On the way down, the landers also measured the upper atmosphere winds. M. K. Rozhdestvensky of the Moscow Physical and Technical Institute points out that this could not be done with the anemometers that measured the surface winds, since the parachutes by which the landers descended partook of the winds' motion. The measurement by Doppler shift of radio signals between lander and orbiter required large corrections, but still indicates upper atmosphere winds up to 100 meters per second.

What was most surprising in the findings? Everything, says Avduevsky, but especially the lower limit of the cloud cover (at 49 kilometers above the surface, higher than anyone had expected), the surface illumination and the surface pictures.

Marov has a slightly different list. He agrees about the Venera 9 picture. The Venera 10 picture, he says, is what one would have expected: It looks something like sandy regions on earth. He also thinks the transparency of the Venus clouds is a big surprise. Everyone had expected them to be dense. But he adds the "quite interesting and unexplained spectra of Venus." There is no indication of hydroxyl or oxygen bands that one would expect from studies of Earth and Mars, nor even the known bands of carbon dioxide. There is quite another system of bands, possibly carbon dioxide in some strange state in the upper atmosphere of Venus. Finally Marov mentions the interaction of Venus with the solar wind. The planet has no measurable magnetic field and so no magnetosphere, and the way the solar wind flows around it is quite strange. □

Recombinant DNA: Impacts and advances

The new techniques of recombinant DNA engineering have rarely been out of public view since the Asilomar conference convened 18 months ago to discuss the safety of the work. Last week at Massachusetts Institute of Technology, the subject was again in view. This year's annual Miles International Symposium, sponsored by the Miles Laboratories, focused on the impact of recombinant molecules on science and society.

While the three-day program's emphasis was more science than society, the symposium was held in what is probably the strongest center of resistance to the new field, and thus offered a wide divergence of opinion on social issues. The science was diverse, as well, from synthetic gene splicing to plant genetics.

A morning program on societal impacts, chaired by University of Edinburgh biologist Ken Murray, produced the symposium's most passionate discussion. Science for the People, the Cambridge-based group of radical scientists and students, provided a steady presence throughout the meeting, opposing the impending National Institutes of Health guidelines on recombinant DNA research, due later this month. The morning session on impacts covered issues from human genetics to a rather heated discussion of the public role in guideline formulation. Science for the People eventually drafted a petition to NIH director Donald Frederickson, calling for increased community participation and stringent safety precautions. The petition found few willing signers.

Reports of significant scientific advance garnered far more sustained interest among the 500 conference attendees. One important report was the first demonstration of a synthetic DNA sequence that will work in a living cell, described by Herbert Boyer of the University of California at San Francisco.

Boyer, in 1972, discovered the class of enzymes called restriction endonucleases that have made recombinant "gene splicing" possible. Boyer's research group, along with Arthur Riggs's group at the City of Hope Hospital in Los Angeles, used such restriction enzymes to achieve this first insertion of functional synthetic DNA.

The group chose to synthesize the operator region of the so called lac-operon. This operon is essentially a group of genes found on the circular chromosome of the bacterium *Escherichia coli* that produce three enzymes needed to break down the carbohydrate lactose. The operon has a structural gene to build the enzymes, a regulator gene to control enzyme production and an operator gene to switch off the entire operon. Together, the genes form a repressible enzyme system that, with elegant energy economy, will make enzymes to break down lactose only when the sugar is present and the cell needs it.

The team synthesized an operator sequence of nucleic acid base pairs, then "glued on" two short DNA regions called restriction sites—the chemical equivalents to dotted lines where restriction enzymes can attack. They then snipped "holes" in small, circular chromosomes called plasmids and spliced in the operator region with restriction enzymes, one region per plasmid. Using the recombinant technique called cloning, they produced many copies of the plasmids in *E. coli* cells, then grew the cells on special dye indicator plates to test for functioning of the artificial DNA. The colonies turned blue, an indication that the synthetic operators were functioning.

The technique of attaching synthetic restriction sites to synthetic DNA, then using recombinant DNA techniques to insert the region into living cells, "will give great flexibility to our technology," Boyer told a symposium session. It means, too, he said, that in the future, important proteins such as insulin or antibodies might be produced in living cells from inserted synthetic genes.

Another report, this one concerned with plant and bacterial genetics, presented evidence of the first natural example of a long-term genetic crossover between primitive and advanced cells. If confirmed, it could have, as well, potential significance for a costly agricultural problem and for the safety of recombinant genetic engineering.

Eugene W. Nester, a microbiologist at the University of Washington at Seattle, has for several years studied the genetics of crown gall disease, a tumor-forming condition in several plant species caused by the bacterium *Agrobacterium tumefaciens*. Nester and his colleagues now have suggestive evidence that DNA from *A. tumefaciens* plasmids is present in the plant tumor cells. This DNA, moreover, remains in cultured tumor tissue for several decades, and if these data are confirmed, would represent the first long-term natural coexistence of genetic material from prokaryotic cells (the bacteria) and eukaryotic cells (the plant tissues).

Such natural coexistence could have impact on the recombinant engineering safety question. One biochemist, Robert Sinsheimer of Caltech, warned recently against tampering with the natural barrier to genetic exchange between the two great classes of cells. But the new evidence shows that barrier could be flimsy, indeed.

Nester, as well as other researchers, continues to study crown gall tumors with hopes of determining precisely which *A. tumefaciens* genes are transferred to the plant's genome, and how they lead to tumor formation. When the transfer mechanism is clearer, Nester says, it might be used to introduce other foreign genes into plants. □

Lyme arthritis: Insect vectored?

One day last October, a concerned mother in Lyme, Conn., placed a call to the State Department of Health in Hartford. Her daughter, she told David Snydman of the department's Division of Preventable Diseases, had suddenly and inexplicably become ill with what seemed to be a form of juvenile rheumatoid arthritis. What, she asked, was this strange form of arthritis that had recently afflicted her daughter and more than a dozen other children, and some adults?

To date, 51 persons—39 children and 12 adults—have been diagnosed as suffering from a similar type of arthritis not seen before. They all wanted answers.

The truth is that no one yet knows what causes the mysterious malady now known as "Lyme arthritis." But the unusual geographical and temporal clustering that seems to characterize it finally led Snydman to question "whether it was really