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COVER: Elevations on Venus, measured from orbit by the Pioneer Venus spacecraft's radar, have been arranged by computer graphics into a globe that can be viewed on a screen from different angles and distances and even rotated. In this view, centered at 0°W by 30°N, the continent-like near-polar feature is Ishtar Terra, topped by the towering Maxwell Montes. For more ways to look at the hidden world, see p. 167. (Data: G. Pettengill et al. Image: J. Blinn/JPL Computer Graphics Lab. Thanks also to G. Zucman).

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SCIENCE NEWS OF THE WEEK

Transplanted Gene: From Egg to Mouse

Cells in the laboratory have been generally accomodating to transplanted genes. Both bacteria and animal cells growing in culture have accepted foreign genetic material and reproduced it as if the genes were their own. Even bone marrow cells continue to replicate an inserted gene when returned to laboratory mice, passing on the foreign gene to each daughter cell with every cell division (SN: 4/19/80, p. 244). But for genetic engineering to succeed in perhaps its greatest challenge — the direct correction of genetic flaws — a gene inserted in a young embryo must be correctly reproduced through the many stages of development.

Yale scientists have announced a step in that direction: They have identified in newborn mice a foreign gene that was implanted into the mouse egg just after it was fertilized. In two cases out of the first 78 attempts the foreign gene turned up in most, if not all, cells of the newborn. Whether the gene will be active in any cell of its new host remains a question for future investigation.

The gene transferred by Francis H. Ruddle, Jon Gordon and George Scangos came from the virus Herpes simplex, where it directs production of an enzyme called thymidine kinase. To obtain enough copies of the gene for injection into mouse cells, the scientists linked the gene to a signal sequence from another virus, a monkey virus called SV40. The combined material was inserted into a ring of bacterial DNA and that plasmid was reproduced in bacteria.

The scientists injected thousands of copies of the plasmid into the nucleus of each newly fertilized mouse egg. They used glass needles finer than a human hair and guided the injection by observing it through a microscope. The eggs were then implanted in foster mothers — mice made receptive by mating with sterile males. Ruddle and colleagues sacrificed the newborn mice and extracted the DNA. The viral genes were identified by their specific binding to radioactive copies of the material originally inserted into the nuclei. In two cases there was evidence that DNA matching the foreign genetic material had been incorporated permanently into the developing embryo. The scientists expect further refinements in their technique to increase the proportion of successful gene transfers in future experiments. In addition to examining whether the viral gene can function in mouse cells, the researchers also plan to determine whether the foreign gene will be passed on to offspring of the genetically engineered mice. If so, it may be possible to create animal models to study more human diseases. This would be accomplished by introducing a disease-causing human gene into mice and creating a colony of the genetically modified animals.

Ruddle, who is well-known for his work in mapping genes on human chromosomes, believes the gene transfer experiments will lead to more powerful techniques for locating and examining human genes. The scientists also believe the work will lead to further information about how the functioning of the genes is controlled during development. □

A way of modeling a reforming reaction

Our society runs on industrialized chemical reactions. An instance in which that metaphor is literally true is in the case of reactions involved in the refining of petroleum. Physical organic chemists are reporting some success in the study of these reactions on the molecular level, that is, to know precisely how they happen, how the bonds form and break, with just how much of each reagent and so on. It is a pure scientist's reflex to want to know this, but they also hope to discover ways of improving the inherited empirical rules and formulas on which industrial chemistry is often based and thereby effect important economies in this age of shortages and galloping prices.

At the Fifth IUPAC Conference on Physical Organic Chemistry held recently at the University of California at Santa Cruz, George M. Whitesides of Massachusetts Institute of Technology reported some successes in studies of an important reaction in petroleum refining, the so-called reforming reaction. An example of such a reaction is illustrated below. The compound on the top, made of seven CH^2 and CH_3 groups, will burn in an auto engine, but not well. For a high compression engine it has very poor antiknock qualities. The compound below the arrow (toluene) is what is wanted, and the upper com-