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THE LOGIC OF CHANGE

CHAOS OR DOMINANCE / DYNAMICS OF CHANGE / FIGURE AND GROUND / DIALECTICAL REASONING / TRANSCENDING DICHOTOMY / HOFSTADTER AND ANALOGY

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Introduction
The Logic of Change

Welcome to Issue 33 of the **SHAPE Journal**.

This short set of papers by no means comprises a definitive statement of the Modern Logic of Change that it purports to deal with. They arose as a separated series of brief explanatory contributions to various different research areas, and hence, in their intended contexts both assumed that context, and in addition each had a fairly limited remit as to their objectives.

Nevertheless, on inspection of these clearly-philosophical contributions, it became clear that they could indeed be put together as a brief, if varied, introduction to what is evidently becoming an extremely valuable approach to Developmental Change.

Though there are some references to other areas of study, I have modified the parts that would be meaningless outside of the context for which they were originally produced. Therefore, hopefully, these essays will indicate the path that is currently being constructed – a Holist approach to Science with an appropriate and useable methodology.

Jim Schofield Jan 2014

The Dynamics of Change
Evolution of Reality

The whole point about a Logic of Change compared with Formal Logic, is that though the latter is incomparable when dealing with things that qualitatively remain the same, it is useless in revealing the trajectory of things that do indeed develop into something else. So, the former is less like playing chess, and more like the development of a Living thing.

For, as soon as "A = A" can, and indeed, must, be transcended, and something more like "A into B into C into D…" occurs, then the crucial things to be addressed have to be the Transitions.

NOTE: In the usual Formal Logic approach within say a science like Physics, for example, as soon as such a situation is detected where such a transition occurs, the current, "physical" form of investigation is immediately terminated! The phenomenon is then usually exported into a quite separate science, such as Biology. The actual transitions, themselves, are never addressed, simply because they are impossible using the agreed logical techniques, predicated upon Subject assumptions.

And merely describing the transitions as named interludes, is certainly no kind of Logic, for that would require some kind of explanation as to why the transformation took place.

Indeed, the heart of any new, required form of Logic must be deeper than a mere sequencing of named Phases: it must explain each one as it actually arises, with causes and their playing out.

Now, in Formal Logic, none of this was ever necessary as "A = A = A = A…" was a basic and necessary assumption, so no changes of nature could ever be involved. Indeed, anyone found re-stating "A as B" would be guilty of a contradiction, and any conclusions drawn would be condemned as invalid! So, actually embracing such transitions is clearly in a very different "World" from Formal Logic.

Indeed, one of the most lauded achievements of Formal Logic displays not only its undoubted strengths, but also its insurmountable weaknesses. And that example is, of course, Euclidian Geometry.

For this involves the most elaborate and surprisingly useful features developed within that system, and include methods of proving geometrical theorems, and ending each with the final Q.E.D. - relating an "Absolute Truth" so delivered. But, of course, such a system is NOT a truth of this World! It considers only a simplified, or even "purified" set of premises, and because they always extract only ideal, indeed wholly abstract, forms from Reality by a rigorous and reforming process of selection, they invariably limit what they can do in the Real World that we inhabit. Indeed, I am always insistent that such a system, being composed of ONLY completely pure forms and nothing else is therefore about an abstract man-devised world, which we call Ideality.

In contrast, the all-inclusive Reality that is our actual, concrete World consists of a great deal more than these abstractions. They are the thinnest gruel when it comes to causality and explanation. For they at best only describe common analogistic, abstract forms, which by their evident multiple applications in unrelated areas reveal conclusively that they can explain nothing.

Now, because the touchstone for defining the limits of Formal Logic are these described transitions, it would be easy to say that Reality includes Time, whereas Ideality does not: one is dynamic, whereas the other is static. But that would be Untrue!

For, even Time can be given the same treatment to allow its entry into Ideality. For, we can certainly assume that Time doesn't change into something else. So, for such a "measureable", we can turn it into an unchanging background reference, a purely quantitative Time, and, therefore, it can be included into our Ideal World without any trouble at all.

No, it isn't mere Time that we must include in Reality, but Qualitative Change with Time by various causes: the difference is considerable!

For, in that perfectly handle-able Ideal World, we can change Time quantitatively without any difficulty at all, and without "breaking the Rules" of that World of Pure Form alone.

What we can never do in that serene and ideal parallel World (of our own making, do not forget) is consider qualitative changes and exactly how they come to convert one Phase into another. For, purely quantitative changes involve only the amount, and never the nature of the thing being measured: that is always fixed and unchanging. Clearly, in many interludes, such an assumption will be close to the truth, though always approximately and temporarily – a good and useful approximation.

But it certainly is never the Absolute Truth. (Except, of course, in Ideality, where it is exactly that!)

So, we must re-calibrate our thinking for the true nature of Reality, which at many levels, and over many different scales is always on the move qualitatively. Indeed, therefore, among the first things to extract from Reality are explanations as to why we can "get away with" assuming Ideality in so many cases. Why do our idealised relations hold, or at least seem to do so? To get any sort of hold on this important feature we must tackle first the tempo and trajectory of change as it invariably proceeds. For, instead of some sort of constant and evident qualitative change, we instead have long periods of Stability – systems in which abundant small changes do NOT compromise its overall nature – they are effectively constrained or balanced to maintain the same overall state of the system as a whole.

But, such periods are never permanent: they are always finite and end up in a rapid dissolution of the current stability, first, into something similar to Chaos, but then turning things right around via an ascending series of states, to finally produce a new and very different Stability. These interludes are of a relatively short duration, and are termed Emergences.

Now, exactly what happens in such an Emergence is crucial, has already been partially revealed, and will be dealt with later. But, at this early stage in addressing Real Change, we must also consider the more evident form we call Dominance. But, to understand all these aspects, we must start by establishing a new kind of basic assumption. WE must be holist rather than pluralist.

Let us contrast these two alternatives (though fairly briefly at this early stage).

Plurality, as the basic assumption of most of Science, for example, assumes that the World is governed, and even driven, by many, many Natural Laws, which do not change: they are eternal. And all phenomena are produced by the actions of these laws in various mixes or proportions. The task of the scientist is clearly to isolate and extract these Laws, one at a time, and then, by various means, use them to predict and to produce.

Holism, on the other hand, condemns such principles as invalid. No *eternal* Laws exist! There are complexes of mutually-affecting components, which are certainly not mere summations of basic primary factors. The crucial point is that the techniques based upon Pluralism, assume unmodified laws adding together, whereas Holism insists that all results are due to complexes of mutually modifying tendencies, NOT fixed laws.

NOTE: These points are not easy to differentiate, mainly because we never question either Analysis into a set of fixed components, or Synthesis into combined effects. It is the normal, universal way of seeing such things. But, once "everything affects everything else" is brought in, it is difficult to talk about individual contributions. We can only say that every glimpsed relation is always the end product of all of the modifications, and NOT the mere sum of eternal laws.

Now, in the Buddha's original idea, the analysis of anything (the essence of a pluralistic standpoint) is actually impossible. You can neither separate a phenomenon from its ground, nor separate out individual law determined components. Everything is produced by everything involved, NOT as components, but as an ever-changing skein of mutually affecting tendencies. Indeed, all that can be extracted are not low-level components, but high level, system-type regularities.

Basically qualities are not bottom-up, but more like top-down. It is more like resultant trajectories produced from an infinite set of possibilities.

Modern Holism is not so all-encompassing, all-of-the-time. It recognises patterns of change and principally attempts to discern dominances when they occur, recognise phases when they are evident, and constantly attempt to explain them all.

So, having clarified what a current holist basis is, we can now address Dominances.

In spite of the "everything affects everything" principle, they are most certainly not all equal in weight.

If you think about it, that is a consequent assumption of pluralist thinking, because it sees all the contributions as separate. They just aren't separate: they are integrated from the start and throughout, and everything is changing all the time. Clearly if we need, conceptually, to think in terms of contributions, we must also insist that they will most certainly be of different weights! (It isn't the Absolute Truth as yet, but it is an advance upon the assumptions of Plurality).

Indeed, elsewhere, in the Theory of Truly Natural Selection, which is the general, applied-anywhere version of Darwin's form, applied only to the evolution of living things, it became clear that even non-living processes can also compete! With chemical processes, for example, each will both require resources, and generate products. So, in a complex melee of different processes one may well require some of the very same resources as another. And the efficacy with which one process out-competes its rival processes for the same resources, will depend upon both conditions and context,

Indeed, that theory considered both mutually-conducive sets of processes and mutually-contending sets - the former being advantageously-linked via products and resources –

with the product of one becoming the essential resource of another - So consequently, in the right circumstances, forming highly advantageous sequences, and even cycles of processes.

NOTE: such ideas when applied to Miller's Experiment, by using the usual pluralist thinking, could not be explained, made the final production of amino acids in such a small period of time inconceivable. What was really happening in that "unknowable" black box, were just such systems of processes, both happening simultaneously and then sequentially in multiple forms, within an environment actually self-transformed by its own resident processes.

In such circumstances, Dominances will be inevitable, and by a kind of positive feedback, these will come to determine the overall state of a local, even totally-contained context.

Now, if such a locality was totally isolated, and its physical conditions were totally unchanging, then Dominances may appear to be permanent. But, in the longer run, such is never the case. And the current dominances will either subside or even totally crash!

Either way the seemingly permanent dominances will end: the seemingly eternal Natural Laws will vanish!

Of course, such trajectories can happen at many levels in a hierarchy, and when the occurrence is cataclysmic and at a higher level, it has become an Emergence, and has a complex trajectory of its own.

Now, such events are not usually observed by Mankind, at the unavoidable tempo of their lives, and the individuals' durations of existence. But, they also happen in Society, in what are termed Revolutions, and as these have been greatly studied by significant historians, such as Michelet, some idea of their trajectories has been revealed, and can be developed to guide the application at many different levels by the use of analogy, at the very least.

Chaos or Dominance?
Forms of Order in a Holistic World

As soon as Science abandons Plurality, Analysis and Reductionism as the major planks of its methodology in investigating Reality, it (and ourselves) are presented with an extremely meagre and alien set of alternative methods,

For in assuming the alternative Holist view – that "Everything affects everything else!", means that those usually reliable methods are invalid and misleading, and, therefore, not available, and we have to consider scenarios, in which many different, maybe mutually conducive, or directly antagonistic, and finally even fairly minimally involved factors, together make up the true contents of our area of study, and hence will NOT merely sum to give an overall effect, but actually modify one another, and perhaps coalesce into several completely separate, yet locally general effects, all happening simultaneously. Clearly, such situations will be very different to cope with when compared with our usually extensively farmed and constrained experimental set ups as in the standard pluralist approach.

And, a very wide range of general, resulting systems will be possible.

The most obvious, and regularly assumed (even in pluralist Science) is that in which the multiple factors are so many and so diverse, that they together, more or less cancel out, and we usually dub such a scenario as being "Totally Randomised". Of course, that doesn't usually mean that every single measurable is "zeroed". For with a gas, for example, though the individual particle movements will be roughly equally shared between all possible directions, that, in itself, would result in an even pressure on all containing surfaces, and also that we can allocate an overall temperature to the gas, reflecting a predictable contained energy averaged across the whole producing population.

But, such is certainly an extreme case, and is by no means the commonest outcome possible, for it does require very easily mixed and uniform content to arrive at such a condition.

The exact opposite extreme might well be the dominance of a single system of related (indeed integrated) processes, delivering what appears to be a single law. While between these two extremes would likely be a range of situations involving several separate and different dominant sub-systems, which coexist, though the balance between them may well vary sufficiently to deliver only glimpses of one or another of the various dominant systems comprising the overall mix at any particular moment.

This description of the various possibilities shows why, and even how, Plurality was a possible first line of attack in investigating, and then using, some situations in Reality with a very different set of assumptions. For, in certain cases, those assumptions would deliver a close match to the actual situations being investigated. The two extreme cases of Totally Random mixes and a major single dominance are the most obvious examples, that would fit reasonably well with such an approximation.

And the most able users of such methods were even able to manipulate the unfavourable cases in between, by careful isolation, selection, removals and rigid controls of what became known as a standard experimental set up, or appropriately "farmed" Domains, to tailor them to very closely conform to the usual pluralist assumptions.

These pluralist, "farming" techniques have two important features. First, it allowed laws to be extracted from those tightly organised Domains, and secondly, it also allowed those laws to be successfully used to some intended purpose, as long as the applications were confined to the appropriate Domain (i.e. that from which the law was originally extracted).

But also, and perhaps most importantly, it totally distorted any consequent understanding of what would actually be occurring in totally unfettered Reality. The use of particular laws in highly constrained circumstances, did NOT equip us to deal conceptually with processes in Reality-as-is, nor in any way at all with periods of significant qualitative change.

The development of Understanding was sacrificed upon the altar of Pragmatic Use!

So, that compromise methodology, while delivering both prediction and production, did NOT deliver adequate explanation. Indeed, its founding principle – that of Plurality, involved the key assumption that relations extracted from highly farmed and controlled Domains, were the EXACTLY SAME as pertained in totally unfettered Reality. And, that is simply untrue!

And such an assumption allowed theoreticians to explain Reality through a series of Levels, with the conditions required at one Level causing the results at the next Level up. And, clearly, when seen the other way round, in explanations, allowed a downwards series of causes all the way down to some final fundamental particles and their eternal laws to deliver the final phenomena seen and

measured at an accessible place many, many Levels higher. It led to the assumption of Reductionism.

Now, no-one was able to trace this from bottom to top: it was an assumption, but it too was predicated upon the mistaken Principle of Plurality, because the latter allowed the SAME relations to pertain, wherever they occurred, and this meant the experimenters could vastly alter their necessary Domains at each Level: it didn't matter because the relations were "unaffected by context".

Indeed, not only were these assumption underlying Reductionism incorrect, but it changed what these scientists were doing to become ever closer to what mathematicians do with found relations.

For, the mathematicians really did not deal with concrete Reality at all. All their relations were as close as possible to totally Perfect Abstract Forms.

The physicists may have arranged for their extraction by Domain farming, but they were also removing the found relations from concrete Reality-as-is, into its most abstract, pure Form. They were making each any everyone eternal: just as the mathematicians not only liked it, but actually insisted upon it.

The relationship between these scientists and mathematicians grew ever closer, and with this came an abandonment of materialism and causes, for idealism and eternal natural laws. And consequently, the whole emphasis became that these laws actually made Reality conform. Concrete behaviour was put down to disembodied, totally abstract laws driving it to behave as it does.

The relationship between scientists and mathematicians grew ever closer, and with this came an abandonment of materialism for idealism. For, the whole emphasis became that the extracted laws were the "true essences" of Reality – its Natural Driving Laws, making Reality conform, and producing the effects that had been observed. To put concrete behaviour down to disembodied, abstract and purely formal relations is, of course, Idealism.

Now, once the above revelations are accepted, the whole approach of Pluralist Science becomes a pragmatic, useful "frig", and certainly NOT an explanation of any sort, and such a belief as these scientists inevitably sends then careering into the open, idealist arms of the mathematicians, and hence leading any attempts at real causal explanations astray.

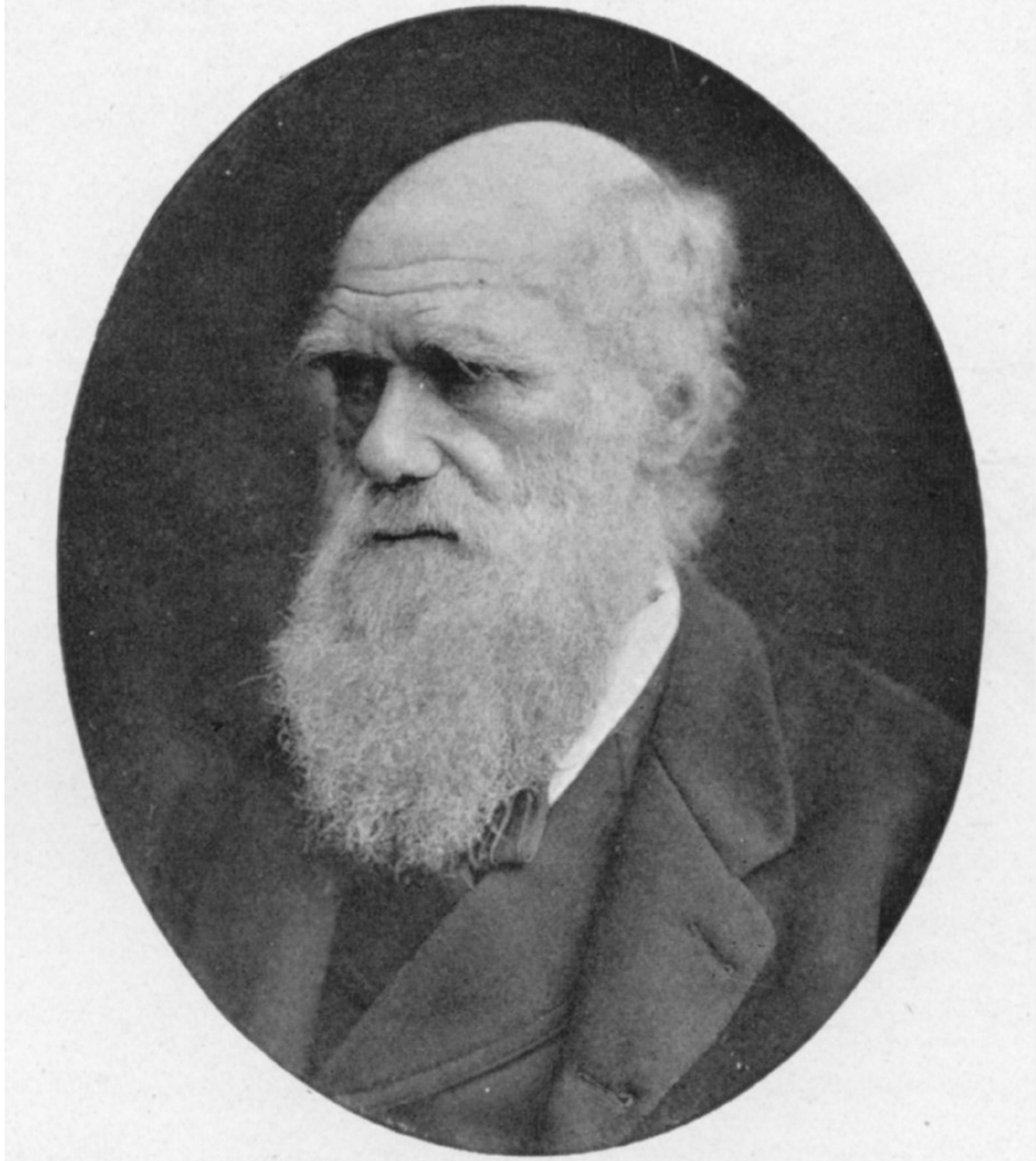
The standard, "farmed" Domain approach becomes suspect and it becomes necessary to at least reinterpret what those types of experiment yield, or perhaps devise whole new methods designed principally to allow explanations to be developed, tested and improved or replaced.

The question has to be "How can this be done?"

And, perhaps surprisingly, several of the World's greatest scientists have already carried out significant holistic investigations, which have already transformed Science.

Try to put Darwin's Origin of Species into the pluralist camp.

You will fail!



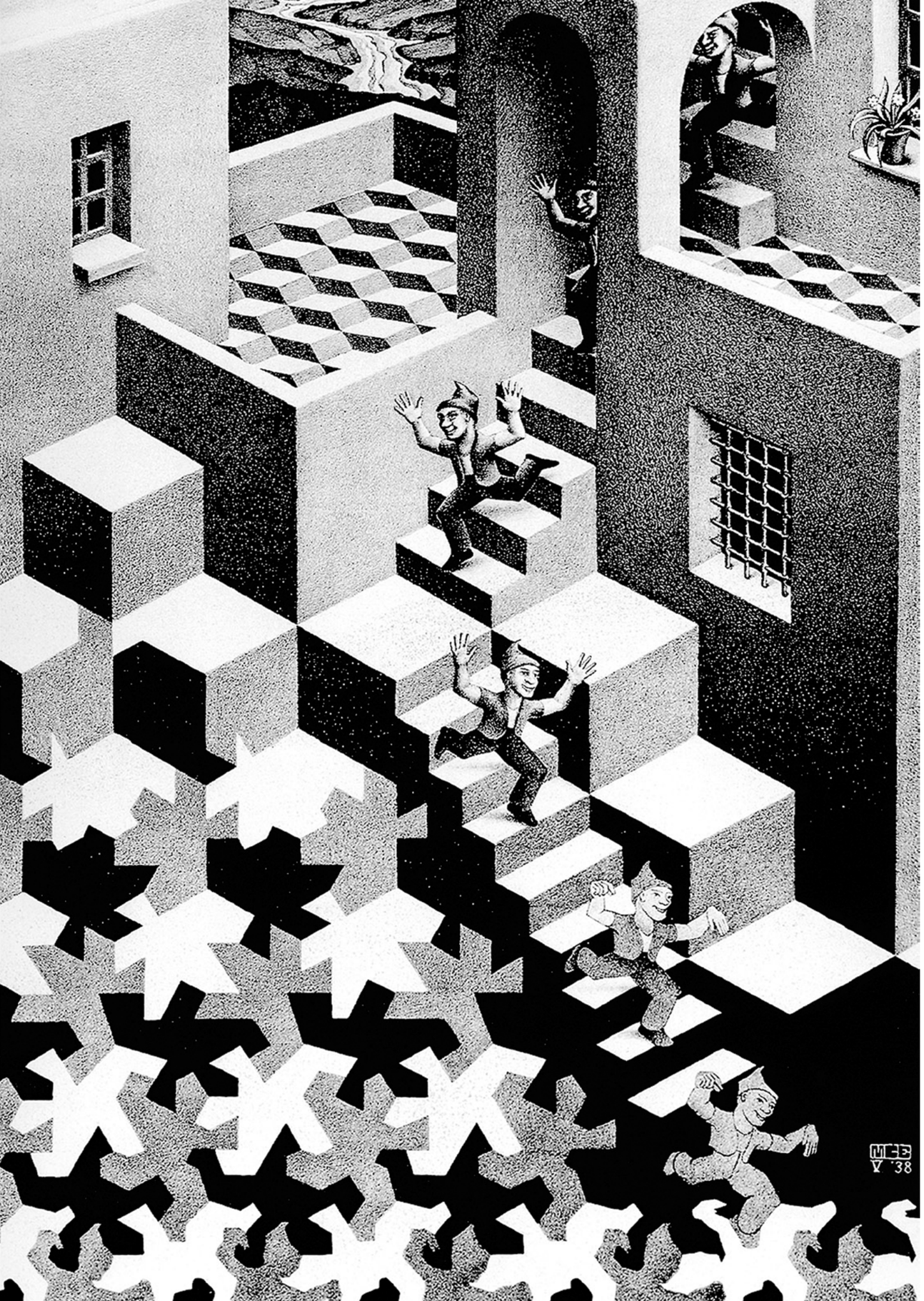


Figure and Ground
The Dangers of Simplification

We have learned that the most productive approach is to avoid confusing complexity, and, instead, work to simplify situations as far as we possibly can. So, we select & isolate situations, attempting to leave only what we are seeking: we simplify first conceptually, and then concretely until we have both a revealing and amenable Domain - ideally conducive to our further studies.

By now, we are, without doubt, the masters of such isolating and constraining of phenomena in such a way as to "completely reveal" their supposedly "Key Relations".

It has, indeed, become the fundamental approach for all our experimental set-ups, and, therefore, produces not what we think we have revealed – Fundamental and Universal Laws, but, on the contrary, specific and limited relations locked fast into the specially arranged, conducive situations we have erected.

Thus, our "Truths" are always fragments – particulars or aspects. And so, though we crave overarching and universal laws, we never actually get them. We get a multiplicity of particular laws-plus-their-contexts. So, with many complex areas, this fragmentation is multiplied even more.

Yet, before this revelation gets too depressing, it has to be emphasized that we certainly know how to use what we currently extract. Our methods have been very successful, for we know precisely where to apply our "partial truths" – in the appropriately constrained situations that we constructed to get them!

As long as these correct contexts are accurately constructed, we do indeed have places where our laws work: we can predict, and hence also produce!

Our methods equip us for production, but also inevitably disarm our ability to explain why things are the way that they are, and behave in the way that they do, when left to themselves!

We are very adept technologists, but not scientists (though we think that we are), and, most certainly, are nowhere near being even competent philosophers.

Now, the pragmatists will dismiss any such criticisms of both their method and standpoint, because their purposes are in no way compromised by the inadequacies of their approach.

Continuing "Progress" still appears to be continuously assured. But, of course, without the essential development of understanding as well as pragmatic use, what we get can only be an aberrant growth.

It is really a maximal exploitation of a partial truth, rather than a step on the path to an ever wider and deeper understanding of our world. [Like the young man who built me a working Amplifier, but could not tell me why it worked, or what the various components were actually doing: neither could he use what he had to design something new].

Indeed, if the stream of scientific explanations ceased forthwith, technology (as with my young electrical constructor) would etiolate and die, like a pea shoot without sustenance. Science is the source and lifeblood of technological progress, and much more important, it is also our only means to understand the world.

Now, considering a problem like Fields in Empty Space, for example, the difficulty is that our isolating and simplifying also walls us off from what we are trying to understand. For such things are not appropriate to such methods: Such Fields are certainly NOT isolatable phenomena! Why can I say this? It is because the "Figure" and the "Ground" in such situations are not only inseparable, but also actually mutually defining and determining! We simply cannot separate them without destroying what they are. For example, is a Field actually erected by its "causing" charge, or is it actually a response of the Background to the presence of that charge?

We usually assume that our Grounds are always totally inert – mere formal references, whereas the holist suggestions outlined above change all of that! The two always have a reciprocal relationship, and often an evolutionary one too.

Now, rather than halting the conclusions here, and arguing whether these assertions fit all cases or not, let us first concede Dominance. Though the philosophical basis for the ideas being explained here constitute Holism, they are NOT the same as that early version espoused by The Buddha, though it is still very much closer to his position, than it is to that of the sub atomic physicists of today. It does, in contrast, admit that things are not all of equal weight, and in many situations, particular relations can dominate to such a major extent that they can be fairly easily isolated, extracted an then used in the pluralist sense described above as the usual scientific experimental practice.

But, “Exceptions always make Bad Law”, and Dominance is not triumphant either everywhere, or permanently.

It is a surface effect, upon a holistic World, where literally everything does indeed affect everything else, and in many crucial areas we have to deal with not only Systems of Processes, but also hierarchies of such Systems too.

A great deal is always going on simultaneously, and our Simplifying, Isolating and Constraining in order to extract any usable order does indeed change the overall situations that we are attempting to understand. The classic, impossible-to-handle example is, of course, the Weather, but there are many cases where such situations also defy Analysis by our usual pluralistic means.

My favourite is Miller’s Experiment, wherein he attempted to make an emulation of the conditions upon the primitive Earth – before Life had emerged, in the hope that he could reveal something of the developments leading to that revolutionary Origin of Life.

Sealing “everything necessary” in a glass containing-system, and adding heat and electrical discharges (as lightning), he set the system in motion, which was as near as he could get to the actual primaeval Weather System, in order to see what might occur. As we all know, after only one week, the water in his system had already turned a deep reddy-brown, and on dismantling of the system, he was able to show that amino acids had somehow been synthesized. But, as to how this had happened, there was no way that he could confirm the processes involved.

The absolutely essential isolation from any present-day contributions, also prohibited any time-based Analysis, and most certainly, many different strands of changes must have been happening throughout that momentous week, both as parallel simultaneous processes, and as parts of crucial ongoing and changing sequences. So, without any possibility of intervention, NO further explanations were possible.

This is, and always has been, the classic dilemma of investigating a Holist World using the only available methods - pluralist science could get nowhere in such investigations. They seemed to be Unknowable. And in spite of the undoubted success of Miller’s Experiment, it was also the “end-of-the-line” in most scientists’ eyes. Pluralist science offered a great deal more and it was there that ALL the research was concentrated.

So, these inevitable cul de sacs in attempts to develop a Holist Science did dissuade anyone else from embarking on such a seemingly doomed-to-failure route.

Yet, it would be wrong to consign this approach to the dustbin just yet.

Darwin’s Origin of Species was a masterpiece of Holist Science, and other major holist contributions have also been made. But, the philosophical ground, and necessary methodology for a general holistic, yet scientific approach, has still not yet been defined. It still awaits a generally applicable methodology!

Now, this author has attempted to apply such a method to the infamous Double Slit Experiments, beloved of the currently dominant Copenhagen School in Sub Atomic Physics, and he was finally able to explain all the anomalies involved, without any recourse to Wave/Particle Duality or the probabilistic formulae of the Copenhagenists.

So, with this demonstration the Copenhagen View was proved to be NOT the only possible approach, and he has since embarked upon a particular area of Physics, which has long annoyed him. It is, of course, Action-at-a-Distance, the propagation of electromagnetic radiation through totally Empty Space, and, of course, the “daddy-of-them-all” FIELDS!

So, let us assume the very worst!

Let us say that our “Figure” is really composed of multifarious and mutually determining processes, while our “Ground” is not only very similar in its diverse content, but also both determines the behaviours of the contents of our supposed “Figure”, and is, in turn, modified by them.

Now, here is surely a suitably messy situation to attempt to make sense of. How might we do it?

Well, we do have a vast set of pluralist techniques, that though compromised conceptually, do give us “something”; and what we get is never merely pure invention, it always contains some aspects or fragments of the Truth. So, as long as we don’t wander off down the usual road, we can use these gains in a different way.

Though all gains made by such methods are always predicated upon restricted and maintained Domains, they do include an important measure of what is called Objective Content. So, rather than careering off down the pragmatic sweet, downhill road to Production, we should gather as many closely related sets of pluralist Results as possible, and attempt to make some sort of conceptual integration out of them instead.

And, with such a change of philosophy and of methodology things can change profoundly.

We now consider all the skewed, pluralistic evidence, knowing that it has been extensively processed, and hence treating much of what we have with a measure of scepticism, and instead, attempting to formulate a common explanation, that would, in each biased pluralist set up, produce what has been extracted, but would integrate all cases into a single explanation. Now, at this point we must address the universally applied frig that is the traditional answer to their “sets of pluralistic results”

That frig is the belief that each pluralistically obtained relation (a Law) is in fact the actual Truth for those factors, and if we simply add all such obtained Truths together, totally unmodified, we will get True Reality.

It replaces the true inter-relating integrations with crude Complication. The various Laws are summed to reconstruct what really happens.

NO THEY DON’T!

What has to be done is to attempt to merge the individual isolations into a functional and integrated whole. That is much more difficult, but is essential!

NOTE: The alternative to the Copenhagen explanations of the Double Slit Experiments that was my own holist alternatives were amazingly different in every possible way. And though the Copenhagenists could immediately motor off with their probability equations, they also brought understanding to a dead halt. Whereas, the holistic explanation have opened up theoretical prospects not only in these areas, but generally!

The Logic of Development
When Qualitative Change is properly addressed

After many years of trying (and usually failing), I feel that I may have, in the last short period, finally breeched the barriers to making some real contributions to the Logic of Change.

For usually, the really debilitating restrictions have emanated from the “iron rules” of traditional Formal Logic, and its forms of reasoning, but, in addition, they have also come from my own lack of understanding of any holistic alternatives, so that I, finally, consider myself to be in a position to make real and additional contributions.

Indeed, what seems to be emerging is something very similar to Hegel’s life-long objective of a true Logic of Change – considering things in transition and development, of which Formal Logic was never able to deliver anything of real value. Indeed, Hegel termed this wholly new projected system of Logic “The Science of Logic”, and expected it to transform the way we deal with qualitative changes of all significant types.

But, as with all truly profound and important achievements of Mankind, Formal Logic is, quite rightly, very difficult to merely dump, or even to push to one side. It towers over all our thinking, like an immoveable monolith to True Reason, and nothing but a vastly superior alternative and comprehensive system could ever remove it from that position.

It still is,always will be, an amazingly powerful means of exposing flawed arguments.

But, nevertheless, it is not appropriate to dealing with developmental change, and when used in that area, all sorts of incorrect assumptions and models are foisted misleadingly upon such an area in which lierally everything that is wholly new is forged.

So, what is required is something that is full of the dynamics of change – the trajectories of development, and its important qualitative transformations. For such is, by now, long overdue.

Indeed, the major weaknesses of Formal Logic were correctly revealed by Hegel some 200 years ago, and his contribution seemed to promise a general turn by philosophers to addressing the problems that he identified and described so well. And, to begin with, the disciples of this great philosopher seemed well up for the task.

The Young Hegelians, who were ably led by Karl Marx and Frederick Engels, immediately inverted Hegel’s Idealist standpoint, and redefined his contributions in terms of a Materialist position. They turned Hegel on his head, or rather, on his feet!

But, their whole approach was causing significant opposition in the corridors of Academia. For these philosophers of a wholly new type had openly turned their backs upon all Academic Philosophy (as dealt with in Universities), and instead began to apply Hegel’s (now materialist) Dialectic to Society, to History, and to Politics. And the particular kind of Politics pursued was the “most reprehensible of all” – Revolutionary, pro-Working Class politics. Needless to say, this did not enamour them, or their ideas, to the incumbent and in-charge classes, or their theorists and apologists in the Universities.

In spite of the laudable philosophical objective of their standpoint, it immediately became anathema to Philosophy Departments in Universities worldwide; for they certainly knew which side their bread was buttered on!

Yet, the New Philosophers, without any sort of intellectual penumbra, were not only on their own, but committed on principle, to working with a largely uneducated Working Class, and in that difficult context, of not only continuing to fulfil Hegel’s legacy in philosophy, but also having to construct a conscious, and theoretically–equipped cadre, to intervene in the revolutionary upheavals that they knew were inevitable, and occurring with increasing regularity.

In fact, the task was too large, and the group of cooperating philosophers much too few, to be able to carry the objective to a final conclusion. And, in spite of the contributions of the best of the Russian revolutionaries, it has to be said that still, to this day, the basic problem of a comprehensive set of methods have certainly not yet been delivered.

What was certainly missing was a whole expanse of what could be grouped under the heading of The Sciences. Hegel, Marx and Engels were primarily philosophers, as were many of their original co-thinkers, and though Hegel had been insistent that Science was essential in delivering his avowed objective, it isn’t something that you can just read about.

The whole methodology and standpoint of the many different sciences had to make contributions.

Yet then, as now, philosophy was never a profound interest of the majority of scientists, and their closest allies, the mathematicians, were, without any doubt, the most idealist of thinkers.

What this odd amalgam delivered was the most eclectic mix of "Idealist Form" and concrete experimental data. And the sources of the latter – carefully designed and erected experimental set ups, were NOT representative of Reality in general, but were always assumed to be such!

The philosophical ground for Science at that time was a mess, and though Marx, with his studies of Mathematics, and Engels with his efforts in Science, did make some headway, it actually needed some of the very best quality, practising scientists in on the the mix, while most of these were charging off in the opposite direction.

And this was later proved in the early 20th century, when Lenin had to take on a group (including Lunacharsky), within his own Bolshevik Party, who were leaning strongly towards the then current Positivism in Science. The problem of Science was then, and still is now, not solved in this philosophical position.

Indeed, I have been attempting to grapple with this very problem for over 50 years, as I am both a fully qualified mathematician and scientist, but not only were my earliest attempts seen, by my political colleagues, as intellectual diversions from the Real Struggle, but also as mechanist nonsense by a quite different set of colleagues within my academic specialisms.

It wasn't simply a matter of importing Science into Philosophy. For within Science, the implicit philosophical standpoint was not only entirely wrong, but also steadfastly defended by all its participants.

And, it is only now, when I have been able to spend the whole of my time solely upon this question of stance and method, that the glimmerings of what I seek are becoming both evident and developable.

So, let us attempt to lay out the problem as clearly as possible, to reveal the major differences in Reasoning between Formal Logic and the Dialectics of Hegel. Marx and the rest of those committed to its content and method.

The major problem is that in spite of the above philosophical advances, and, of course, the establishment of a seemingly entirely materialist approach that developed in Science, the reasoning of all of us is STILL impregnated with purposive Idealism.

Indeed, the whole way we talk about things implies that it is the concept or idea that drives Reality (as it sometimes drives ourselves).

To prove my point, let me take the current argument in the USA between the Fundamentalist Christians and the scientists as to the truth or falsity of Darwin's theory of The Origin of Species.

A recent effort by the scientists in a TV programme entitled *Major Transformations* (PBS America) was, in the end, self-undermined as both sides of the argument believed in "Progress". The scientists assumed a natural imperative within Reality towards progressive change resulting in *inevitable* Evolution. Now, such a stance is not scientific, for it abandons materialism for idealism – the concept – a clearly abstract and disembodied idea, taken as somehow determining development in the concrete World. And even Adaption in the descriptions and arguments within this programme, was given the same treatment, by seeing it as purposive - heading towards something better. It was no surprise that not a single word was included to really explain Natural Selection. It was because they didn't really understand Darwin's crucial argument, OR they didn't want to be labelled as Godless materialists.

So, these two sides, which on the face of it seemed to be miles apart, were philosophically very close to one another in what caused change, but they differed as to what drove these developments – was it God or Nature? So, allying yourself with the apparently "progressive" certainly cannot deliver the philosophical standpoint that is being sought.

Now, this sort of self-limitation is evident over a wide range of areas of study. Even in Physics the fight between the so-called traditionalists, and the "radical" Copenhagen School was totally compromised by once again both sides having exactly the same position upon the Primacy of Equations – of Form driving concrete Reality.

And the same sort of eclectic mish-mash is evident in all our thinking. We, like it or not, are saturated with the established pragmatic techniques of everyday survival, and the total lack of any worked up and explained alternative does not help in this current endeavour. For, in day-to-day living, we are not constantly confronted with significant qualitative changes. Things, during the spans of time that we experience, stay pretty well the SAME. So, our methodology reflects that and Formal Logic is totally adequate in almost all circumstances.

It is only when we conceptually have to position ourselves as trying to deal with vast tracts of time and space, that these methods prove wholly inadequate. We have to step outside our normal experience into a world with a totally alien tempo and transformations.

But, we, as individuals, cannot pull ourselves up by our own bootlaces, to deal with such un-experienced situations. We depend upon the "received wisdom" that is endemic in our Society, and that is impregnated via our education, whether school or home or media, and that is the unavoidable Common Denominator of all our normal thinking and reasoning. Clearly, we don't crack the problems outlined here by just thinking about them: for that conceptual inheritance will always lead us astray.

And finally, the surprising thing about the necessary inclusion of the Sciences in the necessary development of Hegel's philosophic objective has turned out to be the necessity of actually rescuing Science, or more particularly, Sub Atomic Physics, from its own long and thorough-going crisis. And even then, Salvation will not achieved solely by inclusivity, but crucially only by mutual integration!

The major Crisis in Physics, brought about by the discovery of the Quantum, had to be solved before the evident strengths of that discipline could positively contribute to a better Philosophy. Philosophy had to rescue Physics in order for it to be rescued itself! But, scientists, it must be said, had repeatedly proved themselves totally incapable of achieving that resolution. They had long ago painted themselves into a corner, from which they could never escape without a radical revision of their philosophical basis.

Indeed, in the hope of a life-giving injection from Science, Philosophy found that I had first to save the doctor from his own possibly terminal ailments. The problems for Science turned out to be a wholly inadequate Philosophy, while Hegel's intended development of Philosophy, had to include the gains of the Sciences to proceed.

So, for this particular scientist/philosopher (the writer of this paper), the problem boiled down to solving the contradictions involving the experimental investigations around the famed Double Slit arrangement related to major contradictions in Sub Atomic Physics.

The physicists found that they could not deliver a consistent explanation in these experiments, and descended, on the one hand, into Wave/Particle Duality, and on the other, into probabilistic formulae, rather than the usual type of Laws.

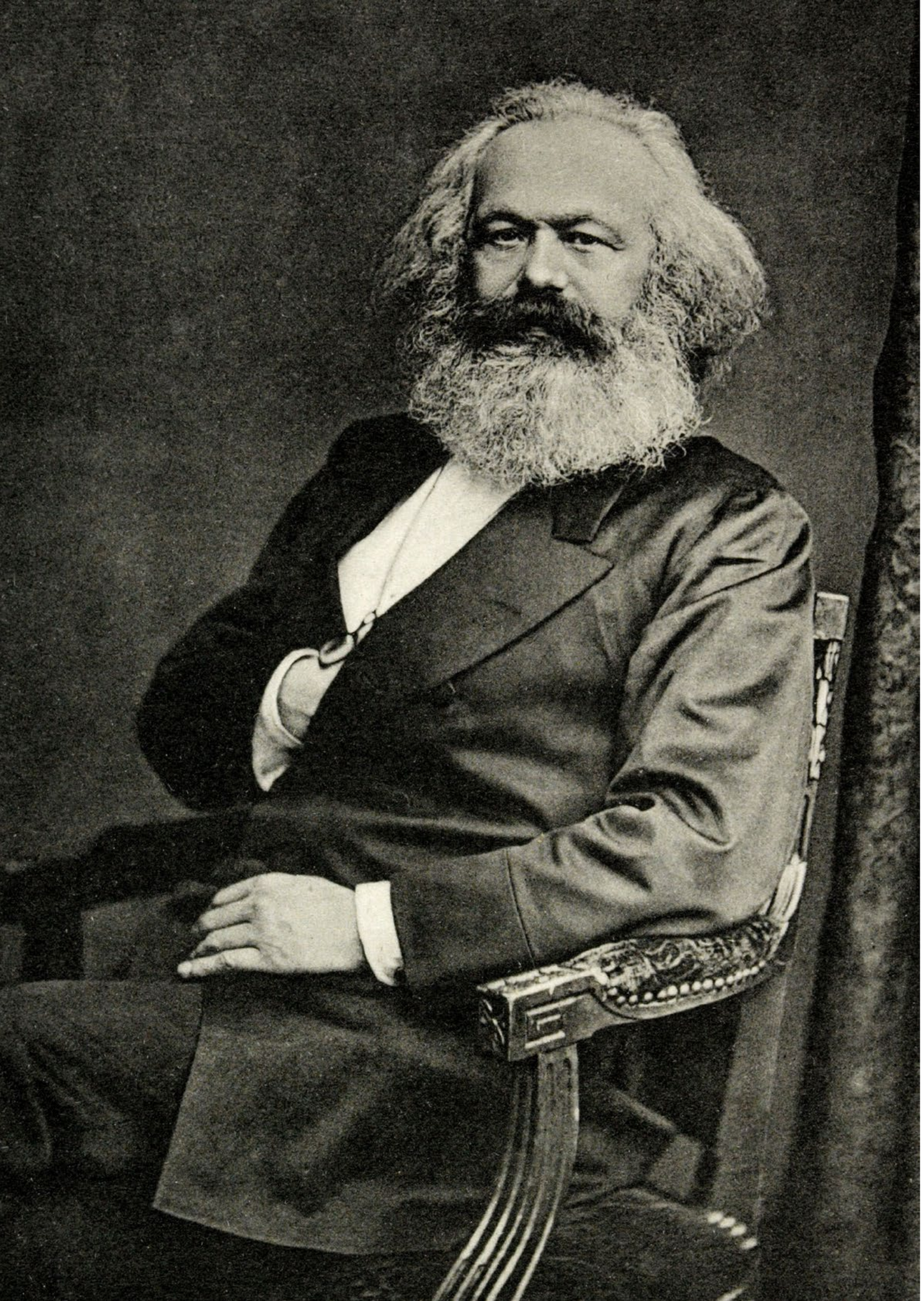
The Crisis was so catastrophic that all experimental studies thereafter narrowed down into the only form that could guarantee to constantly reveal ever "new" features – Accelerators! And Theory subsided into pure formal relations without any meaningful explanations to accompany them. As the "way-forwards" continued to narrow down, the only possible adjunct to pure quantum equations (and most of these were probabilistic) became Pure Speculation.

Behind the opaque wall of Pure Probabilistic Form, there began to arise a matrix of amazing creations, from multiple, physical Dimensions, to Strings of Pure Energy, to Dark Matter, and a Universe for ever running down to oblivion.

Now, the real solution to the problems in Physics, were, undoubtedly, philosophic, but as Zeno had found 2,500 years ago, such suggestions would entirely fall upon deaf-ears, He therefore devised his Paradoxes in an attempt to make them address the real problems, so I had to find a compelling area, which hopefully would guarantee their attention to a philosophic alternative, but presented entirely in the forms that they were used to everyday. I decided to "solve" the contradictions of the Double Slit Experiments.

I was not at all sure that my constructs were entirely legitimate, but that didn't matter as much as whether the philosophical implications were correct! But by using their usual methods, I felt that I could, without recourse to Wave/Particle Duality and idealist formulations, solve these experiments, and therefore I just might get my foot in the door, and could then deliver the philosophical coup de grace.

I assumed an active content for Empty Space, which would not only deliver all of the phenomena and anomalies of the whole set of Double Slit experiments, but was also entirely consistent with the existence of the Quantum.



Dialectical Reasoning

The revolutionary methodology of reasoning, handed on from Hegel to Marx, was of a very unusual type compared with what had been universally employed previously.

For, being holistic, rather than pluralistic (as literally all prior reasoning had been, and, of course, all of Science certainly had become), the new approach started from the total inter-relatedness of all things, and hence fulfilled the credo, “Everything affects everything else!”.

But, such a stance does seem to totally exclude the possibility of Analysis, which is surely the central plank of the scientific method, and has to look beyond individual (and separable) contributions to integrated and mutually transforming effects at a higher level, to get any sort of handle upon how Reality actually behaves.

But, in spite of these major difficulties, it alone can cope with both Change and Transition as caused processes, and that has to be its critical contribution to human reasoning.

One vital feature was that the multiplicity of contributing factors meant that in any situation both complementary, and even totally contradictory, factors would certainly be present and making a contribution. And, any observed overall effect, would be the result of the increasing dominance of certain mutually conducive factors over other less effective sets. And, even that situation would never be permanent, but would have the ever-present possibility of such a “current “solution” being overturned as the general situation changed, and even a directly contrary dominance could come into overall hegemony. To address qualitative change is very different from purely quantitative changes within a stable situation.

The conceptual model adopted, therefore, became one of contradictory pairs of overall outcomes, and as the most important aspect of the studied situation, its development into something entirely different. It could be dealt with (to an extent) by the activities of these Opposites – the Dialectic of the situation!

Now the validity of this rather surprising approach has been confirmed innumerable times, but only in developments: it is not about stable, quantitative and slowly-changing situations, but about transforming and qualitative changes.

Perhaps before this discussion gets out of hand, the crucial evidence of The Impasse should be brought in?

Most conceptions of situations are far from being the “absolute truth” of it, but are usually an acceptable and useable approximation: the assumptions, processes and even entities involved do get reasonably close to what is going on, and in most stable circumstances “do the job”: conclusions and even predictions can be relied upon. But, such is never the case forever. No matter how clever (or even wise) were our suppositions, there will always be situations where the conceptions and assumption fail. Now, our fallback practice is to have a second-string theory, which also works in some very closely related cases, and we switch to this to see if it does the job here too. And sometimes it does!

We then have two mostly workable alternatives, and we pragmatically switch between them to be in the position to carry on with our objective.

NOTE: But, we must not confuse this with pure unprincipled Pragmatism, as displayed in the current models of the Nuclei of atoms. For there is, at the present count, an unrelated set of some twelve alternatives to juggle between, This two model alternative is not only much more tightly constrained, but, as it will turn out much sounder philosophically.

But, there are cases when even these dichotomous pairs fail to deliver anything at all. And this indicates a true impasse, where the possibilities of the current situation have been left behind completely. No matter what we do using these alternatives, they still always lead to a contradiction: they are both wrong! The situation seems to defeat our usually applicable pair of alternatives, and we seem to be able to go no further.

But, as you may already have guessed, our two alternatives can never be wholly arbitrary, or unrelated to one another, they both will have a measure of the Objective Content of the situation within them, and it was that, which caused them to becomes our pair of alternatives.

But the occurrence of The Impasse, instead of being a dead-end, is perhaps the much more productive situation - for it is only here that the necessary transcending solution can actually be addressed.

NOTE: In his book *Zen and the Art of Motorcycle Maintenance* Robert Pirsig called such situations the vital periods of “Stuckness”: situations to be sought out and welcomed as the places to make real progress in our understanding. Dialectics takes the naturally emerging pairs of such dichotomies as temporary truths in the short term, but also as anvils on which to beat out a transcending alternative.

One obvious area, totally unintelligible to today’s physicists, involves the alternatives of Wave and Particle in Sub Atomic Physics. And, perhaps, the most famous is

the perennial Descreteness and Continuity dichotomy, as Zeno was clever enough to demonstrate so superbly in his Paradoxes.

But surely, such a method, is not, repeat NOT, predictive, as are most quantitative equations in Science, though, on the other hand, it does give the person a changing situation - to think about what factors are involved, and which way a transition is likely to occur.

In contrast to the usual method in Science, which can ONLY predict within its appropriate and defining Domain (set of producing conditions), the holistic approach is much more general and unconstrained.

The holist alternative does attempt to juggle all the involved factors as changes occur and by defining them into pairs of opposite-yet-possible outcomes, points strongly to a particularly limited pair of possibilities.

It is by no means as crude as it at first sounds, for whatever "wins" in a competition of many contributing and distortable factors, will always get there due to its cooperating, and even integrated and mutually modified, set of conducive factors to ensure dominance. While, when a transition does occur, it will again be to one with a similar set of conducive factors, which are likely to be the opposite of what pertained before. The natural marshalling of simultaneous factors will always take such a form, for such groupings ensure proliferation best.

It is about multiple factors with different directions interacting to lead to a particular overall dominance.

A pluralist equation doesn't even include what factors are present. It is merely a quantitative relation within a static, non-changing situation: it is incapable of saying why it behaves as it does, and the nearest it can get to suggesting what might replace it, is for it to "blow up" into one of its terminating singularities.

But, though this contribution is only a beginning, Dialectics did reflect the true dynamics of multiple interacting factors in real systems. The seemingly arbitrary concentration upon opposites is NOT what was being inflicted upon the situation by Mankind: it was NOT simply another imposition. For the division into conducive and antagonistic contributions to combined effects did cause related groups of factors to form conducive, mutually-supporting sets or systems. And in any complex situation, the direction of these proto-systems would be defined.

It is also important to understand just how dominance occurs: it is basically a version of Selection, which I have elsewhere termed Truly Natural Selection, and it occurs not only in Living Things, but at all levels, even between chemical reactions, which might "compete" for the same resources.

And, a working through at this basic level turned out to deliver a viable model. Mutually conducive or supporting processes, where the product of one was the necessary resource for another, would certainly mutually affect one another. And such could even develop into quite long sequences or even cycles.

Clearly, as such systems came together they would really be greatly more successful than lone processes or mutually contending pairs of processes. The conducive systems would soon collar the majority of the available resources and begin to dominate.

Yet, such sets would not all require the same conditions and resources, so many such systems would occur.

The rivalry between them would be of a different character. It would not be direct competition – for they required different things, but efficiency and rate of production would tend to see some systems growing bigger then others.

NOTE: though too early to deal with it here, these ideas have led to the Theory of Emergences, which addresses how the "wholly new" comes into existence – clearly crucial in any complete theory of Evolution.

Transcending Dichotomous Pairs
From Two to One

Perhaps the most difficult and important transformations to understand within any Emergence (as well as being the most likely area at which the whole Event can be initiated), is in the resolution of Dichotomous Pairs – those contradictory alternative "truths", which, most certainly and clearly, indicate that there is something wrong with the current, seemingly-steadfast Stability.

NOTE: Perhaps we should differentiate here between Natural Emergences, which are mostly totally internally caused, and the much "smaller scale" revolutions, which a human being's thinking undergoes, when attempting to transcend such impasses conceptually. For, it surely has to be the latter that we must first attempt to address, before anything on a much more cosmic scale.

Of course, as with all the discoveries in the field of Qualitative Change, it was first revealed by the genius of Hegel, in his chosen area of study in addressing Development – which was, of course, Human Thinking. So, we must not immediately see the phenomena involved in such revelations as identical at all levels. To avoid that we will attempt to address the problem as Hegel did, and restrict it, for the time being, to that same area alone.

Other thinkers have arrived at a closely similar point – the most significant (for me) was Robert Pirsig in his book Zen and the Art of Motorcycle Maintenance, in which he insisted that the most fruitful areas to concentrate upon, when attempting to develop a personal philosophy, were precisely those that produced what he termed "stuckness" – a seeming inability to get beyond one or more of a related set of contradictions. He had, of course, found his own way to Dichotomous Pairs of contradictory "truths", and he knew that to make real progress, you had to concentrate all your efforts upon those key areas, rather than either avoid them like the plague, or pragmatically keep them both (in spite of them being totally contradictory), and using each when it apparently worked well.

Of course, resolving contradictions that entirely arose and maybe could also be solved entirely in your head, have to be very different from the natural, self-moving Emergences in the World at large on many different levels. But, the underlying causes are comparable – the foundations of our Thinking, like the foundations of a particular form of Society, are at the root of all such contradictions. But, what happens inside your own head can be considerably more accessible, than transformations of a Society.

Nevertheless, Pirsig's point of application, just like Hegel's long-investigated research area, could, and did, reveal important "truths" about development.

NOTE: Without attempting a rigorous investigation at this stage, I should mention the same process as it occurs in Scientific Theories. As with all "things to be explained", individual phenomena are the easiest. We can, with application, careful experiments and the study of the produced sets of data, come up with analogies, and maybe with an explanation, which fits those revealed facts. But, it will never be the Absolute Truth! We will, at best, have found an analogy, that could be useful and allow new things to be achieved. Clearly, for Science to advance, we have to also resolve any then emerging contradictions between the new extracted form and any clearly closely related areas. We cannot just "collect" individual "solutions" into an ever-growing bag of tricks: we must, wherever possible, integrate these into deeper and more profound relationships. For example, we have to integrate (say) two quite separate explanations into a single overall one, which covers them both.

So, what is actually involved in resolving a contradiction in our thinking?

Let us pick a substantial one to illustrate the difficulties. Though Zeno of Elea found an important contradiction, and embodied it in his famous Paradoxes, he did not solve it. He went about it the right way, by digging as deep as he could into our most basic assumptions to find what was the foundation of the contradiction, but at that time they were only just inventing Philosophy, he wasn't yet in a position to provide a solution. He was able, as was Hegel 2,300 years later, to show a significant Dichotomous Pair. They were, of course, Continuity and Descreteness!

Continuity was a basic assumption, that considered the area under study as totally and smoothly connected, with NO gaps involved. The parameters involved varied continuously via slope of possibilities. We use this assumption all the time in Science, and it can work very well.

Its opposite, *Descreteness*, assumes that such continuous variations are invalid in the area under study, so that it can only be composed of individual, descrete entities. This alternative works admirably in many areas – such as dealing with Gases. Which though they appear continuous, are only explicable in terms of descrete entities – molecules, dashing about in all directions.

Most philosophers, contemporary with Zeno, saw no problem with these two: you just learned by experience which assumption to employ. But Zeno proved that BOTH were human constructs, and in his Paradoxes demonstrated all sorts of failures, such as infinite processes with finite results, and even the "impossibility" of movement! The lack of a full explanation, however, caused his revelations to be ignored, and the reliable "suck-it-and-see" methods were continued as before.

The now long-in-the-tooth Crisis in Physics (at the Sub Atomic Level) is the most clear case of such a Dichotomous Pair, where in the famed series of Double Slit Experiments, what seemed to be tiny, inconsequential changes within the experimental set up, could switch the entity involved from being considered as a descrete Particle, to one where it was only explicable in terms of continuous Waves. In spite of this discovery, now almost 100 years ago, they have never managed to resolve it.

Yet, this author (now quite old) who has long rejected the Copenhagen Interpretation of Quantum Theory, that has led to staying with this contradiction – this Dichotomous Pair on principle(?), has indeed solved it. He did it by changing the number of involved contributions to the phenomena, and, "Wait for it!", taking a Holist stance as distinct from the Pluralist one of the consensus in Sub Atomic Physics.

This example is worth relating because the only way that the dichotomy could be transcended involved digging down to the very basement of our unquestioned assumptions, and considering something entirely opposite to the usual basis. Of course, this researcher is well aware that he has by no means arrived at the Absolute Truth of the situations, but his explanations are a great deal better than the current speculative (and idealist) concoction. For he has already realised that Holism vs. Plurality is yet another Dichotomous Pair, though clearly at a deeper level.

So, having clarified the problem, how are we to treat a Dichotomous Pair, with the objective of disposing of a "two-truths" eclecticism, and finding a single integrated alternative? Clearly, the problem always resides in our assumptions. And, by that I do not mean overt, self-admitted simplifications, but what are considered to be Banker Truths, but which on the contrary turn out to be long-term, fairly reliable simplifications, with validity only in the areas that then appear to hold to very well.

NOTE: The reason we are less than sceptical about these simplifications is demonstrated very well by what occurs in Euclidian Geometry. For there our various idealisations quite definitely push the many seemingly blurred situations in Reality into a much clearer form. And the consequent extractions work extremely well almost everywhere that we apply them. We slip into the mistake of thinking that we have by our simplifications revealed the true essences of Reality, rather than finding an easier, simplified device.

And, of course, we always pick first the easiest areas to solve, and these usually conform reasonably closely to our assumptions.

It is when we consider what we have found in these special cases to be also universally true, and, indeed, the basis for literally everything, that the real trouble arises. They have, of course, occurred regularly, but Mankind found a tidy way of dealing with the most important cases, which demolished our assumptions – we actually put them in another different area of study, or even another Subject, where the assumptions could be different.

In the early years of development of Science, the participants called it Natural Philosophy and literally everything was included, and investigated by the same people. But, as the number of exceptions rapidly grew, the solution to contradictions between a new discovery and prior results from another area, was to fence off each group of exceptions, which, it was assumed, depended upon an alternative set of assumptions, into their own, separate Sciences, such as Biology or Geology. And these had their own set of specialists. The overall views in the separated Sciences gradually moved apart and even came to widely different numeric estimates for the very same things. And as the years rolled by, more and more inconsistencies even within particular Sciences, caused the divisions so caused to produce even more Specialist Areas, so that each sub group so formed would not be constantly undermined by such contradictions, that would be evident if things from the different specialisms were attempted to be integrated. More and more such areas were increasingly walled off from all the others.

It is interesting just how inter-disciplinary research efforts have been affected by these categorisation tricks. My own "specialism", for an extended period, was precisely in the field of such inter-disciplinary research, as I was a computer programming expert in the area of computers-in-control. So, I was regularly called upon to assist research efforts in many very different disciplines. I was seriously involved in providing access and control facilities in Nursing, Dance, Identification and Taxonomy problems in Biology, the capture and analysis of the output from Gas Liquid Chromatographs, control and robotic measurement in Engineering test rigs, and even in chaotic behaviours in models of the Human heart. In addition, I was frequently called upon to use my other major specialism - Pure Mathematics – in graphical investigations into tessellations in 2D and 3D for re-entrant shapes and solids, and even the modelling of changes within Emergences (Revolutions). This exceptionally wide experience with an increasing measure of success in serving the primary research workers meant that I became an appropriate and effective servant in areas where an inter-disciplinary approach was unavoidable.

Yet, such achievements are surprisingly exceedingly rare. I was amazed just how poor the existing services were in this area from most computer experts, who most times tended to impose what they could already do, and force-fitted it to what the "served" discipline had requested. Most such "parachutings-in" were consequently total failures!

So, perhaps in the application of computer control in the area of Teaching both Dance Performance and Choreography, where my wide experience with increasing success, and always providing wholly new and tailor-made aids, was entirely appropriate. For, in that project, the perfect access and control of Video footage of exemplar Dance works was essential for their teaching methods. The demands of a long period in inter-disciplinary research projects allowed a solution of the complex problems in Dance fairly quickly, and our first published Multimedia offering won one of that year's British Interactive Video Awards (BIVA). And twenty four years later, we are still in the lead in this area.

The point of relating this experience is not to gain credit from it, but to show how the avoidance of facing contradiction by the multiplication of quite separate disciplines has led to a general inability to co-operate productively over discipline boundaries.

Yet, the reader may be wondering when I will get round to addressing the resolving of the Dichotomous Pair contradictions. As already made clear the first area to be addressed has to be assumptions involved.

Now, these are usually considered "so obvious" as to be both left totally unstated, and certainly unquestioned. The necessary technique must be to overtly list everything that we think is involved, and then also restate our basic assumption about Reality. And we must take great pains to overtly include the usually taken for granted Banker assumptions.

One key example in Sub Atomic Physics is to do with the nature of Empty Space. For, in spite of being able to propagate electromagnetic radiation, and occasionally producing real, physical particles out of nothing, we always assume that it is totally empty! And, when we end up with more of these than we have admitted entities to deliver them, we double up and allocate new properties to already existing entities. In the Double Slit Experiments in Sub Atomic Physics, we added "wave properties" to our particles, delivering the infamous Wave/Particle Duality. The resulting problems were almost totally debilitating when it came to explaining these phenomena.

Yet the inclusion of a "substrate" in Empty Space solved all the Double Slit anomalies. The fact that such a "substrate" could not be detected, led to an investigation into what might constitute such a substrate, yet at the same time being totally undetectable. And the possibility of mutually-hiding pairs of properties was addressed. This purely theoretical solution was later found to actually exist as the positronium particle. Yet once more assumptions about this particle had to be addressed and corrected, to demonstrate its possible role in these experiments.

It must be remembered, of course, that none of our theories is ever the very last word. Each will be adopted because it will have greater Objective Content than the prior and now ousted theories. But they, in turn, will, themselves, be superceded in the future.

The important thing must be to get ever closer to the real nature of the things that we investigate, and crucially this will be most fruitful where the inevitable Dichotomous Pairs indicate a false basis to our reasoning.

Hofstadter & Analogy
The alternative to Formal Reasoning

NOTE: Though not originally intended as part of this set of papers, but as a review of a specific New Scientist article destined for the Shape Blog, it nevertheless concerns one very important aspect of a holisitic approach to studying reality - namely Analogies - so it is inlcuded here as a pointer to another relevant area yet to be fully addressed.

Douglas Hofstadter and Emmanuel Sander delivered an interesting piece in this week's New Scientist (2915) about the role of Analogies in human thinking.

Of course, Hofstadter is rightly famous for his excellent books, with perhaps the most influential being *Gödel, Escher and Bach,* which got a whole generation thinking about Form and Reasoning. But here, he quite rightly gives precedence to Analogy, which he describes as, "The motor driving the build-up of concepts throughout our lives", and continues with, "For it is through such analogies that we manage to orient ourselves in the world". He proves his point with an extensive set of examples, and particularly those we use in the way we describe many things. He crucially recognises that analogy is the basis of all our categorisations and hence in our initial abstractions.

But, he constantly refers to Logic as the usually recognised main feature of human thought, and takes for granted its power as a means to arrive at what he calls "truth". And, being a mathematician, he certainly means Formal Logic in that context. [And, of course, that form of logic is also the undisputed basis for all of Mathematics]. But, nowhere does he mention Formal Logic's most important flaw – namely that it deals only with fixed things. The Identity Relations, A = A, is the first and most defining rule of that system of reasoning.

So, though he, quite rightly, gives Analogy its due, and points up its power, he sees it as an adjunct to the superior system of Formal Logic, which he distinguishes as real reasoning, and he misses, as do all his examples, the fact that Analogy is crucially invaluable in dynamic, qualitative or developmental episodes, which Formal Logic cannot deal with at all.

My favourite analogy is of a very complex process, with clearly evident changing phases, that can be applied to a very wide range of developments. It is, as you may have guessed, the process of conception, gestation and birth in living things, particularly and initially with our own species, but thereafter to Life in general, and even to non living developments of many kinds.

Thus, though Analogy does indeed deliver the initial role in conceptions, it is, in fact, much wider than Formal Logic. It constitutes the first few steps in what Hegel called the Logic of Change.

Indeed, for anyone attempting to grasp his alternate kind of reasoning, analogy is the key. And even in Science analogies are vital, where they are usually termed Models. Yet, in this context, Hofstadter realises that such "analogies" can also be misleading, even if they initially seemed to be particularly apt.

In fact, all models in Science are both temporary and partial: they never deliver the complete and, indeed, Absolute Truth, but only an increased measure of what we term Objective Content. The task of the scientist is to constantly find better analogies (models), with ever more Objective Content. But, he couples this partial nature with the undoubted unreliability that occurs in the uses of analogies in speech, for these can be of an entirely different nature. For, they abound in political speeches, and are invariably manufactured and false analogies, constructed to mislead, and support a particular a priori position. To, in any way, equate these two forms is clearly wrong. The scientist does his best to move towards Truth, while the politicians is doing the exact opposite! Clearly, to term all of these Analogies, is to "give with one hand while taking away with the other". They are NOT the same!

Indeed, at such a point, we have to delve considerably deeper, for if we don't the unavoidability of Contradiction raises its head, and most importantly, as referred to above, and most obviously in the application of Formal Logic in inappropriate areas, where dichotomous pairs of concepts – both of which can be applicable (even though opposite in meaning) in almost identical situations. These involve pairs such as Continuity and Descreteness, or even Wave and Particle behaviours for the same entity, with innumerable others.

For, in situations of actual Development, NOT addressed by the necessary Logic of Change, but by the universally lauded Formal Logic, will, following the applications of the usual lines of reasoning, always tend to end up with one or the other of such a seemingly mutually exclusive pair. So, in spite of their being incompatible, we "keep them both", and use as and when which one looks like giving the right result.

So, though Hofstadter seemed to be broadening the set of useable methods in dealing with Reality, he always makes

sure that we don't confuse analogies with "true reasoning", which he restricts to Formal Logic. Even though he revealed the qualitative nature of some analogies with the description of them as, "Fluid mental structures, that (when taken) through many successive versions evolve constantly".

Hofstadter also related something of the role of analogies in Science, when he described the one used by Einstein between molecules in a contained gas, and light waves within a Black Body – for the equations he developed were exactly the same for both. And in carrying over the number of gas molecules into the analogous version for light, he could not resist the idea of the Quantum as individual packets of light directly mapping onto the number of molecules.

But, we have to be very clear that this was an analogy in a purely quantitative set of circumstances. He did not mention an analogy in a clearly qualitative context.

In fact, in both Mathematics and in modern Sub Atomic Physics that role is still not understood, and the contradiction of Wave/Particle Duality was unavoidable.

So Hofstadter's position on these questions is made quite clear by his abundant examples, and by his references such as, "Thinking can be objective, and …there exist truths reachable by pure thought alone?" But, this is exactly what we should expect from a mathematician: for in that World of Pure Form alone, a kind of Absolute Truth is considered to be entirely possible (though both Gödel and Turing might well most certainly disagree even with that). But, that is certainly NOT what we mean by "truth" in the real World. It is "a truth" concerning only pure abstract forms.

Now, of course, Hofstadter's contribution in this essay is welcome, but it certainly doesn't go anywhere near far enough. It is a pluralist view, entirely consistent within that World of Pure Form and absolutely nothing else that we call Ideality. For, the best analogies are always firmly rooted in Reality, and hence underpin our abstractions including actual physical developments.

The solution to the "Copenhagen Wrong Turn" will never be found in Mathematics or in the pure Forms that are Equations, because they rely upon the very same formal assumptions. It, most definitely requires the extension and understanding of Analogy into real World development and change to tackle the dichotomous pairs resident in that cul de sac.

Finally, let me finish with a current and crucial example of a qualitative analogy, discovered by Professor Couder in France.

He constructed an experiment using a metal tray, holding a thin layer of silicone liquid, with the whole arrangement vibrating constantly up and down. Onto this "substrate" he let fall a tiny drop of silicone liquid, which DID NOT merge with the liquid "substrate", but instead bounced continually up and down above it, yet caused that substrate to suffer a set of outwards moving waves, centred on and in synch with, the bouncing drop.

Couder likened his drop/wave entity to the particle/wave entities proposed for the Double Slit, but it was a long shot, and not accepted by the current theorists of those experiments.

The trouble was that in the current consensus model for those experiments, there is certainly NO substrate, and consequently the "electron" fired towards the Slits acts sometimes as a particle and sometimes as a wave.

Yet, using an entirely different and theoretical alternative in which there IS, indeed, a substrate, filling Empty Space, it had been possible to solve the problems of these experiments without recourse to Wave/Particle Duality. So Couder's work is an excellent example of an analogy driving theory (or in this case confirming it) in a new direction.

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