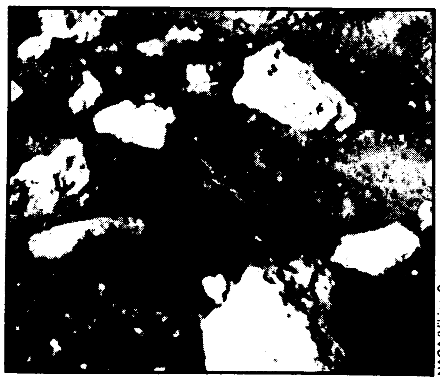


NASA/Viking 2

Organic sample site: Crusty evaporites?

when the craft's soil-sampling arm stuck last week, a problem since resolved, the delay amid the press of time gave rise to second thoughts. A special chemistry working group headed by GCMS team leader Klaus Biemann of the Massachusetts Institute of Technology concluded that the similar biology-instrument data from the two sites probably promised a similar lack of organics if the GCMS soil samples were taken from virtually the same places. It would mean a lot of extra work to change the mission's tightly interdependent programming so that the GCMS could get its samples from other types of terrain. But the group argued persuasively that the labor was worth it.

The first alternate site was a spot that appeared in the lander's photos to be topped with a crusty layer, possibly representing evaporite deposits formed by water migrating upward through water-soluble salts. The chance of more water, the salts and the hope that the crust might offer protection from the sun's ultraviolet radiation all contributed to the choice. The sampling operation, delayed from Sept. 13, was set for Sept. 25.

The second possibility, if all goes well with the first, is to use the sampling arm's scoop-head to push a rock out of the way and dig in the uncovered spot, in hopes that the rock would have provided long enough protection from UV to have given organics a chance to form and survive. The Martian rocks are an unknown quantity, however, and fear of damaging the lander's only arm has led to more meetings and yet another working group, dubbed "The Rolling Stones." Viking officials have even ordered some custom-made Mars-rock replicas to be made, using photographs and stereo contour diagrams for guidance, to use in practice rock-rollings. This week's plan called for moving the real rock on Oct. 8, with the dig to follow four days later; the four days' UV exposure, says Biemann, is unlikely to destroy all detectable organics, if they are there at all.

The changes involved in doing all this site-switching and rock-rolling are affecting Viking's other scientific teams as well. The rock-rolling dig, especially, could restrict lander 2's photographic plans and even the relatively nondemanding collection of weather data, since it may require most of the earth-to-Mars "instruction period" for three days running. In addition, the computers at Jet Propulsion Laboratory are so busy with data from the four craft that the photos being taken by the orbiters as they walk around the planet are hardly getting a glance when they come in. In fact, says one Viking engineer, just out of a rock-rolling meeting, if anything else delays the start of the roll-and-dig operation, "we may just leave the whole thing until after conjunction." □

Superheavies: Neutron star origin?

Now that there is experimental evidence for the existence of superheavy elements with atomic numbers 126, 116 and 124 in nature, nuclear theorists and astrophysicists must figure out some way nature could have made them. Two communications in the Sept. 9 NATURE, one by George L. Murphy of the University of Western Australia and one by J. E. Pringle, D. S. P. Dearborn and A. C. Fabian of Cambridge University's Institute of Astronomy, present similar answers. Both blame neutron stars and black holes. (There are more things in heaven and earth, Horatio, that are being blamed on neutron stars and black holes nowadays.)

The question of elemental origins is not so simple as it might at first seem. Cosmologists tend to agree that the lightest elements, the isotopes of hydrogen, helium and lithium, could have been made before the galaxies formed in the big-bang process that began the universe. Elements of middleweight range, up to about nitrogen and oxygen, are made by nuclear fusion processes in stars. The elements in about the heaviest half of the periodic table, the long-known terrestrially present ones, that is, still present something of a mystery, although theory says they can be made in supernova explosions.

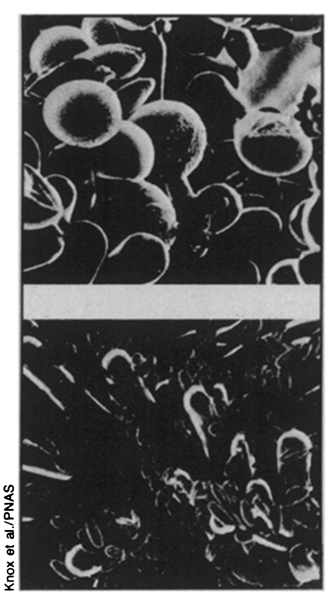
To make the ultraheavies, an environment loaded with neutrons is necessary, and that leads Pringle and company and Murphy to the outer regions of a neutron star as their birthplace. One way of scattering the superheavy elements from the neutron-star surface into the universe at large that both parties suggest is tidal disruption by an encounter between the neutron star and a black hole. Additionally, Pringle and collaborators suggest that a neutron star that has accreted too much matter from a possible binary companion may collapse into a black hole, throwing off some of its surface on the way. Another suggestion by Murphy is that during the supernova explosion that makes the neutron star, the neutron star's surface produces superheavies as quickly as it forms, and droplets of such matter evaporate into space virtually simultaneously with the supernova explosion. □

The sex life of flowering plants

Flowering plants usually propagate by fertilizing themselves with their own pollen or by exchanging pollen with a member of their own species. Once an acceptable pollen grain (comparable to an animal sperm) reaches a flower's receptive female stigma, the grain hydrates (takes up water from the stigma), swells and produces a short pollen tube that penetrates the flower's papilla cuticle. The tube then grows down into the ovary of the flower, fertilizes an egg, and the resulting embryo (seed) is capable of becoming a new plant.

How a flowering plant recognizes its own pollen or that of its own species, and not that of another, has now been determined by R. Bruce Knox, a botanist at the University of Melbourne and his co-workers. It is through special cell membrane receptors for the pollen. These results also shed light on a largely neglected field—how plants recognize their own kind.

Knox and his co-workers studied pollen recognition in the flowering plant species *Gladiolus gandavensis*. (The *Gladiolus* genus consists of plants with sword-shaped leaves and spikes of brilliantly colored irregular flowers.) *G. gandavensis*, they found, accepts either its own pollen or that of other plants in its own species. Within 20 minutes of landing on a receptive stigma, the *G. gandavensis* pollen hydrates, swells and produces a short pollen tube that penetrates the papilla cuticle after an hour or so. Pollens from other genera in the same family, Iridaceae, can also land on the *G. gandavensis* stigma, hydrate, swell and make a pollen tube. But their tubes are not able to penetrate *G. gandavensis's* papilla cuticle. Pollens from other families do not even get to first base with the stigma of *G. gandavensis*—they don't even hydrate.



Knox et al./PNAS

Scanning electron micrographs of Gladiolus gandavensis stigma after pollination with compatible pollen (top) and after being exposed to totally incompatible pollen.

So why does the stigma of *G. gandavensis* initially accept pollen only from its own species or from related plants. and then ultimately only from its own species? Because the stigma has cell surface receptors that positively recognize only the correct pollen, the experiments of Knox and his colleagues show. When these receptors are blocked, fertilization by the appropriate pollen cannot take place. Like many animal cell membrane receptors, plant membrane receptors are glycoproteins.

On the basis of both their own results and those of some other botanists, they theorize how cell surface receptors on the stigma help it screen for the right pollen. A first set of receptors positively identifies proteins on pollen from the plant's own species or from a related species or genus. Once identified, the pollen then proceeds to the first stage of fertilization—hydration and pollen-tube growth. Pollen from unrelated species or genera would not be recognized and would not even start this first stage of fertilization. Then the pollen that has made it through the first screening process would encounter still another set of cell surface receptors. This time only pollen from the plant's identical species would be accepted, and only this pollen would then proceed with the second step of fertilization—penetrating the cuticle with its tube.

These experiments, the investigators conclude in the August PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, also "provide an insight into the biochemical mechanisms involved in the discrimination of self from not-self in plants . . ." In other words, plant recognition does not seem to be all that different from recognition among animals, where cell surface receptors on T and B cells of the immune system acknowledge proteins as "self" or "foreign." □

Leg 49 samples youngest sea crust

The Mid-Atlantic Ridge, a huge underwater mountain chain that ranks among the major topographical features on the planet earth, is the site of the birth and the continual rejuvenation of the Atlantic Ocean basin. In its latest voyage in the Deep Sea Drilling Project, the scientific vessel Glomar Challenger has drilled into the ridge and retrieved samples of ocean crust younger than any previously recovered in the project.

Scientists on Leg 49 of the project, completed Sept. 4, bored 10 holes along the ridge, where new crust is continually being formed, and at one site drilled into a crustal layer only about one million years old. This is less than one-third the age of any crust the project had previously sampled in its eight-year history. The Leg 49 drilling took place between Iceland and just south of the Azores where Project FAMOUS was conducted last year.

The task had its difficulties. "To drill it," note Leg 49 co-chief scientists Bruce Luyendyk of the University of California at Santa Barbara and J. R. Cann of the University of East Anglia in Norwich, England, "we had to look for a pocket of sediment only one-half mile across amid the craggy mountains of the ridge crest. It then took 11 tries before we found enough sediment to stabilize the drill bit so that actual drilling could begin, after which we were able to reach 40 meters into basement."

There is great interest in understanding the complex geological processes in the mid-ocean ridges, not only because of their scientific importance as the site of crustal formation but also because they are thought to be where many ore deposits are produced. Luyendyk and Cann say what they learned about boring into young sediments will be useful in gaining understanding of these processes in the future.

Iceland is of unique geophysical importance because it is one of the few pieces of the mid-ocean ridge that rises above sea level. The northernmost holes of Leg 49 provided an opportunity to study the history of Iceland. Three holes were drilled across the ridge south of the island. The youngest hole, into crust about 2.5 million years old, revealed lavas containing abundant gas bubbles, an indication of eruption of watery magma at shallow depths. The other two holes, into crust 20 million and 40 million years old, showed fewer gas bubbles. This could be an indication that Iceland did not exist during that period of time, say the project scientists. But much more analysis of recovered cores is needed to test this theory.

One perplexing discovery was that in two holes, only a mile apart, on opposite sides of a fracture zone, lavas of very different characters were found. This could be due to chance, or it could indicate profound effects of fracture zones on nearby lavas.

Better understanding of climate change during the ice ages may come out of Leg 49's North Atlantic cores. The sediment near Iceland appears to have a gap at the time the ice ages began 3 million years ago, but the cores farther south appear to contain a sedimentary record of the entire span.

The work of Leg 49 was cut short by Hurricane Emmy, which moved across the site where the Glomar Challenger was drilling. When the ship moved to an alternate location, the hurricane followed, to waters seldom struck by hurricanes.

Leg 49's achievement of drilling into the youngest ocean crust contrasts nicely with Leg 50's goal of drilling into the oldest ocean crust (SN: 9/4/76, p. 151). That work, northeast of the Canary Islands, is just now getting underway. □

'Science court' idea: Toward a test

With all the awkwardness one would expect of a colloquium between two groups so different in their training and daily practice, nationally prominent scientists and lawyers meeting this week to find a better way of resolving scientific disputes groped their way toward establishment of a science court. Though they could not even agree on the proper name for such a fundamentally new kind of institution, the participants generally expressed enthusiasm for trying it out.

The idea for the science court, in its present form, is the brainchild of Arthur Kantrowitz, chairman of Avco Everett Research Laboratory. Nearly 10 years ago he proposed an "institution for scientific inquiry" to isolate the scientific components of a controversial issue and subject them to the scrutiny of cross-examination. The principle would be to bring both sides of an issue together in face-to-face confrontation, where spurious claims could be challenged, gaps in knowledge delineated and decision-making speeded up.

As the present system of "expert" panels, public hearings, impact statements and ad hoc studies slowly bogged down in scholarly quibbling and legal red tape, other voices were added to Kantrowitz's, calling for some simpler, more direct procedure. Eventually, a Presidential task force was formed to study the question. Its interim report in SCIENCE (Aug. 20) set forth a tentative list of procedures and proposed a series of experimental trials to test the court concept.

At the heart of the proposal is a system by which opposing sides of some purely technical, but disputed issue would be presented by opposing "case managers." In a debate on nuclear power, for example, a spokesman for the Sierra Club might face one from the Atomic Industrial Forum. These adversaries would argue their respective cases before a panel of judges, selected for suitability to both sides, who would eventually issue an opinion. The judges would be scientists from fields related enough to give them insight, but who were not caught up in the present dispute. A separate referee—probably a scientist advised by a lawyer—would conduct the proceedings.

Ground rules for the proceedings would differ in several respects from those of a normal court. Evidence would be admitted or excluded according to the rules of science, which are designed to elicit facts, not those of law, which are designed to protect people. Value-laden opinions would neither be admitted nor produced, and the final judgment would be simply a statement of which scientific facts had been adequately supported. It would be left for other agencies to apply these facts to policy decisions.