surements would suggest, Tera proposes that the uranium may be concentrated more closely to the surface than has been supposed. This fits nicely with what seemed to be one of the general conclusions of many Rockfest VII participants: that the lunar lithosphere is thick indeed, encasing whatever lunar core may exist in a rigid shell perhaps 1,000 kilometers deep. More important, perhaps, is that the more nearly terrestrial element ratios allowed by the reduced heat-flow data do not require the moon to have formed at a great distance from the earth.

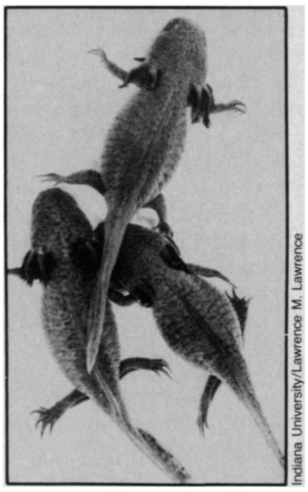
Comparisons between the moon and the earth and other terrestrial planets, in fact, were a significant part of this year's conference. Mark J. Cintala, James W. Head and Thomas A. Mutch of Brown University, for example, calculated the differences in crater shapes for the moon, Mars and Mercury. On Mercury, Cintala pointed out, craters of a given size are shallower than they are on the moon, in part because the surface gravity of Mercury is more than twice that on the moon. But Martian craters tend to be shallower still, and the gravity of Mars and Mercury differ by barely 3 percent, so there must be other factors that affect the hole produced by an impacting meteorite. Because Mars and Mercury are at different radial distances from the sun, he suggested, their impact velocities, even with similar gravity, could vary by as much as 30 percent. Atmospheric differences would make a difference, as might variations between the two planets' subsurface layering (providing a harder or softer floor to absorb impact energy).

Charles A. Wood, also of Brown, adds that basins—large craters with concentric ring structure—follow a regular progression from Mars inward to Mercury, both in the total number per planet (19 on Mars, 33 on the moon, an estimated 100 on Mercury) and in the number for a given surface area. That they are so different in number for Mars and Mercury is further evidence that other, nongravitational influences were at work.

Survivor and Genesis rocks notwithstanding, a major goal for planetologists is to identify "pristine surfaces"—areas where portions of a planet's original outer layer have not been radically altered by impacts and volcanism. Earth presumably has none; tectonics and erosion have seen to that. The same may be true for Mars, but there are promising signs in Mariner 10's photos of Mercury. Vernon R. Oberbeck of NASA's Ames Research Center and R. H. Morrison of LFE Corp. in California have carried out laboratory studies showing where the fall of material tossed out by an impact would be at a minimum, and Oberbeck told the Rockfesters that a few such areas—with a minimum of small craters between the big ones—may exist on the moon. One appears to be a region in the south-central lunar highlands near Hipparchus. □

# O+ in eggs: Getting past the hollow ball

The "gee-whiz" approach to biology went out with Buck Rogers and his magic flying machine. The "wonders of this" and the "mysteries of that" began to melt away when biologists turned high-powered microscopes and biochemical techniques on the living cell. There is still at least one life process, though, that deserves the term "amazing": It is the series of events that begins with one egg cell and ends with a young organism composed of several trillion. Embryologists are still baffled by the early events in this series, specifically how the egg cell is "activated" and its genes suddenly turned on and directed toward the production of differentiated cell types. One embryologist, a doctoral candidate at Indiana University, has now unraveled a bit of this "amazing mystery."



*Adult Mexican axolotls, grown from egg cells with transplanted nuclei, to show that o+ proteins must be present for normal development.*

Indiana University/Lawrence M. Lawrence

Ann Janice Brothers reports a detailed study on the "*o*+ substance" from the Mexican axolotl in the March 11 NATURE. The axolotl is a strange looking, neotenous salamander that never loses its feathery gills or tail fin during maturation. The "*o*+ substance" is one or more proteins that seem to be necessary for egg cell activation past the early stages of development. These proteins are laid down in the cytoplasm of egg cells during oogenesis (egg production) in the normal adult female axolotl. Abnormal females with a mutation in the gene pair that codes for synthesis of these *o*+ proteins cannot produce the proteins or stock them in the egg cells, and thus make defective eggs. These defective eggs stop dividing a day or so after fertilization and never form normal axolotl young. Normal eggs, with the *o*+ proteins, continue to divide.

Two Indiana University embryologists made the initial discoveries that led to Brothers's experiments. R. R. Humphrey found the mutation in the female axolotl, and Robert Briggs discovered that the *o*+ proteins are laid down in the egg cytoplasm before fertilization. But Brothers, for her doctoral dissertation, did an extensive series of nuclear transplantation experiments to pinpoint the role of the *o*+ proteins in egg cell activation.

Brothers took nuclei from normal axolotl eggs and transplanted them into mutant eggs (without *o*+ protein). Nuclei removed from normal cells during the early blastula (hollow ball) stage did not induce full development of the mutant eggs. But nuclei removed during the mid-to-late blastula stage did induce full development of the mutant eggs to adult axolotls. This shows, Brothers says, that the *o*+ proteins in the cytoplasm begin to work only during the middle or late hollow ball stage, just in time for the gene activation that directs the next and subsequent stages (gastrulation and organ formation) in the growing embryo.

The implication is strong that this *o*+ substance somehow interacts with the embryonic genes during the blastula stage, perhaps to "turn on" the genes needed for continued development. "But," Brothers says, "we don't have direct evidence of this interaction yet." The next step, she says, will be to isolate and characterize the *o*+ proteins, then to trace their movements within the cell with fluorescent antibodies. These will adhere to the *o*+ proteins and should make it possible to detect whether or not they enter the nucleus during mid-to-late blastula stage and form a complex with some of the chromosomes—an indication of gene activation. It is also not clear yet whether this *o*+ system works only in axolotls. Briggs's earlier work, however, shows that a wide variety of amphibians have an egg activating substance. □

# Laser enrichment: Companies vying

In spite of Marx, Engels and Lenin, the wave of the future with regard to the one socialized industry built in the United States, uranium enrichment for reactor fuel, seems to lie with the corporations of bourgeois capitalism rather than the proletarians of the federal bureaucracy. As long ago as 1972 the Reynolds Metals Co. filed an application with what was then the Atomic Energy Commission for a license to build a uranium enrichment plant in Wyoming. Reynolds has since dropped the idea, but at least three other private enterprises are now asking for a piece of the enrichment action: Exxon, Garrett Corp., and Centar Associates, the latter described as "a joint project of ENI Nuclear Co., owned by ElectroNucleonics, Inc., and Arco Nuclear Co., owned by Atlantic Richfield Co."

For use as reactor fuel (or as bomb charges) natural uranium must be processed so that the concentration of the fissile isotope U-235 is increased com-