PHILOSOPHICAL MUSINGS

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Philosophical Musings

Special Issue 10

Preface
Philosophical Musings

Welcome to the 10th Special Issue of the **SHAPE Journal** - a collection of musings on the interrelationships between:-

1. Reality-as-is – totally unconstrained and developing of its own volition

2. Pluralistically Constrained Reality – still a part of Reality but locally isolated into rigidly constrained Domains to reveal, and allow extraction of, so displayed relations

3. Purely Formal versions of these – clearly removed into Ideality – the mathematical World of Pure Form alone

All of these come out of a series of considerations and interventionist processes of what we can scientifically obtain from the World, and which contribute to our developing conceptions of" Reality".

What is exciting about all these versions is that there are two things that thankfully seem to be present in all of them.

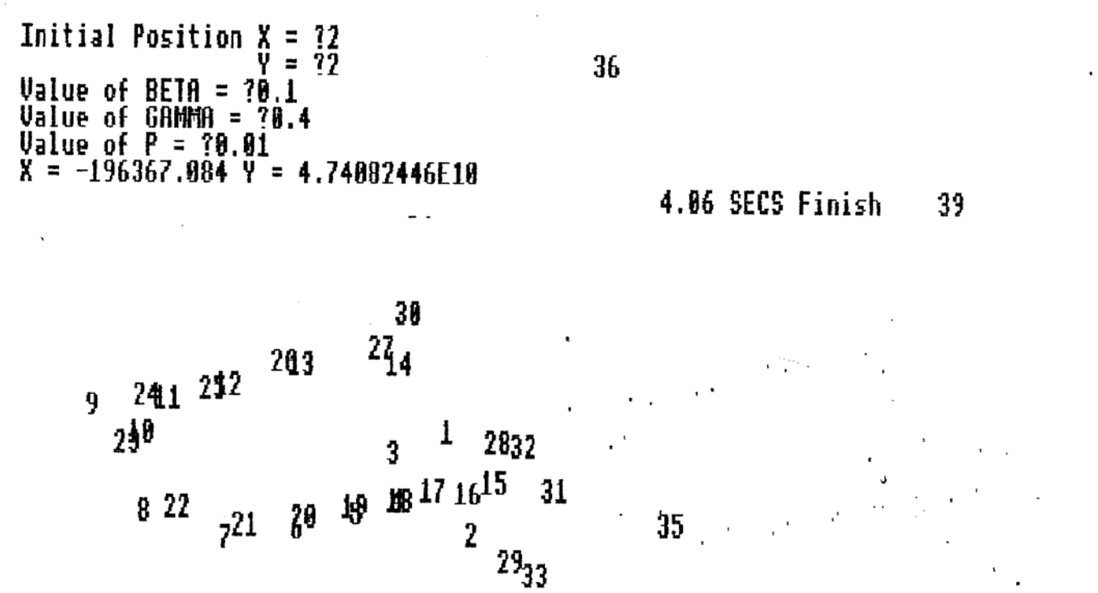
First, there is what I have called Objective Content, which is present even if the models we derive or construct are not by any means a full and correct explanation.

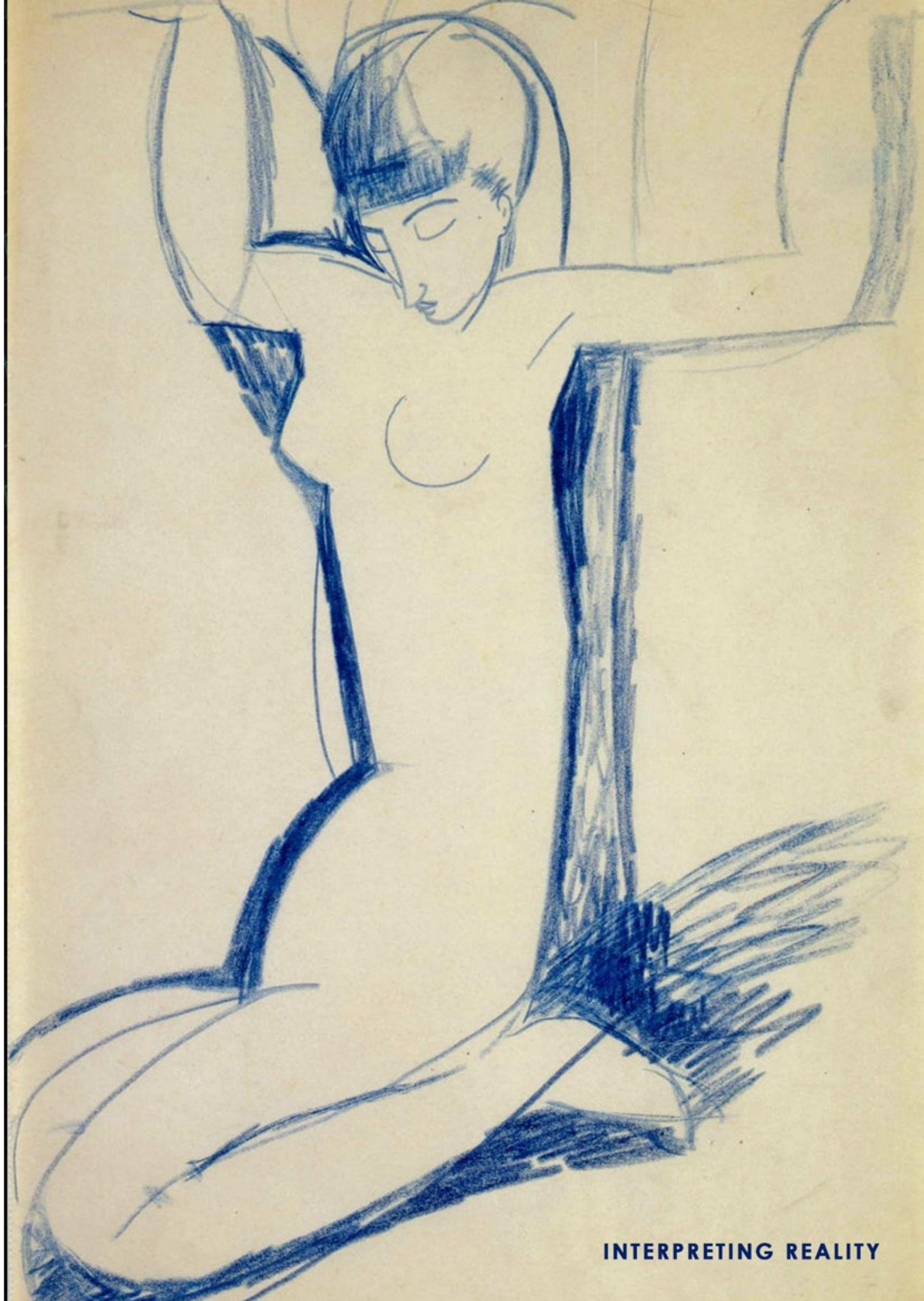
And there are also Resonances, which though they occur in the different forms and for different reasons in each, do, in fact, relate strongly to others in the alternative (and clearly parallel) versions.

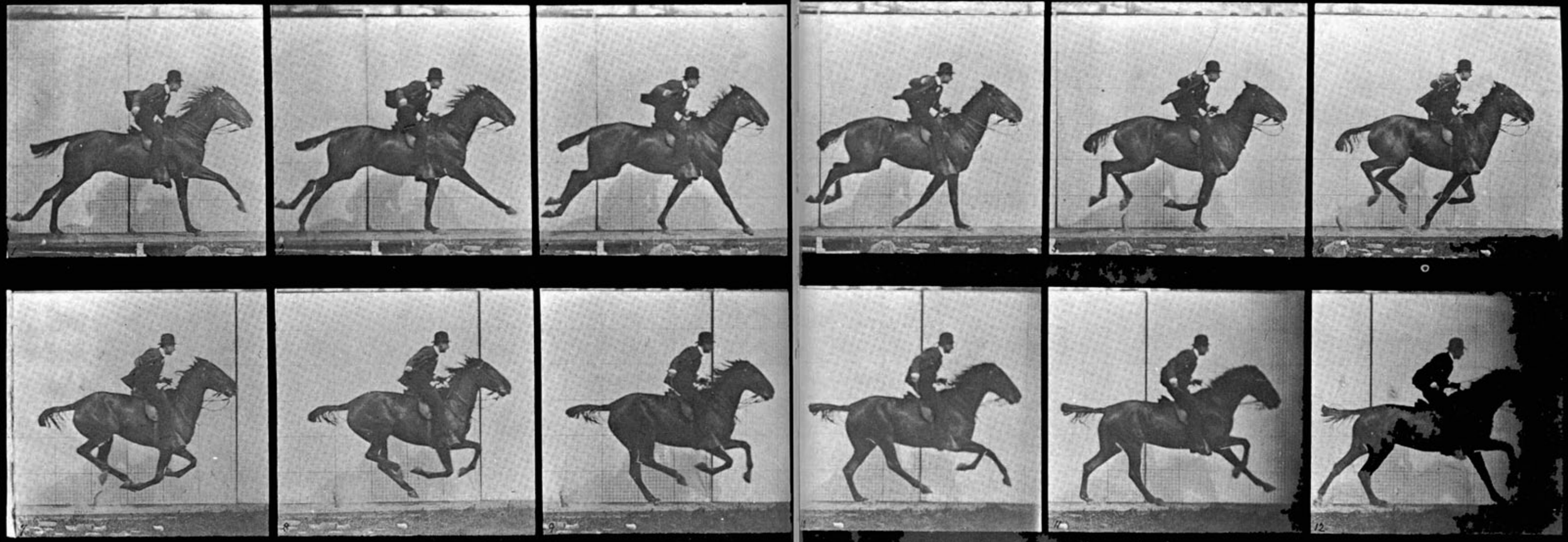
Of course, as well as these helping our struggle to continually improve the truth of our understanding and explanations, they also can, and often do, mislead us into interpreting them as being the same in each manifestation, and that is certainly not true!

The small collection of papers gathered together in this issue attempt to reveal these various versions of Reality and how they distort our developing grasp upon "what the World truly is".

Jim Schofield May 2012







Interpreting Reality

If, as Zeno demonstrated long ago, both of our usual basic and mutually exclusive assumptions about Reality – Continuity and Descreteness, are inadequate, then how are we to address it in a way that is not compromised from the very outset?

And in what ways are these seemingly sole alternatives misleading? Can we in fact conceive of any completely general conceptions such as these to guide our investigations, and more closely ground any extractions that we make?

Now, it's easy to see why each alternative can break down, but the obvious and usual result to simply switch to the opposite idea if our first choice fails.

Now clearly, that may well pragmatically suffice, at least temporarily, and in the midst of some present and necessary purpose, but it cannot a permanent basis for real understanding!

Without any doubt, a different set of circumstances will just as certainly reveal the inadequacies of our sole alternatives yet again, and we will be pressed to flip back-and-to our most recently rejected alternative more or less constantly. So, these are obviously not adequate conceptions and something other must be found to replace both, but to, at the same time, generate one or the other of these prior alternatives in the appropriate particular circumstances.

Now this, seemingly, has never been achieved, and Mankind has had to keep both alternatives handy to use as and when appropriate, but Reality is out there being what it is, yet also not being adequately dealt with.

It doesn't switch from one to the other in a Copenhagen-like way (as in current Sub Atomic Physics).

It is clearly and concretely "something else", which can appear either continuous or descrete depending upon circumstances, but is actually neither of these simplifications.

The question is, "What is that concrete existence?", and, "Can we reveal it?"

Now at such points, I am prone to reminding both myself and everyone else of the difficulty of lifting yourself up by your own bootlaces and seeing things as they really are. For Mankind is certainly a part of Reality, and not separate to it. Why should that part be intrinsically able to analyse its own and everything else's bases?

Of course, the answer is that if it could, it would indeed be truly miraculous, but, of course, we will never completely achieve that state.

But, that doesn't mean that these particularly intelligent and able apes will not find ways of getting ever closer to grasping more and more aspects of Reality as-it-really-is!

But to see how this could possibly be facilitated, we have to look at Mankind's frontline means of interpreting Reality, which are well in advance of the role that our brains evidently play.

We have our senses, and by far the primary sense has to be Sight. Whatever the derived trajectory of development of that sense, the eye must have had to develop in ways that could reveal ever more about "all things seen".
And, of course, that is exactly what did happen in Mankind's evolutionary development.

And, in my studies in a very unusual area for a scientist to be studying – the teaching of dancers and choreographers, I came up against severe problems in how movement was recorded on Film and Video, and the difficulties it caused in using such recorded footage in teaching.

The problems occurred when recordings had to be slowed down significantly to reveal detailed and subtle movements, and also, sometimes, actually stopped, to give a stationary snapshot to allow precise noting of multiple positions for many parts of the dancer's body simultaneously. With the usual rates of recording (and, of course, of cheap and accessible delivery) of about 25 frames per second, difficulties abounded!

If, as was certainly the case with film, these 25 (though sometimes 30) frames were Stills, then all sorts of actually contending requirements raised their heads and seemed to prohibit what we needed to extract.

If the frame exposure time was very short, a crisp and adequate still image could be produced, and measurements could be accurately extracted for dancers to replicate in their own movements. BUT, and it is a very big BUT, a sequence of such pristine stills completely excluded the vast majority of any given movement.

Almost ALL of the movement was NOT included.
For a complete 1/25th of a second of movement was replaced by only two 1/200th of a second stills, with the movements between these two totally missing! So clearly the recordings were inadequate for any quick and subtle parts of the complete movement: they simply weren't there!

Now, investigations showed that a quick movement could cover a yard (36 inches) in 1/25th of a second, and with the crucial dynamic of impulse, swing and impact as detailed nuances of all such artistic movements the occurrences of these for 90% at least of the total movement were absent. And as Modigliani always insisted, "Art resides in the Articulation of Form!"

Clearly, any intention of such recording being a reliable source of such movements was clearly dashed completely.

Now, it soon become apparent that the cameramen involved in shooting such footage for educational purposes would have to extend the shutter open time to record very much more in each single captured frame.

NOTE: In order to avoid the usual response to these points, I must emphasize that expensive high-speed cameras and their delivery systems were, and still are, unaffordable for these products. They are intended to be affordable at all levels of teaching.

They had to be cheap and deliverable on things as ever present as ordinary televisions.

But, on looking at such a frame as a still, the initial reaction was panic!

The extension of the shutter-open time did capture more of the actual movement, but superimposed on top of one another to produce very blurred and undecipherable images. So, though more of the movement was there it still wasn't available for study.

Perhaps surprisingly, the usual decision was to abandon that alternative in favour of the "pristine Stills" option, which looked OK at full speed, and could be analysed by precise measurements of the individual stills.

Yet, we still have to ask, "Why did the full-speed version look alright to the viewer, when most of the movements were missing

The answer is, of course, that our brains filled in the missing data from past experience.

But, of course, that would never reflect all the important and subtle dynamic detail. A general, overall and average conception would determine the infilled assumed data. [Just as it is in animation, which is constructed in the very same way]

But, in using recorded movement to teach Dance, all the nuances of a movement MUST be available, and would "ideally" be revealed by a slow motion playing of adequate material.

But clearly, they just weren't there, and such footage was useless for such absolutely essential content.

Now, as it turned out, there was a solution, but it involved a return to what was rapidly being dispensed with in recording such things. Film and digital video were both useless, but that was where the technologists were going at an ever-accelerating rate. The solution was to revert to analogue recording as it had been for many, many years.

In classic analogue video for broadcasting a very special kind of capture had become the norm. In this recording each individual frame was a kind of mini-movie. It was in fact built up over the frame open time by means of a varying dot scanning the whole frame. This started top left and moved left to right across a line of the image, and then continued line by line until it finally reached the end of the image – bottom right.

[Indeed, because of the problems caused by losses in broadcasting, this was soon changed so that two complete fields were traced out. Field One could be the odd numbered lines, while Field Two could be the even numbered lines. And one complete frame would be recorded as Field One followed by Field Two.]

But, either way, what had been recorded included point moments from all times for a sequence of points over the complete frame while the shutter was open. And such a complex sequence therefore delivered samples from all parts of the image.

The distortions imposed by this system were nowhere near as important as the quality of the information made available, and the human brain instead of relying upon" averaged experience", had instead a continual data stream, which it correctly interpreted.
The dynamic of movement, even at 25 frames per second, was captured and even slow motion playback delivered what was required.

Of course, any single frame viewed as stills were abysmal, and detailed measurements of positions were very difficult indeed.

Now, I must bring this detour to a premature halt, because though a great deal more was achieved including the design of a twin camera that delivered EVERYTHING that was required, the purpose here was to focus attention on the eye/brain system that was interpreting the supplied information.

How did it correctly interpret real directly viewed movement, and even more intriguing, how did it make sense of the supplied complex video coding?

Now, in these crucial areas, no real advances were made until the work of Ramachandran into what he termed Blind Seeing and Visual Neglect.

In dealing with patients with brain damage, he was able to show that the eye not only had two ways of seeing, but that these alternatives were simultaneously directed to different parts of the brain for analysis, before coming together to deliver two different aspects of “things seen”.

Parts of the retina (the macular) delivered detailed positional information, while the rest of the retina was optimised (along with other facilities) for detecting movement.

People with certain brain damage could not see certain things in front of them, but could detect movement accurately of those “unseen things” (Blind Vision). While with a different part of the brain damaged things were reversed, and the phenomenon of Visual Neglect still had them seeing detail, but were unaware of movement.

Now, I had to explain all of the above, for without it we would not be able to address our original problem.
“How do we correctly interpret movement using our eye/brain system?” And the answer is that we use two systems, which highlight different aspects of the seen thing, and our brains, again use prior experience, but differently from the previously addressed case, which simply had insufficient data to do anything at all adequate to such a complex thing as Movement.

Now, clearly, the above researches on vision do not, of themselves, solve our problem, but they do reveal that we often have no choice but to hold on to two opposites at the same time, and treat them, not as mutually exclusive alternatives, but, but as views of different aspects of concrete Reality.

Our abstractions, though invaluable in taking us forwards in an attempt to understand Reality, are usually not only extractions from, but also impositions upon, the Reality we struggle to comprehend.

Hegel and Marx knew this from the start and talked of the interpenetration of opposites, and that is always an important starting point.

So, we should also see why we often have alternative assumptions for helping us to deal with certain events, and our simplifications will be those evidently the best for given requirements. It is common for there to be such pairs of opposite alternatives, reflecting the simultaneous, yet clearly opposing aspects of a situation, which reflect the “contending factors” producing the actually observed phenomenon.

But we need to comprehend it more simply, and usually one option or its alternative will suffice in most circumstances.

However when striving to get ever closer to an explanation, which can even deliver some idea of how the situation may transform into something very different, then holding both of the contending opposites as present simultaneously may well contribute to a meaningful resolution at a higher transcending Level.

Where is the Origin of Space-Time?

When we are convinced that we must include Time as well as Space in our conception of a Frame of Reference, there emerge immediate and significant difficulties. And this is because our positioning of an Origin for either a Cartesian system or a polar coordinate system seems initially to be entirely “up to us!”

We position it where it is convenient to do so, and because of that and for no other reason, we also have to allow negative numbers in reference to that origin to include positions in the space on any chosen arbitrary axis in both directions on either side of that Origin.

So, before we go on to the alternative polar coordinates (if indeed it proves necessary), let us consider what the inclusion of a fourth dimension = for Time must involve.

To give, in the usual way, a quantitative value to a position in Time, it again seems that we must choose an arbitrary Origin for our convenience.
But, right away we are in difficulties, For though a common origin for the three initial perpendicular directions in Space is clearly necessary to give us a single absolute reference point in Space, bringing in Time to the same system is certainly a vey different thing. Why do we even consider it?

Well, of course, it is to deliver a “conception space” for any equation we might be able to extract, including both Space and Time. We like to plot our relations on Graphs! And, the graphing tail is wagging the reality dog!

Now, when we consider the usual Equations of Motion as they are called, which include time as well as special parameters, we are usually applying it to something like experiments in the laboratory, or guns in a particular position in a battle, and the origin to be used there is always completely obvious and without implications: it is an arbitrary and useful origin in a limited, relevant locality.

But, what of Space-Time?

When Einstein brought it in, he was not considering pluralistically isolatable Domains, but space and time in general, and when you do that the “locality” aspect usually dominating is absent.

For example, when considering the Universe, the spatial Origin, might well be ideally a point which was initially the location of the Big Bang, and presumably the time Origin would give t = 0 at the moment of the Big Bang. And we cannot just dismiss these considerations because Time is THE measure of the development and indeed Evolution of the Universe. And, without ant doubt, plonking an origin at some arbitrary point can really only be done for eternal laws, which will be identical wherever they are applied.

And that is certainly NOT what will have been the case throughout that cosmic development. Even the most conservative of cosmologists has the Universe continuously evolving, or at least going through major and dissimilar Phases. So, position of an Origin, in such circumstances, can never be arbitrary!

Clearly, the basis of the vast bulk of our usual physical

aws, must be an assumption of them “staying exactly the same”, and hence allowing arbitrary origins to be placed wherever convenient. But there are untold numbers of laws, which could not have existed for vast periods of the past. For not only were there times without Life, but even times without planets, or even stars. And the consensus suggests that even mass had at some point to come into being.

So, the hidden assumptions allowing our usual arbitrariness will not be available, when our scheme has to add Time to Space, and for the reasons that Einstein did it.

Now, the above doesn’t involve all the difficulties that will arise.

For with arbitrary origins of Space there will be the inevitable negative spatial parameters for things back beyond the Origin, and orbits will doubtless allow negative spatial values if the orbited thing is taken as the spatial origin. But, what can we do with Time? Can we do exactly the same with it?

For Time certainly cannot flow backwards, and it is prohibited to use equations in exactly the same way as we would with merely Space involved.

Time is clearly a one-way co-ordinate and actually changes at the same constant rate all by itself, even when no process is involved.

And equations with only spatial parameters involved can be traversed in either direction, if we hold that the equation to be mathematically true, when “scribed” into the usual conceptual 3D “Space”.

But, when our equation also includes Time, we are surely considering a different world? Though we may insert differing times into our equations and hence move to different points on a line in 4 dimensional conceptual Space, one parameter - Time, is not at our beck and call: we cannot engineer it as we can the others physically.
When representing a real process with Time included, that time parameter merely flows on at a constant rate in a single direction. We may conceptually “dot-about” in Time, but it merely means that we are looking sometimes into the future and sometimes into the past. It is the way that we use our cosmological equations to arrive at situations that occurred in the past, or that will occur in the future.

BUT, several things must not be forgotten.
First, Time cannot flow backwards: it is a constant conveyor belt moving ever onwards if we are monitoring a real process, which obeys the law (including) Time, and when “accompanying” such a process on-its-graph, the “now-point” is seen as traversing along the line that is the given equation. And, of course, the time element does not intervene, but merely “plays out at a constant pace.

So let us consider the major difficulties when “graphing” such processes. First we only have THREE dimensions of space that we can use as a reference system for equations to be inscribed upon. There is NO fourth dimension for us to use to graph any extra parameter (such as Time) physically! So what do we do?

We algebra-ise things from 3D geometry so that we don’t have to use the visualisation availed by viewed graphing, and so in 4D we extend that kind of algebra-ising to include the extra parameter and invent a 4D geometry – impossible as a real concrete spatial thing, but subject to the same algebraic methods.

Now the dangers must be obvious!
We are treating Time in exactly the same way as the parameters of Space, and hence we tend to forget the severe limitations upon it. We consider the actual real process, as it proceeds, as being the same as before, with a traversing of the line of the equation (though in an imaginary 4D space). And remember, in the usual (non-temporal) uses we regularly moved along the equation line in both directions, for the parameters represented could both increase and decrease. But, surely, to do the same sorts of things with Space-time would be wholly illegitimate.

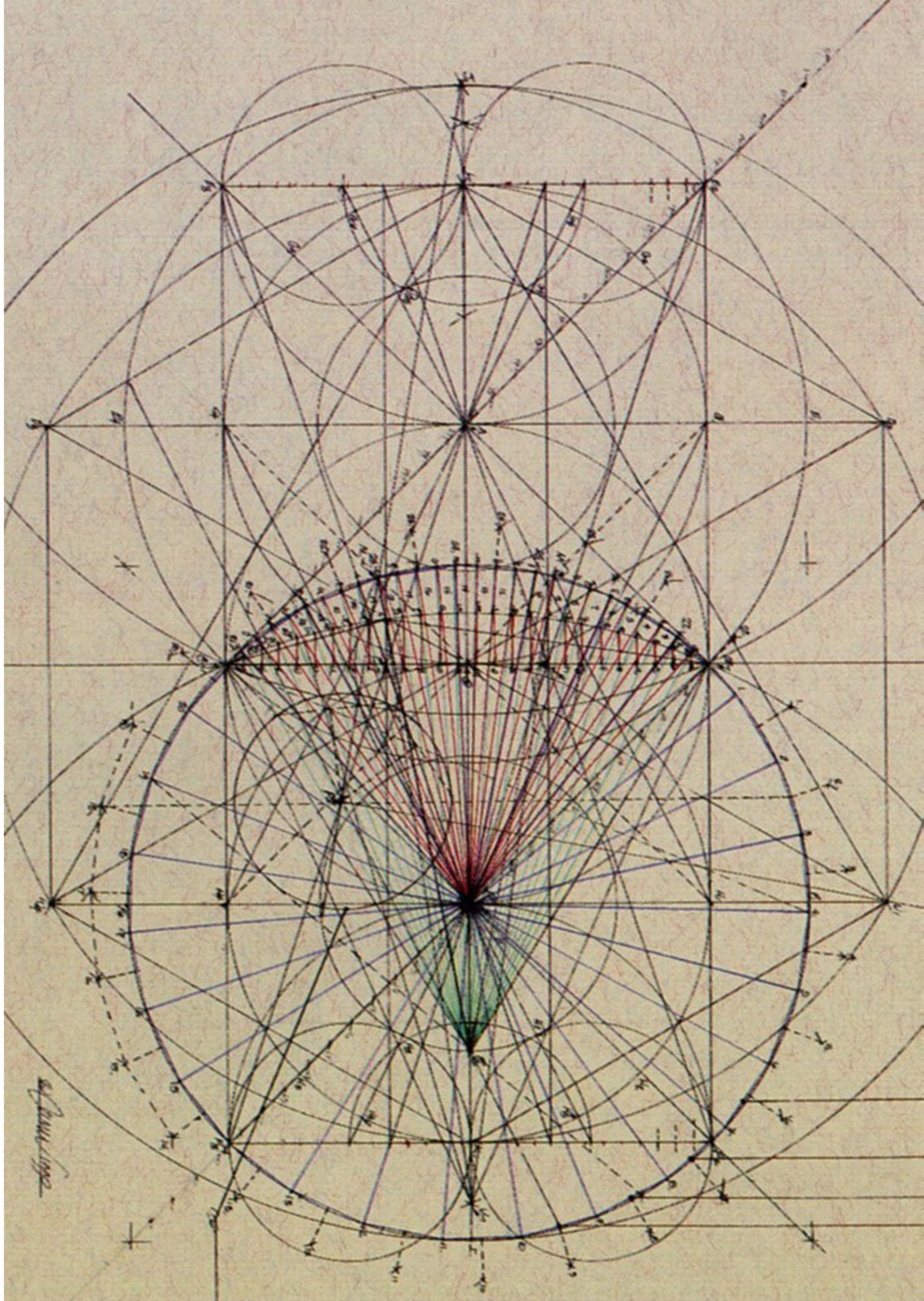
Though we can still consider points in the past as well as in the future, we cannot assume that our equations involving time can do the same traversing of the equation line.

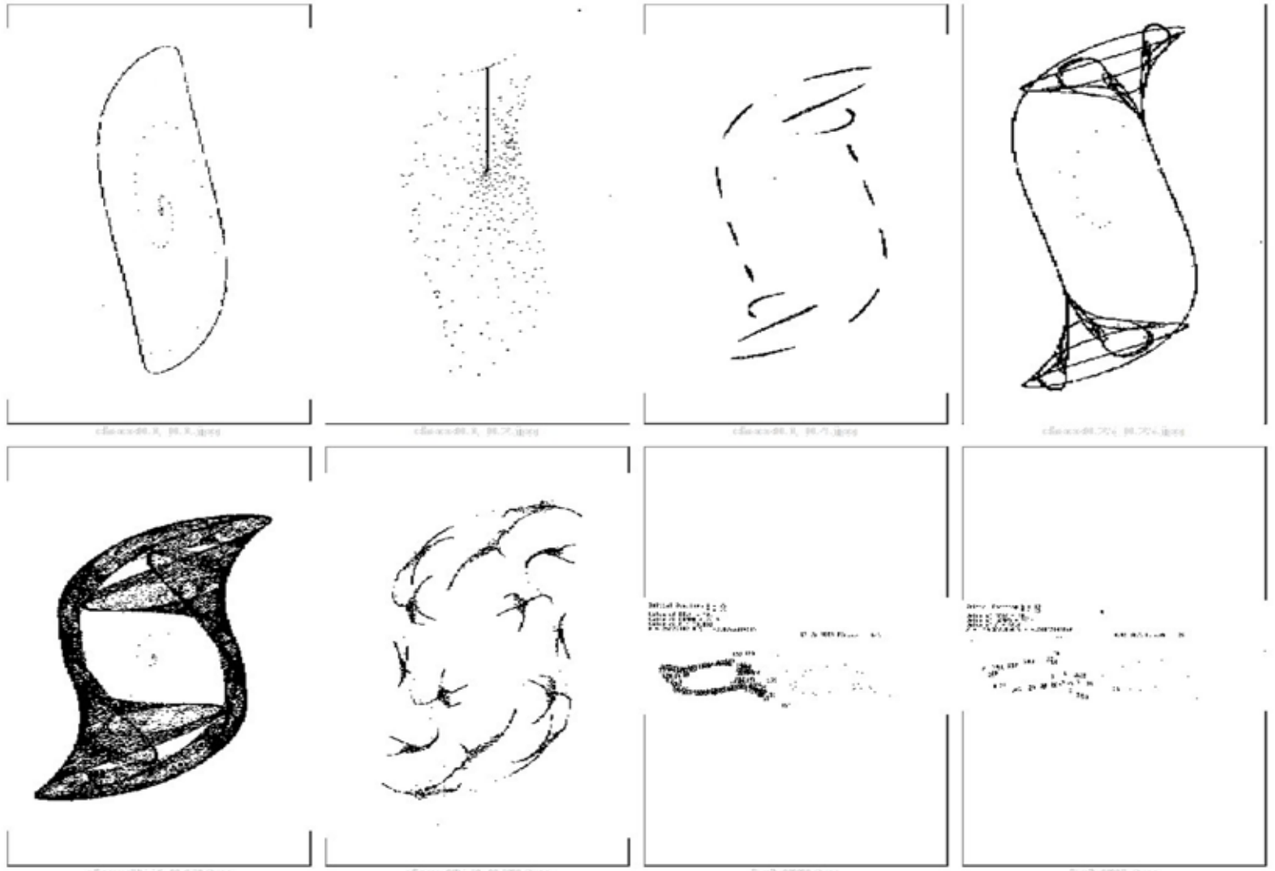
But, who is generally doing this sort of visualisation? For if it is a mathematician (living in his world of Pure Form alone – Ideality), he will, as usual, explore all formal possibilities! That is what mathematicians do isn’t it? And the consensus drift, after the Copenhagen retreat, is for sub atomic physicists to do likewise: after all, their Reality is now “equation-based”. What else can they do?

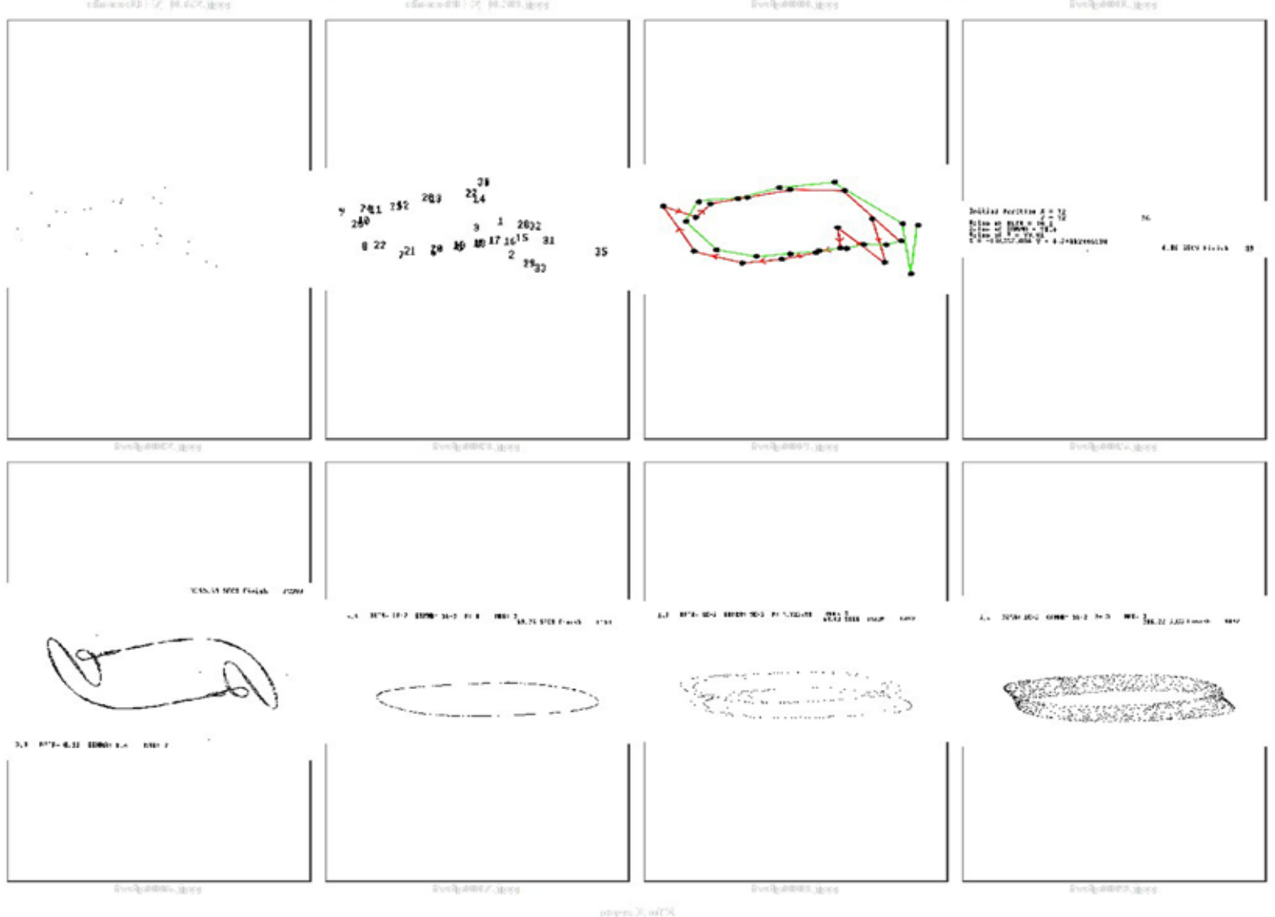
Now, there are even more and crucial considerations, which begin to put the whole conceptual space thing into question. Are our equations really happening exactly as such in Reality-as-is?

The question boils down to what is called Plurality – the assumption that every Whole can be analysed into separable Parts, and therefore in this context, the equations we graph are such separable Parts. But, that is most certainly incorrect!

The extracted equations that we consider as legitimate Parts have been very carefully “organised” by powerful constraints and controls of any Domain of Investigation. For, if we didn’t do this, we would certainly NEVER be able to extract any relations (which we then always generalise into formal equations) When Mankind attempted to do this in entirely unfettered Reality his glimpsed patterns came and went all the time, and NO reliable laws could be formulated.







Only when he nailed down the conditions in many necessary ways did he get to a situation wherein he could regularly reveal such Forms, and could then extract them and generalise them as his separable abstract relations.

So, this methodology, based upon the assumption of Plurality, became absolutely essential, if these "farmed formulae" were to be taken as actual laws of nature.
But try as he might Man could never use them back in unfettered Reality. They invariably failed!
He had to reconstruct the very same Domains from which he had extracted them in order to actually use them reliably.

Now, where does this leave our graphing conceptual space and the whole algebra derived from its geometry, and used as a precise alternative to the equations or their graphs.
It puts the whole thing solidly into Ideality, and NOT Reality!

It surely must mean that we are using a "farmed, and separated" Form in a conceptual space that is also assumed to be entirely continuous! The forms are NOT the actually occurring ones in Reality, and the conceptual space on which we display and manipulate them will be artificially totally continuous!

"So what?", you may well respond, "As long as we can match our manipulations and extractions in both Investigative and Application Domains with the conceptual aids that we use, who cares? It works doesn't it? Pragmatism is sufficient!"

Well, it you are an engineer it is, but if you are drawing theoretical conclusions and constructing sound philosophical standpoints, it certainly isn't.For we must be absolutely clear what are the various things that we are dealing with, and what their true relations to unfettered Reality actually are! We must consider what is going on in several ways.

First, we have totally unfettered Reality, which is where development takes place, but in which we cannot predict because it is evidently too complex, mutually interacting and variable.

Then, we have our highly constrained Domains with displayable and extractable relations.

And thirdly, we have our regime for dealing with these relations based upon a conceptual space with built-in properties such as continuity, and which is clearly solidly within the World of Pure Forms alone called Ideality!

Let us take our banker extractions first!

If we were to construct our Domains differently, we would get different relations often involving a different set of variables.

The Gas Laws prove this conclusively with:-

$$PV = C$$

$$PV^{\gamma} = C$$

$$\frac{PV}{T} = C$$

depending upon the conditions produced in the Investigative Domain.

So, we have complexity even within our extractions.
Our "Parts" at all levels are not separable: Plurality is wrong!

So where does this leave Reductionism and the idea that by cracking each Whole into its Parts, and then those Parts in turn, and on down to a final, fundamental set of entities and their eternal laws?

And let us, for a while at least, consider the assumption of Continuity in our main methodology for dealing with our extracted relations. Is this entirely adequate?

Well, to begin to address this we must investigate Turbulence, and the only well-researched aspect of this, which is Mathematical Chaos.

Many years ago I worked with a world-class mathematician named ***Jagan Gomatam***, who was researching a series of crucial areas including Reaction Fronts in Undisturbed Liquid Chemical Reactions, and Formal Models of the Human Heart (image opposite).

He recruited me to program various aspects of the latter research, which involved Chaos. The means of ensuring Chaos in given deterministic equations was very revealing. It was necessary to use Iterative Forms derived directly from the original deterministic equations, and when we did, Chaos could be easily generated. But what are the Iterative Equations, and how do they relate to the ordinary deterministic forms? The answer turns out to be, "It is how we traverse the form in a conceptual graphical space!"

In ordinary equations following through an occurring process would involve a traversing along the "line of the equation" – moving along the line of the graphical representation. But the iterative forms turned out to be very different.

Each known point substituted into the iterative forms produced another distantly situated point, and when this was substituted back into the same forms it did exactly the same – yet another separated point was produced.The full line of the original deterministic equation was built up instead by dotting about in a zigzag fashion until the form

was as complete as necessary. In non-chaotic situations the so delivered graph would look exactly like that plotted directly from the deterministic equation.

But, sometimes, the produced iterative version went haywire and produced "literally chaotic" results.

The wonder of all this was that the iterative process could produce phenomena that actually occurred in real human hearts, but which were unobtainable using the strictly determinist equations and their normal use.
Both Fibrillations and even terminal Heart Attacks were regularly produced.

The non-continuous exploration of the relation produced situations that were real, while the usual continuous exploration of it could never do that.

NOTE: Slightly different initial conditions were known to produce different outcomes, so the iterative method was similar to this in that each generated point was like a "new set of initial conditions", and delivered accordingly.

NOTE: Being something of a biologist too, such phenomena seemed more real as instead of an eternal Form totally delivering everything à la Laplace, we got each situation feeding directly into the next. It seemed more like the Living World than strict mechanistic determinism.

Now, I must emphasize that I am NOT putting forward the iterative exploration of a formula as being its "real truth" by these comments. It is still only Mathematics and the original equation was obtained pluralistically, so that cannot be true.

But, it does show that even with the distortions imposed upon extracted results and relations, there was always some Objective Content within it even then.

As in all such "formalities" Reality can be "echoed" by extracted Forms and their manipulations, and that is how I interpret the results from the Iterative Investigations that I was involved in for Jagan.

I still put Mathematical Chaos as within the Formal aegis – still in Ideality, rather than Reality, but approaching its limits, where stability is questioned and stumbles, but is not yet overthrown.

A much more philosophic explanation must be that Formalism can in special and controlled circumstances reveal coming together of many mutually affecting contributions into a seemingly deterministic law, but with two crucial provisos.

First, what we extract is always a simplification and a consciously "farmed" version.

And two, that even then it is temporary, and will be superceded as the world turns, even under our "farmed land", and will move on to something else!

Now, after these various (though absolutely essential) detours, perhaps we should return to our "graphing", and consider our original question- "Where can we put the Origin of Space-Time? And also could we relate Continuity and Descreteness to all of the above considerations- perhaps relating to the sister paper Interpreting Reality?

But first, it is probably the priority to muse upon Stability, episodes of slip, and its ultimate final breakdown.

If we consider an area where tectonic plates are colliding, such as Japan or Indonesia, the "norm" is Stability – no eruptions, no earthquakes, but periodically subterranean pressures build up in the rocks and slippage occurs – a movement along a fault line (a line of prior weakness) caused by an earthquake, and its immediate consequences can be shattering as in the Major Earthquake and following Tsunami in Japan only a short time ago.

But, though there are usually aftershocks, the situation can, and often does, settle down into an extended period of stability again.

Except, of course, when the cause (perhaps a major doming of an upwelling of mantle lava can no longer be contained and a volcanic eruption ensues, which can have truly devastating and even global consequences. Indeed, there is geological evidence for eruptions of such size and effects throughout the records in the rocks across the whole globe. And when such do occur, they can radically alter what is left. Long periods of literally devastating and life-eliminating conditions can and have wiped out whole sectors of living things with immediate massive extinctions, and major changes in the geography of large tracts of land. And, in some circumstances, along with other incremental processes, major re-routing of rivers and even global ocean currents have drastically modified conditions for considerable periods.

And yet these are mainly inanimate, physical processes. Consider what the content of such upheavals would be on the complex, higher levels of Reality.

Now, once such unavoidable phenomena are included in all systems (though on different scales of course) we do indeed depart from eternal laws conclusively. And whenever we extract seemingly unchanging relations we must not give it too high a status. It certainly will not be eternal or even a separable Part of a complex Whole.

It will depend on multiple, mutually affecting processes occurring at varying rates, and factors, and they will similarly be variably determined, with Stable periods, the equivalent of Earthquakes, and sometimes the major cataclysms (which we term Emergences).

So now we have a very physical alternative, which could have resonances with Iterative Procedures in Mathematics, involving descrete leaps – like fault-slips moving the action to a different part of the relation, and occasionally approaching Chaos too. The totally artificial leaps of the iterative processes, though NOT the same as the concrete leaps of a fractured stability, will still produce similar effects.

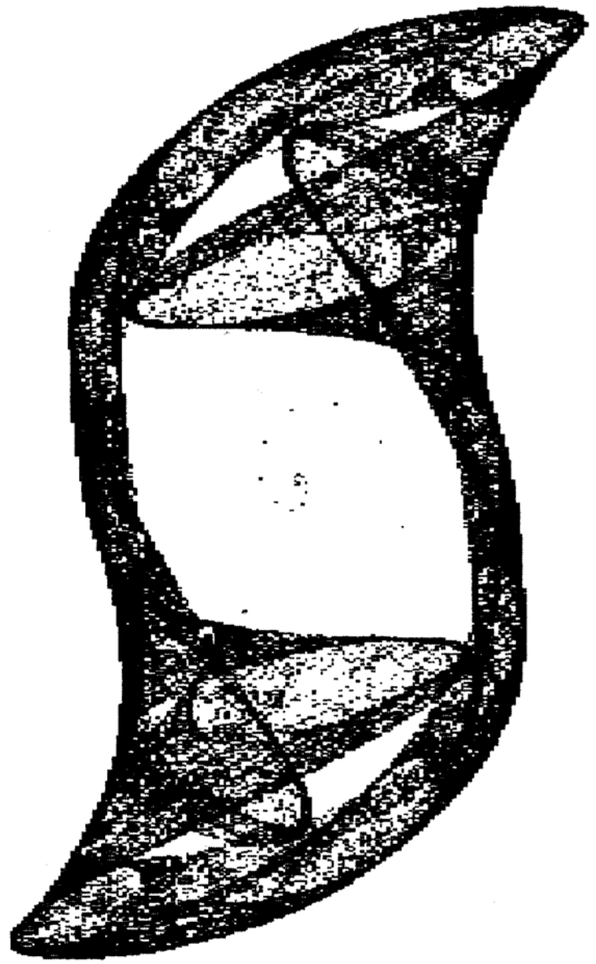
So, finally, "What are the effects of subterranean factors on our extracted formulae?"

For one thing is certain, at some point even our constrained and maintained Domains will not be enough to keep the relation "true", Ground beneath that "farmed area" could move, or its assumed constant atmosphere could drastically change, and the relation would fail.

So, what might the smaller scale aberrations be?

How would our assumptions of an "on-the-rails-only" traverse of a given relation be modified (maybe temporarily) by out-of-frame changes? We have seen how "within frame" aberrations can lead to Mathematical Chaos – still based exclusively on the same pluralistically extracted equation, but what of other changes?

Could they cause "fault-like jumps" to other places on the line, which represents the relation – indeed descrete jumps as in iterative plots?



The Wondrous Myths of Mathematical Chaos

And their Resonances with Instabilities in Concrete Reality

Way back in the 1980s, I was working with the mathematician Jagan Gomatam on Chaos applied in the main to models of the Human Heart.

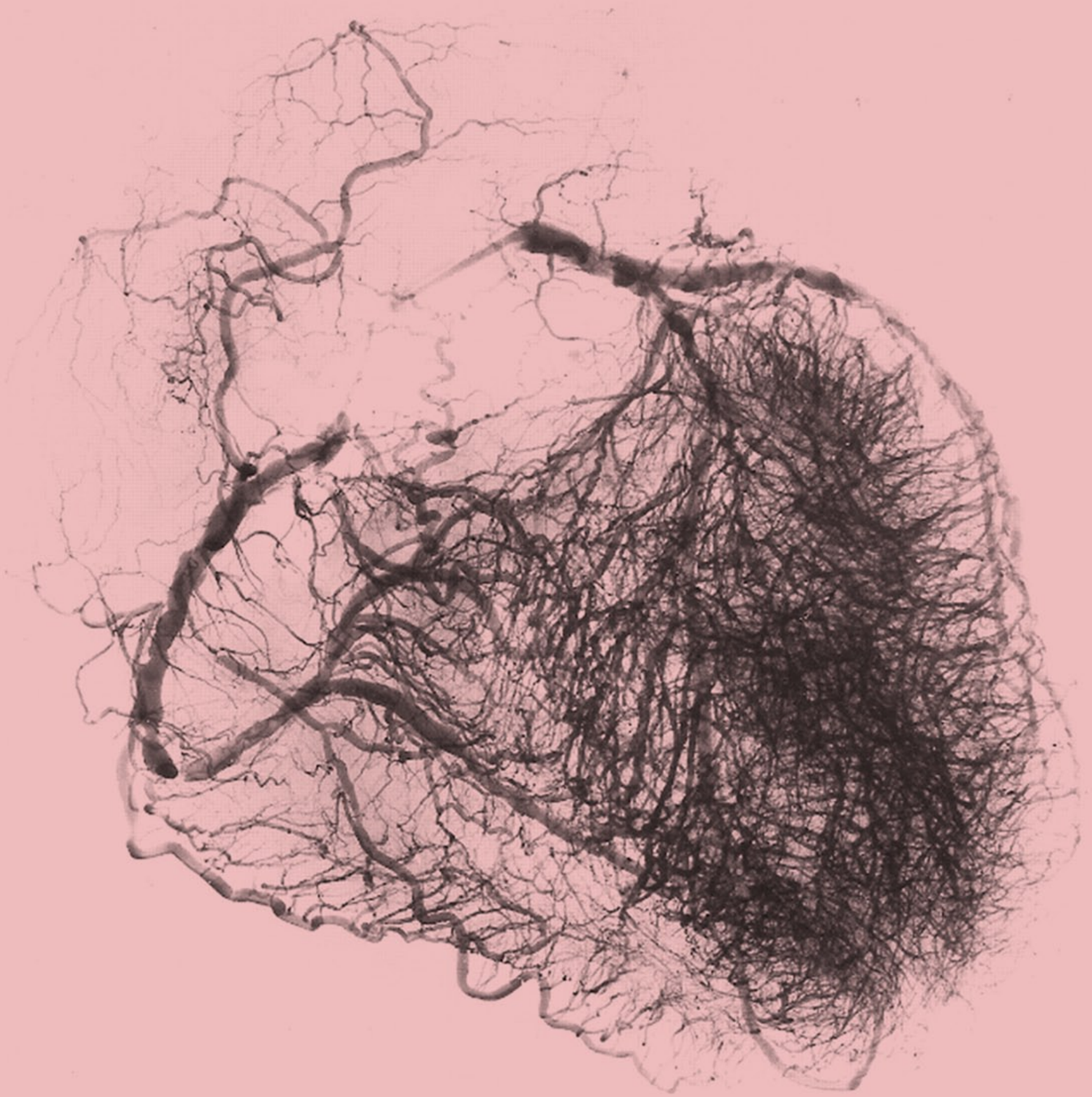
In this relationship, he was the primary mathematical researcher, and I was a recruited physicist with advanced computing skills, and the work that we did turned out to be significant, both mathematically, and perhaps surprisingly, philosophically too.

But at a certain point my colleague was banned from continuing this cooperative venture by his Head of Department, which was a shock to us both, because we certainly seemed to be getting somewhere. But, what was specifically being studied by us was concerning the forms of mathematical chaos generated by Iterative Formulae, which could, in the right conditions, be tipped over into chaotic situations (of the mathematical or purely formal kinds, of course).

As it turned out his Head of Department was aware of the "growing funding possibilities" becoming available in what was being called Systems Reliability, and he didn't want such an evidently able colleague wasting his time with an amateur from another department on research that was not winning such backing as he knew to be there for the "right" projects. The intention of the ban was clearly to terminate our researches, and instead involve Jagan in the far more lucrative area of Systems Reliability.

Needless to say, Jagan didn't stay long. He was offered a period of residency at a College of Oxford University, and grasped it with both hands. So his Head, the University and I lost a very good man, though at the time, with many calls upon my skills I didn't realise just how significant Jagan's work was, and the conclusions that could be drawn from concerning the Philosophy of Mathematics and its relevance to Concrete Reality.

Of course, the aim of finding the reasons for systems "unreliability" in the Real World, purely within the formal mathematical side, would have been doomed to failure anyway. To really address such questions is not a job for mathematicians, but for someone (or more properly interdisciplinary teams) with a developed holistic philosophical standpoint, and who



have a wide experience of multi-component systems from many different areas.

And it was certainly on this front that the most important gains were subsequently made, though not immediately, because only if the original work was carried through to a conclusion could these subsequent philosophical conclusions have become evident a great deal sooner. For the crucial questions were already being asked even at that early stage in the project.

Indeed, it was not until very recently that the implicit content of that research was carried to important philosophical conclusions.

In the latter part of the previous paper by this author entitled, "Where is the Origin of Space-Time?" relevant considerations to what is being addressed here were finally carried through to some sort of implicit features of the ideas and methods employed.
But, what were not mentioned in that prior paper are perhaps the most important points of all. For the research into Models of the Human Heart were investigated using Iterative Forms of the Van der Pol equation (an invented deterministic model for the heart), and various phenomena that actually happened in Reality seemed also to have occurred in those purely formal investigations.

The first and most frequently occurring were various cases of fibrillations, which were most certainly examples of instability within the usually stable deterministic model, when in those investigations formal chaos ensued.
But several other cases that were uncovered proved to be even more profound. The clearest of these were those that which could be interpreted as various types of Heart Attack, wherein the most startling cases of the cycling, beating model were when they actually stopped dead, and the immediately following content abandoned any cycling for a dramatic zooming off of the resulting data towards Infinity.

IMAGE OF THIS ON NEXT PAGE

But also, several others continued to display a maintained cycling, but with amplitudes reducing significantly until the whole thing subsided into a string of zeros.

Now, in the previously mentioned discussion in the sister paper to this, these points were not described, but they turned out to be absolutely crucial.

Just as the perceived "Fibrillation" cases were without doubt forms of a purely mathematical chaos within a maintained stability, though clearly relating to real Fibrillations in an actual Heart, the "Heart Attack" cases of both kinds could only be interpreted as the total breakdown of formal stability too.

The formal model had ceased to function as required and had failed totally, just as the real Heart System became irretrievable unstable and expired.

Yet the temptation was to "explain" the real entirely in terms of the formal, and a version of formal processing that was almost impossible to relate solidly to real processes. Formal "causes" were substituted for the search for real concrete causes.

Now, what we have here are clear examples of the dangers of Formalism! Though such investigations can, if interpreted correct throw important light on the search for the real concrete reasons for these phenomena, the immediate allocation of cause to purely formal reasons terminated the necessary search for the real causes. Such, terminations were proliferating and the full scientific process was being brought to a halt at a very early part of the process – when data led to formal description.

The most important part of the whole process, when full explanations were sought and delivered was not even started. "We have formulae, and that is enough!", was the usual conclusion.

Now, of course, all such equations have their Domains of Applicability, and will always fail outwith these defined areas.

But here, for the first time, we have some idea of why they fail. The stability in which the equations hold is pushed first towards the limits of the stability (represented in the mathematics by chaos), and in Reality by actual Fibrillations.

Thereafter, the exceeding of the bounds of the stability beyond both the chaotic aberrations outside of the limits of stability, also had both a mathematical manifestation, and a real one in the "Heart attacks" in both the forms of stability.

But, as always we slip into a possible impermissible transfer and inversion, which has the formal features causing the real manifestations.
And that is certainly wrong!

What we do have in these resonances are not cause and effect, but similar outcomes in Pure Form and in a real heart – in Ideality and in Reality.

But, let us be clear, to have the Pure Forms causing the real concrete effects would be Idealism. But, the fact that these two worlds have resonances should not surprise us. For the initial content of Ideality was a whole series of Forms extracted from experiments within Reality, though constrained and processed to only produce purely formal outcomes.

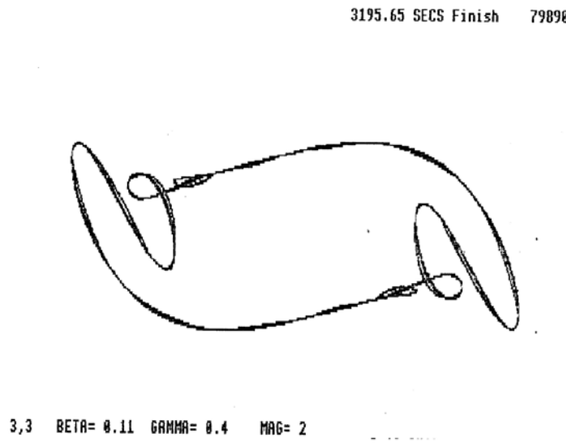
Mathematical Chaos did not cause the real world happenings, they will certainly be explicable in terms of Real World causes.

The real world system could not move to another viable mode, and therefore failed in the real Heart Attack.

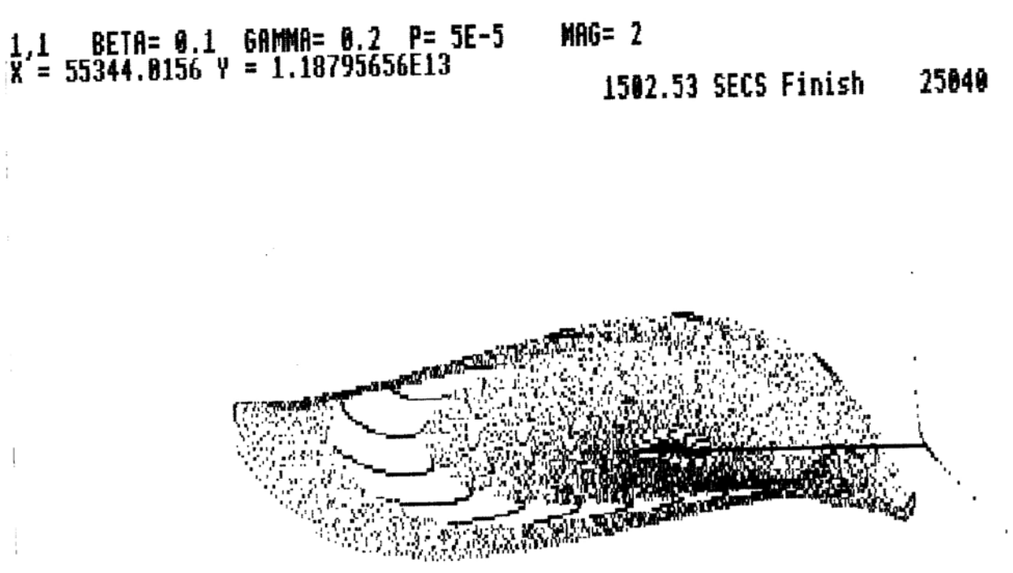
All this throws ever more light upon the relations of real world phenomena and the abstracted formulae that have resonances with them, and hence can help us to seek real causes. The trouble is that many are totally diverted from such endeavours, and as soon as they find a formal resonance, they make the maths the cause.
It most certainly isn't!

Remember that the examples studied here are dramatic cases.

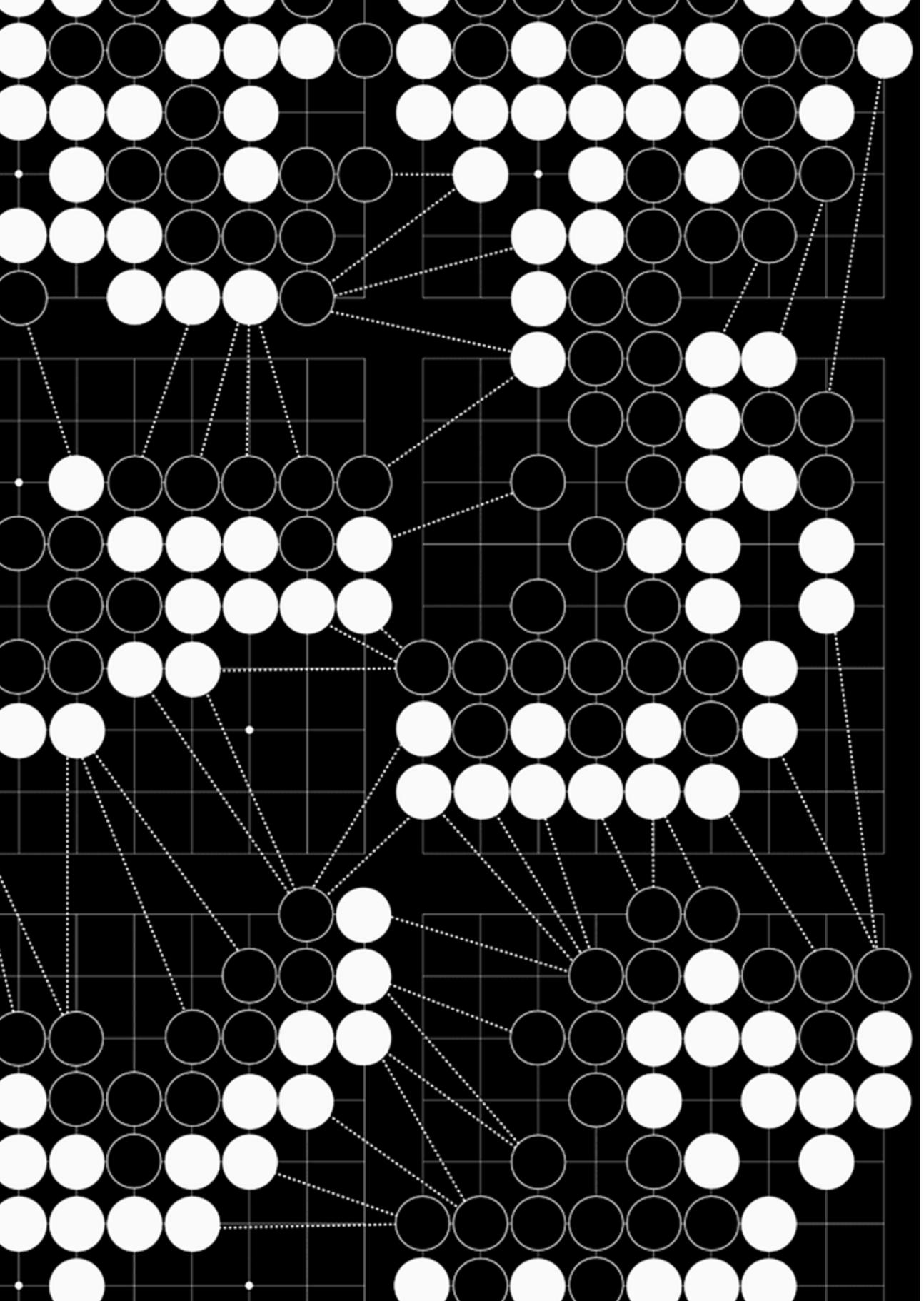
The normal, frequently occurring cases would have a given stability failing on transgressing the limits of its applicability and being transformed into another and different stability in the new conditions.



FIBRILLATIONS



HEART ATTACK



The Interpenetration of Opposites

Form or Content?

So, when avowed “Marxists” talk of The Interpenetration of Opposites, as Peter Mason does in his support of the Copenhagen Interpretation of Quantum Theory (though he insists, instead, on calling it “Quantum Mechanics” throughout his article), are they just saying the words, or perhaps using the term as encapsulating some kind of two-sided way of looking at many complex processes?

And if either of those is what they are doing they are, I’m afraid a million miles from what Zeno, then Hegel, and finally Marx were actually explaining. For these giants were, first and foremost, holists, and knew that Mankind’s endless task was to find ways of dealing with the complexities of that very difficult kind of World.

Indeed, as with all great abstractions, the Interpenetration of Opposites was a step towards getting a handle upon a changing, indeed an evolving, Reality. For it included the full holist conception of multiple simultaneously acting factors, many of which would seem to be directly contending, while others might well be mutually supporting and even actively facilitating one another, so that the subsequent discernables would be those that were currently dominating, but even then it would be a transcending of seemingly opposing sub dominances into some new and higher synthesis. And this, also having to be conceived of as a current, temporary coming together, which would always change, but usually not immediately!

Indeed, perhaps a simpler example might reveal something of what is considered to be going on.

Some years ago, two colleagues of mine in Glasgow were seeking to reveal the geometric Forms of Reaction Fronts in liquid-to-liquid chemical reactions in totally undisturbed conditions (as distinct from the usual “mix thoroughly and wait for equilibrium” of most such investigations).
But to even clearly observe such chemical reactions in such conditions was almost impossible. To facilitate their actual observations they found an oscillating reaction, in which the chemicals at either end of the process were of markedly different colours.

Now, this certainly revealed what was going on. The reaction would initially proceed in one direction with a consequent clear change of colour, until a certain point when it would reverse, and proceed in the exact opposite direction until sufficient of the original chemical appeared to change the colour back.

Of course, being entirely internally driven, the oscillation would then carry on leaving a striped volume behind the reaction front.

Absolutely no outside additions were involved so there could be no doubt that this was indeed an oscillating reaction and revealed a surprising geometry. The reactions as they proceeded formed a Toroidal Scroll.

Clearly both these reactions were always present, but their rates depended upon the amount of resources present, so initially the first reaction dominated because its resource was abundant, but as the reaction proceeded its resources would diminish, while its products would grow. And at a certain point the reverse reactions rate would surpass that of the initial reaction and the situation would be reversed. Clearly a couple of thresholds would indicate when the dominance switched over.

NOTE: If the above detail seems a little too much, may I point out how much better it is than merely saying we have a case of “The Interpenetration of Opposites” and nothing more!

Though much simpler than the significant cases usually mentioned, could not this work be a very simple example of the Interpenetration of Opposites?

Of course, the crucial cases wherein this phenomenon is most often cited, are those involving the natural creation of New Levels of Reality, which would transcend contradictions within a new and higher level system – such as the Origin of the very first primitive Lifeforms. These would effectively contain the opposites as parts of the higher order, and maintain the new stability until it, and later others in turn would be transformed via other such Emergence Events, as Reality then climbed the Evolutionary possibilities inherent in each New Level.

A couple of contradictions and an over simple wordy suggestion of resolution is surely just too pat and easy to be considered valid.

The meaning of the word “interpenetrating” is surely crucial!

If we consider opposite processes actually contending one against the other, it seems that the only resolution either the victory of one over the other, or a negating of both to

deliver an outcome which is neither one or the other of these processes.

But clearly, that is not what is meant by "interpenetrating".

Clearly in such a process, both must somehow survive as such, but don't cancel each other out or be individually vanquished by the stronger opponent. They must continue as before but be contained ("subsumed") within sub divisions of a higher controlling system. They become "Parts" within a higher system that has top-down controls.

Now this is highly important, because it is the opposite of the usually assumed bottom-up causality, which we term as a pluralistic system: it also makes Reductionism inadequate in delivering only a level-below-level causality to explain everything. This true meaning of the Interpenetration of Opposites must be part of a developing process wherein incremental bottom-up processes alone cannot lead to the real revolutions, which transform a situation into something wholly NEW.

Life did not appear by pinheads, but by a wholesale revolution – an Emergence. And if our avowed "Marxists" do not explain that, then their "Interpenetration of opposites" is indeed mere words.

NOTE: In case the reader feels that this writer too fails to deliver what he criticises others for omitting, may I refer to his Special Issue in SHAPE Journal on the web entitled The Theory of Emergences.

For when we recognise the strands, which seem to contradict one another, it is because we see them acting as if upon a common, but neutral, ground, and hence they seem to directly oppose one another. Indeed, they run directly counter to Formal Logic, so we are stymied by them.

But clearly, when we notice them, we, both physically or conceptually (or both), extract them from their true ground, and instead position them upon an imagined identical common ground for both!
It is easily done because it is almost true!

They do exist upon a common ground, but it is not that we imagine it to be. It is an intrusive and affecting ground, which can accommodate both, but in different ways, indeed from above.

Perhaps what I am attempting to describe is best illustrated by the total integration of development in a living organism by the constant elimination and death of all its constituent cells over time, so that in a surprisingly short period almost none of the cells that constitute the organism remain. They have all perished and been replaced by newly produced and identical cells seemingly fitting exactly into the same positions and roles.

Another illuminating system is that which we call The Metabolic Pathways.

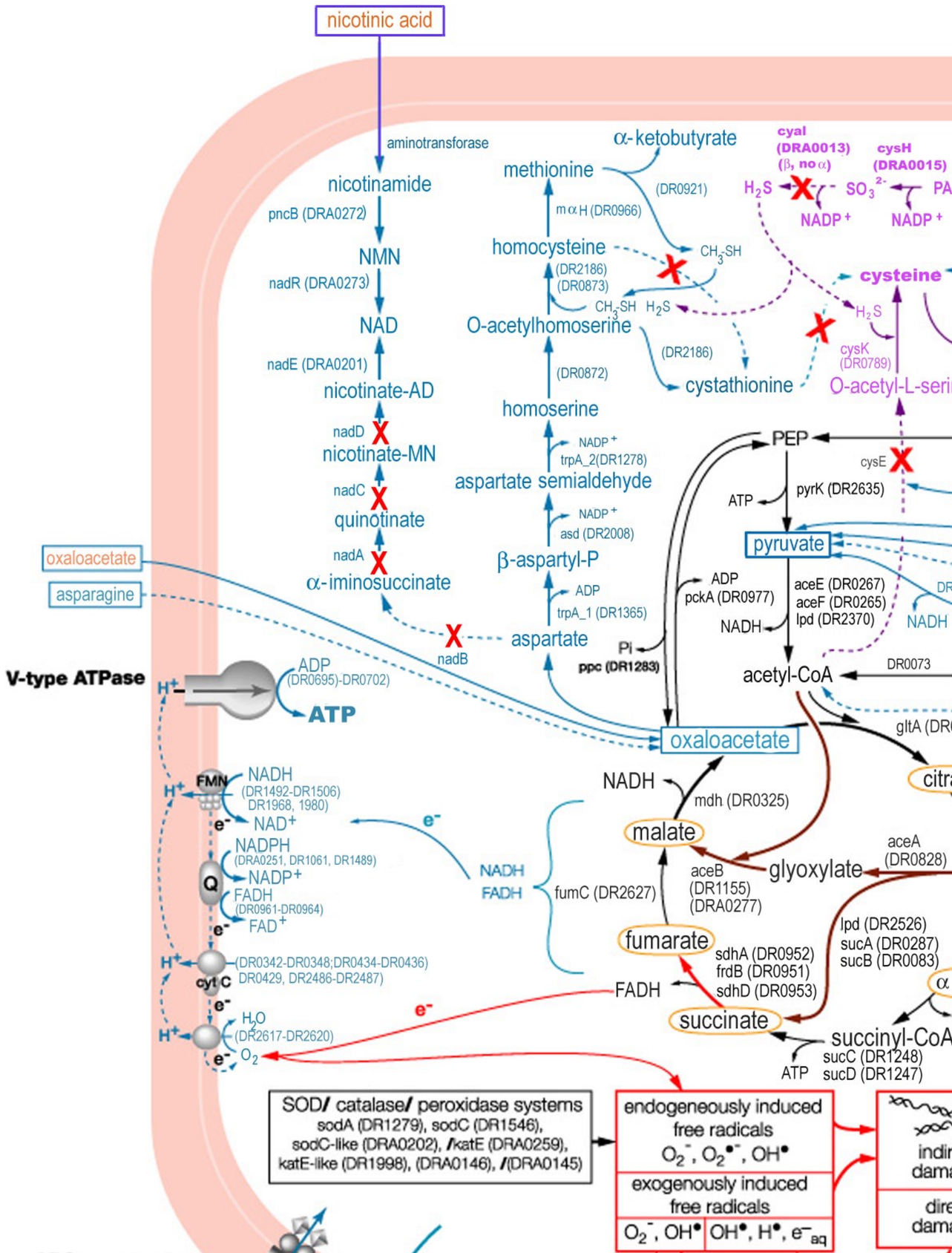
SEE OPPOSITE

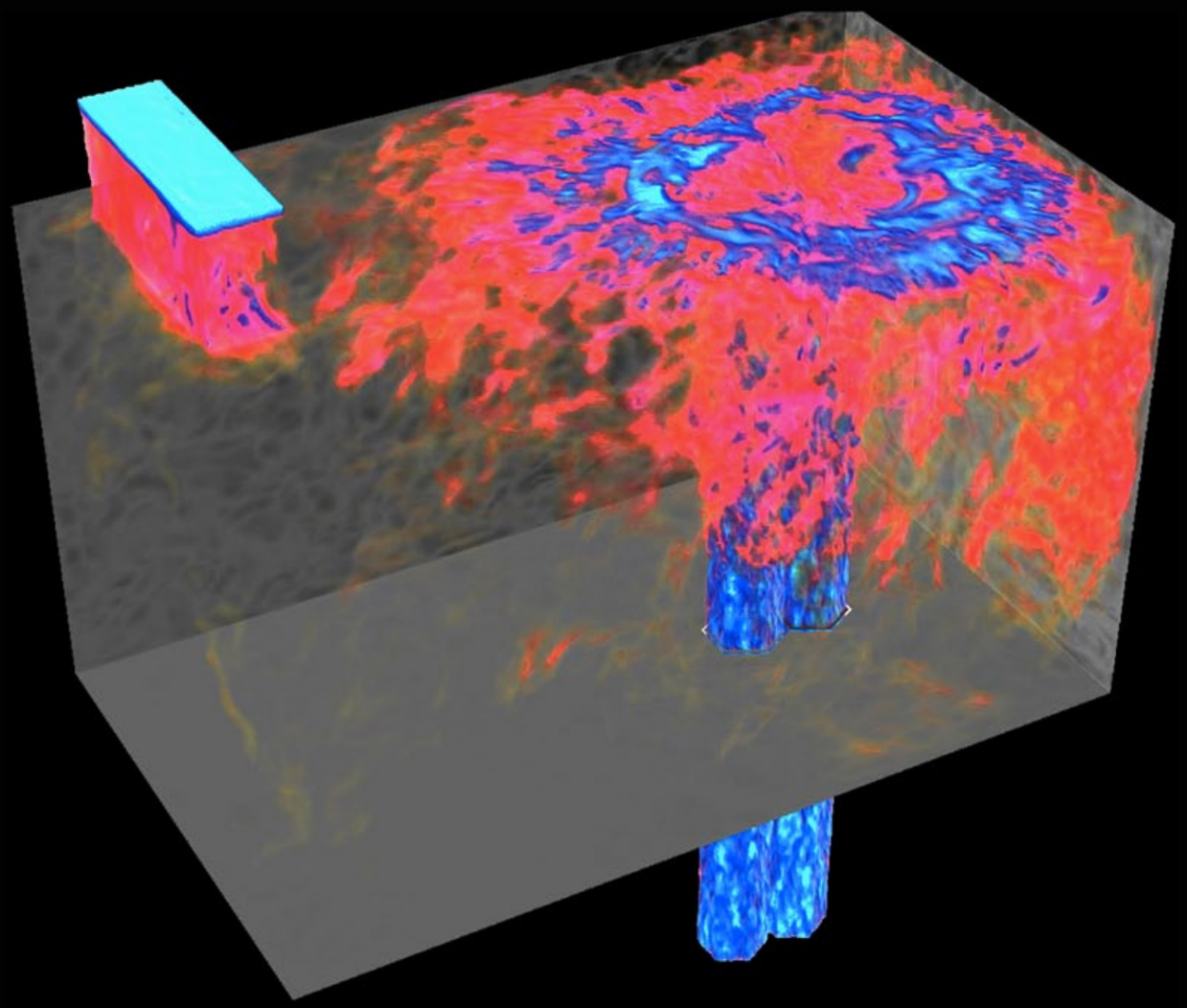
But this is usually used to prove the existence of cooperating sequences and even cycles of processes in a living organism.

But, it also illustrates the inclusion of opposite processes. The conversion of ADP into ATP is a means of storing energy from incoming resources via an endothermic reaction. While the process of converting ATP back into ADP by an exothermic reaction releases that energy for movement and to fuel multiple other processes required by the organism.

If we didn't have the overall, controlling system, we might see these as directing contradictory processes, but in living systems they don't merely reverse one another. Indeed, the first builds in from outside, while the second fuels necessary processes.

Though opposites of a kind, they are essential components of a higher and much more complex system.





The Phases of Systems

The reason that Turbulence comes up so often when considering natural law, is that on attempting to model many phenomena, and most particularly in Fluid Flow, we can by a series of reasonable assumptions arrive at a Form, which we can call Streamline Flow, where (in a pipe, for example) a situation can quite naturally arise, consisting of a centre tube of high speed flow, surrounded by successive concentric cylinders of decreasing speeds, until at the outermost edges of the flow in contact with the containing pipe, we actually would have zero movement, with the cylinders as we move inwards displaying increased speeds, with the maximum at the centre, along the axis of the pipe.

Now, in spite of its seeming artificiality, something close to Streamline Flow can indeed be achieved, and the reason seems to be because inner frictions within a fluid are so low, enabling to be achieved, though I am guessing that the cylinders will not be descrete but more like a continual change in speed right from the edge of the pipe to the centre.

But, all too regularly, the system can descend into what we call Turbulence and the throughput will under those circumstances decline catastrophically. And, of course, without a containing and constraining pipe, when a flow occurs through, say, an initially stationary fluid, the descent into a special kind of turbulence becomes the norm, and the overall picture usually includes both forms simultaneously.

It is interesting that constantly recurring features of such turbulence are the spiralling islands (like miniature whirlpools), which can spin off at the edges of a strong (almost) Streamline Flow. What seems to be happening is that different Phases of the movement are occurring together, as conditions slip from those ideal for one, to those ideal for a different phase.

In a sense, it is like the Phase Changes of a substance from Solid-to-Liquid-to-Gas, ad vice versa, in that conditions cause a switch to a more appropriate Phase.

NOTE: It is interesting to ask why Streamline Flow can ever be maintained in any circumstances, with the adjacent cylinders moving by one another at differing speeds, but the earlier comments on friction may be close to a reasonable model for this. Certainly, it is conceivable that at high-unconstrained speeds these differences will cause turbulence from the outset. And when this happens the occurrence of whirlpools becomes clear as the faster speeds will curve the local flow outwards towards the slower flows and gradually build a spiral, which will break away, and a new similar process will commence once again.

Similar spirals happen with the growth of climbing plants for very similar reasons, as that side in contact with a possible stationary support, will grow at a slower rate than the other side away from the support, and the tendril gradually coils around the support.
And, of course, in such plants the transforming of the part from soft and bendable to hard and rigid changes the tender support of the tendril into the strong and durable support of the hardened helix.

As I sit here writing, I can see on my mantelpiece a wonderful helical form in hard wood from a very old ivy plant, that had long ago ceased its original delicate hold, and had hardened into a remarkably strong yet resilient coil of solid wood.

What I an attempting to stress here, is that the same stuff can exist in different Phases depending upon conditions – not only external conditions, but also those as they change within the stuff in question. And when, for example, we consider the aggregation of atoms at the beginnings of the Universe, it seems likely that in a high energy situation we would certainly have something a great deal simpler than atoms – indeed, some sort of nuclear flux or plasma, which as the energy subsided could become atoms (with electrons added) then gaseous molecules, and perhaps thereafter liquids and finally solids. Yet these Phases will be very different in spite of being composed of the same stuff!

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