

The Nature of Reality – Paper II

II. *Change.*

So, looking at Change should start us on our way.

Change is all around us. We always ignore it in our everyday dealings. We assume that everything does not change. We can depend on this assumption to merely carry out the tasks of our daily lives, and to use the things that we need to. They are the same. It is a reasonable assumption. We ARE aware that things can stop working, and that we ourselves get older and can no longer do what we used to do, but these gradual changes are generally tidied away, and the trajectory of all our major activities and efforts is concentrated on dealing with the unchanging things about us. And, the further away we are from physical thinking and doing that our lifestyle takes us, the more we deal in only our labelled, unchanging parts.

But, looking at Change on many Levels can give us a more correct and dynamical conception of the world around us. But, this task DOES present us with an enormous range of cases, so I am going to take only ONE rich area, and hopefully generalise from it some more widely applicable principles.

I am going to look at an extremely high level of Change – that of Emergence, and in particular, the Emergence of Life on Earth, as my test case. Now, let us be absolutely clear as to what actually happened in this, the most profound, and unchallengeable of Emergences.

Prior to this Event, matter was inanimate. Its processes were purely physical and chemical. Under the action of environmental factors such as , the heat of the Su, the weather and local vulcanism, and many other contingent effects, inanimate matter was mechanically changed and chemically combined into many different compounds. The famous Miller's Experiment using only the established factors known to be present on the pre-Life Earth, demonstrated that these combinations were not just simple, easily-formed compounds, but could amount to amazingly complex forms such as amino acids, which are important in subsequent Living Things. When we study planets such as Mercury, Venus and Mars, and latterly some of the moons of the Gas Giants, we see Matter as it was before the Emergence of Life, but nonetheless in conducive circumstances amounting to occasional complex, pre-life compounds. Also, even on Earth, today, many processes are still inanimate, and indeed their study has led to the whole of modern industry.

So what were the crucial Changes that precipitated a significant and wholly novel change?

Certain chemical processes began to happen *in concert* – one process fed off another and sequences of processes – taking in products from previous processes, and producing products of their own, began to link together. Initially these were very susceptible to prevailing changes in conditions, and could just as easily be reversed and dissociated to produce, once again, the original inputs. These processes proceeded backwards and forwards as the driving conditions changed to and fro. Naturally this random build and demolish system got nowhere fast. So, something had to happen in these processes which somehow “changed the game” What could these changes be?

Certain sets of processes had to gain a certain resilience; in spite of minor environmental changes, these sets had to form resilient, self-maintaining systems, which meant that they persisted even though conditions varied. This stability meant that the processes could get more complicated than they could ever get with much smaller life spans.

In these new situations, we can imagine local areas, which had a series of inter-related processes, and which both persisted and grew in physical extent. In particular, these systems could dominate these areas and thus exclude any competing variants or alternatives.

Yet, even in these localities, we still only have accidentally cooperating reactions which led nowhere in particular, and these would still be wholly dependant ultimately on physical and chemical environmental conditions for the “materials” required to make up and subsequently supply these self maintaining patches.

A further step must have occurred when loops happened – when sequences became CYCLES, by the output from the last process in the series being the exact required input for the first process. In addition, as these systems survived over longer and longer periods, they were subject to conducive changes – that is changes which did NOT challenge the system as a whole, and these could include lateral links, where products from one constituent process produced outputs which turned out to be helpful to another. These could and did work

like natural catalysts, and strengthened the resilience of these systems. They survived longer and longer and grew considerably in extent. Even though not yet “alive” such systems would grow at the expense of less sophisticated systems and could in the right conditions completely dominate the circulation of compounds and the ultimate production of unused products. For we must be clear that these systems could not be wholly self sufficient. They appeared and persisted because they were surrounded (even immersed) in a medium conducive to their continuance: a medium that could carry and supply essential ingredients, and carry away their products. This medium would have to be the intermediate recipient for all these, AND would in addition have to deliver them to where they were required.

It is most likely that this medium was liquid water, which had all the qualities required to carry out all these supporting functions.

So, what have we got so far?

We have, in a water environment, a whole series of chemical processes that have been selected out by the fact that they complement one another. They form sequences, and then cycles, of processes. The more effective and even powerful, are these processes, the more likely they are to survive, in spite of environmental changes such as weather. As long as sufficient raw materials were available and some dependable source of energy to fuel the reactions were available, such cooperating cycles could survive. We still do not have Life, but we must be getting close. What might have been the significant threshold that kicked such set ups into primitive Living Matter?

To be continued

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