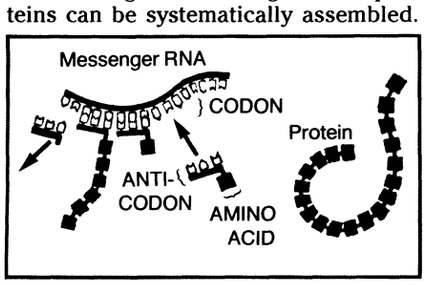
Is there a cosmic chemistry of life?

The genetic code in life on earth may reflect a universal chemistry — one essentially consistent throughout the cosmos, according to Cyril Ponnamperuma, director of the Laboratory of Chemical Evolution at the University of Maryland in College Park. In fact, he says, new experimental data from his laboratory suggest that the formation and linking of life's building blocks — amino acids and nucleotides — may have been all but inevitable, given the starting chemistry of earth's "primordial soup."

On the basis of these data, reported last week in Anaheim, Calif., at the American Chemical Society's fall national meeting, Ponnamperuma now believes that "if there is life elsewhere in the universe, chemically speaking it would be very similar to what we have on earth."

The Maryland experiments show "an intrinsic relationship between the molecules that make up the [genetic] code and the amino acids, which the code regulates," he says.

Proteins consist of amino acids that have been assembled according to a pattern specified in DNA's genetic code. The pattern used for synthesizing the proteins is copied from the DNA template onto RNA, in a series of linked three-letter "words" known as codons (see diagram). The ordering of the codons in this RNA, called messenger RNA, is the blueprint for building a protein. For each codon there exists a corresponding anti-codon — a three-letter fragment of RNA that fits hand-in-glove into its complementary codon. Amino acids are attached to the end of a different type of RNA molecule — one that has an anti-codon embedded within it. Once each anti-codon links up with its complement codon along the messenger RNA, proteins can be systematically assembled.



Courtesy: Ponnamperuma

This organization has been known for many years. What hasn't been known, Ponnamperuma says, is precisely why particular anti-codons and amino acids pair up. In nature, the pairing is always well defined. For example, an anti-codon made from three adenine bases (AAA) links up with the amino acid phenylalanine. An anti-codon made from three uracil bases (UUU) links up with the amino acid lysine. Some have suggested that the natural association between these molecules represents some quirk of early evolution — and one possibly unique to earth — that has been passed down.

But the new Maryland experiments, Ponnamperuma says, now indicate that not only the chemistry of these molecules, but also their physical structure, draws them to each other. For example, recent experiments by Nalinie Senaratne (now at Ruhuna University College in Galle, Sri Lanka), performed as part of her doctoral dissertation research, indicate that although a nucleic acid's subunits (a sugar, phosphate and bases) can be linked in many ways, only those with the specific three-dimensional structural orientation common to the nucleic acids in earth's living systems — DNA and RNA — show a statistical preference for pairing off with amino acids. Moreover, anti-codons show a stronger affinity for the amino acids they link up with in living systems than for other amino acids — an affinity sometimes 10 or 20 times greater.

Ponnamperuma says these observations suggest that if the laws of chemistry operating on earth hold constant throughout the universe, one might expect that wherever these chemicals coexist, they will preferentially link to form the same subunits that define the essential building blocks of life on earth. In other words, the ordering of the genetic code does not appear to be an accident or quirk of nature, he says, but instead a manifestation of the logical rules by which chemistry operates — rules that would operate not only in living systems but also in nonliving ones. By extrapolation, he says, this suggests that the genetic code seen operating throughout life on earth may be repeated elsewhere in the universe.

Adding support to this contention is the recent identification by Ponnamperuma and others of amino acids and DNA bases in meteorites that formed elsewhere in the solar system (SN:8/2/86,p.71).

Mitchell Hobish, for many years a coworker at Maryland with Ponnamperuma on these studies, says he believes these experiments indeed "indicate that there is a physical, structural and chemical basis for the genetic code." The goal, he says, is to find the origins of life by identifying what original combination of molecules and conditions led to the development of a self-replicating system. "Our spark-discharge work [SN:9/3/83,p.150] has shown indications that virtually all of the building blocks of bioorganisms can be produced abiotically," notes the biochemist, now a private consultant based in Baltimore. "Whether these building blocks can hook up to make the more complicated molecules [seen in living systems] has not yet been established," Hobish says. However, he told SCIENCE NEWS, "all the data we have indicate that we're on the right track."

Since 1971, James Lacey and his colleagues at the University of Alabama at Birmingham have been acquiring somewhat different but related chemical evidence linking anti-codons and amino acids to the development of the genetic code and to protein synthesis. "We were the first to present data correlating [chemical] properties between amino acids and their anti-codons," Lacey notes. Referring to the Maryland studies, he says, "We are pleased that their data lend such convincing support to that model." — *J. Raloff*

TV coverage linked to teen suicides

Teenage suicides have received much attention on television in the past few years. Two teams of researchers now report that the tube may play an active role in these tragedies. Television news coverage and fictional movies about suicide, they say, appear to trigger a temporary increase in the number of teenagers who kill themselves.

While "imitation suicides" are widely assumed to take place, as in recent instances of clustered teenage suicides in several suburban communities, some researchers say the new studies do not yet establish a clear statistical link between television and the adolescent suicide rate.

The investigators involved in the projects, however, see important implications in the data, which were published in the Sept. 11 NEW ENGLAND JOURNAL OF MEDICINE. "[Our results] indicate that the national rate of suicide among teenagers rises significantly just after television news or feature stories about suicide," write sociologists David P. Phillips and Lundie L. Carstensen of the University of California at San Diego. This increase, they add, is proportional to the amount of network coverage.

The researchers examined suicide rates in the seven days following 38 stories or pairs of stories that appeared on the three networks between 1973 and 1979. The stories were a mixed bag, including pieces on the suicides of television actor Freddie Prinze, an unnamed teenage girl and a man who had murdered several people; features included programs on "suicide and teenagers" and "suicide and prison."

On average, in the seven days following a single suicide story, there were about three more suicides than would normally be expected. The total of 1,666 suicides following the 38 stories was 110 suicides greater than would otherwise have been expected. Suicides among teenage girls during the week-long "danger period" rose by 13 percent, in con-