Maxwell's Demon and the Epic of Creation

As a lifelong scientist and educator I am compelled to consider seriously the evidence from evolutionary biology that favors a slow and progressive developmental process for the origins of life on earth. However, I remain unconvinced that this process could possibly have produced the subjects of my studies solely as a result of random probability, even given the amount of time the evidence tells us was available. These subjects appear to me to be far too complex to have been produced in that way. So, to test that hypothesis, I'd like to propose a simple thought experiment.

The use of thought experiments—by which one reasons out causes from effects or effects from causes—dates back to antiquity. However, some of the more well known of these experiments can be found in the work of more recent workers, particularly 19th and 20th century theorists in the physical sciences. Among those, "Maxwell's Demon" is one of the more celebrated examples. Although Maxwell proposed his "finite being" to further our understanding of the 2nd Law of Thermodynamics, I would like to use it here simply as an introduction to the use of thought experiments as a means of testing hypotheses that cannot be directly validated by experimental means. In this case, we would like to test whether or not the rules of probability alone are adequate to have brought about the changes that have produced life as we know it today.

We will start our experiment with a very simple question. We know that the basic materials of biological structure and function are macromolecules consisting of specific sequences of sub-units (information polymers). Then let us ask how easy it would be for such molecules to appear by means of random processes. The fact is, those kinds of specified-sequence polymers, some of them hundreds of sub-units in length, would seem to be virtually impossible to assemble at random. Consider, for example, a short (21-unit) peptide of known amino acid sequence; the A-chain of cod insulin. If we had a primordial soup containing all 21 of the naturally occurring amino acids in adequate concentrations, imagine the sequence of reactions in that soup to produce this insulin chain at random. The first amino acid in the chain is glycine, the second is isoleucine and the third is valine.

Given that the conditions in the soup are right for peptide bonds to form, the first dimer (two amino acids) has only a 1 in 21 chance of being the required sequence, glycine-isoleucine—and, on the average, 20 glycine molecules will have been wasted making a wrong dimer. Before the first few desired peptide bonds are created, the soup will have already become a random mixture of every possible combination of amino acids, with the desired peptide in an ever decreasing proportion. It's not hard to imagine how far down that peptide sequence the reactions would have to progress before the soup is so full of extraneous peptides that the desired sequence would be overwhelmed and impossible to isolate. If we had done the experiment with a presumptive nucleic acid, the result would have been the same.

The simple fact is, you can't expect information polymers to self assemble…ever. If you want information out, you are going to have to put information in. The origin of that information is, of course, the point of contention between those who believe such information exists—and has a supernatural origin—and those who reject any supernatural involvement in the origins of life. This experiment makes it virtually impossible to reject the reality of supernatural origins, but it does not necessarily reject the involvement of evolutionary processes in the origin of life. It simply requires a new model of beginnings, like the one on the web at www.ocomm.net/adam.