In 1958, K. Uehara of the University of Osaka in Japan observed that phytoalexins accumulated in plant tissue exposed to filtrates from cultures of fungi or other pathogens. This suggested that there are specific compounds in the filtrate, termed elicitors, that elicit this response. At least three candidate elicitors have previously been reported. I. A. M. Cruikshank and his associates at the Commonwealth Scientific and Industrial Research Organization in Canberra, Australia, have isolated and partially purified a polypeptide with such activity. Noel T. Keen of the University of California at Riverside has isolated what he believes to be a low-molecular-weight chemical with elicitor activity. And Roland Rohringer and his associates at the Winnipeg Rust Research Laboratory in Manitoba have detected what they believe is a nucleic acid elicitor.

Cruikshank's polypeptide, however, acts as an elicitor in only one species. Some investigators thus think that it is an artifact rather than a true elicitor with a role in the disease process. Neither Keen's nor Rohringer's compound, furthermore, has been adequately characterized yet. Thus, Peter Albersheim and his associates at the University of Colorado in Boulder reported at the ACS meeting that they had, for the first time, isolated and characterized a phytoalexin elicitor.

The elicitor was initially obtained from filtrates of cultures of *Phytophthora megasperma* var. *sojae* (PMS), a fungus that attacks soybeans. It stimulates the accumulation of the phytoalexin glyceollin, which had previously been characterized by Robert Sidney Burden and John A. Bailey of Wye College at the University of London. The most crucial aspect of his group's work, Albersheim says, was the development of a sensitive and quantitative assay for elicitor activity that would make it possible to monitor the course of the purification.

The Albersheim group's assays are, in fact, refinements of semiquantitative assays developed by other investigators. In essence, the techniques require application of the test substances to wounds on the cotyledon (the first leaf to be developed by the embryo of a seed) or hypocotyl (the segment of stem directly below the cotyledon) of soybean seedlings, and incubation for 20 to 26 hours. Glyceollin is then extracted in a quantitative fashion and assayed either by spectroscopy or by a combination of thin-layer chromatography and spectroscopy. These tests are sensitive enough to identify as little as 0.2 microgram of the suspected elicitor.

Preliminary evidence indicated that the elicitor isolated from filtrates was a heterogeneous group of carbohydrates with masses as large as 100,000 daltons. Albersheim speculated that they might be parts of the cell wall from dying PMS cells. To test this theory, he broke down PMS cell walls with a heat treatment technique developed by other investigators for isolating surface antigens. Purification of this material yielded four separate fractions with elicitor activity—one of which was virtually identical to the

The Moon: Not So Different from Earth After All

One of the principal scientific questions behind the Apollo flights was the origin of the moon. Lunar samples and surface experiments seemed initially to show that the moon is chemically very different from the earth, low in metallic iron and volatile elements, enriched in refractory materials such as aluminum and uranium. The differences were great enough to boost the view that the moon originated elsewhere in the solar system and was captured by the earth. Certainly, those who believed in a common origin for the two bodies faced difficulties in explaining their apparent chemical disparities.

This past year, however, three separate pieces of evidence indicating that the moon is not after all so different from the earth have come to light. While some substantial chemical differences remain, the two bodies are thought by a growing number of investigators to have been formed from basically similar materials. Capture models have been losing favor for several years, and the latest results seem likely to end speculation that the moon was formed in some far corner of the solar system.

Two of the new results bear on the supposed refractory character of the lunar materials. Laboratory experiments by A. E. Ringwood of the Australian National University at Canberra show that basaltic rocks from the lunar maria, formed deep in the moon's interior and presumably more characteristic of its bulk constituents than rocks formed on the surface, cannot be made from materials very rich in refractory elements such as aluminum and calcium. He concludes that the moon is not so refractory as was previously thought and that the parent materials for the earth and the moon were, in this respect, more similar.

Several years ago heat flow measurements at two locations on the lunar surface also seemed to indicate high concentrations of another key refractory element, uranium. Recent revisions of these experimental results by Marcus Langseth and his colleagues at the Lamont-Doherty Geological Observatory in New York, however, give a lower estimate of lunar uranium concentrations, about 40 parts per billion. Although there is some debate about the heat flow on the earth, Langseth's estimate (an average of 2 microcalories per centimeter^2 second) would give a comparable uranium value for the earth's mantle, 42 parts per billion. In any case, Langseth now believes, there is not a great difference in the uranium concentrations of the two bodies.

The third piece of evidence comes from analyses of oxygen isotopic ratios in terrestrial, lunar, and meteoritic samples by Robert Clayton of the University of Chicago. The data (see *Science*, 21 May 1976, p. 772) indicate that the earth, the moon, and certain highly evolved meteorites were all made from a similar batch of material, isotopically distinct from most meteorites and, presumably, from original material in the parts of the solar system where these meteorites were formed. As a result, Clayton proposes that the earth and the moon were both formed from the parent bodies of the highly evolved meteorites, which he views as sizable planetesimals 10 kilometers or more in diameter—large enough to have undergone internal melting. Accumulation of these planetesimals—rather than direct condensation of the earth and moon from the solar nebula or capture of a complete moon—is thus what he envisages for the origin of both the earth and the moon.

The paucity of volatile elements and metallic iron on the moon means that it is distinct from the earth, but, these new results seem to argue, not so chemically distant as had once been believed.—ALLEN L. HAMMOND