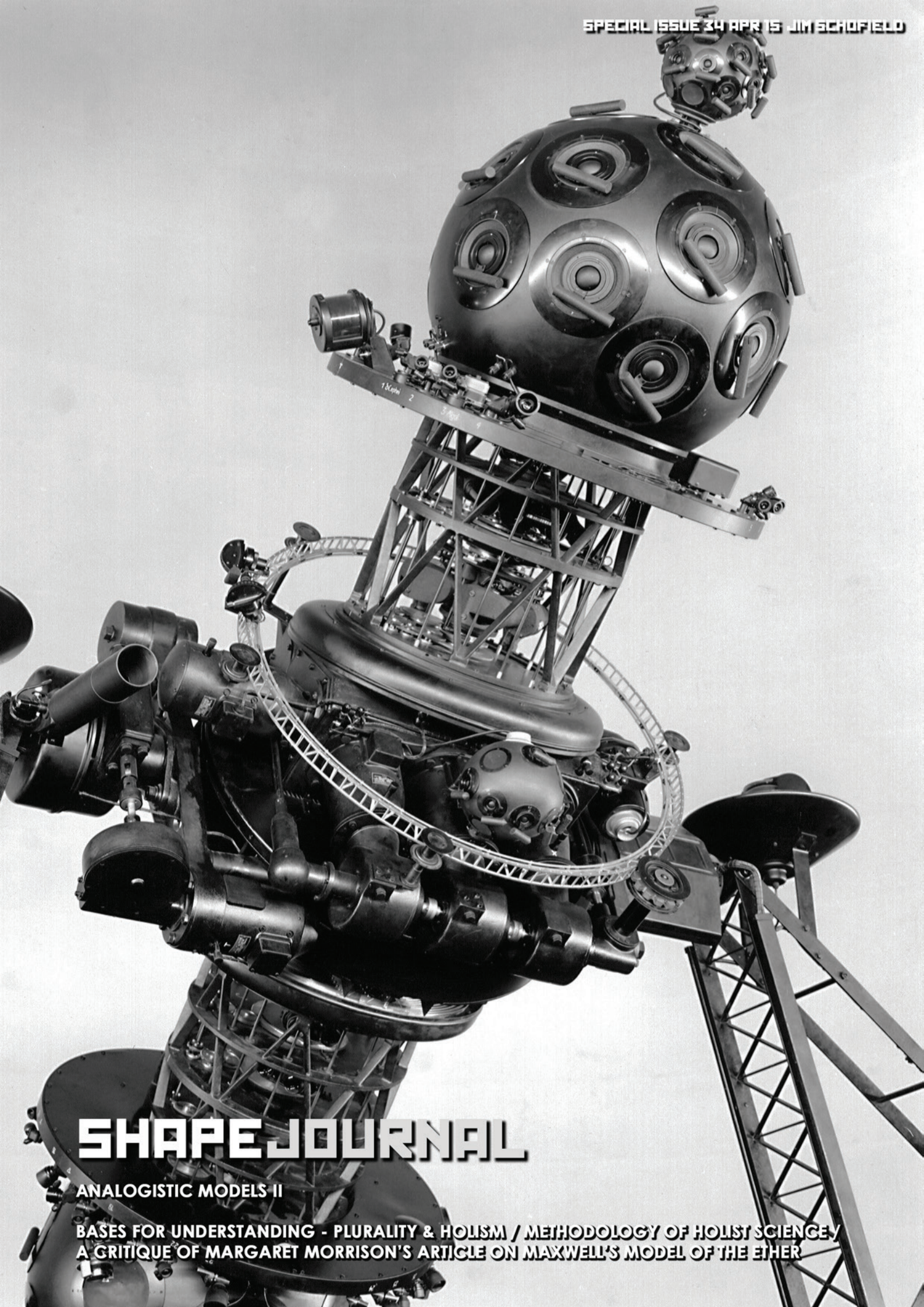
SPECIAL ISSUE 34 APR 15 JIM SCHOFIELD



SHAPE JOURNAL

ANALOGISTIC MODELS II

BASES FOR UNDERSTANDING - PLURALITY & HOLISM / METHODOLOGY OF HOLIST SCIENCE / A CRITIQUE OF MARGARET MORRISON'S ARTICLE ON MAXWELL'S MODEL OF THE ETHER

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Special Issue 34

Analogistic Models II

Introduction:
Analogistic Models II

Welcome to the 34th Special Issue of the **SHAPE Journal** and second instalment of our series on Analogistic Models.

Clearly, the establishment of a comprehensive basis for a whole new standpoint and methodology in Science, was not, and could not be, achieved in the few papers of *Analogistic Models I*. Indeed, such a demanding and consistent basis will take a great deal of effort, and a considerable amount of time.

However, certain breakthroughs have already been achieved by a number of researchers, some of whom did not fully realise the true import of their contributions. And, indeed, the supertanker that is today's consensus of Pluralistic Science, will still take an enormous effort to re-direct into an entirely different Holistic direction, especially as the much admired gains of isolation, simplification and idealisation of the Pluralist approach, will be sorely missed in this new and much more difficult realm in which, "Everything affects everything else!"

Some measure of the difficulties involved has been demonstrated by the problems encountered by the two pioneers of this approach, namely Charles Darwin and Stanley Miller.

For, in Darwin's case, the evident strong opposition to what he was doing caused him to continue studies and delay publication of his Origin of Species for decades.

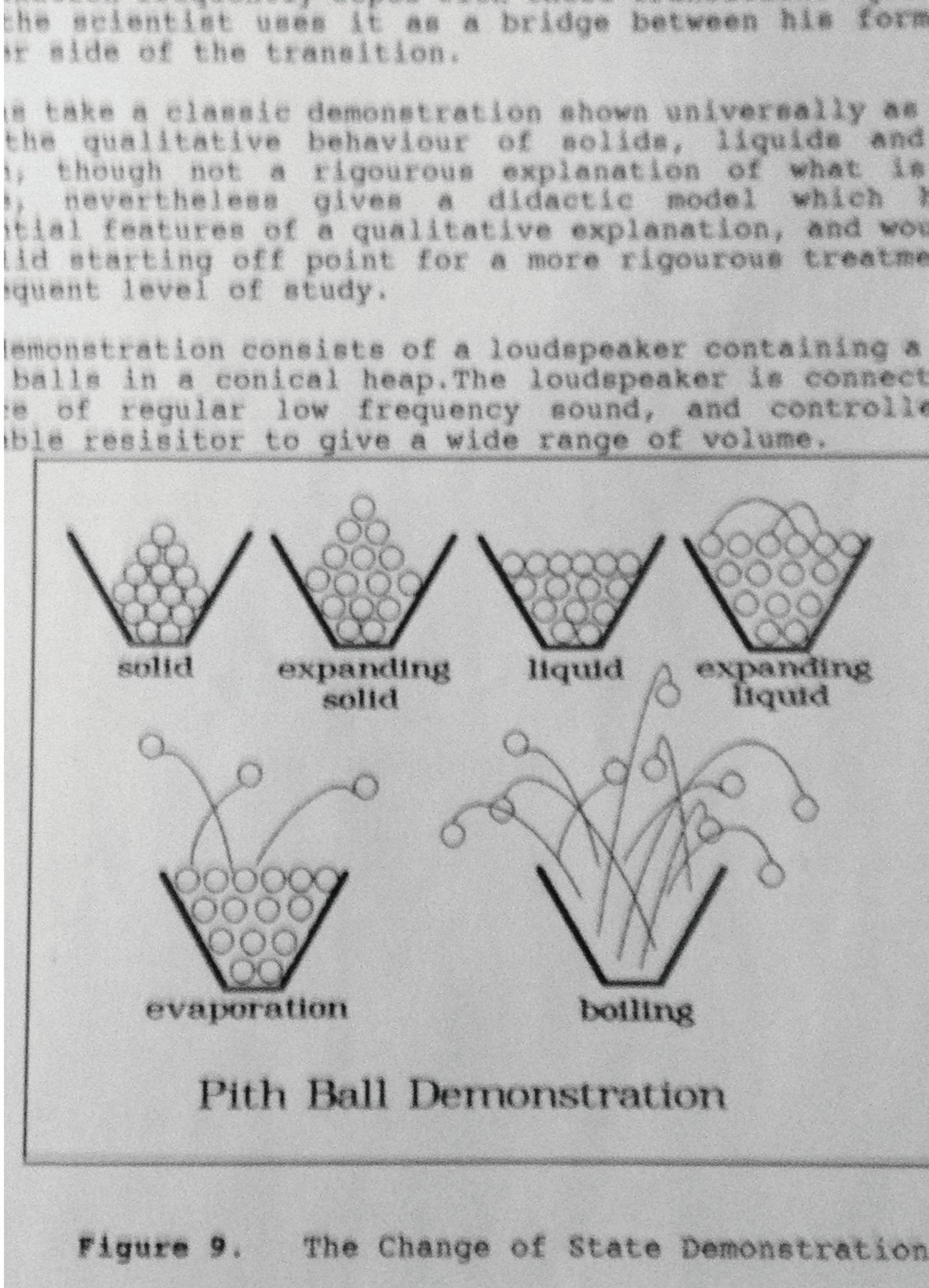
While, Miller's brilliant experiment revealing the natural creation of amino acids in his constructed emulation of the processes taking place in the primitive atmosphere and seas of the early Earth, had to be abandoned as no viable Holistic methodology was available to take things further.

To finally address Reality, in its true complexity, recursivity and evolution, involved a substantial step into much more difficult territory, and, crucially, a return of the currently universally dominant quantitative relations, to their correct and subordinate position in Theory, and the re-instatement of *Explanatory Models* (based upon analogy) as the primary theoretical achievements of Science.

So clearly, the task cannot possibly involve a quick fix, indeed, based on the discoveries of the philosopher Frederick Hegel, the development of theory is NOT an amassing of many eternal Natural Laws, but the continuing development of a whole infinite series of models, validated by their increased Objective Content.

This second in the series on Analogistic Models attempts to clarify this objective.

Jim Schofield April 2015



Ansel Adams

The Bases for Understanding
Plurality & Holism

The Dichotomous Pair of Plurality and Holism are, as with all such eminently useable opposites, an admission that the real underlying situation, which elicited them both in our conceptions, has not yet been adequately defined.

The situation has been complicated by the predominance of Plurality over Holism, particularly in Science, and the fact of the remarkable achievements of this discipline, has to have been, to a major extent, the sidelining of the alternative to a very minor role indeed.

Now, Plurality's dominance has had two major effects. It has meant that the Dichotomy is much more rarely realised, and hence the absolutely essential efforts to transcend the conceptual impasse was, and still is, rarely if ever attempted.

So, in order to get to such a point, the holistic standpoint must first be rescued, and the now dominant pluralistic stance must be thoroughly criticised, for all its errors, which it undoubtedly imposes on our understanding of Reality.

We have spent centuries now discovering the pluralist landscape, which has begun to substantially reduce what we can still deal with, particularly in the major science of Physics.

Though the main objective must be to arrive at an integrating, superior standpoint, that alone will transcend the impasse, we must start with a major critique of Plurality, and a building up of this largely dormant Holism, in order to even demonstrate the problem, and the impossibility of staying with a purely pragmatic and dualist position, which uses each "where it works" and be satisfied just with that! So, to approach the usual even-handed switching from one to the other as circumstances dictate, we have first to defeat the current very one-sided attitude to these opposite standpoints.

Modern scientists, and indeed also most other people, if pressed would insist upon Plurality, and give Holism minimal credit. Indeed, it has been left to spiritual humanists, such as the Buddhists, to emphasize the virtues of such a worldview.

So, let us compare these two opposite stances, and see why this is the case.

Plurality is the banker standpoint in both Formal Logic and Science, mainly because the idea of Analysis is based soundly upon it. If complex situations are composed of multiple and very different factors, then the question is inevitably posed – "How do we get at these contributing factors as the initial step in understanding, formalising and using such situations, to some valuable, intended purpose?"

Now, the idea of Analysis assumes that these factors can be separated out from an evident complexity by appropriate methods. And, this could only be possible, if these factors were actually independent of one another – that is unchanged by their context. Plurality insists that this is in fact the case! And, when, by some means, a particular factor has been extracted, it is the very same as it was within any of its normal complex mixes, and we can, therefore, re-formulate it as a "General "Law". The pluralist scientist sees it as his task to expose, extract and deliver as many of these "Laws of Nature" as possible.

Now, immediately, anyone carefully observing any complex situation, could not fail to notice that it is never steady-as-a-rock: on the contrary, it displays literally constant, if small in amplitude, variations. So, somehow, the contributing factors do indeed deliver a result, which is, overall, fairly consistent. But, how could such a mix of Natural Laws do that?

The pluralist answer is that though the individual Laws do not change one iota, the resources involved can vary due to currents and uneven mixes caused by local disturbances, such as sources of heat and the like. Thus, though the Laws are *fixed* and unchanging, the contributing quantities of these factors will in fact vary, and the overall mix will display a certain variability.

NOTE: I cannot leave considering this point without a mention of Professor Brian Cox, the "guru" of TV Science, and his series *The Wonders of The Solar System.* For he seemed to spend the whole of this extensive series of many hour-long programmes, giving his version of how fixed, Natural Laws (in the pluralist sense) can deliver such amazing variety. His thesis is that such eternal rules merely "summed together", will give very different outcomes for the smallest of differences in their relative magnitudes. Though the laws don't change in the slightest – they are eternal, their combined effects certainly aren't! They can easily produce direct opposite results without any new inclusion or modification of the laws involved. Now, except in retrospect, he cannot predict what those differing results would be, and the only conclusion is clear. Either the meta laws governing such additions are not eternal laws, or the original claimed laws, themselves, are not eternal. And. once either of these is admitted, it is impossible to have eternal laws in any multi-level hierarchy. His "Wonders" are the unknown reasons why Reality produces what it does – the magic(?) of evolving Reality! Indeed, listening to his account of "variety", there seems to be innumerable ways of falling off the teetering balance of factors, when the slightest diversion will send things careering off to one oblivion or another. Despite his effusive use of superlatives, I'm afraid his "Wonders " are still the inevitable results of a fixed set of eternal laws. I'm afraid not!

Holism totally disagrees with this version.

The crucial principle is that, "Everything affects everything else!" – there are NO eternal Natural Laws – they, along with everything else actually evolve. Any apparent relation is always due to all other simultaneously-acting relations in a particular situation, and the clearly evident, perpetual variability of such a "mix", is not merely varying amplitudes of fixed natural laws, but real, mutual modifications to deliver a resultant integrated

overall affect. And this not only varies about an evident mean, but an integration, that could, and does, at particular junctures dissociate the situation dramatically.

Any conception of real effects has to include the major qualitative changes that also emerge from the seemingly same elements. Plurality is incapable of ever dealing with such qualitative transformations! And, indeed, many thinkers and artists of many kinds find their richness, analogues and resonances only in a holistic view.

But, of course, Holism isn't much good for straightforward, scientific investigation and consequent innovative use of what is discovered. There has been, so far, NO holistic methodology developed in Science, though honourable exceptions like Charles Darwin and Stanley Miller have made significant contributions to Science from a more holistic perspective.

It is indisputable that a very effective methodology in Science has been developed based solely upon Plurality. Science always attempts to find its "Laws" by extensive and rigorously maintained control of any given situation – sufficient, in fact to establish a necessary Stability, so that Plurality approximates to the truth in that produced Stability. It was soon noticed that the investigator could simplify his task by first isolating his chosen area of study, and then removing as many present and confusing factors as possible, while holding many of the others constant.
Through removal of "unwanted" variables, this "farming" of the experimental Domain could be relied upon, if very strictly maintained, to reveal clearly a given targeted factor – an assumed Natural Law! Thus, via measurements of a very limited set of parameters, scientists managed to get their sought-for relation.It was, of course, never really an exposé of a fixed "Natural Law", as much as a special arrangement delivering a rule which would hold ONLY within that specific stability.

The crucial question as to whether it was the same in all complex circumstances never arose! And, this was because scientists learned that to use their extracted "Law", they had to replicate the exact conditions of its extraction in order for that "Law" to hold. Then, and only then, was the "Law" reliable.

NOTE: It is interesting that the constant struggle to maintain optimum circumstances elicited a major meta-law, namely the Second Law of Thermodynamics, which embodied the quite natural forces involved in returning an engineered Domain, back to its natural state and balance. The importance of this Second Law is a consequence of the use of Plurality in Science.

So, surely the debate is one of "no contest": what use is Holism if it could not allow either *Analysis* or effective *Use* for production?

Well, let's face it: that is a fair argument, and that position has ultimately led to the technological age in which we now live. But, it never really led to real *understanding* of the natural world, which, when it did occur, was achieved by scientists with a very different attitude and purpose. And, even more crucially, such "Laws" could only effectively deal with a natural, or much more likely, an imposed *Stability*! Plurality only allows scientific understanding of stable situations: and we must also be clear that Stability does NOT mean "stationary". Active stabilities occur all the time, quite naturally, and are the normal, if only temporary result, of complex sets of mutually interacting factors simultaneously present in a given situation. Clearly, we cannot avoid dealing with Stabilities, but to *assume* permanence for them, and never address their inevitable demise, can only produce an idealised conception of Reality.

For, the pluralist approach means that the everyday failures of stabilities can never be predicted or understood or in any real way. Because of that, any sort of natural creative development will also be outside the aegis of such a methodology. Pluralist Science cannot deal with transforming, creative change in reality at all. And the trajectories of development were totally absent from the body of Knowledge extracted from their "farmed" and maintained-to-be-stable Domains. Clearly, in spite of the truly prodigious gains of Pluralist Science, it was, and still is, totally insufficient to deal with Reality-in-Development at any level.

The attempt to understand Reality cannot be left there. All such "Laws" will reach a limit in their applicability, and cease to be validly used. We cannot maintain artificial stabilities in all circumstances, and all natural stabilities will also come to an end. What we seek may not be available within our constructed and maintained Domains, and attempts to see what happens will inevitably transgress the essential boundaries of the Domain, and our "Laws" will simply fail! Of course, we are competent enough to construct alternative stabilities in other Domains, and there pursue our new sought-for relations, but the transition from one Domain to another, as a real transition (as in Reality) will always be beyond our conceptions and methodology. As long as we continue to cling to Plurality, we will never cope with Reality-as-is in its intrinsic and necessary development: we had to kill that aspect of what we study, lay it stable and unchanging upon the slab, and analyse it in absolute, "dead" Stability! Our methods were of a man-made World, and could never address Reality in its unavoidable and necessary Change.

The role of Equilibrium in pluralist experiments must be seen as proof of the necessary conditions for extracting "Laws". The imperative "Stir well before measuring" is in order to establish a stability and then its "laws".

Let us look at little more closely at the pluralist methodology in Science. As an uninformed pupil of Science, when still at school, I was constantly exasperated by my calorimetric experiments (involving liquids and heat), which invariably gave contradictory results. You can guess the reasons! But, we were admonished to merely "Stir thoroughly, and wait for equilibrium before taking measurements!" So, what was the situation before and after this necessary "farming"? Left alone, the beaker containing the reacting substances could have reactions taking place in many different places, around things like specks of dust, or unusual local conditions, but they would not only be dispersed, but also on the move. So, if we dove straight in, we would be measuring different situations moment-by-moment. Though after achieving Equilibrium, the mix will have been *homogenised*, so that the reactions were taking place all over the place, and our readings, though still somewhat variable, would be "averaging" what was going on, and a bit of extra "calculable averaging" would complete the process of imposing stability. Just to ensure some "reasonable" results, the usual objective was to measure, what could only be an average anyway – like temperature. So, we would end up with figures representing a stability, in the most abstract way. The complex, multi-process reactions, taking place in different parts, and the effect of one upon another were totally unavailable by such methods, and I think that those experiments clearly indicated what pluralist Science was all about.

Much later at University, I was working with a chemist and a mathematician on Mathematical Chaos, but my colleagues main preoccupation was what was actually happening in a liquid chemical reaction in a beaker *without* any mixing at all. By using oscillating reactions with different colours and keeping the most rigid regime of total stillness, the seen reaction front clearly took the form of a Toroidal Scroll, and Jagan Gomatam, the mathematician involved, actually derived the formula for this amazing form. Now, you may wonder why this was important, but it did show that to exclude such processes and force an un-analysable, thorough random mix, may have given a useful equation concerning "temperatures", but it threw away the dynamic changes as they actually happened.
NOTE: And remember, even this effort was still pluralist, as the set up had to be as near perfect as possible AND as simple as possible to even extract what they did, Imagine a much more likely real situation, with many substances are involved, and multiple, and mutually affecting cross-reactions. What on earth would you get from, "Mix thoroughly, and wait for Equilibrium!"

That is what pluralist-methodology ignores. It is pragmatic, but really poor when it comes to explanations. Real Theory is sidelined in favour of effective and productive use!

So, it is clear that we avoid the crucial interludes of significant qualitative change like the plague, and have constructed both a methodology, and a philosophical stance based upon the fiction of Plurality. To carry Science forward, this will certainly have to change.

Researches, by philosophers like Hegel, considering Human Thinking, and historians, like Michelet, considering historical Social Revolutions, both made it clear that Reality self-develops, and its general trajectory, left entirely to itself, did indeed involve a kind of overall Stability that is usually long-lasting (but is clearly also true of complicated systems), and was always terminated, and totally re-constructed in turbulent interludes of significant qualitative change termed Revolutions, or more generally Emergences. Science could not develop further without addressing these crucial, and indeed, creative Emergent interludes

The methodology of Science, heretofore, has proved to be inadequate for dealing with these vital periods of change. Such Emergences not only happen on the wider Super-System scale, but also on down through much simpler interactions to almost all processes. Every single Law produced by pluralist Science would always fail in inappropriate circumstances, and instead of only concerning themselves with Stability, scientists will also have to find out how to deal effectively with Qualitative Change and the Interludes in which they occur.

Let us, therefore, address the usually complex situations that Science must deal with, and be absolutely clear what is happening there!

The pluralist view is that the given complexity has two sources. First, the simultaneous activity of many fixed Natural Laws. And secondly, the unavoidable unevenness of the mix can be due to local effects, concentrations and even currents. The task is to eliminate as far as possible these latter effects by working to eliminate those possibilities, and then to so "farm" the given experimental situation to filter out as much as possible, and then control what remains to reveal a targeted Natural Law, and to repeat this several times, until all the major laws involved have been extracted and formulated as equations. It is based upon the Principle of Plurality, and can only be applied in those fixed and maintained Domains.

The holist view is that the "given" complexity is due also to the local effects admitted by Plurality, but the way that contributing factors are dealt with is entirely different. For these are not fixed laws, but modifiable "factors", which, though they have internal causes, and therefore a core contribution, are also always affected by their contexts too: they are not immutable, but depend overall upon the other simultaneous factors for the actual natures at any moment. Hence, they will certainly differ all the time. Any laws we extract are in fact idealised versions of modifiable laws.

Now, this definitely means that in other different situations they will be different, and no situation is eternal - though some natural stabilites can exist for a very long time. No matter how strongly maintained, all situations will eventually dissociate – either by lack of adequate maintenance, or intrinsically by the development what is in it. Holism, therefore, can never deal in fixed Natural Laws, but has to instead concentrate upon adjustable and variable factors, and their many contexts. The holist is intent upon tracking qualitative changes, and being in a position to make sense of the Emergences that constitute the crucial interludes in all Natural Development.

Mutually Orbiting Particles
& the Emerging Methodology of Holistic Science

The discovery of the positronium in the Tevatron at Fermilab, and the experimental use of Muonic Hydrogen pose the question, “Just how many mutually-orbiting, joint particles are possible?” And, if such were also of opposite matter-type and electrostatic charge, they would certainly be invisible, or almost impossible the detect directly.

Also, if the now rejuvenated hypothesis of a universal Paving of Space is correct - such as that proposed by this researcher, and is suggested to be composed entirely of just such stable positroniums (neutritrons), then other invisible, and therefore undetectable particles, would certainly be possible too.

NOTE: Yet, though to say “invisible” for such Paving is correct, the property of undetectability is certainly not absolute, For, in The Theory of the Double Slit Experiments (by this author), it is this Paving which actually propagates all electromagnetic disturbances (radiation), and is therefore detectable by this, otherwise inexplicable, process. And the affecting properties of such radiation would also be impossible without this means of propagation

Now, current work on these ideas, by this researcher, has been on what differences there would be to recognising extremely close, local interactions, such as with the atom, if they took place always within such a proposed Paving of Space. Or even if the Paving continued both externally to these local interactions, and even internally, within their *inner* spaces.

Now, the usual, dismissive response is that such a Paving would not allow the known internal interactions to occur, as they undoubtedly seem to do. But, on the contrary, after seeing the experiments produced by Yves Couder, it is the opposite that seems to be the case - and it is the unavoidable interactions and recursive nature of such a situation that actually creates and maintains the stable mutually orbiting entities themselves.

NOTE: For, I am inclined to assign the stability of atoms (as a nucleus and electrons system) entirely to this recursive system/context interaction. And also, I think that it is the pluralist standpoint of the critics, which places all causality, as separable components in a complex situation, as distinct from an unavoidably mutually–affecting, maintaining and integrated set. The alternative pluralist standpoint has all contributions unaffected individually, (they are separate Natural Laws), though they act together with others to produce an overall “summed” effect, varying only due to how many, and which, components are present, and what are their consequent relative weightings.

But, as soon as a holistic standpoint is adopted, things must inevitably behave very differently indeed. For then, the individual components are not eternal: they can, and always are, changed by their companion components, and vice versa, in a given situation.

It is this mutual-modification that causes two very important results. The first is down to the changing effects, which can result in sub systems of various levels of dominance, which, then recursively, can produce forms of persisting Stability, where the various interactions become mutually-sustaining, and result overall, and overtime, in a relatively constant set of sub systems. And, secondly, in an opposite way, there is always the possibility of, at some point, that Stability being increasingly undermined, and then dissociating completely into a form of Chaos, from which wholly new sub systems can begin to form, and their mutual interactions delivering a wholly new form of Stability, at a new and different level.

NOTE: This pair of alternatives has been shown to cause the Stability Phase being relatively long-lasting, while the intrinsically emerging, and initially dissociative phase is then followed by a subsequent creative and establishing phase to produce an entirely new Stability, yet being of much shorter duration – in what is termed an Emergence (or natural Revolution).

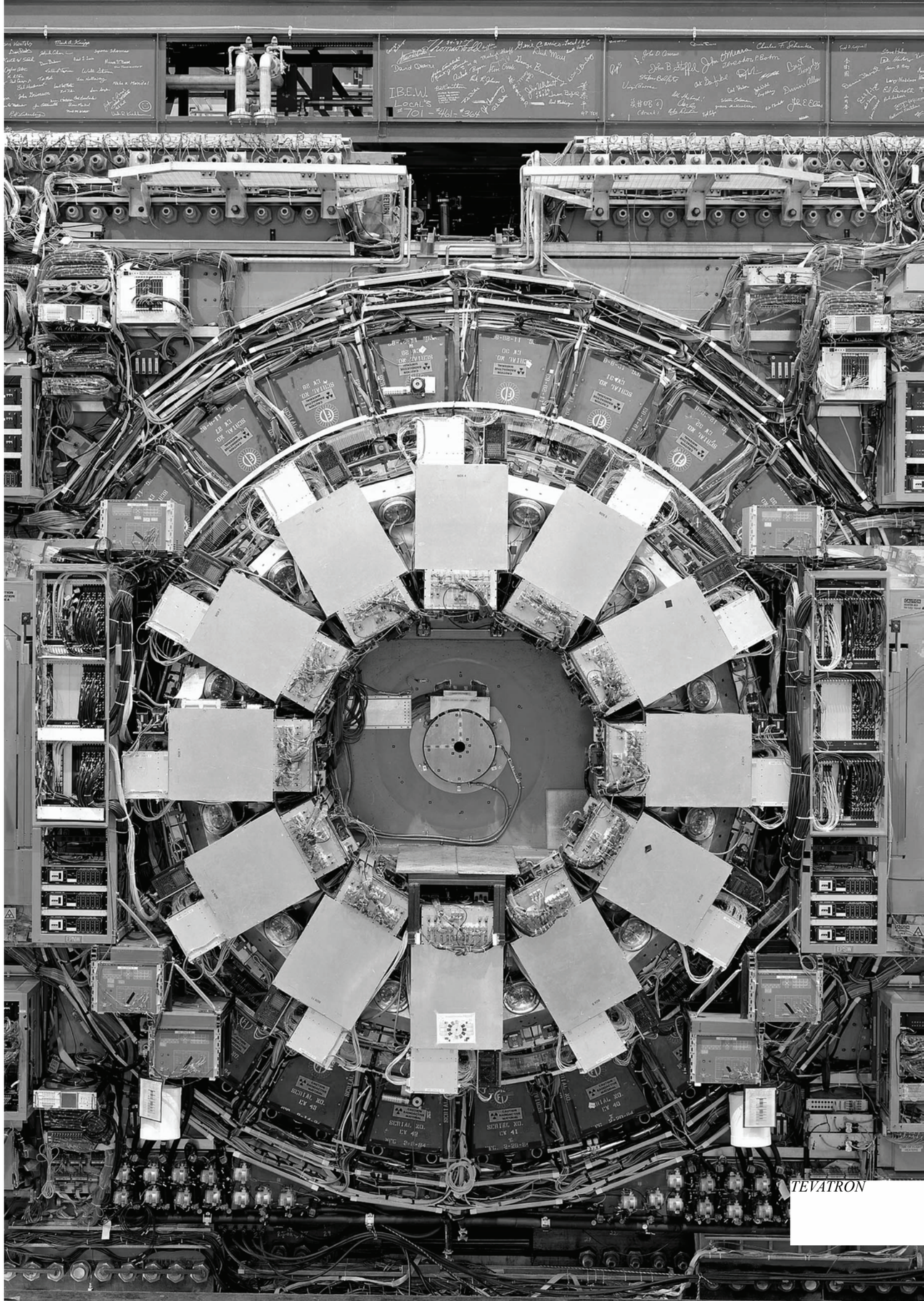
Yet, none of this is at all conceivable with a pluralist standpoint! And, when an Emergence does occur, and a new self-maintaining Stability is finally established, the pluralist theorist merely investigates the newly established Stability, and attempts only to reveal its full complement of “unchanging” relations and entities in that very different and new situation.

There is NO way that the actual transition to the new conditions can be explained in any sort of detail, by pluralist means. At best, we can be told of a crucial Threshold Parameter, and its value at which the switch to the new situation occurs.

But that is not an explanation, or even a real description: it is merely a content-less and retrospectively-established prediction!

Now, on the contrary, the holist knows what he has to do! He must attempt to set-up the conditions that he believes will intrinsically lead to a major qualitative change. And this is precisely what Stanley Miller did with his famous experiment to (hopefully) study the possible phases in the Origin of Life on Earth. But, though his sealed system did what he hoped it would do, and, entirely un-interfered with, nevertheless produced a number of amino acids - the crucial building blocks of essential parts of all living things, he was unable to say exactly how it had all happened. Clearly, Miller did the right things, but as he was entirely at variance with standard experimental methods of the consensus pluralist sciences, and he had no idea of how he could determine what had been going on within his sealed apparatus. And, that, of course, was what had to happen next.

Now, the reader must see that without new developments in this precious area, this employed holist approach would never be adopted. So, the following extended section concentrates upon a particular example of how this impasse can, indeed, be transcended.



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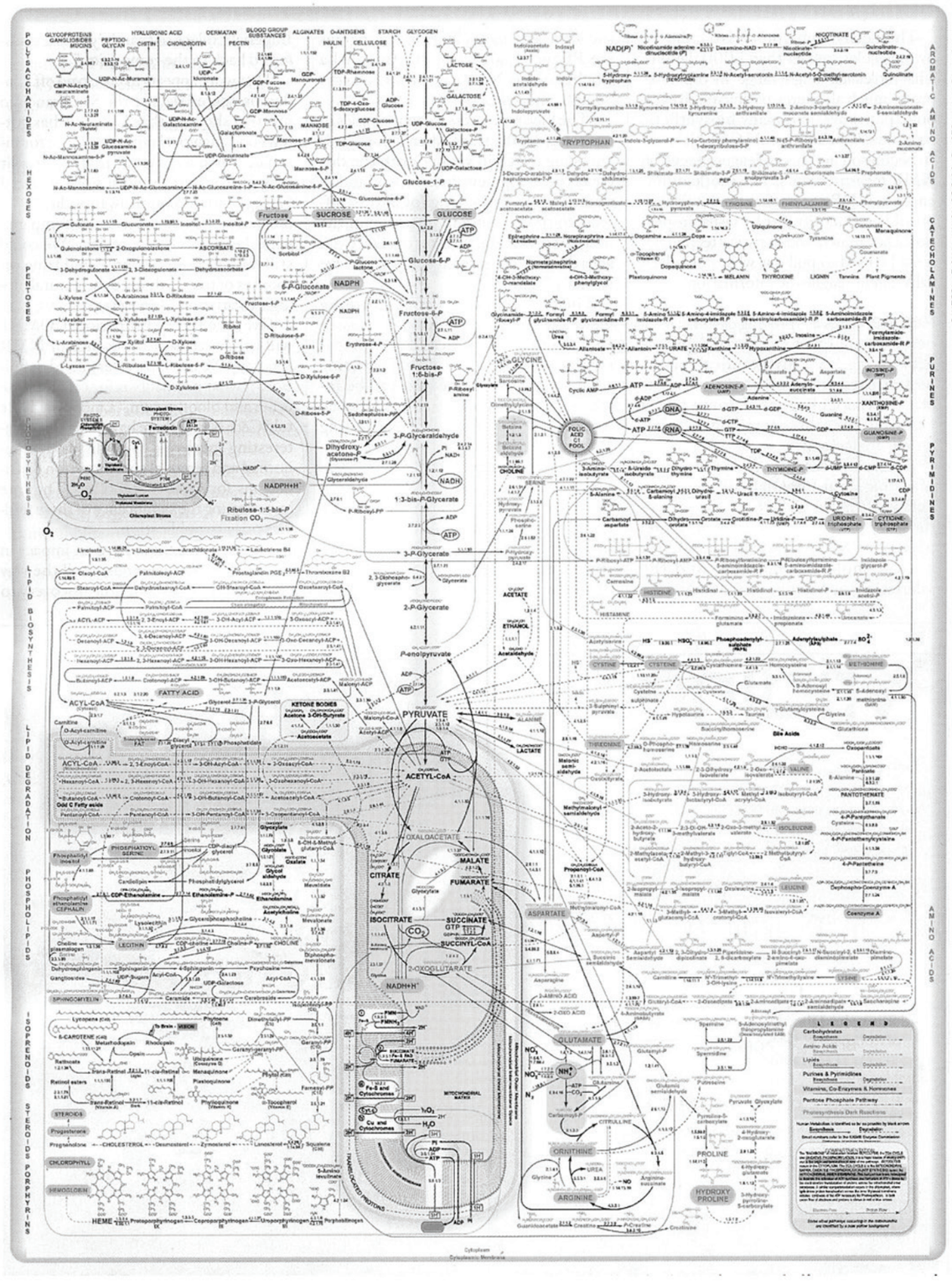


METABOLIC PATHWAYS

For, this theorist has devised a wholly New Miller's Experiment, but with many improvements, with a view to gradually determining what was going on within the sealed apparatus.

First, there had to be ways of sampling the contents within the apparatus, at particular points and at regular, timed intervals. And, needless-to-say, they would have to involve absolutely zero inwards additions to the sealed system. And, though this was impossible for Miller, it can certainly be done today.

Second, the various processes that Miller had planned for happening within his original apparatus, had, in this new version, to be limited to happening within carefully constructed, but un-affecting channels.

Initially, an optimised system would not be possible, for the sequence of processes and their simultaneity with others would not be known. But, by means of those channels, with the consequent experiences they delivered via a series of separate investigations, meant that the main apparatus would gradually be optimised to fit the actual natural processes as they occurred. Unlike the usual type of pluralist experiment, where the intention is always one of removing as many elements as possible, and rigorously controlling others, this holistic alternative would be very different, in that the objective would be to let the processes happen as naturally as possible, including them all occurring simultaneously with the others, without external selection and controls, yet happening in appropriate, and regularly measured, inactive channels.

To get anywhere at all, it would unavoidably involve a great number of redesigns of the first "channel". For if this were far from what would have occurred way back when, it would scupper the experiments intentions from the start.

So, rather than redesigning the whole system each time, the initial of many phases would be making the right changes for a fruitful and likely optimum First Phase to be achieved. Initially the following stages would be relatively unstructured, so the objective end-of-run test would be to get exactly what Miller had achieved, but via a much more revealing initial phase.

This would be a very different kind of experiment to the now standard pluralist methods, for, it would be attempting, in the end, to replicate what must have happened in the real Early Earth, but this time, because of the correct channelling, allowing the collection of detailed, time-based data in a correct sequence of Phases. Clearly, each channel would have to include the right substances for the processes to occur. And these, for all channels, after the first, would have to include products from prior channels, and deliver on, after the correct processes had occurred, all the necessary contents for the next channel and its phase of processes.

What would be the results would be time-based data for each and every channel and phase, so that finally a real history of the actual processes could be arrived at.

NOTE: It would, of course, be a cyclic process. So, the early reactions would be crucial, and, after a while, the cycle would no longer continue to be creative, and would settle into a relatively stable state. Also, the analyses of sampled substances, once taken from the main experiment, would be identified in completely separate pluralist experiments.

Clearly, a fully holistic version would be a very major undertaking, and absolutely nothing like the pluralist experiments that are universally carried out in Science at present.

As should now be evident, the form of this version would have to be such as to make the necessary processes occur in only their ideal channels: so that the final channel structure and its associated time and position based data set would be the real achievement of the experiment. Looking carefully at the results over time and over the length of each channel would suggest several important conclusions.

Clearly, new reactions couldn't occur until their required resources were available, so the sequencing of the appearance of new products would allow a well-founded sequencing to be established. And, in addition, this would enable a close-to-accurate estimate as to what substances would be available for the following channel. Of course, unlike a pluralist experiment, there would be several (or even many) processes occurring simultaneously, and the role of substances as catalysts and inhibitors would also slowly become evident too.

NOTE: Conceivably, the result could be a very different, time-based version of something like the *Map of Metabolic Pathways,* but of crucial, creative, early phases, which, after a host of other processes, finally produced Life.

Already, it can be seen that such experiments would follow a very different path of development and adjustment from a classic pluralist experiment, and changes would always be necessary – some small, but others quite radical, not only in the substances involved but in the required channelling. In addition a whole group of ancillary, supportive, analytic and testing, pluralist experiments would also be necessary to make the maximum sense out of the main experiment.

Finally, we can conceive of these simultaneous and sequenced processes affecting one another, until a balanced and self – maintaining system – A Stability, was achieved. And the processes by which this occurred would be inconceivable to a pluralist scientist. For the essence if that method is isolation and control imposed upon a natural form of multi-strand and mutually modifying overall system.

Very careful studying of results would be necessary, so that the correct modifications to the channels, and what was currently in them, might have to be re-designed very frequently. Even wrong turnings would be invaluable, because they would identify where the overall process could be halted, or even how alternative developments could have taken place.

Now, this surprising and extensive diversion has been necessary to establish the Holist methodology that would be essential in dealing with the suggested situation of a local sub system (such as a pair of mutually orbiting particles) existing within a paving of electromagnetically disturbable elements. For, even at the most simple level, we would have to explain the stabilities involved – both of the local sub system, and also of the effects upon the containing paving.

NOTE: Indeed, even that last statement isn't sufficient, because as soon as the paving itself is changed it would then, inevitably, react back onto the contained sub system. Clearly, such situations are recursive, and this suggests the ultimate arrival at some

sort of balance between the various effects: some persisting equilibrium.

As I did when applying these methods to the Double Slit Experiments, I had to explain both direct effects between a moving charged particle, and the paving through which it was "ploughing", and the subsequent dissociation of those effects by any attempts at measurement. I then had started with the crude analogy of a ship passing through water in a harbour, which though a long way from our situation, did allow several mutually interacting processes to be considered.

But, the crucial evidence, both in considering holistic situations in general, and the problem posed here, was greatly illuminated by Yves Couder's magnificent series of experiments, involving his "constructed" "walkers". For, this took an interesting set of causes/products involving both oscillations and resonances, but also crucially involving recursive feedback. What he was about to produce was a stable construct – his "walker", which acted like an entity in its own right, and also reflected certain classically inexplicable phenomena at the Sub Atomic Level – those crucially demonstrated in the famed Double Slit Experiments. What appeared to be possible with only a holistic approach was the achievement of stable entities with things as insubstantial as oscillations and orbitings.

Crucially, you had to take several processes together – NOT, I must emphasize, as mere additive components as in Pluralist Science, but as mutually affecting and modifying factors as in Yves Couder's experiments.

Postscript:

Clearly, to fully explain such phenomena, we have to enter the region of emergent qualitative changes that are the only means by which such remarkable results could occur. For the creation of such subsystems is wholly new, and can only occur in those special interludes of dissociation, when all prior inhibitory processes have been dismantled along with everything else in a prior stability. This hasn't been fully addressed here, but is available on SHAPE Journal in the Special Issue entitled *The Theory of Emergences*

A Critique of Margaret Morrison's Article on Maxwell's Model of the Ether

An example of "Fictitious Models"

By their very nature, all models in science have an inexact relationship with what they are attempting to represent - namely reality itself. Our criticism of the roles played by illustrative analogues must reflect what valuable content they actually contain and the profound contribution they have made to our understanding of reality. Such models are not only useful, but also informative, and are the only way to extract meaning from a difficult, and often confusing world.

Now, this work is not to affirm that all such models are always good, or that they will contain enough content for given purposes, or even the inverse, that they may be an uninformed and total fiction. Indeed, the commonest type of model in modern science, the so-called mathematical model, is a crucial example of where a model is based upon too limited a collection of relevant data. Such a model can in fact mislead us due to a complete absence of real, physical content alongside a recognised formal pattern. Today a mathematical formula is not only raised to the status of being a true model, but is often claimed to be the only kind of model that can be trusted.

As does Morrison, we begin with highly speculative hypotheses such as those in the study of sub-atomic physics. Focusing effort solely upon purely formal (quantitative) ideas leads to philosophical musing about certain equations and the difficulty of constructing any sort of analogistic model to explain such equations. Now reality itself is replaced by that of unquestioned purely formal elements alone.

The once universal ground of concrete reality has been increasingly replaced by an ever-growing trust in pure form alone. We have lost the causes and properties within reality and replaced them with quantitative relations – equations. These are merely a recognition of the diverse forms that are produced by something else.

Indeed, not only are such equations solely about form, they are only about idealised form. For example, none of the definitions that form the ground of any geometry are as reality is. Each and every one is an idealised version of what actually occurs there. They are the lowest common elements of formal description that can be constructed to give a malleable realm that enables certain aspects of what does occur to be dealt with easily and fruitfully.

We might even introduce the term Ideality, instead of reality, as a reflected world of pure form in which this geometry exists. Such idealisations enabled the removal of all non-formal elements, and concentration upon formal relations alone. A coherent and consistent system could be erected and used. However, clearly, nobody would say that such a system made reality the way it is.

On the contrary, reality allowed a perfect ground to reflect important formal features that could henceforth be used when it was only the formal things that were needed. Form causes absolutely nothing. It, itself, is the result of real physical causes, and the same forms can be produced by very different physical causes indeed, and in very different situations.

Historically, scientists used their extractions from reality in two different ways. The first was formally in pragmatic solutions to quantitative problems, and the second was physically, in suggesting what might be searched for as actual physical causes.

Unfortunately formal equations appear to have replaced all other models in modern sub-atomic physics. Margaret Morrison does recognise that analogical models have played a vital role in the history of science but she seems to ignore the grand retreat that followed the victory of the new mathematics-based physicists, over those, like Einstein, who always demanded a physical explanation of all phenomena as well as any formal, quantitative relations and equations.

After the Solvay Conference, purely formal models were not only given precedence, but they totally replaced the prior role of explanatory models in physics.

Morrison talks about theoretical speculation as being crucially important, but she does not address what that becomes, when applied to merely formal relations, as in current subatomic physics.

She then goes on to illustrate her point by taking the example of James Clerk Maxwell's explanatory model, on which he depended in deriving his famed electromagnetic equations. Such an important approach is very different from the purely formally-based speculations of today's "mathematical-theorists"

There is a world of difference between Maxwell's Model of the Ether, and String Theory, or the current idea of the Multiverse (based solely, of course, on what can be achieved with Form alone). To emphasize her errors, Morrison also mentions Higgs' Boson, and its avowed confirmation recently in the Large Hadron Collider. Yet she significantly fails to mention that such accelerators actually create particles in their supercharged interiors.

Using formal extractions as the sole reliable source - producing only formal equations and formal "theories", is not Science: it is Mathematics (an odd kind of Mathematics, I'll give you, but, nonetheless, just Mathematics). Consequently, the World that is therefore studied is not Reality, but an idealised World of Pure Form alone, call it Ideality.

Now we have to ask what is it that makes the intrinsically physical models, not only superior to Form-only equations, but also so resonant with their real World counterparts, so as to have revealed something significant about that Reality? Margaret Morrison does write about this, but asks, "How do we interpret

scientific models that incorporate idealised, abstract descriptions, which bear a resemblance to the physical and social World that we inhabit?" Thinking of Maxwell's Model, she also categorises it in the same way, for the fact is that the entities and processes that he includes in his model certainly do not exist as such in the real situation he was attempting to understand. However, there can be absolutely no doubt that what he actually derived was, and still is, a massive step forward on what it replaced.

We might ask, what was included within his artificial construction which enabled valid truths to have been, somehow, incorporated? Margaret Morrison mentions other models which are also far from being close to the physical thing they are supposed to represent, yet the models do indeed act as effective guides to our understanding. One particular model type is what might be termed the "legitimacy of the average", where although individual strands in a complex situation cannot be dealt with, overall averages can often lead to the situation being dealt with quite accurately. She mentions economic models which are of this type and, of course, the modelling of a gas can be created in this overall way.

We must ask why these kinds of models work so well? They often make assumptions that are far from the actual truth, but nevertheless prove to be useful to at least to a certain level of accuracy. Within these models the key components are always abstractions, which, though never existing in the complex system being modelled, are very useful, fruitful simplifications with the same crucial overall properties. [1]
Of course, the secret behind all of these fruitful models is the power of analogy.

Margaret Morrison emphasises that being able to correct and improve our models is their greatest virtue. However, though we do indeed do that, it is not the real reason for their efficacy. The experienced modeller draws upon rich experiences to conceive of something that, somehow, captures the crucial features of a situation in a model that can be handled better and easier than the real thing.

What is recognised in the artificial analogue is what might be termed common objective content, but it isn't the Truth. That would have to include absolutely every individual thing that is involved, as well as everything that is happening.
However, the analogue does have aspects, views or parts of the truths involved; which are common to a whole class of phenomena, represented by the same model.

The modelling process is by no means pedestrian, nor is it in any way cumulative. On the contrary, what occurs in the mind of the expert modeller is profound: they realise resonances in an instantaneous revelation.

The philosopher Hegel, in thinking about Thought, hit upon these crucial episodes, which he termed Emergences.[2]
In Thinking, these required a rich and wide experience of not only the given area itself, but also of Reality both in daily living, and in Science. What occurs is that most thinking is both limited and distorted by our unavoidable incorrect assumptions, and our inevitable purely pedestrian manipulations. We reach an impasse requiring a deep and destructive examination of our premises in order to transcend such a dead end. Such a process is the only one that can lead the modeller to an appropriate model. Planck's discovery of the quantum was such an emergence, for it contradicted the whole set of fundamental assumptions underlying electromagnetic energy, yet it was certainly superior in addressing many crucial problems.

Hegel also identified the inevitable, pedestrian result of an impasse in our conceptions. The result is always a pair of dichotomous conceptions – both of which are simultaneously effective in certain important situations, yet are, at the same time, totally mutually contradictory. He saw that such pairs of dichotomous conceptions are so evident in these impasses, that he recommended that their contradiction must never be merely ignored, so as to pragmatically use each where it was clearly appropriate, but on the contrary, to incessantly work on these opposites in an attempt to transcend to what was actually the cause of them both.[3]

Margaret Morrison does reject the word "fictional" for such models, but only by saying that they involve a process of creating an ideal abstract version of the systems, so that it is then easy to make them more mathematically tractable. However, in spite of also adding the focus on "properties of interest", it is really only a throw-away line, in that it isn't pursued rigorously, involving only a few mentioned examples.

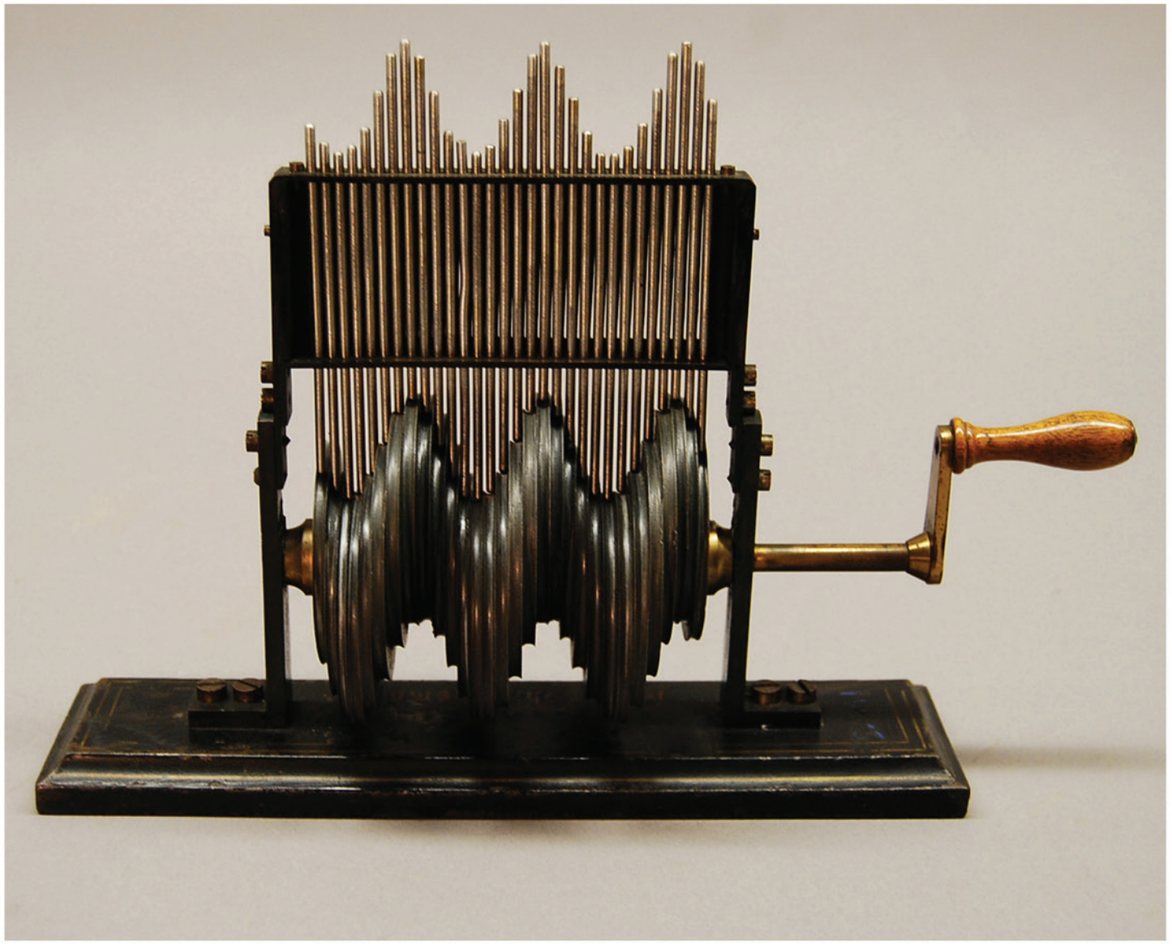
On the contrary, formal mathematical objectives which dominate in the key area of Sub Atomic Physics do clearly lead towards "fictional" ideas, indeed they lead towards unparalleled and irresponsible speculations. It all depends on how significant the extracted formal equations are considered. The very term "Law", when applied to such formulae, is almost endowing the equation with the driving essence, or cause, of the phenomenon. While the older tradition has always been to explain phenomena physically – that is in terms of components and their properties.

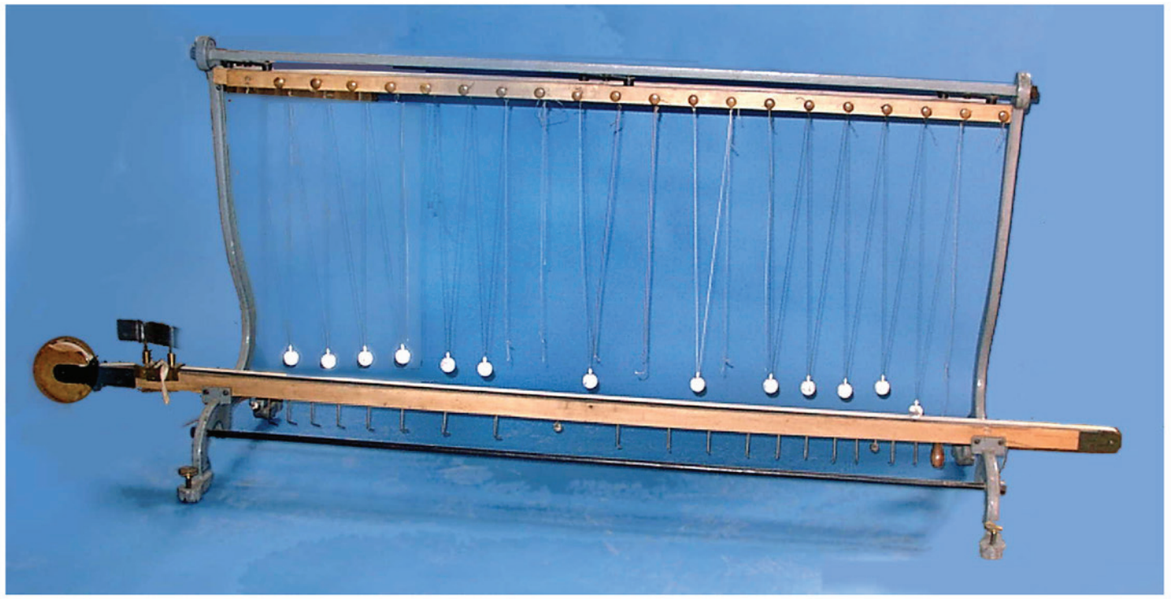
For example, Maxwell's effort involving vortices and electrical particles is NOT mathematical, but an attempt to mirror properties and phenomena *observed*.
He used what he knew from elsewhere, and attempted without preconceptions to construct an analogue, designed to be as close as possible in properties and processes to the real situation.

Modellers don't seek totally comprehensive representations. However, in using parts of other known phenomena they construct a model representing often simplified and idealised versions of the most important elements involved.

It has to be emphasized that, just as Hegel's Thinkers, constructors of analogical models do not know exactly what they are looking for. Describing Maxwell's effort must not wrongly indicate that he knew where he was going. On the contrary, in marshalling everything he thought might be relevant and using all the established assumptions he no doubt was swamped by contradictions before realising a new and more profound integration.

This process of modelling, being an example of what Hegel calls an emergence, is attempting to understand the intrinsic holistic nature of reality. An alternative primary technique is always to simplify a situation – so as to change a locality to more clearly display a glimpsed relation, and when such a construction of a domain is optimised and maintained, a particular and important element can be observed and even extracted, then quantitative measurements encapsulated into an equation!





19th Century Wave Machines

Fig: 2.

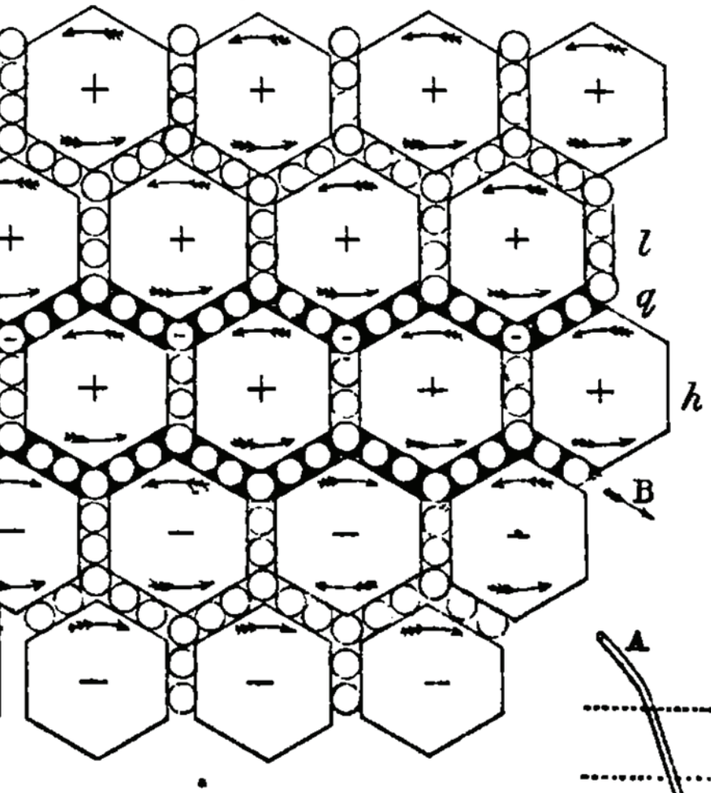


Fig: 3.

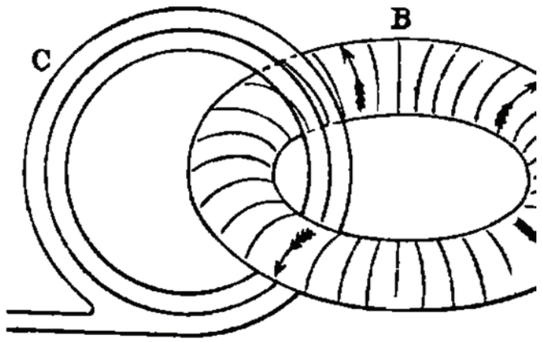


Fig. 6

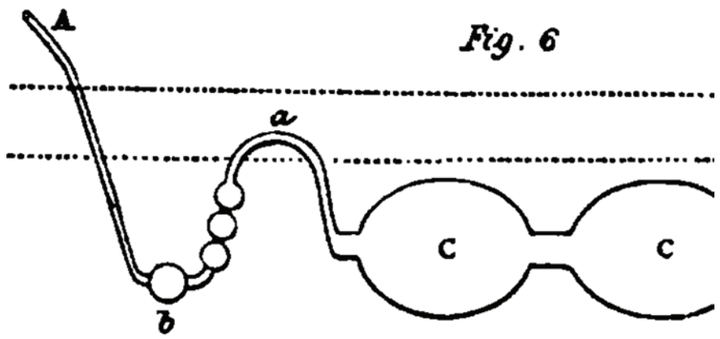


Fig: 7.

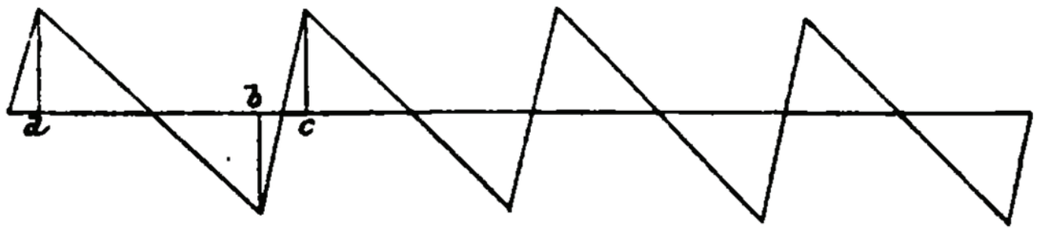
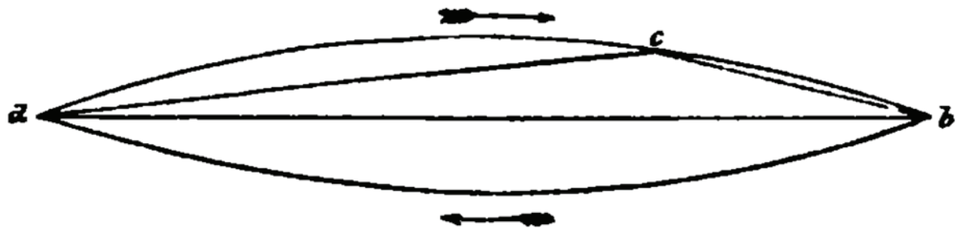


Fig: 8.

Fig: 9.



Hence, this common model-making method is entirely based upon what might be termed “farmed” areas, rather that attempting to deal with reality-as-is. Furthermore, the filtering and idealisation of such created factors naturally leads to an Idealised Formal Model.

Such methods assume the principle of plurality [4], and hence assume as legitimate the separability of all such factors in a given situation. Without the clear establishment of what our assumptions are, we will never understand both the dynamic, and the legitimacy, of modelling.

Margaret Morrison accepts the attempt to understand Reality via developing models but focuses more on how models can be pragmatically usable. Understanding ceases to be the major purpose of models, and effective use takes centre stage. The result being that physical and causal relationships within phenomena are less and less considered. Indeed, it is considered legitimate to select a particular model from an unrelated set in order to match a particular circumstance, provided it achieves a given outcome. Models such as these have a very different objective to a valid analogy.

Let us return to Margaret Morrison’s detailed description of James Clerk Maxwell’s model of a substrate – The Ether, through which electromagnetic radiation is propagated. It should be emphasized that the term “fictional” is wholly inappropriate when applied to Maxwell’s model. This model, which gave rise to important concepts and equations, appears on first inspection to be total fiction, but of course it isn’t. For more on this see the article A Model of Empty Space [5]

The modern day equivalent of Maxwell’s modelling is surely the French physicist Yves Couder’s experiment with silcon droplets. Using vibrations, resonances and recursion with a silicone liquid of various forms he created a persisting system of entities (his so-called “walkers”), with which he was able to display many of the particle/wave behaviours extracted from the Sub Atomic realm. No one but Couder would even have considered such an approach, but it revealed clear possibilities for a real understanding of the anomalies occurring at that level. For more on this see the article Yves Couder’s Experiments [6]

Crucially it was Michael Faraday who insisted that the seat of electromagnetic phenomena was in the spaces surrounding the “seemingly causal” wires and magnets that influenced Maxwell’s attempt to model what was actually going on.
Faraday was unhappy with disembodied Action-at-a-Distance, and Maxwell decided to attempt to construct a model of “Space” which could deliver all the known phenomena that seemed to be situated there and not elsewhere. He didn’t have any evidence of what might actually be in that seeming void, so he constructed the best analogue he could out of things he knew about. He therefore designed an Analogy (just as Couder does physically today).
Morrison is perfectly aware of the questions about the resultant equations that must be answered with regard to Maxwell’s method, but I don’t believe she answers them. She describes his thinking on tackling the problem, but doesn’t really say why it should reveal anything valid.

One thing she does say is that somehow Maxwell’s physical model mirrors the actual mathematical forms of that Reality. But why should they? And, if they did, what are the implications for the actual nature of so-called Empty Space?
Morrison’s argument is that mirroring purely formal relations via conceived-of “physical objects” was valid.

However, if Maxwell’s physical model is incorrect, we can’t just use the mathematical forms, we MUST also reveal the real physical nature of that Space, for it is that which Maxwell is definitely successfully representing in his model.

One vital feature of Maxwell’s reasoning was his interpretation of the elastic nature of his “vortices” in empty space. This meant that, for each movement or distortion, there would be a returning reaction.

This recursivity, in my opinion, is a cornerstone of his reasoning, and is a crucial reason why his model was appropriate. It meant that his Ether was a reacting, and also a causing, substrate that could both be affected by behaviours acting within it, and would react-back in response to such enforced changes.

My own modern-day model of Empty Space, involving quantum-carrying particles, has also allowed a significant solution of the famed Double Slit anomalies [7], without any recourse to the speculative inventions of Copenhagen-type idealism.

Morrison relates Maxwell’s idea that distortion in the Ether could cause tension to build up there, and that this might be identified with electrical charge. Although we might reject this, it is likely that a reactive Ether of some kind is indeed true, and the reason for the success of his informed, yet speculative model was precisely to do with this.

In the capacitor example it is clear that the gap between the plates isn’t empty, and things must be occurring there for the capacitor to store “charge”.
Morrison, in the modern way, identifies these things with “a displacement term” in the formulae, but what moved Maxwell was the nature of what was actually going on, physically, in the gap.

Clearly, in a scientific explanation of what Maxwell was really dealing with, we would have to have a comprehensive explanation of the true re-active nature of so-called Empty Space, and Maxwell’s conceptions (because they delivered so much) must be the starting point.
Obviously, in a critique of an article on “fictitious” models, this cannot be comprehensively carried out here, but successes by this theorist, and by Yves Couder, in his construction of valuable, physical analogues, the task is already underway.

Morrison seems to also endow Maxwell’s model with something important, but she does not call the content that he puts into his model, as I certainly do - Objective Content, or in more everyday language as a legitimate analogy.

She mentions other “analogies” that have proved similarly useful, but her categorising sounds more like a revealed trick, than the revelation of real, if partial, analogous Content.

Though she does realise the importance of these “fictitious” models, she also does not, as she surely must, concentrate her attention on how and why Mankind extracts so much out of these precious comparisons.

Sadly, Morrison ends up stating that the real answers reside in "How Mathematics relates to the World", which, along with the majority in Modern Science, gives altogether too much weight to mere Form, and wholly insufficient attention to Content, and its necessary method – *Analogy*!

NOTE: This is the second in a series of three Issues of SHAPE Journal dedicated to Analogistic Models.

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