Clues to life's cellular origins

A discovery by a biophysicist at the University of California at Davis indicates that the structural requirements for cell membranes should have been present in earth's primordial soup. David W. Deamer has found that in the interior of the 4.5-billion-year-old Murchison meteorite are lipid-like organic chemicals able to self-assemble into a membrane-like film enclosing fluid. The finding was presented last week in Berkeley, Calif., at a meeting of the International Society for the Study of Origins of Life.

"If we assume life begins from self-assembly," Deamer says, "then the nonbiological self-assembly seen with chemicals from inside the Murchison meteorite shows how the essential membrane of the first microorganism might have formed." Such a membrane, notes Cyril Ponnamperuma at the University of Maryland in College Park, "is required in order to get a cell." What Deamer's work shows, he says, "is that the materials required for a membrane will be available."

The Murchison meteorite gets its name from the site in Australia where it fell to earth in 1969. It is believed to have broken off of an asteroid that formed at about the same time and from some of the same solar-system materials that earth did.

Ponnamperuma says his own work with Murchison-derived chemicals provided "the first unambiguous evidence of extraterrestrial amino acids" and, more recently, the presence of all five nucleic acid bases (SN:9/3/83,p.150). He says that if Deamer's work can be substantiated further, chemical-origins-of-life proponents will be one step closer to establishing that the material in the Murchison meteorite – and therefore elsewhere in the solar system – contains many of the essential components for creating life.

However, Deamer cautions, "there is no evidence that these [membranous structures formed from Murchison chemicals] were in the direct line of ascendancy for the life that actually did form on earth." In fact, he notes, the chemical composition of the Murchison compounds he discovered has not yet been characterized except for the observation that they are lipid-like and fluorescent, and contain unique complex-hydrocarbon compounds.

Deamer says that if chemicals like those in the Murchison interior were not naturally available on the primordial earth, they could have been "seeded" into the chemical soup from which life is believed to have formed, by similar chemicals arriving with earlier Murchison-like meteors. *– J. Raloff*

Sequencing the genome: Crusade called off

The order and identity of all 3 billion nucleotides on every chromosome in the human genome has been – as described by Walter Gilbert of Harvard University – the holy grail of human genetics. Recent technological advances have brought those basic genetic units within sight, if not within reading distance, and the tantalizing view has spurred so many scientific meetings in the past year that a massive sequencing project had begun to seem inevitable. But at a July 23 meeting of many of the world's foremost geneticists, held by the Howard Hughes Medical Institute and the National Institutes of Health, both in Bethesda, Md., the idea of a full-scale sequencing crusade met, said one participant, with a "resounding lukewarmness."

The question is no longer whether the genome will be sequenced, but with what urgency – and what money. An intensive sequencing effort is generally considered to be much more than a $1 billion project. "I'm in favor of the project, but I think I can safely say everyone else at Cold Spring Harbor [CSH] is against it," says James Watson of CSH on Long Island, N.Y. "Everyone is scared that if we went toward the thing too fast ... there [would be] less money for [other research projects]."

Learning the order of the nucleotides might generate a lot of information, scientists say, without in itself adding much to understanding. "We shouldn't kid ourselves about having the sequence and [then counting on] some whiz at the computer being able to figure out the control mechanisms," Watson says.

Instead, many of the geneticists expressed enthusiasm for a phased assault on the genome, in which complete sequencing would await continued development of sequencing technology and a coordinating structure that could contain a project of multilaboratory, multination scale. There was consensus on giving priority to an intensive attempt to "map" the human genome – which, in comparison to sequencing, is like looking at the genome's organization at the level of cities and cross-streets rather than individual addresses. According to Sydney Brenner of the Laboratory of Molecular Biology in Cambridge, England, a physical map could be achieved with a few years of concentrated effort. Only about 3 percent of the human genome has been put onto a physical map so far.

"The genetic sequence is a tool," says Eric Lander of the Whitehead Institute for Biomedical Research in Cambridge, Mass. "We should rate it ... with all the other tools we're going to need." *– L. Davis*

Biotech rules receive scrutiny

A new Reagan administration policy governing the release of biotechnology products provides "a workable system of review" for releasing genetically engineered organisms into the environment, says Rep. Harold Volkmer (D-Mo.), who chairs the House Subcommittee on Investigations and Oversight, one of three subcommittees that participated in a hearing on the policy last week. But some scientists question the ability of the new guidelines to adequately protect the environment, while other scientists argue that they improperly exempt from rigorous review some potentially hazardous organisms.

Under the expanded guidelines, which went into effect June 26, products derived from disease-inducing organisms, products to be newly introduced into an ecosystem and products with altered nonregulatory DNA sequences would receive particularly close scrutiny. Products with alterations to regulatory DNA coding sequences, products created by deleting a gene and products created by combining the genes of organisms within the same genus would receive brief review, under the assumption that such products are better understood and pose little risk.

Elliott Norse of the Ecological Society of America in Washington, D.C., sees in the new policy a "tilt toward minimizing safeguards" that could allow the release of potentially dangerous organisms. "There is currently no definitive way to predict what the [engineered] product will be – that is, what an organism will do when modified and released into the environment," he said at the hearing.

Another problem with the rules, according to Monica Riley of the Washington, D.C.-based American Society for Microbiology, is the distinction they make between manipulating regulatory and nonregulatory DNA sequences in engineered organisms. Regulatory sequences control nonregulatory DNA sequences, which affect the functioning of an organism, such as the production of an enzyme. In exempting such altered organisms from in-depth review, she says, the new policy fails to appreciate the power of regulatory sequences to affect an organism's ability to compete and survive in a new environment.

Volkmer also expresses concern that the agencies affected by the new policy have yet to agree on the definitions of crucial terms such as "environmental release" and "containment facility," leading to confusion in the biotechnology industry. Says Volkmer, "It is difficult to implement release guidelines if there is confusion about when a release has occurred." *– T. Kleist*