

## Shuttle fatality: Sloppy operations

On March 19, barely three weeks before the maiden launching of the space shuttle, a group of technicians at launchpad 39A in Florida's Kennedy Space Center entered the shuttle's aft compartment to conduct a test. Unbeknownst to them, the compartment was filled with nitrogen gas instead of breathable air. Two members of the team — John G. Bjornstad and Forrest G. Cole — died of oxygen deprivation; three more were rendered unconscious. Other than the three astronauts killed in a 1967 Apollo groundtest fire, Bjornstad and Cole were the only people ever to die from an accident aboard a U. S. spacecraft.

Now the National Aeronautics and Space Administration has issued its official report on the resulting investigation, revealing the cause to be not any hardware malfunction, but a string of communications breakdowns, improperly followed procedures and inadequate safety checks.

The fatal sequence of events began

when a March 16 document detailing the test activities omitted mention of the fact that the newly added test (a check for a nitrogen-gas leak) would be conducted with nitrogen still in the compartment. The failure to point out a hazardous environment meant that the document was not processed through either NASA or contractor safety personnel. The omission was repeated in a briefing the next day, and the document survived an approval process by various officials without being questioned. One consequence of the perpetuated oversight was that the sign at the entrance ramp to the shuttle compartment provided no safety warning that could have alerted the technicians. Confusion continued when one of the suffocating men managed to call for help — safety officials did not report the accident for 2½ minutes, an ambulance was delayed at the launch complex gate and a fire alarm was inexplicably ordered on.

The investigating committee's 400-page report contains 19 pages of findings, observations and recommendations for use throughout NASA to prevent similar mishaps, from reinforced chains of command to tighter procedures and better signs. □

## Project sunbean: Plant gene transfer

From French bean seed to sunflower, via a crown gall bacterium, is a strange route for a gene. But it is the first step in experiments at the University of Wisconsin applying genetic engineering to crop improvement. John D. Kemp and Timothy Hall report they have used crown gall bacteria to transfer the gene of a major seed storage protein, called phaseolin. The bacteria, carrying the bean gene, cause crown galls on the sunflower. The scientists have named these tumors, transferred into tissue culture, "sunbean." They find that the gene is stable in the sunflower cells and produces the messenger RNA that directs synthesis of phaseolin. But so far the protein itself has not been detected.

"This breakthrough achievement opens a whole new era in plant genetics. It is the first step toward the day when scientists will be able to increase the nutritive value of plants, to make plants resistant to disease and environmental stresses, and to make them capable of fixing nitrogen from the air," says John R. Block, Secretary of the U. S. Department of Agriculture.

The technique of using crown gall bacteria, or agrobacteria, to introduce genes into plant cells (SN: 7/15/78, p. 45) is employed in many laboratories, and a wide variety of genes have been so transferred. In one case there is preliminary evidence that the gene directs protein synthesis in the infected cells growing in culture. A recent report from a St. Louis group (SN: 4/25/81, p. 270), however, was premature. The scientists there transferred the gene for a yeast enzyme but are still searching for the enzyme in the resultant tumor.

In addition to modifying their methods to promote synthesis of phaseolin in the sunflower gall tissue culture, the Wisconsin scientists hope to regenerate a normal sunflower plant from the tumor cells. A group in West Germany and Belgium has already grown tumor-free tobacco plants from the plant cells infected with a modified agrobacterium. A gene introduced by the bacterium is transmitted as a simple genetic trait when the regenerated plants reproduce. But nobody has yet reported a regenerated plant that demonstrably synthesizes the protein of a foreign gene.

Discovering the effect of the bean gene on a sunflower plant is a quest that may be long and difficult. Therefore, Kemp sees the venture not in terms of immediate rewards, but as "laying the groundwork for 21st century agriculture." □

*Kemp inoculates a sunflower plant.*



USDA

## Nuclear safety at DOE is criticized

The Department of Energy nuclear reactor program "appears deeply flawed when it comes to safety," charged Congressman Edward Markey (D-Mass.) this week in a sharp, seven-page letter to DOE Secretary James Edwards. Markey "urged" DOE to work with the Nuclear Regulatory Commission in reviewing its most serious safety problems and to frame an interagency agreement with NRC, giving the latter "a meaningful safety oversight role."

Despite claims by DOE officials (after the Three Mile Island nuclear accident) that the agency's facilities — including 80 DOE-owned reactors — would match or surpass the safety of commercial facilities, a recent internal DOE report shows that the agency has instead lagged behind the commercial industry in upgrading the training of its plant operators and in instituting lessons learned from the TMI accident. That report, completed under the direction of DOE's principal deputy assistant secretary for nuclear energy, John Crawford, particularly criticized DOE's management of reactor safety and notes "a number of serious deficiencies."

Although DOE has an 80-page "action plan" detailing efforts to upgrade its nuclear safety, Markey told Edwards he was disappointed that DOE had ignored or drastically limited implementation of recommendations contained in Crawford's March report. □

## The angle, the age, the oil



N. M. Tech

The coiling angle identifies the animal, which indicates the age and origin of the rock in which it was fossilized, which indicates the potential for finding petroleum. Paleontologist Stephen Hook (above) of the New Mexico Bureau of Mines and Mineral Resources and mathematician Allen Gutjahr of New Mexico Tech worked out equations to determine coiling angles and developed formulae to identify and separate the hundreds-of-millions-of-years-old fossils. This procedure, they say, eliminates much of the subjectivity traditionally involved in identifying these animals and their ages.