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IDEAS ON THE ORIGIN OF LIFE

CRISES AS CAUSES IN DEVELOPMENT / DRAFT THEORY OF THE ORIGIN OF LIFE /
THE ROLE OF INACTIVE STRUCTURES / A BIOLOGICAL 'MANHATTAN' PROJECT

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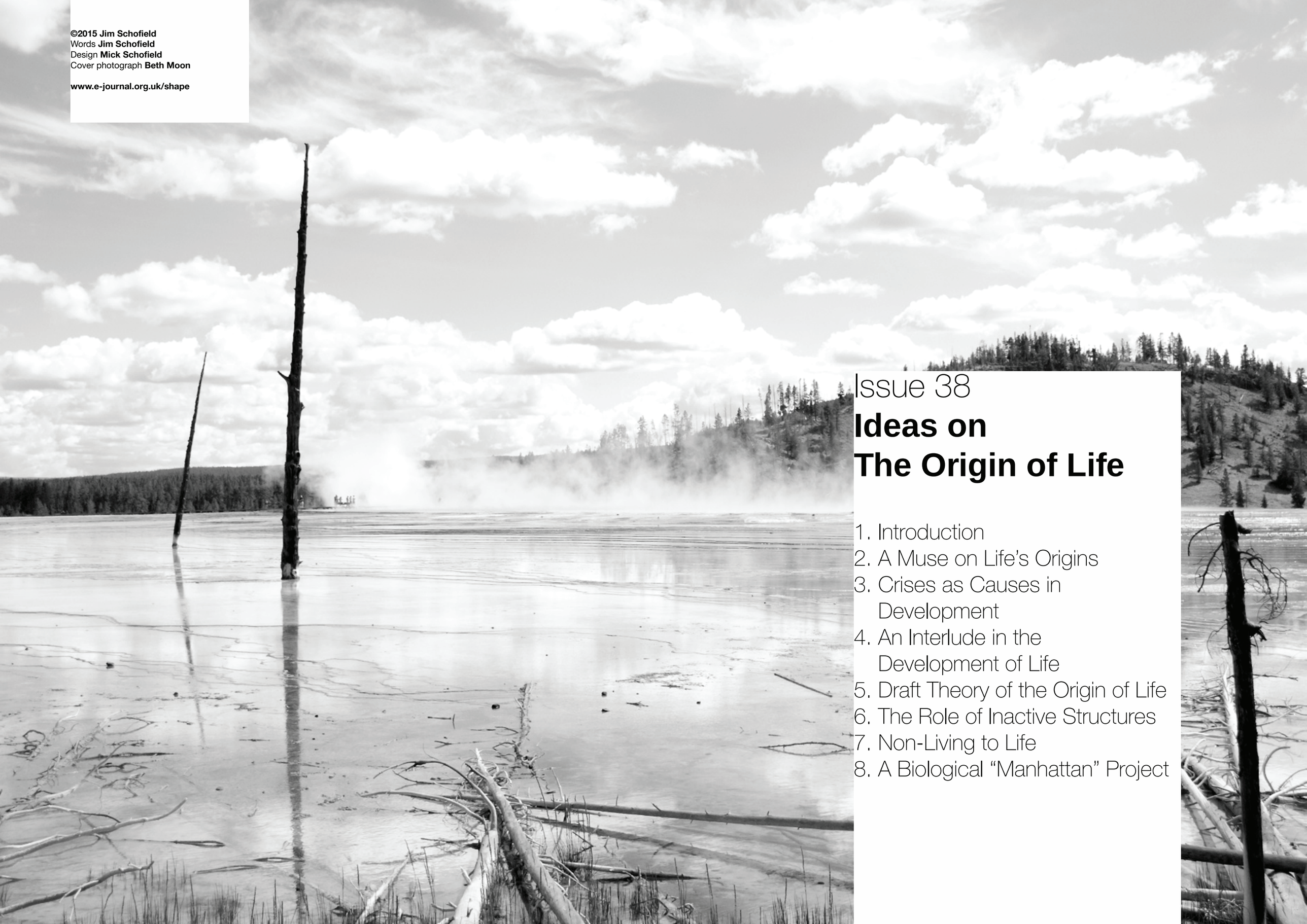


Issue 38

Ideas on The Origin of Life

Introduction:
Ideas on
The Origin of Life

Welcome to the 38th issue of the **SHAPE Journal**.

This latest edition started as a reaction to an article in *New Scientist* (3008) on Eukaryotic and Prokaryotic cells in the development of life, but soon drew in the prior work by this theorist on the Origin of Life itself.

It was worth stressing that either working downwards from living entities, or working upwards from non-living entities, would both fail to explain this crucial event, which rather than being a mere incremental development in the evolution of matter, was certainly a kind of revolution, and must have occurred in what we now term an Emergent Event. Thus this collection of papers became a kind of review of the ideas vital to a solution to the most important problem in Science: why does life exist at all?

"What?" I hear you say, "What could possibly be a Marxist view of the Origin of Life!?"

Well, it is the only approach capable of solving the problem, in my view - Marxism from the outset, was, and still is, a philosophy of change. Not merely a political stance, as some seem to think, but a method of understanding the way things came to be as they are, and where things may go in future.

Jim Schofield April 2015

(a muse upon)
The Origin of Life on Earth

Many different narratives are currently expressed, which seem to indicate that we already have a general idea of how Life on Earth originally occurred. We don't!

We are merely extrapolating backwards from present knowledge, both that which has been known for long periods of time, and from new discoveries, usually made available by developments in technological means of investigating deeper into phenomena. But, all of these suffer the same unavoidably damning fault of being entirely speculative.

For though the supposed necessary conditions for the Origin of Life can be suggested, they cannot be tested by the need for them to "do it again" under our eyes NOW!

The reasons are, of course, obvious; we have no idea of what the processes were, which brought about this amazing event. So, this sleight of hand, in "explaining" the Origin almost confers that merely "appropriate conditions" will always, and even inevitably, produce such a miracle, are clearly just not good enough, and convey the wrong messages to both non-experts and the rich holders of funding essential for many of the way-out means of conforming these speculations.

For example, NASA's tale that Life's Origin may be found by further Space Exploration, is to say the very least, extremely far-fetched indeed. No, that criticism is much too weak! It just isn't true.

The actual Origin of Life would, indeed, require very special conditions. It could never occur, for example, upon a rocky asteroid or waterless planet. For, it is, at base, the most complicated, integrated system of chemical reactions known, requiring an ever-present medium to allow the movement and interactions of its many processes directly. It would therefore require water in a liquid state as a minimum prerequisite. It would also be impossible at tremendously low temperatures, with little available energy.

We currently, and I think correctly, have defined a "Goldilocks Zone" in which a planet would have to exist, nearby to a star, emitting a constant stream of energy, and delivering an ambient temperature in which water was mostly in a liquid state. Such seems to be absolutely vital. Such available energy is necessary to fuel the chemical reactions of the endothermic type, and water provides a medium in which many molecules would be able to float about, and hence come into contact with one another.

Once such ideal features were in place, things could begin to happen, but as to whether Life would then be *inevitable,* I doubt very much.

Of course, the promoters of "inevitable Life" are quick to add that developments would also depend upon the solid substances of the planet benefiting from these ideal circumstances.

NOTE: For example, early forms of stars were based almost exclusively upon Hydrogen, would be surrounded by the same very limited free molecules, so early planets, if they existed then at all, would clearly be too limited to even produce chemical reactions.

It has been shown to take a series of cataclysmic collapses and regenerations of stars to produce elements like Carbon and Oxygen, and indeed a gigantic Supernova explosion to make the other elements and to distribute them over an area of the Cosmos to seed new stars and the necessary complex planets for Life to have any chance at all!

Now, some substances could indeed dissolve into available liquid water, which would then allow various different kinds of dissolved substances to come into contact in a very special way.

Only then would we have a new stage for interactions. As long as the molecules are close to the surface of the water, they could absorb radiant energy from the local star, to enable certain reactions to occur.

Of course, absolutely NO purposes would be involved in such processes, only as yet non-existent propensities. Various reactions would occur, producing yet more (and different) molecules of multi-element substances. With the energy of the star, the optimum condition for liquid water, and the consequent continuing influx of radiant energy, they would begin to populate that with more and more available chemical substances as dissolved and moving molecules.

And, we know that a substance like Common Salt – NaCl (Sodium Chloride) will, very easily, in water splits into mobile Na+ and Cl- charged ions, and such charged fragments will form compounds with other different ions, due to the attractions of opposite charges.

So, the water not only allows both movement and mixing, but also ionisation and a much more active fusing into new substances. The water, in such circumstances, becomes a rich population of different molecules, which can move about freely within such a medium. And, of course, other reactions will occur, in which the products cannot dissolve into the water, and they would be precipitated to coat the solid ground beneath the water covering.

With vast amounts of time such deposits will become particular layers of rock, and, via tectonic processes of the planet (as on Earth) will end up above water as solid ground.

We must not simply curtail a vast trajectory in such a sea over vast amounts of time, for all sorts of seemingly irrelevant side processes can later become significant in new ways as conditions change.

For example, our "Goldilocks" planet would also have an atmosphere, and possible gasses involved could be Hydrogen,

Oxygen and Nitrogen, and even compounds like Carbon Dioxide. And, the last of these, if it is available in relative abundance, could dissolve into the open stretches of water, and make it somewhat acidic. And clearly, such a development would also enable a whole range of new compounds as results of different chemical processes, which were much less likely in a neutral body of liquid water.

The main conception in this muse is to address the fact that results become causes in a rolling on-going development.

As soon as any chemical processes are driven by external energy, the very context is changed, enabling other new things to happen too. And also, we must avoid our usual trick of simplifying and idealising such processes, for, in so doing; we will be making it impossible to address the ever changing context and its constantly changing potentialities.

Miller's heroic experiment was very important in initiating thinking about the very early beginnings of processes that could, ultimately lead to Life, but he couldn't deliver the trajectory that I am trying to establish in this narrative.

His necessarily isolated apparatus (so that no-one could say that what occurred there came in from the outside), also limited what could happen within it. Indeed, this researcher has suggested a major re-design of Miller's Experiment, involving internal, inactive channelling; to allow various environments to occur in sequences of both water and air flows through differing conditions. And modern developments would now allow multiple internal sensors to give a regular supply of information throughout Miller's sequences, which ended up producing amino acids.

In this initial short muse, the details of a developing set of methods with this new set up cannot be described in detail here. But, it is evident that the channelling delivering different conditions on the various routes for both gas and liquid flows would allow for the first time, a time-based narrative of changes, and the sequences in one place providing possibilities in another.

Now, even with such a sophisticated set up, the results would only provide the first in a million steps of development, resulting in Life. No matter how good such a set up was, it would never actually produce Life! So, even with such valuable evidence, we should never gloss over the miracle that the emergence of Life actually was. It certainly wasn't a merely, long-winded, incremental and inevitable continuous process without catastrophe and calamity.

Indeed the *Theory of Emergences* as a suggested explanation of significant qualitative changes in all developments, indicates that it would be precisely such seemingly, terminating setbacks that could re-start developments upon new, previously impossible paths, as older dominating ones met their demise.

We will never create Life from scratch in an experiment. But, with the correct approach we will be able to get closer to understanding something of how it originally occurred.

Illustration (right): ***The Grand Prismatic Spring*** *in Yellowstone. It is the largest hot spring in the US. The vivid colors in the spring are the result of pigmented bacteria in the microbial mats that grow around the edges of the mineral-rich water.*

Crises as Causes in Development
The Nature of True Emergence

When thinking about the ideas suggested by David and Buzz Baum in their article in *New Scientist* (3008) entitled *The World in a Cell*, I was puzzled at the lack of causes given for the suggested new turns in this remarkable development being addressed.

What was actually undertaken was only a description of possible changes to get from a certain "known then" to a certain "known now", but without any reasons. Random Chance wont do, I'm afraid!

Now, of course, finding out what the actual changes were (some 3 billion years ago?) is obviously impossible by any of the usual means. So, it occurred to me that a fruitful strategy would be to assume that the significant changes all took place within Emergences – those periods of crisis, turbulence and qualitative change that happened rarely, but crucially, in nearly all studied developments. For, if this were the case, then all the ideas so far gleaned from the detailed studies into these Events, occurring at literally all-possible Levels, could indeed be helpful, and also considerably different to what would be considered if all such changes were slow and incremental, or alternatively very quick and accidental.

Now, as the reader may be aware, this researcher (Jim Schofield) after many years of study had in 2010, produced his *Theory of Emergences*, which concerned itself with the trajectory of crucial changes displayed within natural Emergent Episodes. This work had delivered a general set of circumstances preceding every such Event, as well as the inevitable consequent processes that would replace a prior Stability with an entirely new, and qualitatively different one. What had already been extracted from prior experienced Emergences (like Social Revolutions) allowed a common, overall trajectory to be suggested.

The ultimate demise of an old, long-established stability, which had previously seemed able to effectively resist the appearance, establishment and growth of all possible competing rival systems, and to therefore persist for truly vast periods of time, MUST have managed this by also having imperative effects beyond its own systems onto the general, background context - around and below. It must have restricted, or even totally prohibited all new possible rivals from that background.

Now, for such systems to ultimately appear and persist, they must come to dominate, create long-lasting stabilities, and for new systems to emerge, those stabilities must eventually become significantly compromised.

Evidence from all sorts of cases at various Levels of Reality show that such crises were often overcome by possible internal changes within the main stability, but such recoveries were invariably only temporary, and new related crises would re-occur, increasingly often, until the structure itself began an unstoppable collapse.

From one view, this would most certainly seem like a terrible calamity – a retrograde step even, which might well mean, if continued, that all would descend into total Chaos. [Indeed, in any Social Revolution, that would be the opinion of those atop the now challenged stability].

But, a study of such stabilities revealed that they actually consisted of a system of relationships, over-and-above the primary processes taking place. And the crucial active elements which inflicted the necessary control of the system as a whole, and its continuing persistence, was down to a set of processes concerned with system-defence. I call these "policemen-processes" and they both acted internally to keep things as they were, and even externally to prevent the development and success of alternative proto systems, which could challenge the dominance of the current stability – the current system.

Now, when this was further considered, it became clear that the Stability was a system of controls keeping the system as it was. It was over and above the primary processes occurring productively (or not) within it. So, any collapse of the system, would be of the system of controls, without any destruction of the many natural, primary processes. They would become FREE from those prohibitions and allowed to establish new relations with other processes. They could, when the last vestiges of the prior system's control had finally gone, begin to form entirely new ones without restrictions.

So, out of the "ruins" of prior system dissociation – like The Phoenix arising from the Flames, wholly new proto systems could appear and develop, and even compete with one another for the same resources.

Clearly, if these ideas were sound, we would have to earnestly seek crises in prior situations, to allow new ones to finally emerge. The necessary causes, for changes in the evolution of both living and non-living systems, would always be *crises*!

Now, we are definitely used to thinking about crises in a very narrow, and directed, set of ways.

First, we always consider them as a threat, which could develop further into a dangerous instability, and hence are clearly seen as a backwards step.

And second, we consider them frequently only in connection with *living* things.

Both of these approaches are too restricted, for crises are crucially the precursors, and indeed the causes of all Emergent Episodes, which can, and often do, lead to significant developments. And also these can occur just as well in non-living systems as well as they do in living systems. We can, and this researcher elsewhere has (in the papers on *Truly Natural Selection*), addressed crises in straightforward chemical reactions, due to due to context, and lack of the required resources.

So, Emergent Episodes precipitated by such crises can, and do, lead to true Emergences, which result in the transcending of such difficulties, via wholly new sets of mutually conducive processes at a new level.

Indeed, it is possible to conceive of a trajectory of development involving entirely non-living processes and sets of related processes including quite significant Emergences.

I always remember, many years ago, reading a book by Oparin (the Russian scientist) which took a very wide brief for his Origin of Life on Earth, and carried his researches into areas long before life appeared, in order to be fully informed as to developments then, so that when the crucial Event occurred, what was essential from the prior non living context was able to play a role then, though it had not been in that preceding period. So, he included many sections, which were NOT about living things, but only about non-living developments. The area I remember, though much of the work was done later too, was about “Sols and Gels”. Going forward to single celled animals like the amoeba, - that single cell had a substance, which was a gel when in contact with the external environment, but was a liquid inside the cell. Flows within the cell of the sol, caused bulges in the enclosing gel (pseudopodia), by which the organism could “walk”. So, quite outside any living situation it was possible to create a non-living “blob”, with precisely the same features as described for the locomotion of the Amoeba.

Such a substance had no purpose, of course, but it could move about entirely undirected but with the same sort of functionality. And it gave the *illusion* of Life!

Clearly, though not positioned in a valid developmental context, this sort of “sol-and-gel” animal-like-entity could exist, though no natural trace was ever found in Nature, it proved that it could in appropriate conditions actually exist. The control of a dominant Stability may prohibit what was clearly possible, but it could be where developments could occur when the Stability’s controls were completely dissociated.

So, within an Emergence, and nowhere else, such things could occur and be linked with other processes to the benefit of both in the creative phase of such an Event.

Once such scenarios are considered, it seems eminently feasible that even before any true Life had appeared, we should be able to conceive of developments, which could greatly facilitate nascent Life when it finally occurred (from a whole series of sequential crises and Emergences.)

Indeed, one area seems to be particularly important, both in these early pre-Life developments, and also in the first stages of the development of Life itself. It concerns crucial-context as distinct from actual causes. In other words we must have appropriate conditions in which the actual causative process would have to occur to be successful. Reactions could take place there, which would, in the end, result in Life, but the appropriate conditions alone would NEVER be sufficient.

The conditions have been defined many times and include such things as the presence of water, as an ideal medium to allow molecules to “find” one another and react. So, if some conducive physical feature (like a protected niche, or even an aggregation of the same molecules in a sort of gel) it might be a refuge in which the resources for a particular process could survive the non-conducive conditions outside, and proceed with the usual reactions.

First, localities and maybe later substances could become involved with processes, because they were conducive to their taking place as external conditions declined.

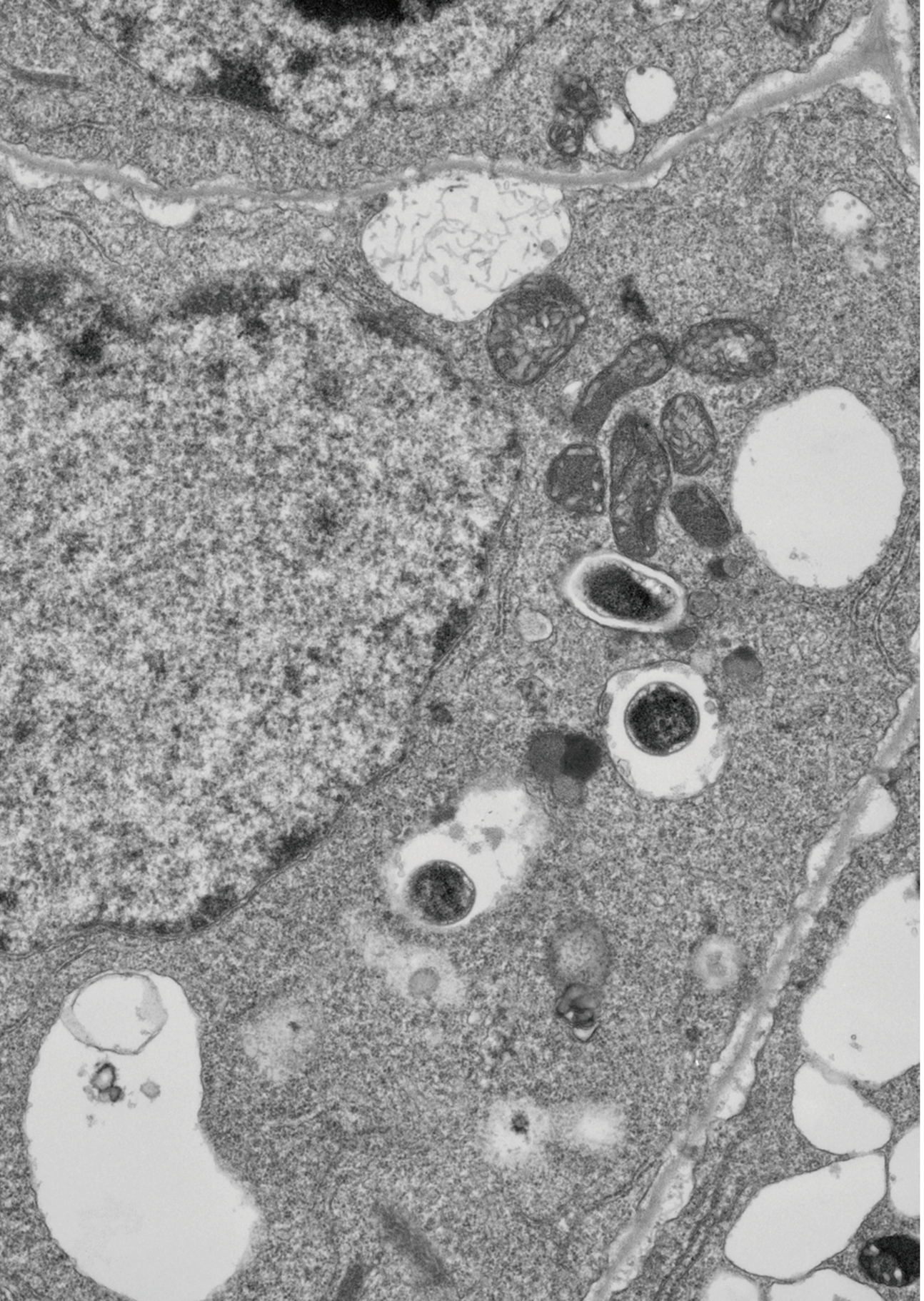
We must clearly consider the Emergence of Life as the result of a whole series of Emergences, the last of which totally changed the game, forever!

Illustration (right): ***Stromatolites*** *in Bolivia. These date from the Proterozoic era (2.3 bilion years ago). Stromatolites are the oldest known lifeform on Earth which has left a record of its existence (up to 3.45 billion years old). Life is estimated to have emerged up to 1 billion years before these single-celled creatures, however there is no geological record of this process.*

Siccar Point in Scotland. A very important site for geologists and the history of the Earth and how we see time in general.

It is the location of Hutton's Unconformity found in 1788, which James Hutton regarded as conclusive proof of his uniformitarian theory of geological development. This lead to the idea that the Earth gradually changed over vast quatities of time.

While these ideas were vital steps in our understanding, the concept of gradualism was certainly flawed, as evidenced by the work of Stephen Jay Gould.



An Interlude in
The Development of Life

From its outset the article entitled *The World in a Cell* by David and Buzz Baum, in *New Scientist* (3008), positions its avowed investigation into the Origin of Life on Earth much later in time than that truly auspicious Event. It considers instead the emergence of the Eukaryotic cell - that which we have discovered is common to all advanced life, evolving presumably from something like a still-existing Prokaryotic cell of present day bacteria. But, that is actually a part of the subsequent Evolution of Life, and certainly nothing to do with its origin.

And, not only that, but the assumed precursor – taken as something very like the present Prokaryotic cell, is also a major error – for that cannot possibly be the case, no matter how a comparison of presently existing versions seem to infer it.

Indeed, general studies, into creative "emergent" developments of all kinds in Reality, have revealed that crucial Emergent Interludes such as this, not only produce something entirely new and unpredictable, but also omits the fact that such new levels, once established, also significantly transform their producing-ground too. The lower form, that produced the new cell, will no longer be allowed to continue to exist as it was, following such a revolutionary Emergence. It will, thereafter, exist, surrounded on all sides by a new and higher form, which will rapidly dominate, not only in numbers, but also in determining its own (and the older forms) new context. Features of that change will not only prohibit the same emergence happing again, but also any other development that may compete with the new system.

It isn't a one-way development, supposedly only "bottom-up". To actually succeed, the new level would also have to constrain its environment in some way – "top-down". Otherwise, it wouldn't reign for very long, and we know that the opposite is actually the case: once established these Emergent Levels can be extremely resilient and long-lasting. They are, after all, the establishment of a new stability. Life has been on Earth in one form or another for some 4 billion years!

The cell that was the basis for the Eukaryotic cell would, in order to continue to exist, be in a transformed context, and no threat to the newly dominant form. To look at the presently existing Prokaryotic cell to devise how "it" became a Eukaryotic cell will certainly lead us astray.

Now, these principles come from the general study of Emergences, which, in its early stages, revealed the oscillation in development between long periods of stability and very short interludes of creative Emergence. And indeed, subsequent discoveries make crystal clear that NO single thread of causality will be traceable through such tumults of change, being the result of a dissociation right down to basics, and a rebuilding on new lines from that chaotic base. Such ideas are NOT evident within the processes and productions within Stability: they are only evident as determining forces during the Qualitative transformations of the Emergence Event.

And, subsequent to each and every Emergence, the lower level is policed by its own creation, and constraints are always present, limiting what can come from below to challenge the new level – that integrated and self-regulated System.

Clearly, without some understanding of the real trajectories of transforming developments in Emergences, researchers will never understand the creative arising of the wholly NEW. They will merely follow the allowed causalities, studied within stabilities, which can never lead to an emergence-as-a-productive-consequence of a prior stable state. The causalities will simply lead them around in circles – always contained within that Stability.

The lost path is clear! They will see the two present levels, and easily infer that the later came from the earlier and simpler. But, a simple search, in one current stability, to explain the supposed next stability will obviously never succeed. Evident required precursors could, and indeed will, be revealed, but that will never deliver the process of Emergences, for the only laws available to the researchers will be those found within a given, still-existing stability, and they will not alone be sufficient.

NOTE: There is only a very dubious backwards extrapolation of increasing functionality or success, which endows Reality with a kind of "look-ahead" an intentional push, which is, of course, ridiculous.

Clearly, if such Events are really to be tackled seriously, they will require a thorough study of Emergences in general.

Now, of course, the vast majority of these formative Events happened long before Man himself had emerged, and hence are not directly, or even sufficiently indirectly available for us to study.

Indeed, the initial clues as to what can happen in such interludes were found in a surprising place: it was in the History of Mankind itself, in what are known as Social Revolutions, on the one hand, and in Hegel's thorough researches into the developments in Human Thinking, on the other, that the first inklings of a very different set of Events actually not only occurred, but were the transforming interludes in the whole of all Developments.

Slowly, it began to dawn upon a few thinkers that absolutely ALL developments involved very similar trajectories, and it was always the unavoidable crisis triggered oscillations between long periods of self-maintaining Stability, and very short interludes of dramatic and transforming changes that turned out to be true of all such significant qualitative change.

Perhaps surprisingly, this new standpoint did not become the universal consensus. The obvious place for Man to begin a serious study of Reality could only be within the seemingly eternal states we call stability.

Indeed, when such couldn't be found like that, in a particular area of Reality, it was then carefully imposed and maintained, in order to facilitate a "deep study". Man began to learn how to constrain and control what became known as appropriate experimental Domains. For, such controlled situations greatly facilitated the extraction of what appeared to be eternal Natural Laws. And, underpinning this endeavour, which later became known as Science, were certain assumptions and even generalised principles, which had been established in many similar prior investigations. The most crucial one of these was Plurality.

Now, this was very close to being true in Man's carefully constructed and maintained Domains, and also in many naturally occurring stabilities. For, within such states, most qualitative transformations are prohibited, and it looks as though the relations extracted from these carefully arranged experiments are, indeed, fixed Natural Laws.

NOTE: there is a creditable standpoint that removes these laws from being the physical imperatives of Reality into being merely Laws of Form, applicable ONLY when Stability reigns and is then reducible into Pure Forms instead of causes.

And, this had significant philosophical consequences.

The scientists came to believe that all such "Laws of Nature" were indeed unchanging, so that all complex consequences would be mere summations of unchanging laws. That became the Principle of Plurality, though it was universally assumed, it was never shouted from the hilltops: it was considered an obvious state of Nature.

Now, some 2,500 years ago, when Mankind's control of Nature was much less, another opposing principle was equally common: it was the Principle of Holism, which on considering the very same Reality as the pluralists, decided that this seemed to infer NOT eternal laws, but ever-changing laws, as a result of individual relations actually mutually affecting one another, and being changed by context!

The thinker of this standpoint was, of course, The Buddha, but it was believed extensively throughout the Orient and for millennia.

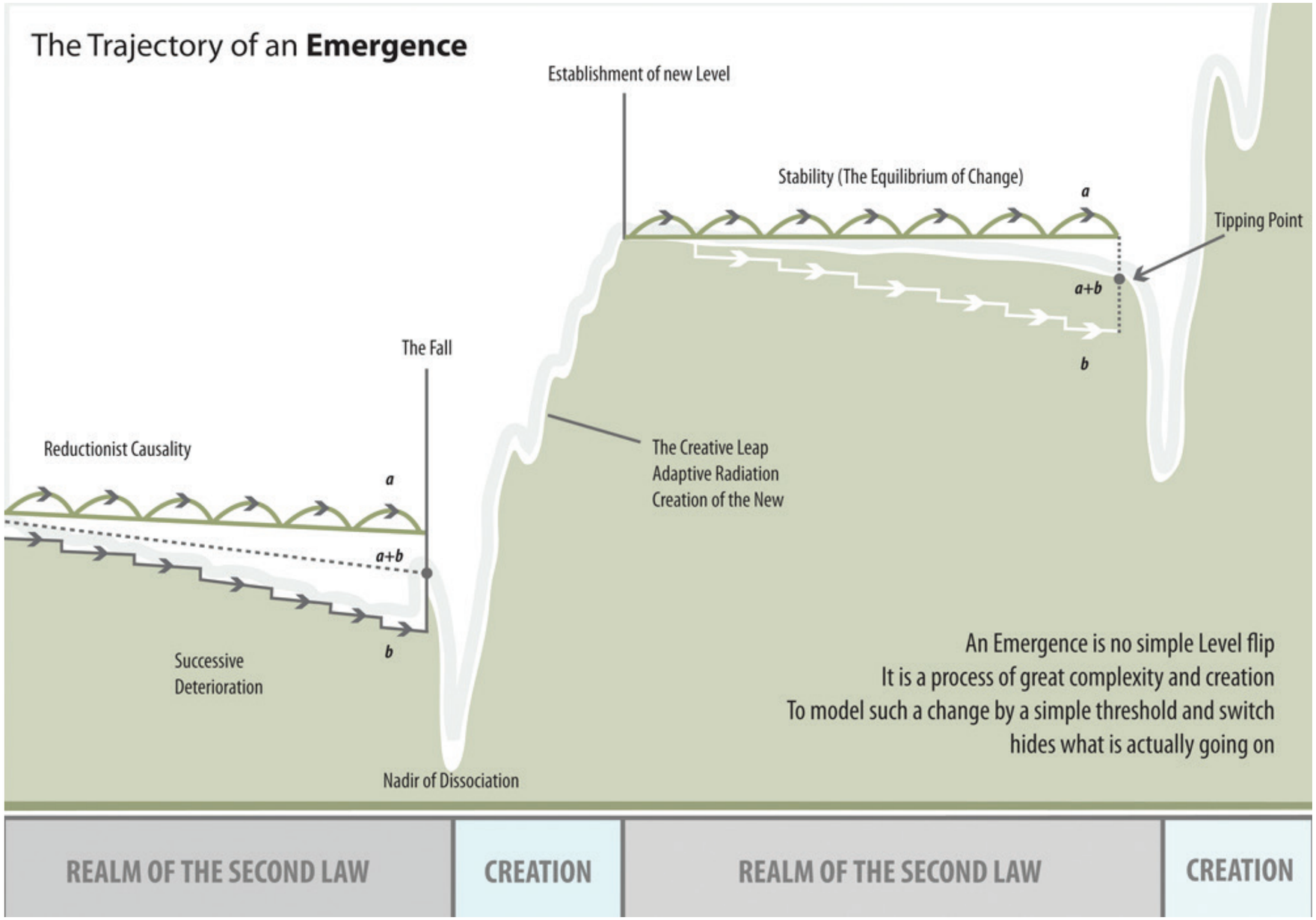
At about the same time the Greeks were making diverse developments and philosophically oscillating between Idealism and Materialism, but significantly gravitating towards Plurality as a crucial basic Principle.

Also Zeno of Elea was about to show that the assumptions and principles taken for granted by his contemporaries were NOT as invincible as they believed, and produced his famous Paradoxes to show that totally contradictory conclusions and even concepts could be generated by the very same bases!

In Europe the Mainstream Greek tradition won out, Holism was forgotten, as was Zeno's valid criticisms, and even today Science is essentially pluralist.

Almost nowhere is there a detailed study of the opposite standpoint in Science, and hence though delivering "tools for Stability" the key transforming interludes in the Development of Reality, and in that of the ideas of Mankind are just not understood.

This (below right) is the author's diagram of the Trajectory of an Emergence, showing not only what happens within a Stability, but also the crisis, collapse and rejuvenation of the intervening Emergent Interludes.



A Draft Theory of
The Origin of Life on Earth

Exactly in what conditions Life first occurred on Earth, is still a contentious issue. But, many of the proposed alternatives seem to be promoted by those with vested interests, rather than being established by consistent reasoning based upon what evidence there is.

For example, the idea of Life first coming to Earth from elsewhere in the universe (Panspermia), as pushed by NASA, and its vast flock of employees and supporters, is clearly a ploy to get the truly vast resources required for further Space Exploration. While the alternative suggestion of that miracle happening, instead, at the Black Smokers at the bottom of the oceans, are pushed by those who explore those regions – again at considerable expense, and hence also requiring substantial funding too.

But, clearly, much more conducive situations are, and have surely in the past, been available here on Earth, and quite easily involving access to literally constant sunlight, as well as an ideal medium, water, for movement and coming together of the necessary chemicals required, and also, all this happening at the surface of such water, with access to the gases of the atmosphere, in order to both access resources and dispose of wastes. It seems reasonable that Darwin's idea of some shallow, warm pools, with maximum access to land, sea and air, would provide the best possible conditions.

But, having said that, such a remarkable event could not merely be a case of the most appropriate conditions, for if that were true it would have happened many times, and in many separate places. And, there is absolutely no evidence for that at all.

So, it wasn't merely the case of the right conditions, where some spot was ready-made for Life. Neither would the provision of such a place automatically guarantee the consequently certain Emergence of Life merely by different Time and Random Chance. No, indeed, you also need a truly major event!

Indeed, the *Theory of Emergences* makes it clear that you also need a total calamity to change the game, and set things upon a wholly new trajectory.

For the normal state of any persisting situation has to be one which we term Stability – a self-maintaining system, which, once established, tends to persist for extremely extended periods of time – a system of processes that support one another, and even actively prevent the emergence of any other processes that do not conform. Indeed, some of these conditions appear to be permanent arrangements (that will never change), and hence lead to Mankind conceiving of a World determined entirely by eternal Natural Laws. Yet, absolutely nothing has that assumed nature!

All systems will at some point, finally crumble and fall, but, when they do, it appears like "the End of the World". All such Stabilities will in time dissociate, and in a short tumultuous episode, be removed and replaced by an entirely different system.

We term such episodes, Emergent Events, and the Emergence of Life is certainly one of those.

The pattern seems to be that from a seemingly permanent Stability, a deepening crisis appears, which though it may be opposed for a while, increases in depth and power to lead to a total dissociation of the prior stable situation, and ultimately to the construction and establishment of a wholly new Stability.

Now, this is a general description of what occurs: it was originally revealed in the processes of Human Thinking (Hegel), and then applied to the History of Human Societies (Marx), but only recently (2010) was it generalised to absolutely ALL Development in my work on the *Theory of Emergences*.

Now, this approach is NOT the usual one by Mankind. It has had individuals glimpsing it in various areas of study, but even these brilliant contributions have not changed our usual stance and approaches.

The perfect example of "where we are", upon such questions, is typified by the work of Stanley Miller. He constructed a sealed apparatus containing what he thought would be the available chemicals on Earth prior to Life, It only allowed the constant input of heat and lightning (electricity), which drove various cycles of processes, ending up, after one week, with a red-brown liquid containing amino acids.

It was somewhat different from the usual experiments, because he "let nature take its own course", within his apparatus, but, crucially, he had no conception of Emergence as such. He merely expected a continuous series of changes that would, in the end arrive at Life. But, what happened is that, after a short time, the system settled into a stability – and stayed there! It was, of course, the exact opposite of our normal experimental method, which drastically simplifies conditions and keeps them that way, in order to reveal "underlying" relationships, that we suppose are happening along with many others simultaneously in Reality-as-is.

Now, without some idea of Stability and Emergence, the complex trajectory of real Development cannot be fully understood, and what we get from out experiments are the "Truths of Domains", and not the Truths of Reality-as-is. So, though our methods do deliver aspects or parts of the Truth, they are never Truth itself, but only models that contains a measure of Objective Content.

So, starting with Miller's Experiment, we have to radically alter our stance and approach to gradually reveal the real trajectory involved in this – the most important question in the whole of Science.

Starting with Miller's apparatus, it seemed necessary, not only to deliver the necessary resources to be involved in a developing trajectory of reactions and productions, but also to provide inactive physical structures that would facilitate certain steps to occur and continue to occur in protected situations.

This researcher took on the task of designing an update to Stanley Miller's Experiment, but one which was physically structured to encourage particular cyclic flows around differing conditions to enable the very special steps to continue to survive as such, at least for a time.

Also, in other researches into development in general, and at diverse levels, it became clear that such processes took place in particular circumstances, and were never constantly happening. The idea of oscillating situations, of long periods of Stability - interspersed with short periods of significant and transforming change, was the rule throughout.

These crucial emergent interludes became known as Emergences, or even Revolutions, and to ever be able to address questions such as the Origin of Life on Earth, it was crystal clear that a serious study of Emergences was absolutely vital!

For, if the usual, long-lasting form was indeed Stability, then such a thing as the Origin of Life could never occur within a stable state. The interludes of transforming changes were clearly where such an amazingly revolutionary event would have to happen in ideal circumstances.

But, what actually causes an Emergent Interlude?

It would have initially to be incipient processes within Stability. But, they could NEVER be towards revolutionary developments, but on the contrary, only dissociative contributions towards a major crisis and even a total collapse of that system.

NOTE: Science has long established such dissociative processes, encapsulated under the overall Second Law of Thermodynamics, but as to the actual natures of the specific processes involved, we know literally nothing.

To exit from a long-lasting Stability, required the emergence and growth of dissociative processes, which began to overwhelm the hidden forces maintaining that stability.

Now, of course, this posed a series of important questions. First, what was it that made Stability so long-lasting? Why could there never be any, new, transforming processes occurring within a Stability?

It had to be that Stability was no mere sum of naturally occurring processes, but instead a cooperating System of processes that also prohibited the continuance and growth of any possible competition to its aegis. What had to be involved was a two-stage development of processes of systemic organisation.

The first stage would be constructive, with all sorts of conducive processes proliferating, at the expense of non-conducive alternative processes, and this would develop into a competition between alternative processes (or even proto-systems) for the same resources, until a single system would finally dominate.

But, why, on achieving this Stability, would this state last so long before any sort of changes could occur again? The only way that this could occur would be by the presence of coercive processes also being present.

The dominant stability, as well as its integrated and mutually conducive constructive processes, would also have to include destructive/dissociative processes aimed at any non-present-system competition. The continuing Stability was due to constraints and inhibitions, built into the overall system, which maintained its continuing dominance by dissociating any competing systems. But, all we see is the dominant Stability – neither as it came to be, NOR how it would meet its demise. And, of course both of these could only happen in an Emergent Interlude.

Towards the end of a Stability, things must have arisen to undermine it. Indeed, they would, in time, be inevitable, but normally defeated by the in-built "policeman processes" of the Stability.

But, eventually, a crisis could occur (still within the Stability), which seemed unstoppable and the first phase of an Emergence would thereafter be one of total dissociation. The overall Stability would begin to collapse, and in spite of various rebuilding resurgences, these would ultimately fail and the situation would decline seemingly to total chaos.

Remarkably, the success of this dissociation, also removed the constraining policeman processes, and produced a free-association phase of all the primary processes (unchanged by the collapse, which was a system phenomenon) and these conditions began to construct new proto-systems and expand.

Phase Two was a kind of mirror image of the oscillations of dissociation, nut now as an oscillating sequence of associating proto-systems.

New dominances came and went as others took over until finally a particular new and persisting system had sufficient policeman processes included to effectively inhibit or even stop ALL the competitor systems, and a NEW Stability would have been established.

NOTE: But it is vital that even in an environment of pure chemistry, the establishment and continuing maintenance of a particular system of processes over a long period (even occasionally overcoming temporary crises via an adjustment to the balance of forces within it) would, when finally "out of the resources" to recover, finally and permanently collapse. But, it would NOT leave the situation exactly as it was before that Stability was established. For, during its long period of dominance, it would most definitely have transformed large amounts of resources into consequent products at a greater rate than any still surviving alternatives, so the final content of the situation, after its demise, and, hence that immediately following situation would differ in two major ways. First, the policemen processes tailored to the now dead Stability, would have perished with it, and second, the contents left behind for the surviving primary processes to act upon would be very different, and would lead to new constructive alliances and competing sub systems.

Now, the above ideas were the work of the writer of this paper, when in 2010 he produced *The Theory of Emergences*. It was unusual because it was a Meta Theory, for it was applicable across a vast range of developments in a multitude of different Levels. It was a conception of overall systems, and it applied at every possible level from chemical processes all the way to Life, Societies and even Human Thinking.

Sianley Miller

It was not established by measurement. How could it be?

It was a generalist, holistic conclusion from studying the actual processes of Development at many different levels.

But, once in our hands, it transformed all areas of study that included qualitative Change and Development. Now as they say- “the proof of the pudding is in the eating of it!”, and it was necessary to apply this principle to real developing situations in Reality, to confirm its validity or not!

And, long before it was formulated in that general form in *The Theory of Emergence*, it was recognised from History by Karl Marx, and then applied in actual Social Revolutions as they occurred most dramatically in Russia in the first two decades of the 20th century.

The crucial phase was achieved by Marx from his training as a philosopher by the great German philosopher Frederick Hegel, and thereafter by the brilliant historical analyses of the French Revolution by Michelet, who had literally spent his life on the happenings in France between 1789 and 1815.

And Marx was able to extend what Michelet had revealed to the whole range of Revolutions throughout Mankind’s History. Indeed, Marx himself was never in such a Revolution, but the best of his followers in Russia actually were, and via the revolutions of 1905 and two more in 1917, were able to use the tools that Marx had provided to intervene successfully and establish the first ever Socialist State.

But, of course this was all in areas where Man could, indeed, intervene, for such events happened within the lifetimes of human beings. They could be tried and tested! And this meant that real verified gains in understanding were possible.

And the *Theory of Emergences* suggested that such things happened, not only in Social Development – Revolutions occurred in ALL developments of whatever kind!

And clearly, the most profound Revolution of all would be in the Origin of Life on Earth.

The Role of Inactive Structures in the Origin of Life

Some years ago I redesigned the famous Miller’s Experiment to attempt to solve its “black box” nature, and reveal what was actually going on in there over time.

It was clear from the outset of this exercise that the initial design would involve a whole series of assumptions, which would certainly have many misconceptions. But, with many non-affecting sensors, and some directing of flows of both gases and water, enough resulting information would be made available to make a whole series of redesigns, to deliver the crucial mixtures of processes and contexts that would be essential in beginning to piece together some sort of trajectory of at least a few of the phases in the transition from chemistry to Life!

So, apart from those multiple, non-intrusive and non-affecting sensors, the main changes had to be in the provision of internal, inactive “farms” to route flows via given physical pathways.

It was already clear to this scientist that totally random happenings in an uninterrupted single space could never take the required chemical processes in this trajectory very far: indeed, it would tend to inevitably settle into the classical stability of total randomness, rather than produce a driving development.

You would have to have at least two things there, in addition to the necessary resources. You would need protected environments, and flows though differing and productive contexts too. Finally, it was clear that with gasses and water involved, and unavoidable cycles of evaporation, atmospheric flows, precipitation and water flows, repeating Cycles would certainly occur, and if these could be wedded to conducive, yet inactive, routes, then things would have a much better chance of a whole sequence of developments, as the processes involved would use up resources, and produce products and hence change the actual contexts produced. The structures built into the experiment would therefore ideally allow such things to be established in one place, yet deliver to another, appropriately positioned place, in the sequence of structures provided.

Clearly, such a possible processing engine would need a driving force, and this was provided by allowing heat in from outside, and the occasional stroke of lightning via an electrical spark.

Now, this would only get anywhere, if the barriers conducted flows in such a way that carried them through circumstances, in which the right sequences of processes were encouraged. It would be impossible to get that right first time. But, as investigators like Oparin have, in the past spent a great deal of time on possible pre-life processes and effects, a start could be made, and the time-based results from the array of sensors in particular pathways would absolutely certainly suggest many re-structurings of the barriers and pathways through the apparatus, in subsequent versions of the experiment.

Please note that this new version is a holistic experiment, just as Miller’s original was. It was the direct opposite of our usual methodology, termed pluralistic, which isolates particular phenomena from all others in order to analyse them in total isolation. There is NO isolation here. Everything required is either there from the start or is produced within the apparatus.

It is related to Yves Couder’s methods, which produced his “Walkers”. The crucial thing in both these examples, which are totally absent in pluralist Science, is the occurrence of mutual effects across multiple simultaneously occurring processes.

Note that in the new version repeated circumstances will be encountered many times allowing minor processes to have a better chance of becoming established processes, and then playing a further role in the system. We also HAVE to consider everything happening at once and affecting one another in various ways.

Remember, in a completely unstructured environment with equal effects from all directions, the results would inevitably settle into a classical totally random situation with opposing processes merely cancelling out, and literally no development occurring.

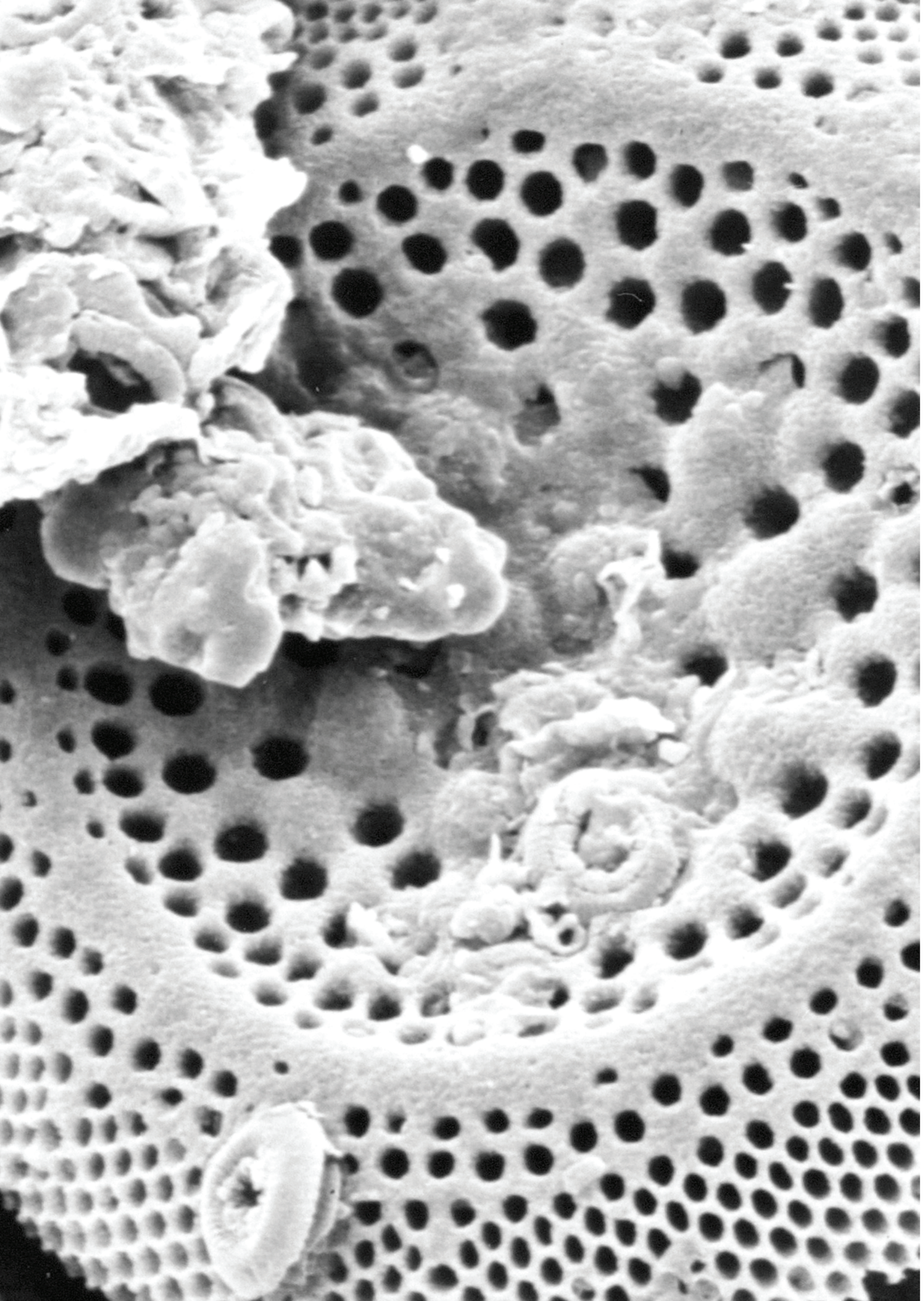
Indeed, this concept of ideal randomness has become a staple of many attempts at explaining all sorts of phenomena. BUT, while such is valid for certain kinds of sub processes, it would not stop others from continuing and producing differing situations. We normally, in such experiments, treat those as mere unimportant noise. But, what is to stop them proliferating over time, and in the long run compromising the cancelling processes, and taking the situation into a new phase?

Of course, such is never allowed to happen, in well-organised pluralist experiments, because they are carefully constructed to omit literally everything but the main targets. But, in holistic experiments such a selection does not take place, and to some extent at least, such experiments will actually *evolve*!

It is therefore clear why the pathways through, with their time-based sensor readings, allow changing pictures of actual developments – indeed, another kind of analysis, somewhat different to the “nailing to the floor” of pluralist methods.

Now, in a recent piece of work by the Baums – *The World in a Cell* in New Scientist (3008), the Endoplasmic Reticulum within all Eukaryotic cells in living things, has been seen, in the same way, as providing inactive niches for selected processes to be protected, as well as inactive routes for substances to follow, while being modified as they went.

Now, this has pointed to something similar being necessary in the actual trajectory of development that actually preceded the Origin of the very first Life. In other words, there was a development prior to Life, without which it could never have happened, and this process would also need some system of inactive, but directing, barriers, allowing routes to develop, and cycles of processes to establish the conducive situations for life to finally occur and become established.



Now, if this sounds too mechanistic to the reader, you would be right. Even with such structures in place, Life would not occur without other crucial happenings – namely Crises!

As *The Theory of Emergences* suggests, transforming interludes are only ever the result of major breakdowns in a previously well-established order – for, whatever level such a stability occurs at, it will prohibit the development of alternatives, and a transformation will only have any chance of emerging, if that stability collapses. Indeed, every stability, though it may persist for extremely long periods of time, will in the end be undermined, precipitating at first a series of increasing crises, and finally, a total collapse – seemingly heading for total Chaos.

It will only be in the very depths of such a dissociation, that a totally different process will finally have the chance to commence. And, this will be the exact opposite of The Second Law of Thermodynamics, which would, in direct contrast, be one of vigorous cooperation between conducive processes that would begin to form into a variety of different mini-systems that in a following positive series of competitive surges and declines, would finally establish a wholly new Stability. An Emergence would have occurred!

So, the usual assumptions of the right conditions and resources being sufficient, along with some magical Random Chance – completely bites the dust.

Indeed, not only must we consider the appropriate resources in this remarkable happening, but also and crucially all other processes entirely unconnected with the chemical developments. These would be to do with structures and possible pathways in the environment for chemical products to follow. The structures would have formed for quite different reasons to how they ultimately played a temporary role in the Origin of Life. But, both in a long development before Life, and in the first steps into Life, these helpful structures would play a series of vital roles.

The direction of routes for flows of water (perhaps?) carrying the key chemicals through a series of different and necessary conditions and thus allowing the appropriate series of chemical changes to occur, has been mentioned above. But, in addition, small enclosing structures could have facilitated local developments by protecting situations prior to the crucial emergence of the intrinsic membrane around a set of processes (perhaps even occurring before Life itself had emerged).

Perhaps it is necessary to emphasize all these different holistic considerations that NEVER come into the usual methodology of pluralistic experiments. Instead of straight forward “analysis” possible with separately investigated steps in a set of processes, what is stressed here is the virtues of taking everything together, and with likely inactive structures too, to get anywhere near what really happens in totally unfettered and unselected Reality. It is also important NOT to make the inactive structures that are conducive to certain sequences of processes, the actual *causes* of a newly emerging stability. They certainly cannot and must not be seen as that!

But, when a prior Stability of processes begins to experience major crises, and begin to collapse, the presence of such structures will prove useful in helping to establish some rather than other processes coming together to make a particular new stability. It is clearly the crises that precipitate hesitations in which wholly new stabilities can coalesce. Without these the new form come into prominence, no matter how helpful the structures are. The Origin of Life, considered within “the void” of random processes, may seem attractive, as “anything can happen”, but that must include dissociative as well as constructive processes. Such an environment is most likely to lead to no-development-at-all, even though at different times and places it might produce some things with potential.

No, what is most likely to allow real progress is a context with all sorts of nooks, crannies and routes in which processes could not only survive, but also find other conducive processes, allowing some sort of complex developments to ultimately occur.

Now, the origin of membranes seems crucial and could originally, and even before Life, have been entirely chemical, originating at the boundaries between two adjacent areas, when something from each could come together to produce a semi permanent separator,
NOTE: the most common example occurs at the surfaces of liquids where they are adjacent to air, for surface tension effects allow quite different things to happen than within the body of the liquid.

Non-Living to Life
Mapping the Revolutionary Interregnum

It is impossible to give a precise time for the occurrence of the Origin of Life on Earth, because it depends on exactly how you define *Life*.

The usual definitions are so "complete" (and close to what we see as Life today) that what is being defined is often a very long way from any of the quite reasonable candidate events that occurred much earlier in this process. Indeed, what is considered the absolute minimal requirement is so advanced that is a considerable distance from earlier candidate developments, even though these suggestions may be of very small organisms indeed.

Now, this researcher, having developed a definition of the Truly Natural Selection process, in which still non-living entities already had an engine for their evolution, while at the other end we have Darwin & Wallace's original Natural Selection, so there has to be a rich and long interlude between these, which started with relatively simple non-living structures, and ended with Life itself.

Surely, we need to define this crucial episode in some detail, if we are to actually define the Origin fully? And, to tackle such a profound trajectory, the usual means we normally employ within stable Levels will never suffice, for the crucial steps will most certainly take us across into a series of new Levels, via what are termed Emergences. Hints have been noticed, particularly in the re-design of Miller's famous experiment, but some trajectory of the sequence of phases involved needs mapping out, with the *Theory of Emergences* as an essential guide.

After all, this very important Theory seems to cover literally all developments, not only in non-living and living entities, but also in human thinking and its social organisation and history too. It must, therefore, be the first port of call in tracing out an initial trajectory in this relatively virgin area of study.

The major contribution, from the re-designed, new version of the Miller's Experiment, involves the essential role of inactive structures delivering not only conducive flow pathways through different conditions, but also protective niches and other locations where tenderer and easily dissociated phases could nevertheless succeed. And, the Theory of Emergences gave us Crises as the key, precipitating events for significant qualitative change to occur.

So, this task had to be one of suggesting intermediate phases between our two known trajectories, which would enable the conditions for Life to finally emerge.

Now, it would necessarily be strictly holistic – involving absolutely none of the assumptions and principles of a pluralistic approach to be allowed. And, the most important principle will have to be the self-changing of context, by whatever processes or systems got established there, to both precipitate crises, and allow natural Emergences to occur. And, in these developments, there will be absolutely NO purposes or directed processes towards some intended end involved. No supernatural or even Lamarckian imperatives will be contemplated. We will have to trace real development via self-produced potentials in a purely scientific way. No matter how ingenious an overall set of changes are, they will be driven by solely generated opportunities, whether great in a development, or vanishing as in a crisis.

It is clear that this investigation will have to precede the initial constructed version of the new Miller's Experiment set up, and will necessitate the installation within it of the first versions of inactive channelled pathways, to facilitate the deemed-to-be-appropriate sequences of reactions, and no matter how successful we believe we have been in this first attempt, the results from that will undoubtedly demolish some of our initial surmises, as well as confirming others as reasonable, and hence these findings will certainly force significant changes for a second and subsequent versions of the Experiment.

Also, for the first time, attempts will also be made to trace out the various simultaneous processes – both those affecting one another, and those that do not. And, adjustments may well be made in later versions merely to be able to draw conclusions about the mutual interactions of parallel processes in slightly different circumstances.

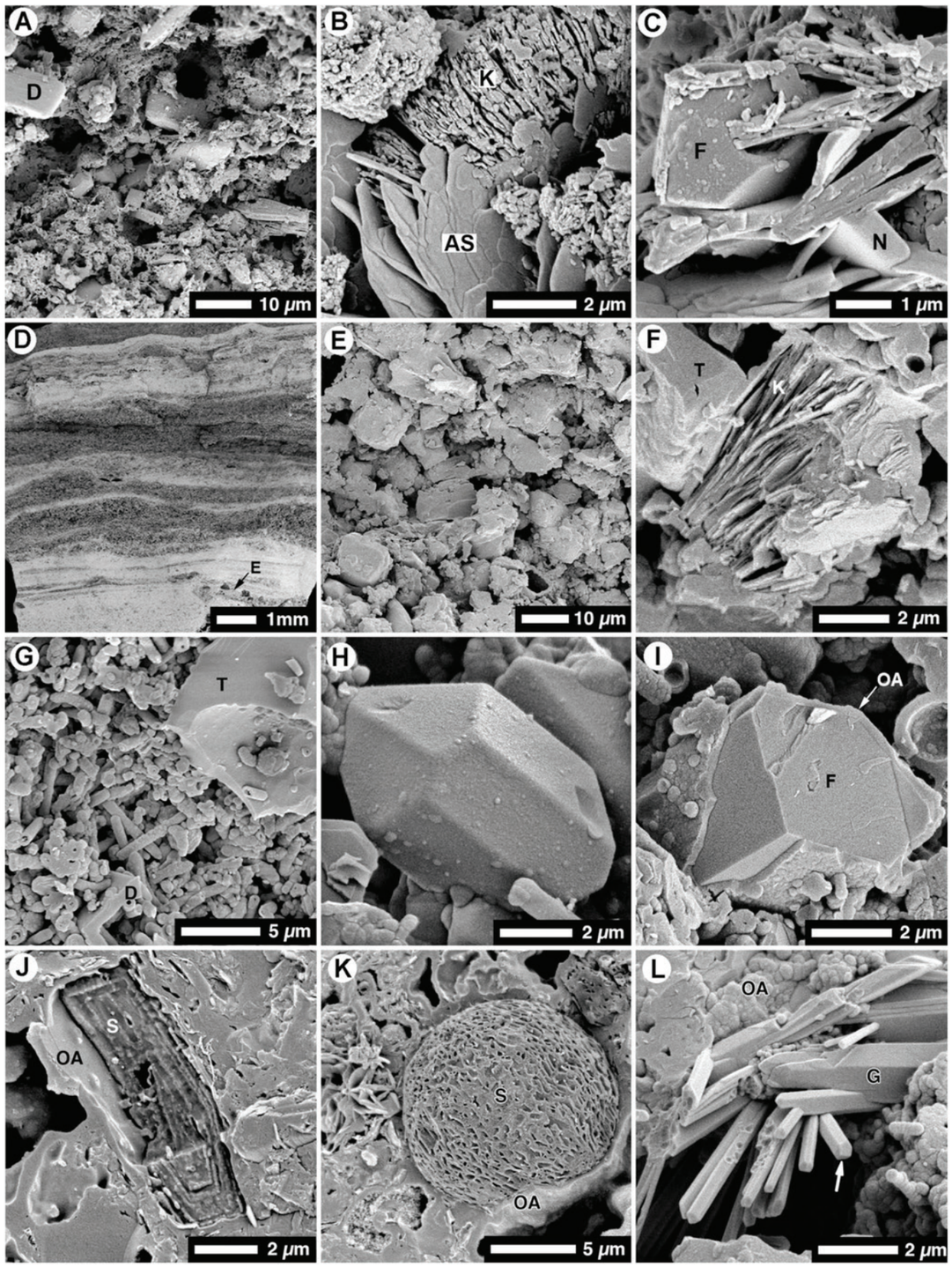
Indeed, with this new kind of experiment, the development of ideas will go hand in hand with the changes in the experiment's set up and resources, as they are changed to discover the most appropriate analogistic model that can be developed.

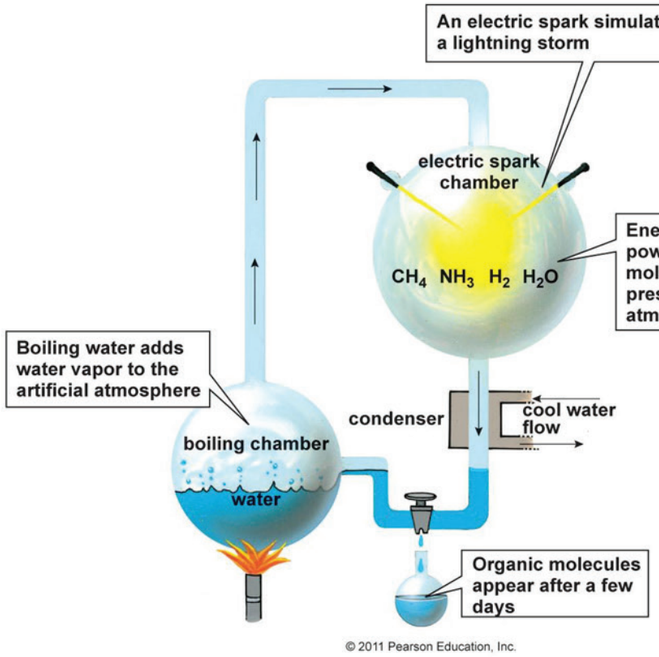
NOTE: The main experiment with its distributed time-based sensors, will also take samples for analysis elsewhere, in separate ancillary analytical experiments to identify new products as they emerge, and associated with various, identified time –positioned processes.

The availability of other necessary inclusions into the resources of the experiment, perhaps those that in Reality will have come from some kind of vulcanism, may well also prove to be essential and occurring at a particular stage in the overall process. And, it is anticipated that discoveries that are produced in the apparatus (which will need to be dismantled to gain access to any deposits, in order to identify them via analysis after each trial has been completed of a given version.

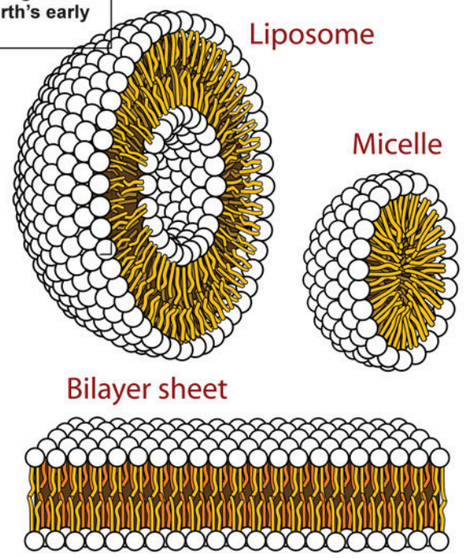
And secondary experiments outside the main one, will always be necessary to see how certain produced substances have been produced, or what additional substances might be necessary to make them happen.

Indeed, such research as is being suggested here, will not be single one-off, and specially-arranged-for experiments, but, on the contrary, a whole set of related investigations, by one means or another attempting to reveal holistic, multi-strand, and mutually-affecting processes.

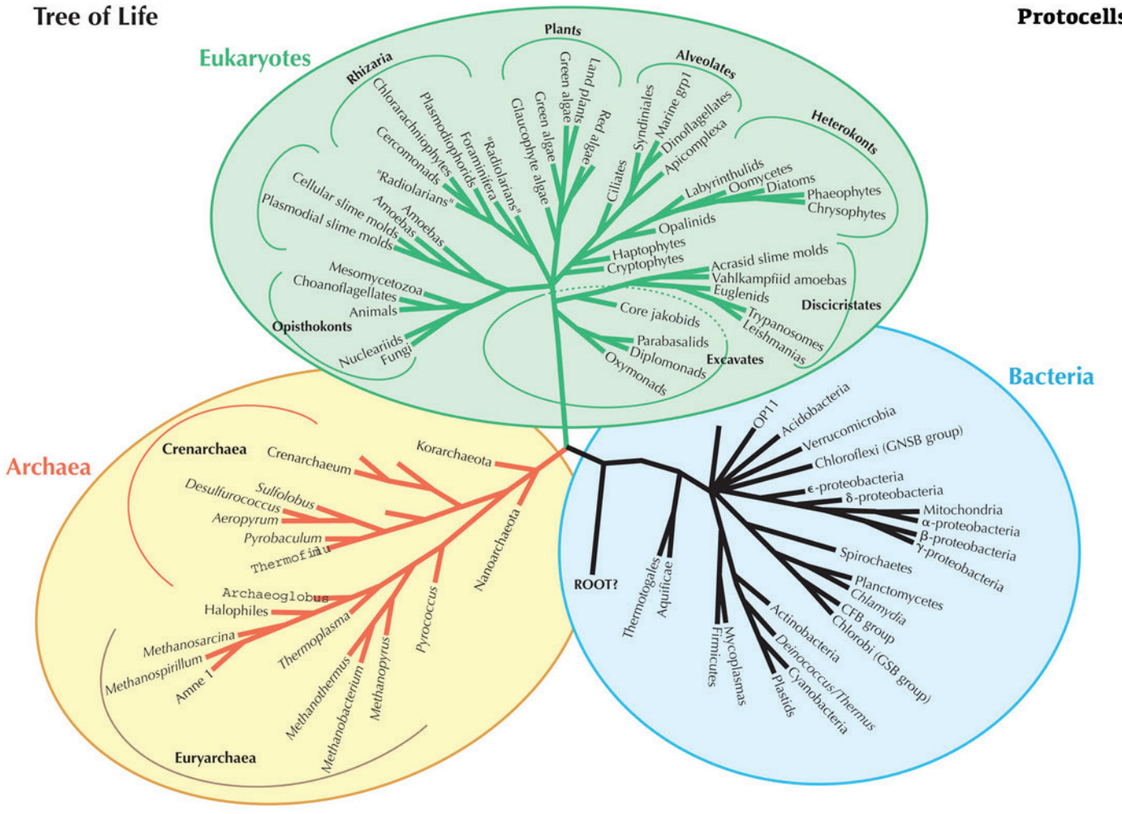




Miller Urey Experiment



Protocells



Indeed, experiments into "sols and gels", proto membranes and conducive substances of various kinds, will have to be investigated outwith the main experiment, to facilitate its constant improvement.

Even when still well within the non-living part of this development, I am convinced that remarkable interludes will occur, which will transform those situations radically. I am thinking of something akin to Adaptive Radiation as in Darwinian Evolution, where a certain occurrence of circumstances – perhaps following an almost terminating crisis, delivers a situation in which a whole diverse set of developments are made possible by the elimination of prior systems, which had previously prevented them. In such circumstances, many different and rapid developments could occur, and inevitably transform the environment. Such productive phases, following crises, would be inevitable, and worthy of detailed study.

The incremental chance path of traditionally-seen developments is just too dispersed to get anywhere at all.

Even with pre-Life, chemical reactions, the occurrence of run-away change will have occurred, and redirected subsequent changes, via a changed context.

Finally, it cannot be stressed too firmly that this must be a holist investigation. Any pluralist side-experiments in traditionally controlled environments, must now be seen, theoretically, solely as indications of what processes might occur in a truly holist mix, so the primary purpose would be to so adjust the inactive, channelling structures and pathways, so that the investigative pluralist processes could would have a chance of playing a role in the main holist experiment.

A Biological “Manhattan” Project?

The necessary trajectory of truly holistic investigations

The revised form of a new Miller’s Experiment cannot be a string and sealing wax, back-room affair.

For, as distinct from the great majority of scientific investigations, it cannot afford to be based upon the Pluralist Principle. To trace even a small interlude on the way to The Origin of Life on Earth, it can only be a completely holistic type of study from beginning to end.

Indeed, having already spent a great deal of time re-designing Miller’s original approach, it also soon became clear that such an undertaking is not about revealing and extracting some eternal law, but, on the contrary, a rich and extended set of phases, consisting of many simultaneous processes and differing sequences, which at different times will require different resources, and will involve not a single ideal context, but a series of contexts, most of which will have been “self-produced” by earlier phases.

It soon became clear that the main purpose of the experiments would always be to discover a better way of doing them, and would therefore generate a whole series of experiments – each better than those that proceeded it.

So, as NASA purports to be addressing the very same agenda merely by the further exploration of Space, and the admission that such will cost many billions of dollars (which frankly will produce absolutely nothing for a vast quantity of money, it is clear that this proposed Earth-based alternative will also cost a significant amount of funding. But, it does have a major advantage. It will be carried out where it actually historically happened. And has a chance of actually teaching us something truly profound about reality!

Now, it is true that so far all attempts to address this problem have failed. But, there is an excellent reason for that.

This amazing process, which can only have involved a series of holistic phases, has to date only been tackled using the universally applied pluralist methods, and they will be guaranteed to deliver absolutely nothing. As it happens, this necessary approach has only been glimpsed in the work of scientists like Charles Darwin, but has still a long way to go to be able to tackle such questions as this. So, this undertaking will be as much about finding and using new holistic methods, as it will be of tracing out phases in the Origin of Life.

So, just as each new accelerator and new updates of the Large Hadron Collider involve a great deal of time, effort and money, so the new Miller’s Series of Experiments will be many times bigger, more complex and require many wholly new techniques, than Miller’s heroic first effort.

For, what is being suggested, is a new kind of Science entriely – Holistic Science, so that instead of the stripped-down, and maximally controlled methods of the usual pluralist experiments, the new way will, throughout, attempt to deal with Reality-as-is, in flux – with all processes happening together, and mutually-affecting one another – a holistic approach! Absolutely NO eternal, unchanging Laws will be sought – for they are the simplified and idealised products of pluralist science, where separable and eternal Laws are assumed to be merely summed, and replace that with the holist conceptions of multiple-interpenetrations of various factors, not only changing each other, but also creating the ground for following processes to occur.

Now, it is clear that what is to be attempted is certainly a very tall order, We will not get anywhere near what is required with our initial attempt. Some steps will occur, as they did in Miller’s original experiment, but they will always grind to a halt, because the optimum conditions for each succeeding phase will not occur. We will have to find out as we go, what changes will be necessary. We will, in the classical way be “pulling ourselves up by our own bootlaces”.

The major problem will certainly be the need to have everything happening at once, Faced with this our predecessors found a way, by purposely farming the situation extensively. The Domain of study was always isolated, then selectively filtered to remove many confusing factors, and then tweaked in all sorts of ways, until a dominant relation became evident and could be extracted as a Natural Law. The repetition of this technique, with a different objective each time, resulted in a set of such Laws.

But then, a flawed assumption was mistakenly applied! It was assumed that these Laws were separable (or independent) from one another, and the natural phenomena that we see, were assumed to be mere summations of these separable laws. But, it just isn’t true! We got away with it by only using each law separately in the very same ideal context that it had been extracted from.

So, in spite of a mistaken theoretical analysis, it did deliver a useable pragmatic method of application in small and separate steps. The factory demonstrates how these “laws” had to be used. It was not like how things occurred in Nature, where all processes could occur simultaneously. In the factory each law was applied in its correct context to produce a single outcome.Then, this was taken to a wholly new set up with its Law and context, to take things to the next step. A product for the market will often have to go through hundreds of processes to end up with what was required. That isn’t Science: it is mere Technology!

Clearly, in our, as yet undiscovered method to reflect Reality-as-is, we will never get it right immediately. We will use what we have surmised from pluralistic experiments to design a first version, but, we will not know, beforehand, exactly what processes will take place simultaneously and in the same conditions.

Now, it will also not be clear what the sequences of the reactions, will need to be such as to take us towards our ultimate objective, but we will make assumptions, and construct internal, inactive barriers to direct any flows via a series of these involving differing conditions.

The set-up will involve water in one place and gases in another, and the addition of heat will generate a series of cycles.

So, we will initially construct our inactive pathways to take things through what we, at this stage, consider to be a “likely” sequence of processes. It, certainly, wont be right, of course! But, with well-positioned sensors throughout the structures, taking time-based tests and measurements, the investigation’s first job will be to find any evident mistakes, then conceive of and set up secondary pluralistic experiments outside and totally separate from the main experiment, to address revealed or imagined problems, and allow an improved re-design of the main holistic system.

This new type of Science will initially be expensive, for it tackles the real world as it proceeds, and crucially also, as it develops.

The grounding theory for such an approach has to be *The Theory of Emergences*, which sees real development, NOT as incremental, minor changes, building up to an automatic switch to a better form, but, on the contrary, it reveals the emergence of a counter-development, and long-lasting Stability – why it persists, yet ultimately dissociates, in an almighty Crisis, and it happens in the so-called Emergent Interlude, following such a terminating Crisis, that the ONLY and SHORT phase of real development ever occurs.

Clearly, experiments must, in this type of problem – The Origin of Life, attempt to produce such Emergent Interludes and capture what actually occurs there in great detail. Now, as it is only in such Interludes that the wholly new actually emerges, so exactly what we test and measure will not only be a moving target, but we will afterwards not know what we should be looking for.

We may be helped by the ultimate product of such Emergences – we may know something of what will have been produced as side products but in something as complicated as the Origin of Life, the process will inevitably involve not just one, but many Emergences, so we may only be attempting to judge by looking backwards from the final endpoint, and hence get intermediate products wrong.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