3/10/64

One must distinguish between the origin and the evolution of the genetic code. If the code arose as the result of an extremely rare combination of events, then the nature of the original code might ~~well~~ influence the ~~latter~~ evolution of the code. Alternatively, the genetic code may have been selected from a large population of precursor codes.

The genetic code may have originated in conjunction with the first primitive cells, perhaps 1-3 x 10^9 years ago. As discussed previously, the code probably was frozen at a relatively early date, because soon after a sufficient amount of information had been selected and stored in nucleic acids, alterations of the code probably were limited to those that would not radically alter the retrieval of information that had been required.

Neurons may have originated as single cells evolved into more complex multicellular forms of life. Therefore, the genetic code probably evolved earlier than neural codes, perhaps when cellular chemistry was quite primitive. Since the most primitive single-cell organisms that we are aware of are ~~quite~~ highly ~~sophisticated~~ biochemically, neural mechanisms almost surely were based upon sophisticated enzyme mechanisms. Also, the neural coding mechanism of today undoubtedly were selected from a large population of precursor codes. It is likely that the molecular logic of the neural codes became fixed relatively early in evolution, however, additional mechanisms may have been acquired during the course of evolution.

We are now witnessing the evolution of a new biological cycle It is clear that living organisms process information systematically in at least two major channels; intra- and intercellular, corresponding to the genetic and neuron-hormone mechanisms, respectively.

3/11/69

SPECULATIONS

One must distinguish between the origin and the evolution of the code. If only code originated due to a single extremely rare event, then the original nature of the code may have restricted the course of its subsequent evolution. Alternatively, if many kinds of precursor codes originated, the genetic code may have been selected from a population of precursor codes. In either case, the code probably originated as the first primitive cells evolved, perhaps 1-3 x 10^9 years ago. As discussed previously the code probably became fixed at a relatively early date, because after some information had been acquired, further evolution of the code probably was restricted to changes that would not prevent the information that had been acquired from being expressed.

Living organisms process