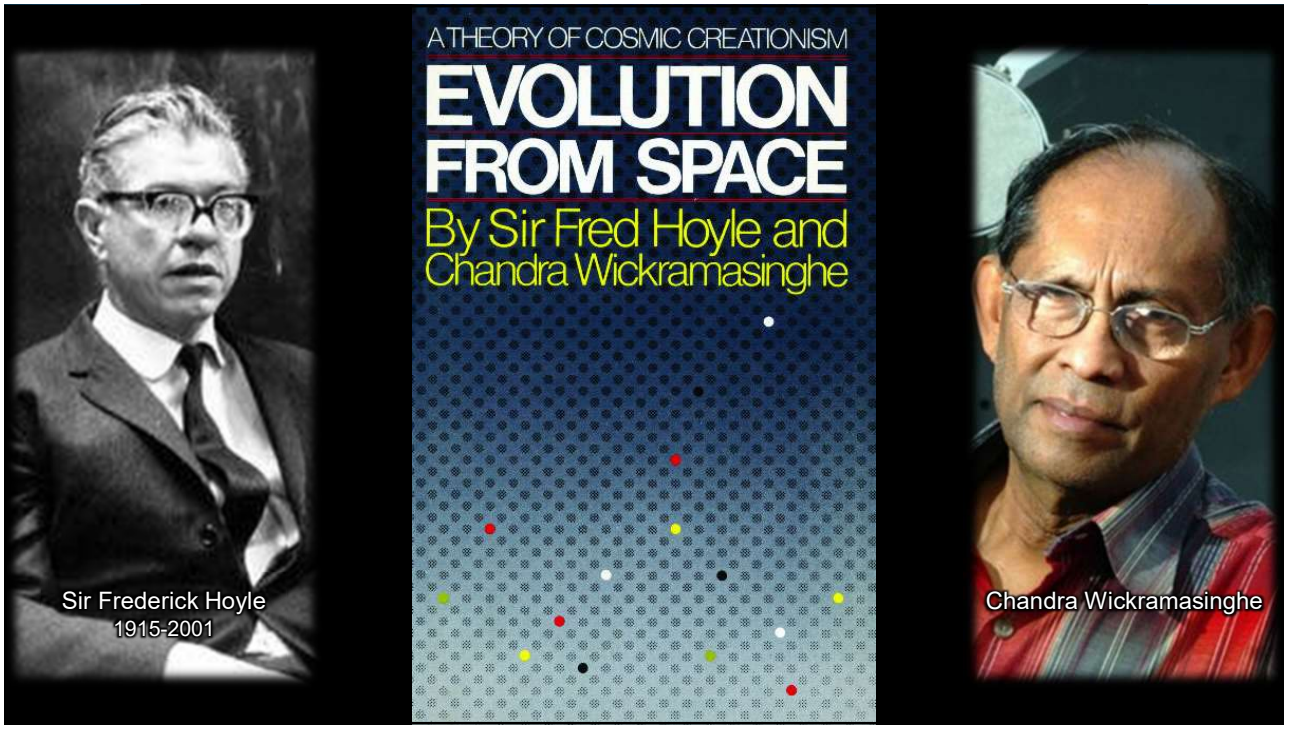
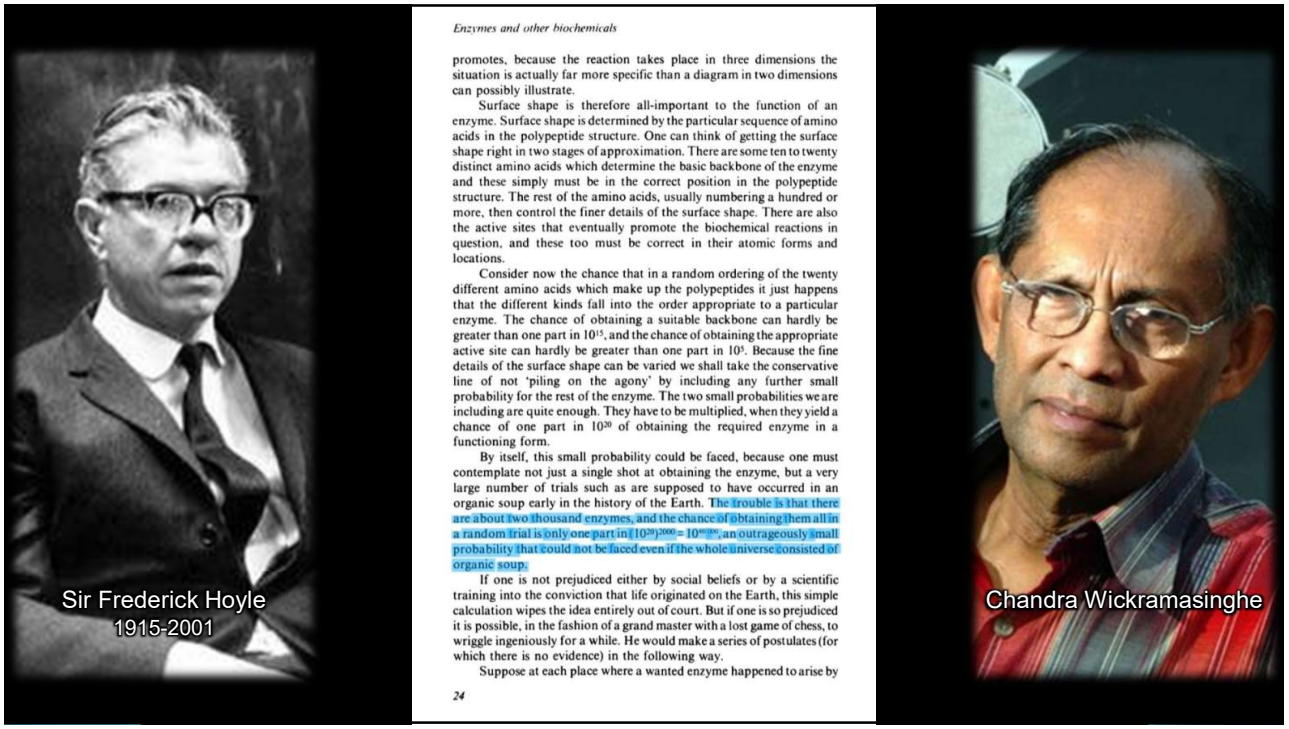

Sir Frederick Hoyle
1915-2001
A THEORY OF COSMIC CREATIONISM
EVOLUTION FROM SPACE
By Sir Fred Hoyle and Chandra Wickramasinghe
Chandra Wickramasinghe


Sir Frederick Hoyle
1915-2001
Enzymes and other biochemicals
promotes, because the reaction takes place in three dimensions the situation is actually far more specific than a diagram in two dimensions can possibly illustrate.
Surface shape is therefore all-important to the function of an enzyme. Surface shape is determined by the particular sequence of amino acids in the polypeptide structure. One can think of getting the surface shape right in two stages of approximation. There are some ten to twenty distinct amino acids which determine the basic backbone of the enzyme and these simply must be in the correct position in the polypeptide structure. The rest of the amino acids, usually numbering a hundred or more, then control the finer details of the surface shape. There are also the active sites that eventually promote the biochemical reactions in question, and these too must be correct in their atomic forms and locations.
Consider now the chance that in a random ordering of the twenty different amino acids which make up the polypeptides it just happens that the different kinds fall into the order appropriate to a particular enzyme. The chance of obtaining a suitable backbone can hardly be greater than one part in 10^{15}, and the chance of obtaining the appropriate active site can hardly be greater than one part in 10^5. Because the fine details of the surface shape can be varied we shall take the conservative line of not 'piling on the agony' by including any further small probability for the rest of the enzyme. The two small probabilities we are including are quite enough. They have to be multiplied, when they yield a chance of one part in 10^{20} of obtaining the required enzyme in a functioning form.
By itself, this small probability could be faced, because one must contemplate not just a single shot at obtaining the enzyme, but a very large number of trials such as are supposed to have occurred in an organic soup early in the history of the Earth. The trouble is that there are about two thousand enzymes, and the chance of obtaining them all in a random trial is only one part in $(10^{20})^{2000} = 10^{40,000}$, an outrageously small probability that could not be faced even if the whole universe consisted of organic soup.
If one is not prejudiced either by social beliefs or by a scientific training into the conviction that life originated on the Earth, this simple calculation wipes the idea entirely out of court. But if one is so prejudiced it is possible, in the fashion of a grand master with a lost game of chess, to wriggle ingeniously for a while. He would make a series of postulates (for which there is no evidence) in the following way.
Suppose at each place where a wanted enzyme happened to arise by
24
Chandra Wickramasinghe

Sir Frederick Hoyle
1915-2001

Enzymes and other biochemicals

"The two small probabilities we are including are quite enough. They have to be multiplied, when they yield a chance of one part in 10^{20} of obtaining the required enzyme in a functioning form. By itself, this small probability could be faced, because one must contemplate not just a single shot at obtaining the enzyme, but a very large number of trials such as are supposed to have occurred in an organic soup early in the history of the Earth.

24

Chandra Wickramasinghe

Sir Frederick Hoyle
1915-2001

Enzymes and other biochemicals

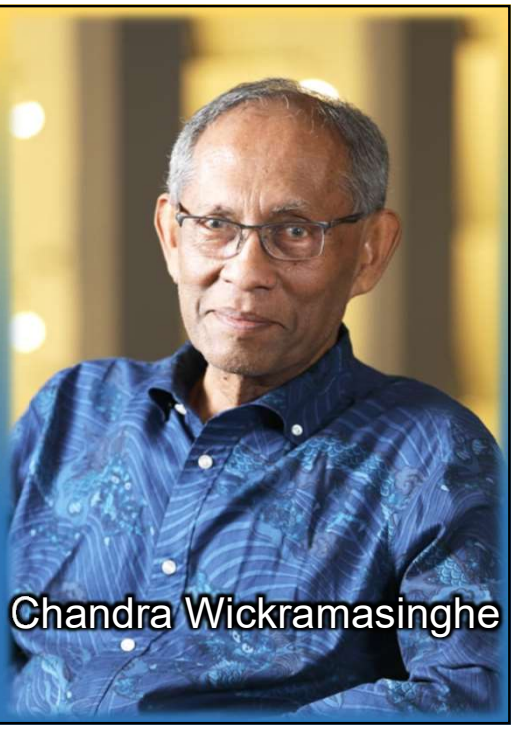
"The trouble is that there are about two thousand enzymes, and the chance of obtaining them all in a random trial is only one part in $(10^{20})^{2000} = 10^{40,000}$, an outrageously small probability that could not be faced even if the whole universe consisted of organic soup."

[Sir Fred Hoyle and Chandra Wickramasinghe, *Evolution from Space: A Theory of Cosmic Creationism* (New York: Simon & Schuster), 24]

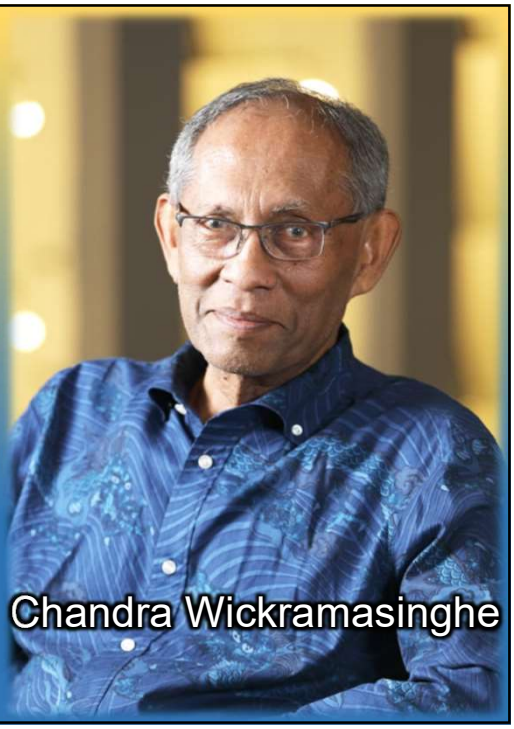
24

Chandra Wickramasinghe

"At a conservative estimate say 15 sites per enzyme must be fixed to be filled by particular amino acids for proper biological function. The number of trial assemblies needed to find this set is easily calculated to be about 10 ^40,000 —a truly enormous, super astronomical number. And the probability of discovering this set by random shuffling is 1 in 10 ^40,000. This latter number could be taken as a measure of the information content of life as reflected in the enzymes alone. The number of shufflings needed to find life exceeds by many powers of 10 the number of all the atoms in the entire observable Universe.



"There is also a serious difficulty to understand how any re-shuffling of amino acids could occur at all in the context of a canonical terrestrial-style primeval soup. To link two amino acids together requires the removal of a water molecule and the supply of some 150 times more energy than heat in the Earth's oceans could supply. In the absence of a joining enzyme used by biology or without an excessively large flux of ultraviolet light at the ocean surface, no new arrangements could be achieved. But even if chemical barriers for the linkages are artificially and miraculously removed, the really vast improbability of 1 in 10 ^40,000 poses a serious dilemma for the whole of evolutionary science.



"Life could not be an accident, not just on the Earth alone, but anywhere, anywhere at all in the Universe. The facts as we now see them point to one of two distinct conclusions: an act of deliberate creation, or an indelible permanence of the patterns of life in a Universe that is eternal and boundless. For those who accept modern cosmological views as gospel truth, the latter alternative might be thought unlikely, and so one might be driven inescapably to accept life as being an act of deliberate creation."

[Chandra Wickramasinghe, "Evidence in the Trial at Arkansas, Dec. 1981," https://www.panspermia.org/chandra.htm, accessed 02/28/22]