

## Space: Two Safe Trips

The successful arrival of a spacecraft on the moon and the successful return of another one to earth, both following previous failures, made last week a happy one for the National Aeronautics and Space Administration.

Last July, Surveyor 4 crashed full-tilt into the moon when its retrorockets failed. Last week, Surveyor 5 narrowly avoided the same fate.

During the moonbound Surveyor's flight from earth, the helium pressure system, which was to force fuel into the retrorockets for a controlled landing, developed a leak. This meant that to avoid a crash, the firing time of the braking rockets would have to be drastically cut. After some frantic calculations, the JPL scientists decided to first lighten the spacecraft by burning up some fuel with the main engine, then to both shorten and delay the braking period. Instead of firing the retrorockets 270,000 feet above the lunar surface and keeping them on down to 40,000 feet, they held off until Surveyor had descended to 150,000 feet, then kept firing until the craft was less than a mile above the moon.

The split-second timing paid off. In spite of its handicap, the vehicle touched down gently in the Sea of Tranquility, thereby preserving its unique cargo: a robot chemical laboratory that is now analyzing the elements in the lunar surface by firing alpha particles at them from a piece of radioactive cesium. A pair of alpha detectors identify atoms by measuring the energy of particles reflected from the lunar atoms' nuclei, while four proton detectors do the same thing, measuring the energy of protons split off the nuclei by the particles. The energies measured by the device are characteristic for each element.

Back on the home planet, Biosatellite 2 brought its diverse complement of fruit flies, frogs' eggs, pepper plants and other living things safely down out of orbit, where they had spent two of an intended three days exposed to the same weightlessness and radiation that confront human space travellers. Biosatellite 1 (SN: 12/17/66), with an almost identical passenger list, became a failure after a flawless flight when its retrorockets malfunctioned and would not bring it down from orbit. The satellite was lost in the vicinity of Australia.

Number 2 lost a day in orbit due to troublesome communications and an impending tropical storm, but at least it was recovered, in a perfect midair snatch by plane. The scientists who had sent the various plants aloft found that

gravity does indeed control the orientation of plants; the roots of some wheat seedlings, for example, were found to have grown "in directions quite unlike they do on earth." The spacefaring fauna, including wasps and flour beetles, will have to be examined in laboratories for genetic effects, but the scientists seemed happy just to have them back in one piece. ♦

### MAGNETISM

## Ferrites in GI Series

A drawback to barium sulfate, the standard material for gastrointestinal X-ray, is that once introduced into the body it cannot be easily controlled. The material passes through the gastrointestinal tract by the process of peristalsis, the involuntary constriction which moves food through the alimentary canal.

New techniques for diagnosing GI disorders involve magnetic contrast material swallowed by the patient, thereby permitting viewing and photographing by X-rays while the physician maintains control of it. It also promises to prove useful in treating peptic ulcer—a drug could be combined with the magnetic material, then directed by means of an outside magnet to the ulcer, keeping the medication at the exact internal location.

The substances used are magnetic compounds of iron, as well as one or two other metals, and oxygen. Several such ferrites have been tested on dogs and guinea pigs. Manganese and manganese zinc ferrites were used first; later, magnesium ferrite and magnesium ferrites combined with magnesium oxide were tested. These materials neither perforated the intestinal wall nor remained inside the body.

Dr. Ephraim H. Frei, leader of a team of Israeli scientists from the Weizmann Institute of Science and the ASAF Harofe Hospital, expects the technique to prove important not only for diagnosis but for therapeutic procedures.

Magnetic materials in the GI tract have already proved valuable in another use. A few children have a rare affliction known as intussusception or invagination, in which peristalsis is so strong that the intestinal lining folds over on itself, forming a barrier that can lead to death within five or six hours.

When magnetic ferrites are placed on each side of such a barrier internally, a sharp yank of magnets on the outside will straighten the inside kink. This procedure has been successful several times with Israeli children, including five separate occasions on the same boy. ♦

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