the decay of K mesons we may be seeing the operation of a new kind of force, a fifth class of interaction, designated "superweak" to add to the four interactions physicists now believe in (the strong, the electromagnetic, the weak and the gravitational.)

What is unusual in the K-meson decays is that they violate fundamental symmetry principles that physicists would have liked to believe pervade the entire world of particle physics. Labeled collectively by the letters CPT, the symmetry principles are basic to the theoretical formulation of particle physics. C, for charge conjugation, says that nature makes no distinction between positive and negative electric charge, that is, there are equal amounts of matter and antimatter in the universe. P, for parity, says that nature is space symmetrical, making no distinction between left-handedness and right-handedness. T, for time reversal, says that there is no way to tell a particle going forward in time from its antiparticle going backward.

Along about 1956 it began to be clear that all was not quite universal about the symmetry principles. In certain experiments in which neutrinos are emitted by decaying cobalt nuclei it appeared that parity was violated. In 1964 came the observation of neutral K-meson decay, which was the first found to violate two symmetry principles at once, P and C. This means that there is both a spatial asymmetry and a preponderance of one kind of electric charge in the decay products.

The decay of the neutral K meson is one of the class of radioactive decays that physicists ascribe to the governance of the weak interaction. It seemed that sometimes the weak interaction respected CP symmetry, and sometimes it didn't. Proposed explanations generally sought to confine the violation to this kind of occurrence, preserving the symmetry principles in other weak-interaction decays.

One of the suggestions made at the time, by Lincoln Wolfenstein of Carnegie-Mellon University in Pittsburgh, was that in the K-meson decay the operation of a new force mixes in, the superweak force, which is 10 million or 100 million times weaker than the weak interaction. Wolfenstein's suggestion would preserve other weak-interaction decays from CP violation, but would permit certain rare instances in other types of decay. The superweak model makes certain predictions about the amount of charge asymmetry and other experimental results. Further experimentation in the 1960's could not sort out Wolfenstein's suggestion from others, and the subject went into a certain eclipse for a while.

Now comes the CERN group. It includes people from the University of Dortmund in West Germany (C. Geweniger, K. Kleinknecht, G. Presser), the Distrikthøgskolen at Stavanger, Norway (S. Gjesdal), the Stanford Linear Accelerator Center in California (V. Lüth), the Institute for High Energy Physics in Heidelberg (G. Zech, F. Eisele), the Institute for Nuclear Physics at Orsay, France (F. Vannucci), and CERN itself (P. Steffen, J. Steinberger, H. Wahl).

They used a beam of neutral K mesons that they obtained by driving the proton beam of the CERN Proton Synchrotron against an appropriate target. The mesons were provided with a nine-meter helium-filled vessel in which to decay. Beyond this were placed various detectors to record the various decay products.

The CERN group makes high claims for the sensitivity of their apparatus. With it they measured a number of quantities related to the outcome of neutral K-meson decay including two kinds of charge asymmetry and the mass difference between two kinds of neutral K meson (the long lifetime and the short lifetime) that get mixed together in these occurrences. The results are embodied in four papers submitted to PHYSICS LETTERS. The general conclusion is that the experimental results agree with Wolfenstein's predictions. As one of the abstracts puts it: "The result [of one kind of charge asymmetry] may be compared with the result of the foregoing letter on [another parameter of the decay] in the framework of the superweak model. Good agreement is observed." □

Medical schools: The female influx

One of the last strongholds of discrimination against women in American universities is finally beginning to crumble—female enrollment into medical schools is rapidly increasing. In the last three years, the number of women in medical schools has more than doubled from 3,894 to 7,824. Their proportion of total enrollment has risen from 9.6 percent to 15.4 percent. Furthermore the curve is steadily rising.

This fall exactly a third of the students entering Harvard's school of medicine are women, compared with 11 women among 139 students (not quite eight percent) entering three years ago. Last year at Columbia University's medical school 47 of 147 entering students were women.

The new feminine influx is already producing pressure for more women teachers, as well as for more women on admission committees. Among other changes forseen are an end to the isolation that women seeking medical careers have faced since Elizabeth Blackwell first broke the sex barrier in the United States in 1849 when she graduated from the Geneva Medical College. Also changing are attitudes that women have long considered discriminatory, ranging from admission interviews that often include questions about managing career and marriage to the barring of women from some medical specialties, notably surgery, to the exclusion of women from certain laboratory practices. One woman medical student from the University of Michigan reports that she was not allowed to observe a complete physical examination of a male patient because his genitals would be exposed, while nearby, her student husband was conducting a pelvic examination of a woman.

Another expectation is that in the future more women patients will be able to find members of their sex practicing obstetrics and gynecology. And last, some feel that women's social conditioning will perhaps make medicine a more compassionate enterprise. □

Salyut crew comes down

On July 19, after more than two weeks in space, Soviet cosmonauts Pavel Povich and Yuri Artyukhin undocked from the Salyut 3 space station and returned safely to earth aboard their Soyuz 14 spacecraft. They had photographed the earth, studied the atmosphere and performed a variety of other scientific tasks, but to U.S. observers the mission represented a successful practice run for the joint Apollo-Soyuz rendezvous flight next summer.

As the schedule now reads, cosmonauts Aleksei Leonov and Valeriy Kubasov will take off in their two-man craft on July 15, 1975. About seven and a half hours later, Thomas Stafford, Vance Brand and Donald Slayton will leave the ground aboard their Apollo ship. Using a docking adapter carried by Apollo, the two craft will link together for about two days. After the vehicles undock again, the Soyuz is expected to remain in orbit for about 43 hours, Apollo for about six days. □

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