Cosmos 186 satellite maneuvered and docked with Cosmos 188. The operation, almost certainly run from the ground, provided Soviet mission controllers with their first flight experience in the technique. Six months later, the feat was repeated with Cosmos 212 and 213.

Now cosmonaut Georgy Beregovoi has tried, if not the actual coupling, at least the close-in maneuvering necessary for a docking operation. On Oct. 25, the day before Beregovoi was launched aboard the Soyuz 3 spacecraft, Russia secretly fired Soyuz 2, unmanned, into orbit to await him. Before he had completed his first orbit, Beregovoi was within 650 feet of his target; later he approached Soyuz 2 again.

Russia made no immediate announcement of how close he had come either time, but his precise piloting was the tightest by any Soviet cosmonaut. The closest any previous manned Russian spacecraft had come to another, manned or otherwise, was 3.1 miles, when cosmonauts Valery Bykovskiy and Valentina Tereshkova passed each other during a double flight in Vostoks 5 and 6 in 1963.

One use of docking that could be part of Soviet plans, according to some observers, might be to launch three spacecraft segments separately into earth orbit using relatively small boosters, then couple them together and use their joint power to get to the moon.

Russian space officials claimed no actual docking for Beregovoi's flight, however, and whether that was a scheduled, but unaccomplished, part of the mission remained unknown.

Another much-asked question was why Beregovoi was the sole occupant of the presumably multi-man spacecraft. The Soviet space program has been proceeding at a cautious pace since the last cosmonaut, Vladimir Komarov, was killed when his Soyuz 1 spacecraft's parachute fouled during reentry. Some observers believe that the fouling was due to the vehicle's then newly designed hatch, which may have either heated excessively during reentry, scorching the chutes, or else caused so much turbulence and buffeting that they could not open properly. If the hatch was to blame, its redesign could have accounted for much of the delay between Komarov's and Beregovoi's flights and made the spacecraft designers cautious enough to want to risk only one man until the new hatch proved itself. ◇

PHYSICS, CHEMISTRY

Nobel Prizes to Alvarez and Onsager

The Nobel Prizes in physics and chemistry, traditionally announced together, have only one recipient each this year. The chemistry prize goes to professor Lars Onsager of Yale for work in theoretical chemistry. The physics prize goes to Prof. Luis W. Alvarez of the University of California at Berkeley for experimental work in particle physics.

Although he was trained as a chemical engineer in his native Norway, Dr. Onsager's interests have always been more for the basic and mathematical aspects of chemistry than the practical engineering aspects.

University of California

Dr. Alvarez: 10^{-22} seconds.

He has given an especial amount of study to chemical processes involving electricity and heat, especially the so-called irreversible processes, those whose effects cannot be undone by reversing the action. Humpty Dumpty falling off the wall is a trivial example, but important ones continually occur in thermodynamics.

Prof. Onsager's first major contribution, done when he was still a graduate student, was a clarification of the theory of electrical conduction in solutions of electrolytes, in which he explained the strong conduction that occurs in certain cases by connecting it to the random motion of the dissolved ions in the solution.

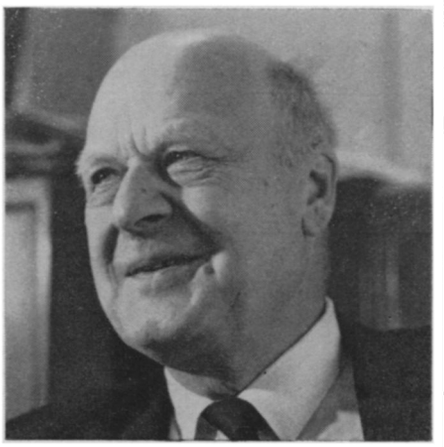
In other papers published early in his career, he showed that when two irreversible processes are going on at the same time, the mathematical equations that describe them are simply and predictably related to each other. This is the Onsager relation specifically mentioned in the Nobel citation.

Dr. Onsager was born in Oslo in 1903. He graduated from the Norwegian Technical Institute at Trondheim

with a chemical engineering degree in 1925. He came to the United States in 1928 to work at Johns Hopkins University. Later, after working for a while at Brown University, he went to Yale in 1933. He was appointed assistant professor in 1934, earned his Ph.D. in 1935, and became J. Willard Gibbs Professor of Theoretical Chemistry in 1945.

Dr. Alvarez discovered a large number of extremely short-lived sub-atomic particles, whose lifetimes are so instantaneous that they are often called resonances rather than particles.

To record the existence of these resonances, which appear and disappear in times like a ten-thousand-billion-billionth of a second (10^{-22}), required the development of new recording techniques. The cloud chambers that had been used to track physical particles until the 1950's were too slow.



Yale University

Dr. Onsager: irreversible processes.

The invention of the bubble chamber by Berkeley's Dr. Donald Glaser in 1952—for which he got the 1960 Nobel Prize—opened the way to recording of the ephemeral resonances, and during the 1950's Prof. Alvarez participated with others in the development of practical bubble chambers that produce series of particle track pictures at very high speed.

Concurrently he realized the need for swift automatic analysis of the flood of data that such pictures brought and calculated the characteristics of the sort of machine that would do it. The first such machine was developed in 1955 by Drs. Hugh Bradner and Jack Franck.

In 1960 the Alvarez group announced the discovery of the first three of the resonances. Since then they have discovered about half of the several dozen that are now known.

Dr. Alvarez was born in San Francisco in 1911. He earned his Ph.D. at the University of Chicago in 1936. In 1938 he joined the Berkeley faculty where he has remained continuously except for war-time leaves of absence.