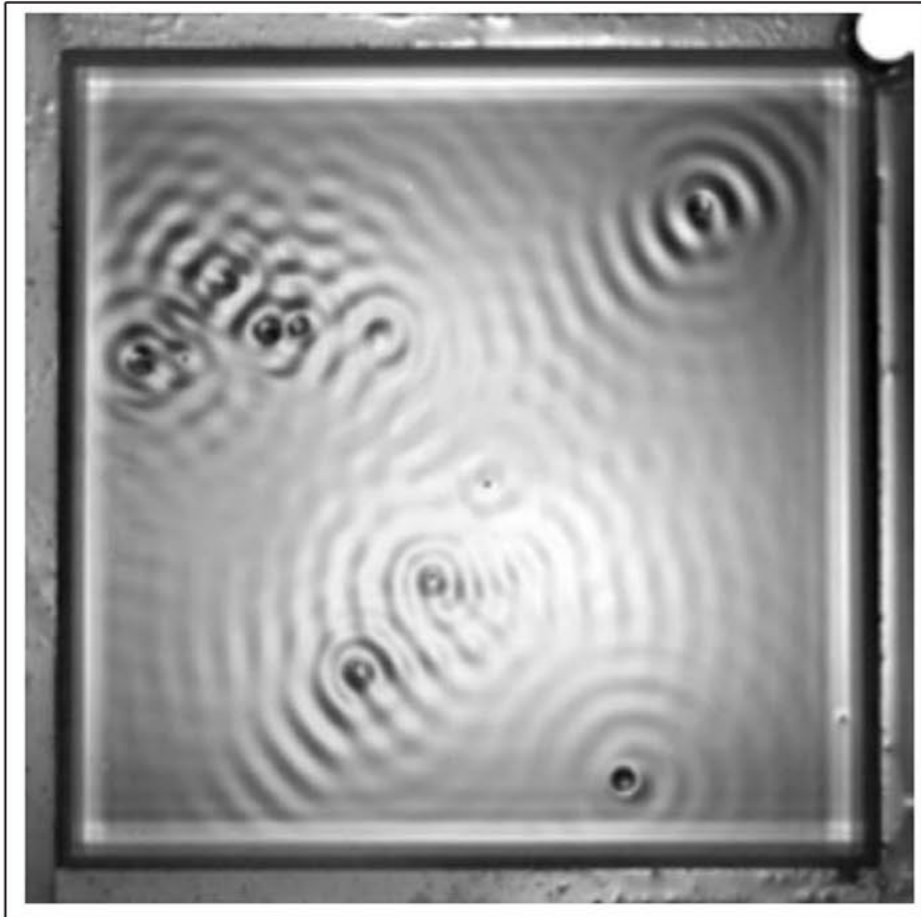




# SHAPEJOURNAL

YVES COUDER'S EXPERIMENT I : TOWARDS THE NEW SCIENCE

COUDER & COPENHAGEN / PORTAL TO A NEW SCIENCE / CREATIVE CHAOS  
EMERGENCE OF EMERGENCES / REVOLUTION IN PHILOSOPHY / DIVERSIONARY PATHS



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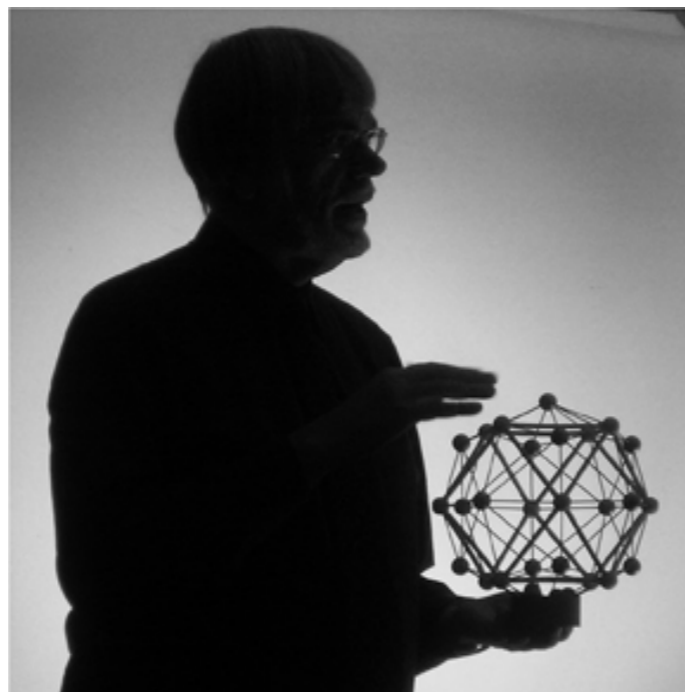
Special Issue 25

## **Yves Couder's Experiment I :** Towards the New Science

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## Editorial

### Introduction to the series



Welcome to the 25th Special Issue of the **SHAPE Journal**, and the first in a new series on Couder's experiment.

Over the past few months this author has been moved to write some 22 papers arising from the crucial experiment by Yves Couder, wherein he has been able to arrange, in the macro area of physics, for very similar phenomena to what occurs at the sub-atomic level.

According to the current consensus in this area of study (The Copenhagen Interpretation of Quantum Theory) such phenomena are meant to be physically impossible outside of that specific area. Over almost a century, a philosophical standpoint and experimental method at variance with those employed elsewhere in physics, had become established. Couder's work disagrees profoundly with this, but his position also differs from the usual pre-Copenhagen standpoint and methods in rejecting the principle of Plurality, for a much more holistic approach to experimentation. Instead of isolating and analysing phenomena, he has been pursuing an approach involving their construction, wherein known forms and behaviour are artificially modelled using areas much easier to observe and study.

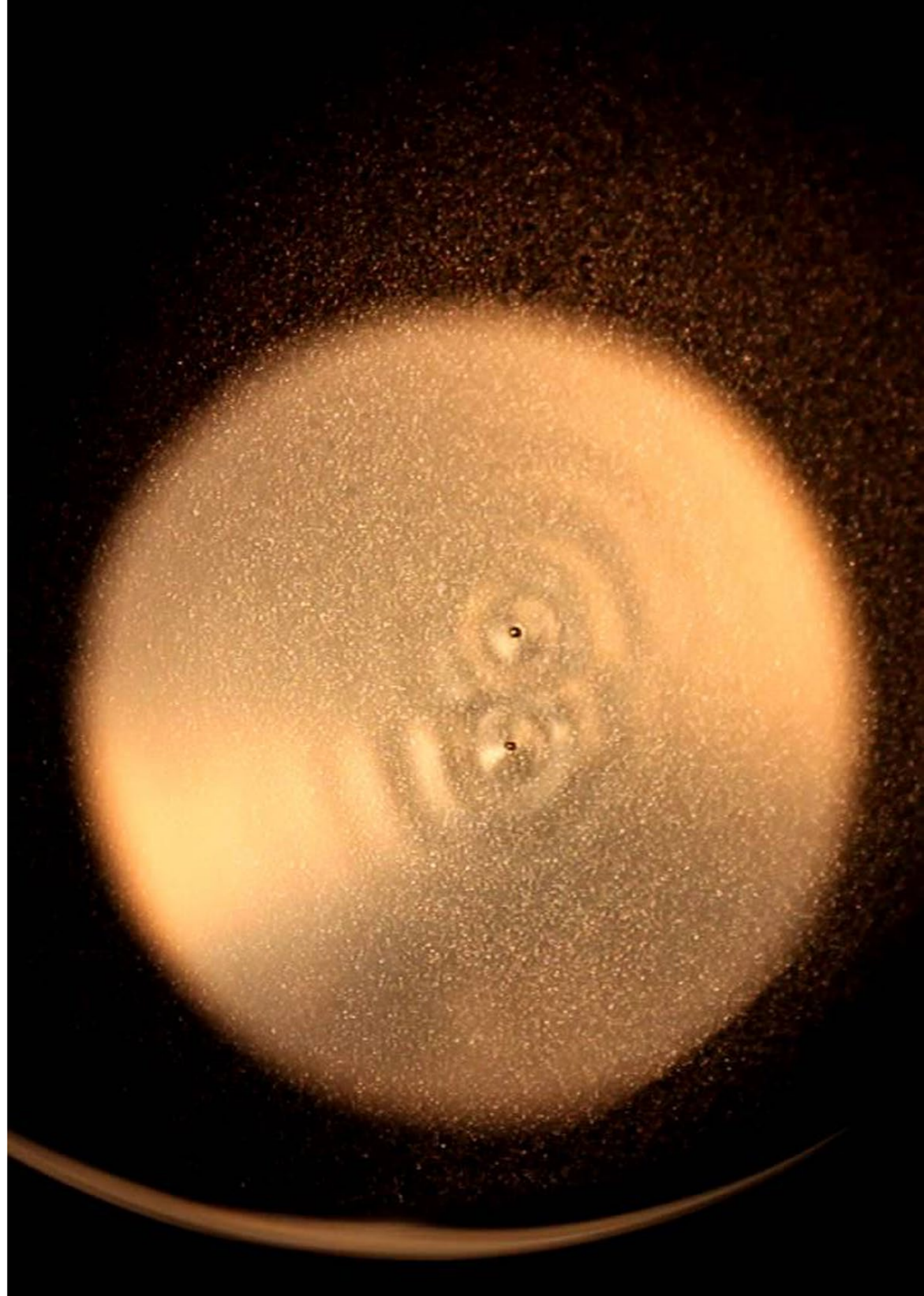
His successes have thrown the Copenhageners into crisis, and they have been at haste to denounce what he is doing as merely coincidental, and certainly not profoundly important. But they are wrong to dismiss this work. These papers are an attempt to make clear the importance of Couder's experiment to sub-atomic physics, the potential philosophical ramifications, and its crucial role in forming a new holistic approach to science.


The papers will be published in over the next few months in three Special Issues of SHAPE:

1. Towards the New Science
2. Explaining Couder's Experiments
3. Standing Waves

**Jim Schofield**

Mar 2014





## Couder and Copenhagen

### Is the Sub Atomic Really A Different World?

The following paper has a fascinating, yet demanding objective.

It intends to relate two sets of phenomena occurring in very different physical realms, in order to necessarily undermine the consensus Copenhagen Interpretation of Quantum Theory by the analogy of the sub atomic phenomena that it is supposed to apply to, with a set of phenomena created by Yves Couder, entirely at the macro level, yet showing amazing similarities with those at the sub atomic level.

Couder, himself, at first merely glimpsed certain resonances between the two areas, but, thereafter, worked consistently to construct an ever closer analogue of that micro world, but entirely at the macro level. His objective was clear!

At the level he was working, absolutely nothing would be beyond revelation and analysis, and via such detailed explanations, he hoped to throw a revealing light upon the current, perplexing detours being “explored” in sub atomic Physics.

And, his efforts produced results far beyond what his expectations. For, his materials and arranged-for performances were merely based upon a single silicone liquid and a series of different oscillations, chosen specifically to cause both resonances and recursions.

What remarkably emerged was a stable sub system, which he termed “The Walker”. And, thereafter, one-by-one, he proceeded to create and display behaviours that were supposedly uniquely confined to the sub atomic realm. And, all of them were occurring at the macro level!

Of course, such things would not normally occur at that level, for in normal circumstances much more energetic and dominant macro oscillations would swamp the sort he was purposely creating and promoting. But, clearly, his main purpose was being fulfilled. These were not only confined to the sub atomic level, and the unique theory associated with them, which was also re-writing many tenets of Physics as it did so, and could indeed be profoundly mistaken.

Couder even managed to make his “Walkers” perform “quantized “orbits!

Now, of course, many “Supporters of the Faith” dismissed his creations as mere coincidences, but they were most certainly wrong! Couder had produced a worthwhile analogue at a directly observable and analysable level,

without the quantum, and in so doing unavoidably put in to question the fundamental tenets of Quantum Theory.

The “Key Things” at the micro level were indeed the quantization of energy levels involved in sub atomic orbits within the atom, encapsulated in the ubiquitous Planck’s Constant, “h”!

Now, if analogous situations could be created at the macro level, the key tenet of the Copenhagen standpoint would most certainly be brought into question, as the quantum could NOT be the cause in any of Couder’s macro set ups. Let us clarify what were being compared.

At the sub atomic level there were the discrete energy levels involved in the electron orbits within atoms, along with the seeming Wave/Particle Duality in many related phenomena.

At the macro level Couder, using oscillations, resonances and recursions, managed to create a stable entity, which he called a Walker, that was composed of a bouncing drop, and also included a Standing Wave associated with it in the oil bath substrate. And this surprising amalgam could be set to perform what appeared to be quantized orbits.

Though, many other analogues of what happened at the micro level were also achieved, it was this quantization that was the clincher. If Couder could explain that solely in terms of oscillations, resonances and recursion in an integrated stable system, the myth of Wave/Particle Duality and probabilistic predictions due to naturally indeterminate features would be scuppered. You could not claim such features in his Walker, and yet it displayed very similar behaviours.

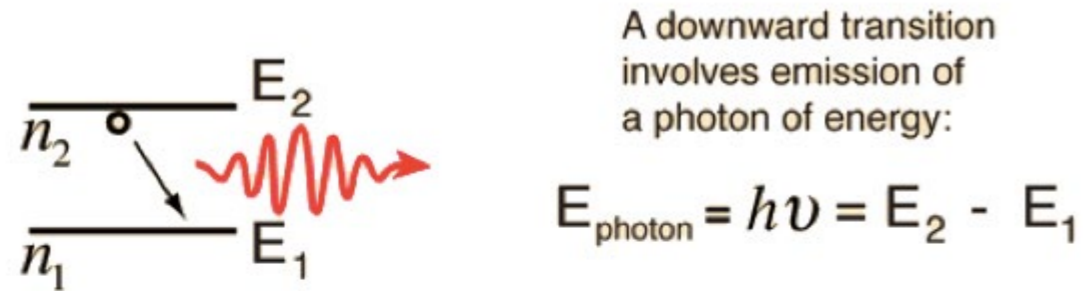
Now, the questions were posed, but how could the theory at the micro level be demolished?

Clearly, a complete explanation of Couder’s Walkers was necessary, and perhaps the data could also be addressed in the very same way, as had been done for the micro situation. If this were done, we might well end up with equations very similar indeed to those for the micro level. Yet, instead of Planck’s Constant, “h”, there would be another, which could not be explained away as the Copenhageners had done for “h”.

So, the initial task is clear – it must be to display the currently-used equations for a basic case at the sub atomic level – those for the Hydrogen atom, and a single photon

(quantum) of electromagnetic energy emitted from the atom, occurring when a promoted electron returned to its base orbit.

The required equations are shown below:



Given the expression for the energies of the hydrogen electron states:

$$h\nu = \frac{2\pi^2 me^4}{h^2} \left[ \frac{1}{n_1^2} - \frac{1}{n_2^2} \right] = -13.6 \left[ \frac{1}{n_1^2} - \frac{1}{n_2^2} \right] eV$$

$$\frac{1}{\lambda} = R_H \left[ \frac{1}{n_1^2} - \frac{1}{n_2^2} \right] \text{ where } R_H = \frac{2\pi^2 me^4}{h^2} \text{ is called the Rydberg constant.}$$

$$R_H = 1.0973731 \times 10^7 m^{-1}$$

Now, before we go any further, we must dispel the myth that these equations direct what happens in Reality. Of course they don't! They are nothing but purely formal descriptions of what has been extracted from that situation: they are the Forms that occurred there! And, crucially, they are not unique to that situation alone. But, are in fact Universal General Forms that can occur in many other places too.

This being the established case, they cannot be the causes of what occurs, but merely formal representations or descriptions.

So, it should be possible, if analogous forms appear elsewhere to fit those same general forms there too.

Hence, ultimately, we would have the same equations representing both the micro level phenomena AND those for Couder's Walker! The only differences will be in the particular constants necessary.

Clearly, if that could be achieved, there would also be possible a physical explanation to accompany the equations for the Walkers, for it would be straightforward at the macro level to explain all the generalised phenomena.

Absolutely NO magic Universal Natural Constants would be necessary. Everything will be explicable in terms of physical properties and relations.

So, then we don't just have a similarity of Forms in the two disparate areas: we have sound, physical analogues!

And, an alternative, physical explanation of the micro phenomena may well be possible, using the same sort of reasons, as did the job at the macro level.

So. This is the task!

But, it would be wrong to limit this critique to this pair of situations alone. The victory of the Copenhagenists would not have been so complete, were it not for other major, and long-standing flaws and contentions in the then current standpoint in Physics. There had always been a continuing case of what is usually called "Cognitive Dissonance", ever since the birth of Modern Science many centuries ago.

At the heart of Science were two opposite assumptions, which most certainly contradicted one another, yet both had proved invaluable in certain contexts.

They were essentially the *Materialist* standpoint, involving Matter and both its properties and its inter-relationships, and the *Idealist* standpoint, which believed that Reality behaved entirely in accordance with eternally-existing, abstract Laws.

Now, these are, indeed, opposites, philosophically, but could be "lived with" quite well. For, the materialist view would look to explain Reality in terms of matter and its properties, while the idealist view would concentrate upon revealing the natural quantitative relations in the most concise language of mathematical equations.

Now, clearly these can exist simultaneously in most pragmatic situations, but they were at extreme variance in the Explanatory Theories extracted from Reality. But, the basis for such a continuing subscription to both standpoints was made possible by both sides subscribing to the very same Principle of Plurality. For, this defining rule insisted that Reality was indeed composed of many different factors, which came together in an almost infinite variety of different sums to actually produce very different phenomena. The Principle claimed that these factors were never changed by their associations in the various arrangements: they all remained exactly the same in their pristine eternal states. All variety was caused merely by different sets of factors and their quantitative differences, and that alone was enough to generate such infinite variety. The individual component factors were always totally separate in their natures: they were completely unchanged by all possible contexts.

Now, this was crucial to BOTH standpoints, for by careful construction of the conditions, under which investigations could be carried out, it would always be possible to so select and control these to make possible a clear revelation of a targeted factor. All other confusing factors could be either eliminated or held constant, so that the selected one would be effectively revealed.

Now, something was indeed always revealed by these methods, and could be extracted and fitted up to an appropriate Form, but the assumption of it being exactly as it would be in totally unfettered Reality, was a consequence of this Principle of Plurality. It could not be demonstrated as the actual case in Reality: it could only be used in the exact same conditions under which it was revealed and extracted. And, of course, these features were enough for both tendencies in Science. They both accepted the extracted rule as being the actual available-everywhere "truth". And, this meant that the idea of Analysis was always possible, and hierarchies of such relations could be conceived of as acting in what was termed *Reductionism*.

An overall general picture of Reality was delivered to both tendencies in Science, which defined an Experimental Method, plus an arrangement for effective use, and a hierarchical system of such explanations. The materialists were quite content with this, but so were the idealists, who by these means built up ever more eternal relations, which were the causes of all phenomena.

*NOTE: This was "proved" when Wiles finally proved Fermat's Last Theorem, because he was able to bring together many relations from a wide variety of real world investigations, and weave them into his "complete and ideal Proof".*

The two tendencies learned to live together, though never considering the other's philosophical standpoint as anything more than a Belief!

Now, for those interested in Philosophy, similar Dichotomies had been recognised for several millennia, at least starting with Zeno and his Paradoxes, and occasionally raising its head, throughout subsequent history, until Hegel defined such occurrences as Dichotomous Pairs – the clear emergence of which not only signalled a crisis in our conceptions, but could, nevertheless, still co-exist for remarkably long periods of time, totally unresolved. Yet, significantly, without a resolution of such contradictions real progress could never be achieved.

*NOTE: That doesn't mean, of course, that NO progress at all could be made, for it certainly could, but it would be, inevitably, an aberrant growth, with some useful content, but lacking real significant understanding to allow major gains to be made. These growths would be like etiolated plants, getting ever weaker and thinner until they, finally and unavoidably, perished.*

Real progress required that these impasses had to be transcended!

So, for centuries these two opposing, yet partially complementary, strands did indeed continue to co-exist. The trouble was, of course, that the halt in real understanding would inevitably, at some point, be impossible to ignore.

Papered-over cracks would widen into unbridgeable chasms, and Zeno's Continuity versus Discreteness dichotomy came to smash Physics asunder in the so-called Wave/Particle Duality, as a result of the discovery of the Quantum.

Sub Atomic Physics was banging up against this dichotomy constantly, with NO integrating new conception in sight. As long as Plurality was sacrosanct, the problem could never be even realised. Both sides in the crisis never questioned Plurality: it was both common and indeed essential to BOTH – and hence never even questioned! But, it clearly WAS the problem!

And, its alternative in yet another Dichotomy needed to be addressed! This opposite to Plurality was Holism.

But, with this having the principle of “Everything affecting everything else!”, not to mention, “Change is always occurring!”, no systematic scientific method of investigation, or of Analysis in the formulation of phenomena seemed even remotely possible.

*NOTE: Interestingly, the main exponent of Holism, The Buddha, had lived at about the same time as Zeno – about 2,500 years ago.*

All the methods occurring in Mathematics, Logic and later in Science, had been developed only via a belief in Plurality. Progress had been possible compared with the situation prior to this consciously-chosen Principle, NOT by addressing Reality-as-is, but by farming Reality via modified, filtered and then rigorously maintained Domains, in which relations could be both clearly displayed AND applied to achieve some intended purpose. To throw that away, for what appeared to be holistic chaos, seemed wholly reprehensible. So though artists, writers, religions and philosophers never totally abandoned Holism, it certainly had NO place in Logic, Mathematics and Science. Until, that is, Charles Darwin broke the prohibition with his entirely holistic theory of The Origin of Species!

So, with that entirely necessary diversion, perhaps we can return to the major crisis facing physicists in the early years of the 20th century?

There was no getting away from it, current ideas were foundering upon the rock of Wave/Particle Duality. What had been seen as continuous waves, now sometimes only made sense as discrete particle-like gobbets of pure energy, or quanta, which became known thereafter as Photons. And, to compound the felony, particles like the electron, occasionally acted as if they were waves.

How, on earth could they be integrated into a new all-inclusive set of conceptions? They couldn't!

The real bases for these emerged dichotomies were NOT understood, so the physicists had to have a “revolution”: it seemed that they had to dump one or the other of their two co-existing standpoints.

They chose Form, and totally rejected Explanation!

They embraced Equations as the real essences of Reality – the actual drivers of all phenomena. They, and they alone could be trusted as being Truth itself!

Explanation was demoted to fairy tales, which might give the appearance of truth, but were in fact totally man-made inventions. The Copenhagen Interpretation of Quantum Theory was precisely this new standpoint!

Now clearly, several things were necessary to retrieve the situation. The most difficult of these to get across, was undoubtedly the philosophic one of explaining and then debunking Plurality, and in its place promoting Holism: no one, at this stage would possibly “but that”, if only because Holism could not compete in supplying a delivering scientific method. So, it would have to be tackled initially experimentally with set-ups that totally torpedoed Copenhagen, and theoretically by showing fully working explanations in the relevant areas without any retreats into the Idealism of the Copenhagen standpoint. Two cases can be shown to have been successful in fulfilling these necessary objectives.

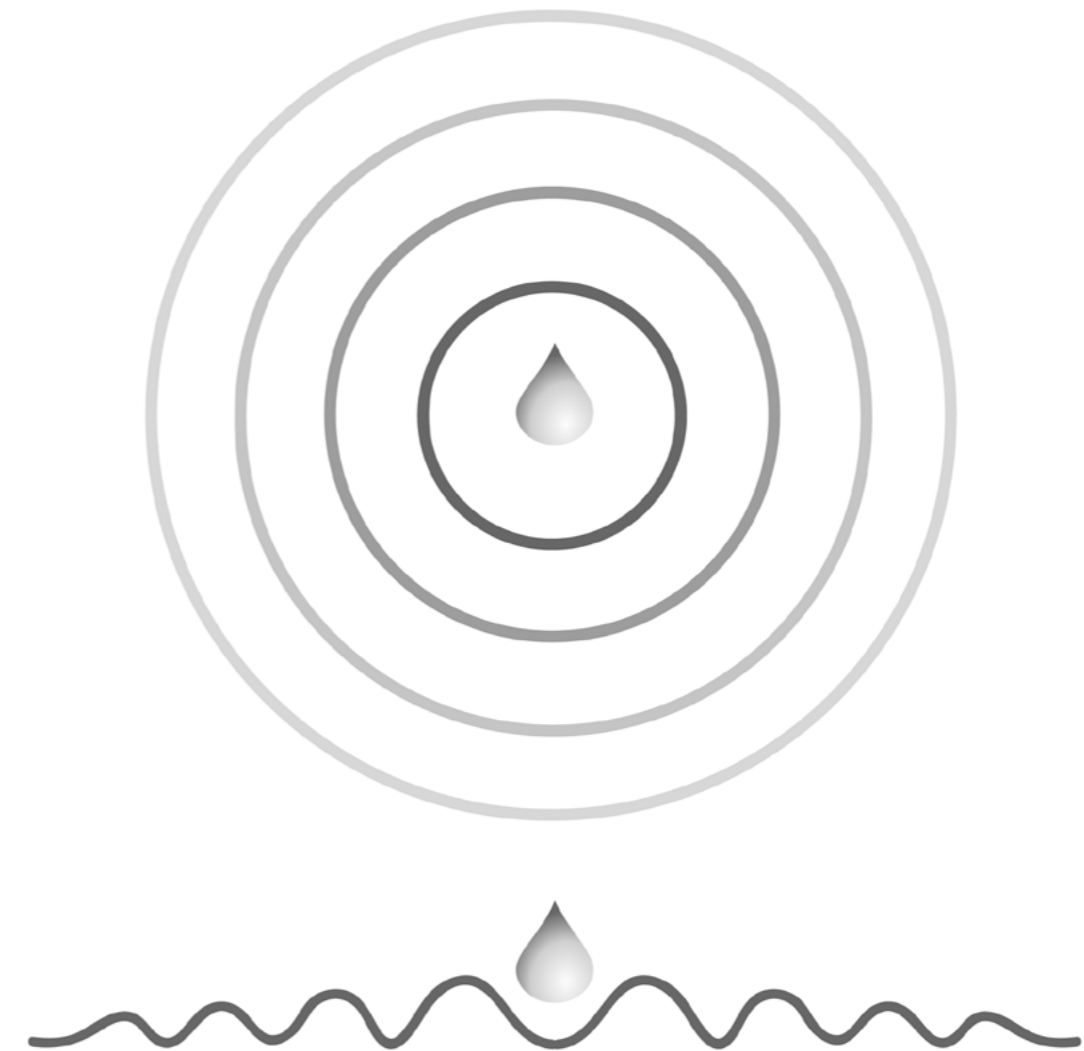
The first was by this theorist; the explanation of the seeming Wave/Particle Duality in the famous Double Slit Experiments, without any of the Copenhagen revisions.

And, the second was inadvertently by Yves Couder, macro level experiments to reveal similar quantization features to what was occurring in the Sub Atomic level, yet existing wholly at the macro level, where the physical causes were clearly evident, and purely physical explanations could be extracted.

The former of these two has been published online as a SHAPE Journal Special Issue, entitled *The Theory of The Double Slit*, and as a YouTube animation on its SHAPE Channel. While Yves Couder's revelations are by now well known via his various academic journal publications, and have even featured on Morgan Freeman's *Through the Wormhole* on TV.

## A Portal to a New Science? New Possibilities with a Holist Approach

Another interesting feature of Couder's bouncing drop experiments is revealed in the detailed structure of the surrounding “standing wave”, in the oil bath substrate, when it is compared with the supposed possible orbits of the outermost electron in an atom. For, in spite of their very different contexts, they certainly have a similar Form.



On the top of this drawing is a representation of the “standing wave” in Couder's Experiment (seen in plan), while below there is an elevation view. Now, these are blithely called “standing waves”, and that is surely what they are, but though there are features that do conform to a stationary wave, there are others which certainly do not match with the usual forms.

In musical instruments, for example we clearly see the fundamental natural frequency of vibrating string of given length.

But, by plucking the string asymmetrically, we can elicit one or another of the natural harmonics.

Certainly, the wavelengths seen on the string are all the same for a given note or harmonic, yet we have here a very rich and greatly amplified range of heard notes due to the structure of the instrument. In the case of the violin, for example, the instrument is so designed that different parts of its sound box are designed so as to resonate different parts of its surface and internal volumes, with different frequencies. And the overall “sound” finally emitted from such an instrument, will indeed, include a significant

range of harmonics, as well as the dominant, intended fundamental. The initiation energy is focussed maximally into sound, and over a broad range by such resonances. Clearly, such phenomena will not only be limited to these well-known cases. Resonance can occur wherever the situation is conducive, and it has a general feature of concentrating energy into particular other features from those which had initially caused it.

So, if we could display the various contributions, it is likely that the higher and higher harmonics will get less and less of the available energy in a normal situation. But, the clever constructor will be able to elicit quite different boosts in arranged-for frequencies. And, of course, in surprising cases resonances could appear where it is least expected if the conditions were conducive to them.

Though in Couder's Experiment, we seem to be approaching something analogous (in some way), it isn't yet clear how the evidently complex standing wave, or even similar possibilities in the higher energy levels of the electrons in atoms are actually produced.

NOTE: The analogy with a musical instrument may be significant, for the player has a particular note in mind, and plays his instrument accordingly, but because of the structure of his instrument, he gets the fundamental amplified and the harmonics treated similarly and added in. Nevertheless, we *hear* the fundamental.

Maybe, therefore, the main part of the stationary wave in Couder's "walkers" will be its fundamental, and most of the energy will be contained therein, while the increasingly higher harmonic frequencies subsumed in the overall form, will have considerably lower amplitudes. It is almost like a filter with a direct relationship between wavelength and amplification.

What seems to be happening is that the amplitude is declining as we move outwards from the centre of the "walker".

Clearly, in Couder, this is a kind of standing wave, BUT driven originally by two main contributing frequencies. The most evident is that of the bouncing drop, but we must not forget that it became a continuing oscillation due to our second contribution – that of the vertically oscillating substrate. YET, between the two is the intermediary of the standing wave, which displays a single frequency.

As with all scientific experiments, Couder didn't just happen upon this as a natural phenomenon. He purposely chased certain glimpses and clues, adjusting the only parameters he could, and devising and adding others, until "the system" gelled into his "walker" phenomenon. We have here recursions and resonances of some complexity!

Clearly, such things do not normally, or easily, happen. He worked to make them happen on purpose!

So, you wouldn't normally come across such behaviour at the macro level. Yet, at a different level where vibrations might well be the most dominant contributors, such things (or at least something analogous) might well be the norm.

It poses many interesting questions, which may well allow a different interpretation of certain phenomena, which currently happen at the sub atomic level.

Now, the writer of this paper has suggested elsewhere, that Couder's methodology is indeed revolutionary! For, it involves a very different approach to the usual experimental techniques. Normally, the purpose of the experimenter is to remove as much as possible from an experimental situation, as is feasible, while still ensuring the continuation of the relation that is sought. He uses various simplifications and controls to reveal a particular "partially hidden factor". And, to make such artificial interventions legitimate, he quotes the generally believed-in Principle of Plurality, which sees all phenomena as the "simple sum" of multiple contributing factors, which are NOT changed by their context at all: they are assumed to be completely separable! And that means that they are NOT intrinsically changed by context (whatever it is)!

Thus the usual methods are intended (and are legitimate if Plurality is correct) to reveal one or another of those crucial contributory factors. Now, because of the absolute necessity of the Principle of Plurality, such a methodology is termed pluralistic, but Couder's method is definitely NOT that. What he does is decidedly holistic! For it infers the opposite of Plurality – indeed, that multiple contributions to a situation do NOT just add up, but are mutually transformed by each other to give an integrated unique result. To ignore this means that our methods have to impose a pluralistic regime, which isn't actually there, but allows something related to the real phenomena to be substituted instead. It can work in highly restricted and maintained Domains, with a single relation being considered, but NOT in unfettered Reality, when all are present and happening together.

The implications for experiments and natural behaviours are therefore both profound and revolutionary!

For, the simultaneous action of factors together means that they are all inevitably changed, and also means that real, overall behaviours could never be achieved by mere pluralistic sums. What is inevitably omitted from that approach are the wholly new and unpredictable results that occur due to the cross influences between contributing factors.

*NOTE: Indeed, the only way to use pluralistic results, is one at a time, each in its own ideal Domain. That is certainly NOT what happens in unfettered Reality, and all THAT richness and creative change is excluded by the usual methods employed.*

Indeed, if you think about the real, mutually-interacting, holistic mix, there will be a kind of selection process going on, not only will certain factors fit and affect one another very strongly, but they are also dramatically change the balance of factors, and a dynamic will be unavoidable, and the context will be changing almost constantly, or at least until an overall joint affect dominates!

Within unfettered Reality, without the straightjacket of enforced Plurality, the range of possibilities is multiplied up, while the uninvolved and uninformed observer will attempt to force-fit the resulting systems overall effect into the usual kind of pluralistic law.

So, how do you construct experiments to begin to reveal what is actually going on and why? You DO NOT simplify down to supposed essential components, but, instead, you do as Couder does! You actually find consequent behaviours by intelligent fabrications of complex situations and monitor them.

Now, if this approach is "more true" than the usual pluralist approach, it must not only transform experimental methods, but also and indeed profoundly affect Theory too.

"Lego"-theorising must be dumped!

Instead of constant-factors summing in various ways to produce every possible phenomenon, we have a much more wide-ranging set of possible trajectories. The same things in different proportions will not merely bias a given outcome, but will transform it!

Analysis as the sole means of understanding has been shown to be inadequate. It will work only when factors are for some reason independent and can be merely summed. But, it will most certainly fail, whenever they modify one another, and always when natural qualitative changes occur.

Plurality is a principle confined to continuing Stability, whereas Holism is the true nature of things that are changing, and is the only effective method when major Qualitative Change is occurring, and hence it alone encapsulates the true nature of real Development.





## Creative Chaos

### Does the Phoenix really arise out of the Flames?

Apart from the broad Stability/Emergence oscillation, and their associated characteristics of Order and Chaos, such simplifications are still in need of further, and much deeper, investigation, as it is, as always, the transitions that are the crucial and transforming processes.

Even our usually imposed characteristics of both Order and Chaos are frequently much too simplified to deliver any real understanding of what is actually going on, so that, particularly when discerned long after the revolutionary changes have established themselves, they are invariably confused with similar situations that are, nevertheless, very different from those involved in such major qualitative transformations.

We invariably confuse *Randomness* with Chaos, and *Eternality* with Order - both of which in their applied general names take us significantly far from their real physical contents.

Another major mistake in retrospective consideration is to turn the actually crisis-ridden development into a smooth, set of incremental changes. For, the zigzags and contentions are lost, and only the persisting gains - often seemingly only quantitative, are what we think we have to interpret.

An excellent example was the initial version of Natural Selection, which, though it correctly identified the necessary relation between the organism and its context as crucial, and the competition with other organisms as the driving force, could easily be seen as an automatic and inevitable process. Whereas, of course, it regularly produced entirely new species! Darwin's book was *The Origin of Species*, and the actual detailed events and changes that occurred, were not correctly interpreted. Indeed, it wasn't until the last decade that Pagel proved conclusively that Species Change had to be a Single Transforming Event, and not a mere accumulation of many increments, finally slipping over into a new Species.

And in this same current period was it that Frank Ryan proved the crucial role of viruses as distinct from cosmic ray caused mutations, causing such crucial and transforming changes. For they were certainly not random, while the usually agreed culprits of mutations certainly were.

Indeed, though the realisation of the alternative of long periods of Stability, punctuated by very short interludes of Emergent Change were already recognised by Hegel 200 years ago, his most significant contributions were

about this trajectory as it occurred in Human Thinking - very different, indeed, from the more "automatic and mechanical" changes that happened in either non-living matter or the exact opposite revolutions in Human Societies.

Clearly, though the trajectories of Qualitative Change were generally the same at all Levels, while the content, rates of change, and forms of intermediate and temporary stabilities could not but be very different.

Herman Hesse's book *The Glass Bead Game* revealed the difficulties, as such generality of development could very easily be confused with the universality of rarely quantitative Forms, and hence be a dead end in trying to understand real Qualitative Development.

The very late discovery (by this author) of a more detailed and complex version of competition, which was termed Truly Natural Selection, and which was indicated as vital in the magnificent Emergence we term The Origin of Life, and even in the trajectory of a Social Revolution, and it exposed two important sets of forces crucial in how competition was played out.

One was the easily discerned Second Law of Thermodynamics; evident throughout periods of Stability, and always acting against stable sub systems in a dissociating way.

While the other, only really effective in near to Chaos circumstances, was the exact opposite, which describes the positive, selective pressure for mutually supporting, and hence creative, marrying of many sub processes into ever more complex proto systems.

The dynamic opposition of these two into theoretically neutral environments can be characterised on the dissociative side by mutually opposing processes, and on the creative side by mutually conducive processes.

Clearly, in such neutral environments, the creative and progressive type of processes will always out-compete the successes of the mutually opposing kinds. And, it is therefore only in the chaotic and initially undirected situations that new sub-systems are created and grow in extent.

Yet, in classical holist fashion, the very success of those processes supplied ever more available succour for dissociative processes that fed upon the latent energy



bound up in Order, and would consequently increase along with the growth of the ordered systems and work to destroy them whenever possible. Thus, increasing growth always begets its opposite, and every progressive spurt forwards would always be countered by a dissociative diminution too. And a series of such alternate growths and declines would be inevitable. So, the resulting unavoidable oscillation meant that you would expect these opposing elements to cancel each other out, and result in no real progress at all. But, that too would be another misleading over simplification.

In fact, these nascent sub systems began to include certain dissociative processes, which aimed solely at other not-of-this-system, and hence competing, sub systems. And, with this “selective foreigner dissociation” became known as Policeman Processes. And, by opposing non-system processes from other collections, became an important part of the maintenance of the home system to a significant degree.

Of course, such unusual bedfellows were not common, and most dissociative process still fed upon each and every move to greater Order, and became collectively known as the Second Law of Thermodynamics.

And, in the end, it was the relative success of those sub systems, with effective policeman processes, against both those of competing sub systems and the general assault of Second Law dissociation that determined a final outcome. The winning sub system finally became everywhere dominant, and a new Stability was established, which usually persisted long enough for the prior tumult to be forgotten, and the new state to be reinterpreted as both permanent and natural.

But, it never was! Because processes and systems unavoidably change and drift away from the initial totally stable state, the current Stability would inevitably be producing the seeds of its own dissolution. In the midst of seeming-Order the Second Law dissociative processes would have remained and could, with integral weakening changes in the dominant Stable System, begin to successively undermine it, and ultimately bring about its final collapse.

Yet in a direct distinction from the usual predictions of a final and total calamity, the inevitable result is never a Decline into Total Chaos, as a termination of Everything, BUT a situation approaching the “level playing field” of a natural randomness, and hence the possibility of the increasing success of new, mutually conducive processes, and another oscillation drive to an even higher New Stable Level.

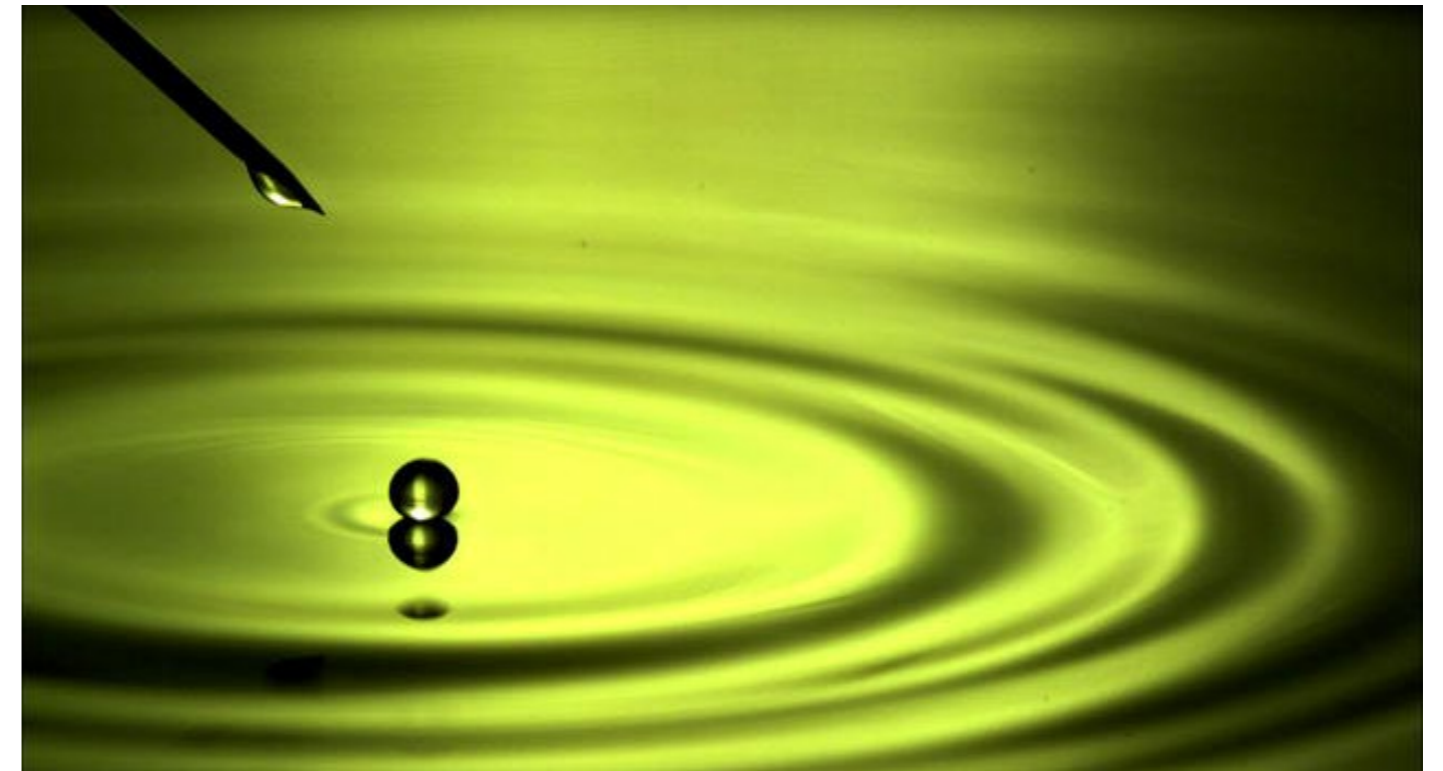
The epitome of our acceptance that we cannot deal with qualitative transitions in Development is embodied in our pragmatic technique of using indicator parameters as

delivering thresholds, beyond which we simply switch from one Law to another, without any caused transformation of one into the other driven by understood processes.

The biggest computer simulations upon Earth are those predicting the weather, and they are an amalgam of fixed Laws and switches, by such threshold-determined transitions. We have clumped together many separate stepping-stone Laws, but always hop from one to another by purely pragmatic tests.

Not exactly an integrated and comprehensive treatment, is it? Indeed, it is decidedly non-holist!

## Emergence of Emergences



Now, let us consider how standing waves can both be the result of emerging identical waves, while bouncing off other such systems. These seem to be contradictory features, for, in the first, the contributory waves have to pass through one another, in order to interact as they do. While, in the second, they are repulsed from doing so. It is almost as if the system so formed must be treated as an entity with its own, overall properties, which contradicts the features that actually formed it!

Now, we do not turn a hair when considering such things with a difference of levels clearly apparent, such as with Life and non-living entities. But, here we seem to be considering phenomena, which are quite clearly all-at-the-same-level. But, is that valid?

We know that gasses, liquids and solids (of exactly the same stuff) can act differently, and act upon one another in various surprising ways (for example liquid Helium and other freaky anomalies). Could we allot properties to our Couder “walkers” that would not only explain their surprising features, but also explain how they emerged? Usually, in an Emergence, such simple analytic explanations are impossible, because they are not merely simple, linear causations, but involve the collapse of a prior stability, and the rise of a wholly new stability, involving wholly new properties, from a whole series of simultaneous developments. Could what we observe with Couder’s “walkers” be a much simpler version of a similar transition?

For the problem with emerging features is that they do not all appear in a massive system-wide revolution. They appear to occur at all levels, including, maybe, situations which are clearly local, and do not transform their containing environment, which definitely happens in a full scale Emergence.

Now we, to some extent, worked backwards from Emergences in Thought and in Societies, to those which must have occurred lower down in the overall development, and biggies like the Emergence of Life must be crucial in all cases beyond such Events. But, these are literally all global transformations that are inevitably context changing! Yet, we already know about simpler “emergences” that do not change their contexts – like Changes of State – Phase Changes, such as gas-to-liquid and liquid-to-solid. So, presumably, way back in the history of Reality, there may well have been a hierarchy of such emergences that were also local, and only as many such sub-systems, systems and super-systems came in to being, were the more global Emergences then possible.

# The Required Revolution in Philosophy

The problem with Mankind's heroic effort to understand Reality is that the investigators involved were in no position to view the trajectory of development of that Reality.

Indeed, individuals could not but be totally unaware of that development for they were certain that the World always stayed more or less the same in all its essential features.

So, to get anywhere, they had to start from that assumption of a totally unchanging World, and attempt to tease out its most important features. If a situation seemed to be "moving about a bit", it would be assumed to be merely a temporary variation, and efforts would be made to "keep it still", while it could be carefully observed. Then, in different circumstances for each thing, the appropriate constraints would enable things to be extracted one-at-a-time.

Now, though these processes always involved drastic limitations upon Reality, that wouldn't matter, as what was being sought was unchanging anyway. So, the ends achieved justified the means employed! And, on small scales, and for reasonably short periods of time, these enabling assumptions did indeed seem to deliver very useful extractions. They were reasonable in such circumstances, but could never reveal a single thing about how Reality was actually changing, either in small ways, or certainly in its major transformations.

Yet, let us be clear, these assumptions had led to the creation of Formal Logic and Euclidian Geometry, which were not insignificant achievements in Man's quest to make sense of his World! For, though both of these were systems that couldn't possibly represent Reality as it actually was, they both contained sufficient elements of the nature of Reality to be extremely useful in certain constrained circumstances. The key assumption was that the elements involved were constant entities and eternal laws, which were reasonable approximations within stable circumstances that had been maintained as such! They were indeed tremendous achievements, even if they were intrinsically misleading when conditions changed.

What else could this remarkable product of Reality (Man) do as it came into consciousness of itself and of the Nature surrounding it?

And the next phase in the process was equally brilliant, in that without departing from the assumptions of constancy, Man began to explain things in terms of evident entities and their inter-relations. And, when taken to the limit, this brilliant form of Analysis would "in principle" be able to explain everything (ultimately) right down to final

indivisible and fundamental units of matter, and their basic eternal laws! And, an implicit (but unstated) Principle of Plurality gave a basis for such analyses, for it made all relations within that hierarchy separable – they were as they were, entirely independent of their differing contexts. Indeed, this principle allowed Science and Mathematics to be developed to a remarkable degree, and particularly because what was found out was clearly useable in the right circumstances to produce desirable outcomes.

So, in spite of this erroneous principle, people replicated the exact conditions of discovery of the relations, in order to use them with confidence and indeed success. The development of Science (pluralistic investigation) and Technology (pluralistic application) went ahead at truly breakneck speed.

But when stability, for a variety of reasons, began to dissociate, all of this was useless!

And, as more and more areas were investigated, new contradictions were unavoidable. What had worked in one area, and was expected to work in another, was found to be impossible to apply. Yet, by similar methods, with sufficient constraints, some other "eternal law" could be found and used, with the same kind, but clearly different, limitations on context.

The solution was easy! Call the new study-area a different subject area, with its own, and different, laws. Thus new Subjects proliferated, wherein most results were both coherent and non-contradictory. Yet even there, the perennial consequences of erroneous Plurality would forever be unearthing contradictions, and subjects were soon divided into Specialisms, and even sub-specialisms to maintain the reliability of these found laws.

In truth, Science pragmatically was a wonder, but theoretically it was an ever-increasing mess! And, of course, because of its still dominant assumptions, none of these specialisms could address the actual Development of Reality, at any level, and particularly in the occurrence of the entirely New!

Science was becoming an aberrant growth, and heading for general Chaos.

Now even so, there were certain key sciences that could not avoid dealing with profound change. First, Geology, with its study and understanding of how rocks were both produced and transformed. And then, Biology (with fossils from the geologists) had to deal with the evident vast preponderances of no longer existing, but certainly





once living, organisms. Finally Wallace and Darwin came up with their explanation of The Origin of Species, which directly addressed the emergence of the wholly new. And, following such a major change, you would expect the floodgates to open and a torrent of similar researches to be being pursued across the World. But, that didn't take place!

Though the origin of the New was accepted, the mechanism involved was very soon conceived of as merely the accumulation of many, tiny incremental changes brought about by very simple causes plus random chance. What had seemed to be a real breakthrough was immediately transformed into something entirely compatible with the usual conceptions and methods. No actual general development of real innovatory change was achieved. What was, and still is, needed was the extension of studies away for purely constant things with eternal laws, to qualitatively changing things – wholly new things with their own absolutely new laws.

The crucial areas for study to be concentrated upon was in what became known as Emergent Events, or alternatively as Emergences, where not only the entirely new came into being, but where the products involved significantly changed their own context to deliver a wholly new Level of Reality, with its own very different laws.

Everything was NOT constant in such episodes, but in process of development, and though the majority of time was occupied by long periods of Stability, these were always, in the end, terminated and then transformed by Emergence into a new and higher Level of Stability – such as Life, for example!

Now, the study of these things was not merely a decision to change what area we decided to study. It actually had to involve a major transformation of our basic assumptions and methodology.

And, let us be crystal clear, that is an enormous task, as was proved by Stanley Miller's famous Experiment. For in that attempt to study what might have happened in the atmosphere of the primaeval Earth, which could have laid the basis for the very first Life, it was impossible to use any of the pluralist techniques. Many different processes were taking place both simultaneously and in multiple sequences, which also and crucially changed their own circumstances many times. So, in spite of Miller achieving the synthesis of amino acids at the end of only one week, how they had occurred was totally unavailable. And in spite of yet another important piece of research, absolutely nothing followed it.

What was needed was a major change in our assumptions, and perhaps surprisingly, the alternative to Plurality had been about and used for over 2,500 years here in human society.

It was The Buddha who put forward an alternative principle to that of Plurality. In Holism, he insisted that "Everything affected everything else", and hence absolutely nothing was separable (as Plurality insisted). All were in mutual interactions and determinations with everything else in a particular context, and could, in addition, also transform that context! Now, clearly, such a description was definitely the case in emergent episodes, where Plurality was wholly inapplicable, and this had to be the basis for a new version of Science. Just as Hegel had seen the need for a Logic of Change, it was also necessary to develop a Science of Qualitative Change to apply in these absolutely crucial areas. But, it was much too early for that, and the Buddha's ideas were formulated into a "philosophic-religion", and in the short term Plurality was victorious, and literally no gains were made in what could be called Holistic Science for almost 2,000 years

However, beyond the constructions possible within Stability, Holism was the only standpoint, which could address Qualitative Change. And, the new direction for investigations into Reality to take to enable it to address these vital episodes in development had to be via a newly developed Holistic Science.

Perhaps surprisingly, this was commenced round 1800 philosophically by the German Idealist philosopher Frederick Hegel, who concentrated solely upon developments in Human Thought, but he made such significant gains that his student, Karl Marx, saw the very same qualitative features in Social Revolutions, and though significant gains were made, the achievements of these two giants were not carried through to a more general application. Lenin did continue on the same path as Marx, and made significant contributions to the trajectory of development of a Revolution in Society.

But, no one tackled Science!

## Diversionsary Paths

Behind all conceptions, there are a series of “common sense” assumptions that unavoidably underpin and determine them, and both locally, and in the short term, these assumptions can indeed suffice. Nevertheless, though still not totally correct, they are correct enough to deliver something eminently useable. Their evident strength resides in the width of experiences that all point in the same direction. But, these generalised assumptions are not usually arrived at by the careful considerations by individuals, for they, on the contrary, seem to deliver a ground so obvious that literally no one would hesitate to agree with them. They emerge socially as “Banker Assumptions”. And, as long as they arose in that way, a perpetually ongoing and improving view of this World would, in spite of that consensus, continue to be severely restricting, in what could be developed from such bases.

Now, if these early basic assumptions really were common to “everything experienced”, then they would certainly contain a substantial amount of what we call Objective Content. But, that was, and still is, certainly never the case. Instead, it is a mere handful of experiences that present these assumptions, which are then assumed as bankers for all similar looking sets of circumstances, for which they are, on inspection, blatantly and totally incorrect.

Indeed, experiences seem to fall into a limited number of general areas, each with its own, never questioned, set of assumptions. So, from the outset, any comparison of such Default Assumptions could not but, in the end, expose inevitable contradictions.

But, “Thinking about Thinking”, as Hegel termed Philosophy, was extremely rare in the ancient World, as it still is today. And when the philosopher Zeno exposed whole sets of these contradictions, he was completely ignored. So, he deliberately constructed his famous Paradoxes, which would lead readers via their own totally trusted assumptions and methods of reasoning into an unavoidable series of such contradictions, which seemed to deliver clearly impossible and contradictory things.

The most revealing were those which addressed movement, and involved the two seemingly alternative concepts of Continuity and Discreteness. But, in spite of no one being able to rubbish his revelations, he was merely dismissed as an enemy of Reason, and confined to the sidelines of “Real Effective Reasoning”, as something of a spoiling sceptic!

*NOTE: Interestingly, in the comedy TV programme QI; this came up as Mankind's surprising, ability termed Cognitive Dissonance to hold on to contradictory concepts without a qualm. What a remarkable ability!*

Such meta-reasoning, as Zeno was employing, was just too early, for the things he was exposing were most certainly gravely flawed, but they still worked in certain tidy circumstances, and the majority would always back such pragmatically effective means, rather than chase up their philosophically evident flaws. But, such a position is always bound to ultimately arrive at absolutely vital areas, which couldn't be avoided, and then a major crisis would occur.

Indeed, the idea of Dialectics, which gradually over the years arose in certain quarters, insisted upon exposing such contradictory pairs of conceptions, and deliberately using and investigating both, in an attempt to transcend their limitations, by finding better, and more profound, bases for reasoning to replace the evidently flawed “past bankers”. Hegel identified such Dichotomous Pairs, and insisted upon the method of hammering at them until they break - the famed Dialectical Method.

But, you have probably already guessed it, such thinkers were always ignored, and Cognitive Dissonance was trusted by each alternative being used when it worked. And, even with the rise of Science, and with systematic investigations by observations, and even very careful measurements in properly organised experiments, their success was assured by not just by taking the opposite view, but also by deliberately making it so. The Domain for both investigation and use was constructed to deliver in accordance with the assumed basis. Consequently, the methodology of Science was to isolate restricted areas of Reality, then filter, tailor and maintain them rigorously, not only during investigations, but also when they were to be used. The exact same local conditions were fabricated for when the discoveries were to be employed to some useful purpose.

And taken to the limit, this could not but arrive at Post-Modernism, where contradictions were not to be worried about as long as we could achieve our objectives.

Now, this didn't mean that they understood their detractors like Hegel. They didn't! But, they did recognise the common features that they used and maintained, they knew about Objective Content, even if they mistakenly called it Truth! And, the result of the resounding success of this methodology, led to a prodigious growth of the “Scientific Method” and its assumptions.

Of course, as more and more areas of Reality were subjected to this approach, the assumptions that were “common sense” were certainly not the same in the various different areas of study, and if anyone attempted to unify them they



E. HADER pinxit. 1884. Gesetzlich geschützt.

*Georg Hegel*

Phot. u. Verl. v. Sophus Williams, Berlin W.

immediately came up against inevitable contradictions. The result was the splitting of Natural Philosophy (the early term for Science) into first a number, and then a multitude of separate sciences, so that such contradictions were avoided as far as possible.

Indeed, the insistence upon such on-purpose-blinkering could not but strengthen another discipline, which from the outset claimed universal applicability, and did it by only considering Form and Pattern. That discipline was, of course, Mathematics. And as restricted approaches to Reality went, Mathematics had the most claims to be applicable in all areas. For, it didn't attempt to explain things, but it was both accurate and succinct in describing them in purely formal terms. Not only that, but such Forms really were universal, and could most easily be extracted from the concrete and caused existences in the Real World. So, the most general and totally abstract Forms could be encapsulated as such in Equations, for the same Forms cropped up all over the place, even though the concrete contents and causes were very different. So, a purely formal approach as Mathematics was able to carry out investigations in its own terms alone. Mathematicians could, and did, dedicate their lives to revealing not only ever more different Forms, but also brilliant ways of both dealing with them and displaying them in the most easily followed ways.

But, in spite of this brilliance, it proved to be the Daddy of all such limiting methodologies, because it encouraged the slip backwards from Materialism, which had been the greatest contribution in all the sciences, and instead embraced with ever greater enthusiasm to purely mathematical forms, and even to the standpoint of making these the actual Essences of Reality – the “causes” of everything in the concrete World.

Science had become idealist!

And, just how damaging these developments were, was brought into focus by the amazing headlong retreat in Sub Atomic Physics – ostensibly brought about by the discovery of the Quantum, but actually due entirely to the worship of Form.

NOTE: Now we have to be absolutely clear what this change really meant! Form is merely the pattern or shape of things, and to make it the determinator of phenomena has to be totally inadequate: for the very same forms appear everywhere in all sorts of physically unrelated areas. And, that being the case, such things cannot, at the same time, cause all the various phenomena where they fit the facts. Clearly, such forms are consequences rather than causes. But, they are useful, and can be used to predict, so the promotion of these to the exclusion of physical causes, reflects the demotion of Science to merely its pragmatic uses. Its *Understanding* has been discarded!

Now, even the mandarins of the New Physics were aware of their isolation, and several major names like Murray Gell-Man and Brian Cox have attempted to extend their mathematical-physicist ideas into other sciences like Biology, but totally without any worthwhile measure of explanatory success. Their attempts, however, did persuade many biologists (aware of their isolation) to attempt to recast their science into the same forms as were (seemingly) conquering vast areas of Reality by the physicists. And, in their case the retreat was even more devastating than for Physics. For Biology cannot ignore Qualitative Change, and the “new course” was forcing them to do just that!

Yet the real salvation of Physics in its most profound crisis, were indeed available from these other sciences. The mathematical-physicists attempt to dominate these qualitative sciences was merely a defensive ploy. For, if following the real content of sciences like Biology, the participants could never wall-themselves-off as could the physicists. And all that was achieved by those who tried to join the physicists' club, was that they severely limited themselves to the local zones where such things could be implemented, and ceased their crucial role in addressing what they physicists seemed totally incapable of addressing. Indeed, what made Biology revolutionary was that it had to address qualitative change on all sides, and because of this was the only area where revolutionary developments such as Wallace and Darwin's Origin of Species could be both tackled and significantly explained.

Indeed, because of this counter-revolution explanatory theory in Sub Atomic Theory has stopped dead! So physicists in this area now spend their time almost exclusively upon Pure Mathematics, and what little time they have left is spent on developing a completely idealist standpoint for this crucial science. Yet, as inferred, a science like Biology has all the wherewithall theoretically, and the method logically to help solve the dead end reached in current Physics.

For, as already mentioned, biologists cannot avoid qualitative change: they occur naturally not only everywhere in current living things, but also have done so throughout the History of Life. And this trajectory, of course, commenced with the extraordinary Origin of Life itself.

And, the first real breakthrough was not only by biologists with the Origin of Species, but also throughout its history it is Biology that has regularly made the most important discoveries with the most recent by Hunt and Ryan.

The atrocious attempts by physicists like Gell-Man (The Quark and the Jaguar), and mathematicians like Iain Stewart (Life's Other Secret) to force the wonders of Life into Quarks and idealist physics by one and into Pure Form by the other are among the most reactionary attempts that I have come across.

No, they and their ilk have it entirely the wrong way round!

It is both Physics and Mathematics that must address their multitude of unsolvable anomalies by studying Biology, and rediscovering Natural Philosophy.

Now, of course, that is easier said than done.

I know it because I am a mathematician and a physicist in my education and training, but a biologist in what I love best, and though I have been attempting to integrate them for many decades, it is only now via the fourth discipline of Philosophy that the possibility of success is becoming ever clearer.

But the impossibility of applying biological methods to Physics isn't what is required. What I required amounts to a very different and comprehensive philosophic stance.

The Principle of Plurality, which underlies the current scientific method, has, somehow, to be replaced by an approach that is based upon the Principle of Holism. Now, the wherewithall that might enable an attempt to do this was taken on by Stanley Miller, in his world famous experiment to investigate the role the Earth's primitive atmosphere might have played in the Origin of Life on Earth.

But, though his attempt was extremely valuable in showing how amino acids (crucial building blocks in the development of Life) were actually produced without any externally applied program of actions, his methods seemed totally self-defeating, for with a holistic stance everything affects everything else, prohibiting the pluralist/analytic method of finding contributory factors and their multiple and simultaneous sub processes.

Yet there has been this successful example delivered by the French physicists Couder and Fort, who instead of an isolating and eliminating approach, used a build-up and deliver alternative, which is certainly beginning to lay the foundations for a possible holistic experimental method.

Also, in a small way, the writer of this paper has made his contribution, with a re-design of Stanley Miller's brilliant experiment, using techniques established by Nobel prize winner Hunt in his work on the development of the fertilised eggs of the sea urchin. And he has also managed to explain the famed Double Slit Experiments, without any recourse to Copenhagen idealism or the new forms of probabilistic mathematics.

NOTE: Elsewhere, a series of Special Issues on SHAPE Journal have commenced to deliver the Holist Method in eight different areas, and it is clear that such a Holist Approach in Science is not only possible, but imperative.

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