in mice," Baruj Benacerraf, also of Harvard Medical School, reminded the symposium audience. "Only now is it being considered for clinical therapy."

Clinical advances in heart disease also stem from biomedical research, particularly of the non-mission-oriented kind, Eugene Braunwald of Peter Bent Brigham Hospital in Boston said. One of the most dramatic advances in medicine during the past 25 years has been the development of open-heart surgery, and only the last phase was mission-oriented research: the development of the pump-oxygenator (artificial heart and lung) apparatus. However, even the original goal of the surgeon who invented this apparatus was not open-heart surgery. It was designed to keep a patient with a blood clot blocking the main artery to the lung alive long enough to remove the clot surgically.

Thus scientists, for the most part, want funds for basic biomedical research with as few goal-oriented restrictions as possible. But with increasing costs of biomedical research, the public prefers to fund research with immediate clinical spin-off. The National Cancer Act of 1971 is a prime example. "The fact that there are two sides is something that most of us in this room have been reluctant to face," Thomas admitted. "We have had so strong a preference for our side that we tend to ignore the major issues of the disagreement, on the assumption that they will go away if we are patient. They will not go away. It is a genuine argument, with two genuine intelligible points of view, and the way it comes out may well determine the course of both biomedical science and the practice of medicine for the rest of the century and beyond." □

Twin-heart patient dies

The world's first twin-heart transplant patient has died, after living four months with a spare heart. The idea of giving a man a second heart was tried by Christiaan N. Barnard in Cape Town, South Africa, under the presumption that if something goes wrong with the new heart, it can be removed and "the patient is at least no worse off than when he started." The new technique, however, does not overcome the basic problem of the body's tending to reject transplanted foreign tissue (SN: 11/16/74, p. 314).

Ivan Taylor, 58, was suffering from terminal heart disease when he received his second heart last Nov. 25 (SN: 12/7/74, p. 358). No reason was given for his death on April 11. Another patient who received a second heart on New Year's Eve was reported doing well. In all, Barnard has given 14 patients new hearts. □

Charting ocean's profile from space

A satellite destined to be "the best-tracked spacecraft ever launched by the National Aeronautics and Space Administration" has been sent into an almost perfect orbit, from which it will provide data ranging from the height of ocean waves to the shape of the world.

Known as GEOS-3, the third Geodynamics Experimental Ocean Satellite, launched last week, is the latest and most sophisticated in a line that goes all the way back to the second object ever put into orbit by the United States. Vanguard-1, launched March 17, 1958, made its mark by proving that the earth is not merely a flattened sphere, but pear-shaped. Since that time, satellite measurements of the shape, gravitational field and mass distribution of the planet have become increasingly precise, to the point where GEOS officials are talking about measuring the globe to within 10 centimeters.

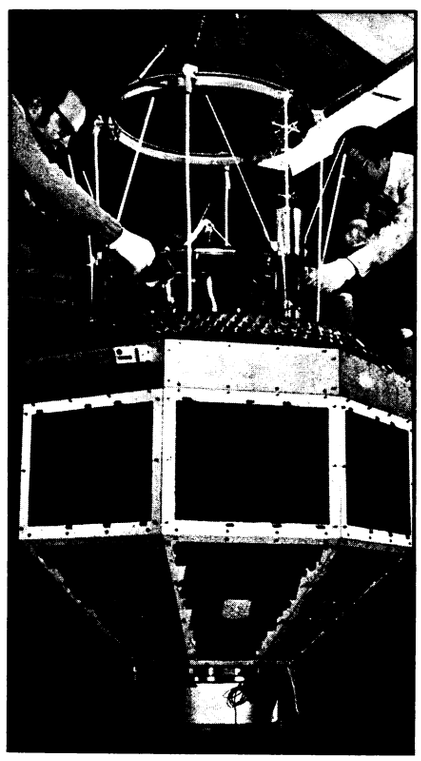
Besides looking at the total planet, this latest GEOS is taking on a second task: mapping the ever-changing "topography" of the ocean. The primary instrument aboard the satellite is its ocean-watcher, a radar altimeter that bounces signals off the surface of the sea and times the echoes.

One purpose of such measurements is to refine the "ocean geoid," the shape that the ocean surface would follow in the absence of winds, currents and tides. GEOS-3's altitude reckonings are expected to be so precise that researchers plan to monitor ocean swells, waves and storms as part of a future goal of making regular "sea state" information available by satellite for shipping, weather forecasting and other applications.

The prototype of the radar altimeter was one of the instruments aboard Skylab, as part of the manned space station's earth-resources experiment package. Data gathered during Skylab, in fact, are now being used to construct models of the sea surface for comparison with GEOS-3 results.

Wave-height measurements with 10-centimeter accuracy are not quite in GEOS-3's capability, although determinations to less than one meter may be possible. Even so, to make such measurements from the satellite's altitude of about 840 kilometers requires that the probe's height and position be known to the best obtainable accuracy. To do this, it will be tracked from the ground not only by the conventional radio doppler method, but by two kinds of radar, and even lasers. A triple ring of 264 specially shaped quartz reflectors girdling the satellite will reflect ground-based laser beams to yield accuracies as fine as 10 centimeters in the probe's position. Careful positioning of the reflectors, and studies of what happens to the beams when they strike the reflectors at varying angles, should pro-

Stabilizer positions GEOS-3 in orbit.



Shroud covers altimeter before launch.