This is about Biology, not about the Biology Group itself: What is Life?

There are many books with that title. The question goes back in history even to the ancient Greeks. It is timeless. But the progress in understanding made over the past two centuries and especially the last 50 years has been so great and has so many implications for our lives, that the new biology as taught in every school affects much of social and political progress. Modern science has become entrenched in our thinking so much that we are now sure about what we understand. Biology has a story that seems certain. Yet for all that, 'What is Life?' remains a mystery. Vital questions remain unasked. So I make bold to suggest that actually we can expect another revolution in thinking. Let's trace the recent progress and then follow it up.

In 1943 Schrödinger's book with that title What is Life pondered how the presumed huge amount of information needed to define a living cell could be packed into such a small space and copy itself there. He postulated that it must be in some form of aperiodic crystal, which copies itself by a process analogous to crystallising. At the time the controversy over whether the genetic material was protein or DNA was being gradually resolved. It turned out to be DNA.
The structure of DNA, the famous 'double helix' then showed (1953) how the structure copies itself by the smallest possible 'crystallisation', with the individual nucleosides binding to their opposite numbers. Watson and Crick wrote that the implications of their structure 'do not escape our notice'. The discipline of molecular biology developed as a result, launching ''the Central Dogma', by which the sequence of DNA's letters, the nucleosides, are the code for RNA and then for proteins; that chain of transcription into RNA and translation into protein determines all development all of life. This created the biotech industry, now worth billions. Our lives and all life are now seen as centred around DNA. The Dogma is firm and irresistible.

But all along, the narrative of DNA has come up with continued surprises, even contradictions. An old one is that the amount of DNA in each cell bears no relation to the complexity of the plant or animal. Then that the linear sequences of the letters, the nucleosides, of DNA that code for protein are not continuous, but that there are long gaps which are later cut out in the transcribed RNA. Then that humans, who were thought to have at least 100,000 genes, have in fact only about 20,000, and that these comprise only a very small proportion of the total DNA. The rest of the DNA was thought to not code for anything and was called 'junk DNA'. Then it transpired that the junk DNA is in fact transcribed into RNA (but not further into protein). Some small parts of this 'junk' RNA were shown to control the DNA genes and protein activities, but most remain unknown. This the major part of the DNA of plants and animals codes RNA about which very little is understood.

With all this feverish activity in molecular biology still continuing, some basic biology is being neglected. Already in the 1940's, Waddington showed how fruit fly larvae develop two thoraxes after mild chemical poisoning and that this becomes inherited after a dozen generations. He called that 'genetic assimilation'. Genetics had to expand to epigenetics. The explanation of this, like that of many other recent findings, was then squeezed to fit molecular biology, as the methylation of nucleosides. But that is a simplification; there must be more to it.

There are many more examples where biology cannot be explained in such molecular terms. I take just one here: In our gardening we often use ‘F1 hybrid’ seeds. These are got by crossing two highly selected parents which each have desirable features, but because of the inbreeding they lack vigour. Full vigour is restored by crossing them.The desired hybrid, the F1, can set seeds bu† the F2 generation will display all the variations from the genes of the grandparents, so you cannot usefully keep seeds from your expansive F1 hybrids. But think, in the wild or in normal open pollinated crops, ALL the progeny are F1 hybrids of their two parents. The real feature of commercial F1 hybrids is that the parents were inbred ‘pure lines’. Why then do they lack vigour? No-one understand this. In the inbred plant the two chromosomes of a pair are identical. This means that most of the DNA is the same in the paired chromosome. Since most of the DNA is ‘junk’, which codes RNA but not proteins it follows that RNA transcribed from that junk exists as two identical parts. Evidently the inbred plant lacks vigour when its RNA is all the same and lacks the normal differences. So that untranslated RNA seems to function in an unknown way

All such findings, and there are many more of them, leads me to suggest that the essence of living is the continued synthesis of RNA, much like we have to go on breathing, and that this RNA has functions in cell development beyond coding, or controlling, proteins. It seems to be ‘junk’ RNA. One could postulate this RNA works something like a hologram making an image. The whole of the image is in any small bit of the hologram, but the more the hologram is used, the sharper the image becomes. If half of such an RNA hologram is identical to the other half, it is only in effect half its size, and the ‘image’, plant or animal, then lacks perfection and vigour. Further, a mass of RNA in which all molecules interact would be ‘au-topoietic’ and create it own course of development. It would be a major part of Waddington’s ‘chreod’, the path by which embryos develop into adults and the abnormal double thorax could be inherited through the egg RNA.

This is just an idea I conclude from what little I know of biology, but it seems to hold. It is stimulated by Denis Noble’s book Dance to the Tune of Life; biological relativity” and by Paul Nurse’s “What is Life; Biology in five steps”. The latter is the latest of many books with that title, and gives the established view of how life is made, although chapter 6 with the title of the book, goes further than 5 steps. Denis Noble’s book gives the relativistic view, that there is no reference point from which to describe life just as there is no reference point to measure the speed of fight.

I have used many such examples to open our critical understanding. This wider view of life has immediate consequences for all, such as on the biotech industry and genetic editing. All is open for discussion by the Biology Group.

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