Gene conference: Long-awaited report

After several weeks of rehashing and rewriting, the Asilomar conference organizers and the National Research Council have released the official summary statement about that unique meeting on the future of genetic engineering research. It appeared in both SCIENCE and NATURE this week and will appear in the June PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. It emerges, understandably, more smoothly worded than the original midnight working paper, and with some changes in organization and emphasis. The spirit of the international decision has been meticulously preserved throughout the extended review process.

The document will serve as a general guide and philosophy for ongoing and future nucleic acid recombination experiments in nations around the world. More specific guidelines for determining risk and containment levels, laboratory techniques and monitoring of safe procedure will be worked out within each nation, Stanford biochemist Paul Berg anticipates. Berg is the chairman of the committee that organized the international conference held at Asilomar State Park near Monterey, California, in February. Conference members discussed the future of genetic manipulation experiments in light of new techniques that suddenly give scientists the capability to combine genetic material from unrelated organisms and create novel life forms (SN: 3/8/75, p. 155). Researchers found themselves last year in the evolutionary driver's seat without a license, and called for a temporary halt to experiments until this conference could be held to set up some rules of the road (SN: 7/27/74, p. 52).

The document carries forth the essence of the Asilomar decision; that work on construction of recombinant DNA molecules should continue, but that biological and physical containment mechanisms should be developed and used which match containment procedures to potential biohazards created by the recombined organism. The original conference statement proposed three categories for experiments and commensurate containment levels—low, moderate and high. Many investigators wrote Berg and the other steering committee members after the conference, however, protesting that three categories "jammed too many potential experiments into the middle category." The newly released version, accordingly, proposes four categories, the new one being "minimal risk," and allowing for containment with less sophisticated laboratory equipment and less complicated laboratory procedures than the other categories.

Among other small additions and deletions, the revised document underscores the responsibility of the individual recombinant investigator during all experiments, regardless of category, and in testing the safety of physical and biological containment regimes in the context of his own project.

The revised summary statement was submitted to the NAS as one of 10 appendices to a report on the history, organization and rationale of the Asilomar conference. Working and background papers from the conference comprise the other appendices. The NAS is currently deciding whether to publish a full volume.

Berg emphasizes that the newly released summary is not "the final draft of the conference outcome, but a beginning towards developing a sensible *modus operendi.*" As recombination research progresses, the guidelines and procedures will be revised, he says, and "no one should believe that this document is chipped in stone, or that the scientists have decided how to deal with the genetic engineering problem."

Grappling with the issue of self-regulation and preparing a summary report was a difficult process, but the more difficult task is translating that position into a set of specific guidelines that the experimenters and institutions and funding agencies can use on a day to day basis. That task has fallen, in large part, to a group of top-notch molecular biologists chosen to advise the National Institutes of Health, the major funding agency for genetic engineering research. Their charge is to provide NIH with advice on how to judge the hazards of any experiment, to oversee development of safer organisms and to set up the guidelines scientists can follow in their laboratories.

At a recent meeting in Bethesda, Md., the group inched forward towards operationalizing the Asilomar decision. Among several items on their two-day agenda, they reviewed recent work on safer hosts and vectors, established a newsletter for recombinant investigators, and discussed biohazards, grants and experimental guidelines.

Four committee members working on the development of safer bacterial host cells and safer vectors for delivering recombinant genes into cells reported on their progress. Roy Curtiss III of the University of Alabama at Birmingham has been trying to develop a bacterium that has lost the ability to repair its own cell wall unless supplied with a specific amino acid by the investigator. Curtiss and his students have been working practically around the clock, but have hit a few experimental snags, and it now looks like safer hosts are going to take longer to develop than predicted at Asilomar. Two others reported some progress. Neither, however, has yet been funded specifically for this work, nor has had enough time to complete it. The investigators worked up a draft NIH announcement for contracts and grants for work on safer hosts and vectors that will be formalized soon.

Throughout the two-day meeting, there were shades of the Asilomar discussions—philosophical exchanges that illustrate an important point: While the future course of genetic engineering may have been charted, the set and drift have not been worked out in detail. Many of the scientists in attendance expressed the desire of their colleagues for a specific classification system that would arrange experiments into risk categories and spell out in *exact* detail the laboratory procedures and containment systems needed for each to ensure safety from release of hazardous biomaterials. NIH Deputy Director for Science Dewitt Stetten, while agreeing with the need for specifics, warned that "the real hazard is the one no one around this table has dreamed of yet, and this you can't specify against." Curtiss and Falkow, both involved in the development of safer hosts and vectors, warned against relying heavily on these rather than on the investigator's own caution. □

A metal made of nonmetals

From those wonderful folks who gave you transistor radios, the chemists and physicists who work with solid state materials, you can expect all sorts of intriguing phenomena. The latest is a metal made of nonmetals—or perhaps it might be described as a nonmetal compound that thinks it's a metal.

The substance is polymeric sulfur nitride. In its composition it contains not a single metal atom, yet it conducts electricity as though it were metal. The discoverers of this property, a group led by Anthony F. Garito, Alan J. Heeger and Alan G. MacDiarmid of the University of Pennsylvania, believe it "may be the forerunner of a new series of synthetic polymeric metals, which are of great scientific interest, whose properties might be chemically altered to fit a variety of possible future applications."

A potentially useful property of sulfur nitride's electrical conductivity is that it is one-dimensional. The compound is structured like a chain, with sulfur and nitrogen atoms alternating as the links. A crystal is composed of bundles of chains stacked parallel. High pressure can flatten sulfur nitride crystals into thin films, and when this is done, electricity passes more readily along the chains than across them. Ordinary metals conduct electricity equally in any direction.

The same property leads to unusual optical effects: Oriented one way, a sulfur nitride thin film will pass most of a beam of polarized light; turned 90 degrees, it reflects most of the beam. Such a combination of properties could be useful in optical communications where electrical fluctuations are to be translated into light fluctuations. □