Holistic Equations?

I think that the time has come when I should make a major attempt to suggest an alternative to ordinarily derived equations, which are initially produced pluralistically by the now universally accepted method involving the isolation, extraction and abstraction of a hidden relation from a highly constrained situation to deliver the usual final and useable equation.

Up to this point, I have had no clear idea of what could be put forward as a significant alternative for what has been to date the *only* way that Mankind has had available to extract anything from Reality, than that which involved the "fixing" of many factors at *constant* values, and eliminating the rest of the minor contributions by *averaging*.

The most obvious, yet impossible, way seemed to involve the deriving of equations involving all the clearly affecting factors, but such an objective certainly seems impossible to set up and carry through.

The simplification gained by the usual methodology would obviously be absent, and the age-old problem of "not seeing the wood for the trees" would make decisions on what should be the significance of the various contributions impossible. Certainly, no obvious method for including all factors, in a single, *useable* equation, could be put forward.

Yet, it is clear that complexes of factors can yield very simple, extractable results as evidenced by the Gas Laws, and other similar forms resulting from situations with many simultaneous factors involved.

And this evidence may be a clue to methods of research, which can be holistic, or at least more holistic than, the usual methods.

Having spent a great deal of time criticising the pluralist approach in Science, and its main products in the form of equations, I realised that even more was involved.

Not only were these equations the direct, yet artificial, products of their pluralistic assumptions and consequent methods, and limited to specific conditions for use, but also they were intrinsically **wrong** in themselves as accurate representations of Reality-as-is!

Now, encapsulated within my criticisms of pluralistic science as such, is indeed the main problem with Science in general, and in its assumed path to Truth.

Just as all truths extracted by Science cannot be other than **partial** and **relative**, so also are its flaws, falsities and untruths. Even though I know that I must condemn the pluralist approach, still cannot, and do not, consign it and all its achievements to the dustbin. For the things I condemn are partially or relatively true too.

When a pluralist approach, experiment and subsequent extraction and abstraction produce an equation, that production is NOT a total fiction. It is not pure invention. It is a partial, relative aspect of the truth of the situation, falsely made independent, and useable as such in further processes, speculations and even analysis.

Plurality most certainly **can** deliver **useable** fragments of Reality wrested from their true context into a simplified man-made alternative, which is itself repeatable, and hence can allow *effective* use as long as these required conditions are constructed and maintained.

Pluralistic Science is a purely pragmatic science, and, without doubt, was a tremendous advance upon previous non-scientific methods of dealing with the World. But, it can *never* form the foundation of a **Comprehensive World View**. It is too fragmentary and omits too much for that to ever be possible.

We can construct very effective ladders for climbing up seemingly inaccessible edifices, but their effectiveness is no basis for *understanding* Gravity. They also could never form the basis of a general view of such things. [But note, we don't burn all ladders, do we?]

I will not go into the full critique of Plurality thus far, as it is extensive and available elsewhere, but here I will concentrate on an as yet unexplained flaw in this generally applied methodology.

The usual counter to criticisms of the consensus methodology is to point out that nobody is making an absolute of any particular equation. But only asserting that each and every such equation is a **component** of Reality and hence worthy of both study and use.

Yet, I am rapidly becoming convinced that even that assertion is incorrect. Such equations are **not** *components* of Reality-as-is.

Now, I am aware of all the usual arguments that dismiss any such conclusion, by pointing out the achievements of using equations to very significant ends. But, that is quite possible without the involved means of *delivering* **being the "truth"**.

It all depends on what you mean to extract from Reality and for what purpose. If the main purpose of the exercise is for **use**, you will use different methods from those whose purpose is to reveal exactly what is happening, and why, in order to understand what they are studying.

They are clearly NOT the same thing.

Last night I was watching one of Ray Mears's TV programmes, in which he was making the tools and living the life of a stone-age man. The tools that they developed and used, made entirely from flint were functional and brilliant, but stone-age man did not understand the reasons for any of these things. In the main, Knowledge of how to make and use these tools was taught by the older generation as a **methodology**. It worked marvellously, but they did not know why it was so. Indeed, the pragmatic motivations have always been (and still are) the main ones for Mankind.

Asking the extra question, "Why?" involves a very different, and more demanding, approach.

For example, the assumption that each equation delivers a **component** of Reality, and hence works as the "explanation" for the user, just isn't true! The world does not merely *obey* such equations, even if we complicate it by pointing to a large number of them. To say that Reality acts as it does by complying with such clearly abstract laws is surely **Idealism,** NOT Science, as the latter demands concrete and explicable causes.

If anything **Reality obeys a complex of physically caused and iterative relations, which together deliver an extractable effect**. Now, such a statement will not mean a lot unless it is carefully explained, so let us attempt to do that.

The assumption that extracted equations are components of Reality comes from the assumption of Plurality – the idea that every Whole is produced by the sum of its Parts. The corollary of this is that to achieve the Whole we need to discover and then sum all its Parts.

But this certainly gives a *relative independence* to Parts – a **separability**: they depend only on *their own* Parts. It is a **bottom-up** determination.

It also leads to the repeated "going down" ultimately to fundamental particles and laws, while "going–up" it becomes the idea of Laplace, that everything can be produced if all components are known and involved.

The alternative position is **Holism**, in which everything physically affects, and hence determines, everything else. This consequently means that everything is *constantly changing*, nothing is constant, and the determinations are not just only **bottom-up**, but also **top-down** and **side-to-side**.

Now, this is very different from the pluralistic assumptions that underlie equation based Science. Indeed, though everyone may give lip service to a holistic *overall* view, very few see any merit in using it to guide Science. It does not deliver any methodology with which to build a matrix of understanding, and it certainly gives no short cuts to affect **actual use**. So, it is universally ignored and all efforts go into pluralistic methods and their achievable results.

But, there are many anomalies in that consensus approach.

It works in specific conditions, as long as those conditions are replicated in use, but this means that each and every equation, even when **packaged with the necessary conditions** delivers only an *isolated* technique. To do anything complicated, therefore, involves the **separate**, and often **sequential**, use of many such packages, and they are used as a series of processes each with its own special conditions.

Now, this is, of course, **Technology**, and Mankind is supremely good at it. But, it rarely explains anything. It rapidly becomes the pragmatic technologists' tool kit, which they can use with great skill.

But explanation of Reality, even of a specific phenomenon, cannot do it that way. A sequence of happenings has to be explained **as an integrated Whole**.

There has to be entities, processes and events, which are common to closely related processes. ***Only*** Explanation attempts to address such requirements and deliver coherent, comprehensive and understandable accounts of an area of Reality. If you need to do more than get a given result, you must attempt to ***explain*** phenomena.

Now, after this necessary reminder, I must return to my earlier assertion that what results from a situation holistically, due to the simultaneous action of many factors acting in all directions, and constantly affecting each other, is likely to be the progress of a particular parameter with a certain **Rate of Change**. The role of this is MOST important, because its Rate of change can carry it towards some value ***differently*** from any other simultaneously acting processes.

It seems to me that the Rates of Change are more important than the quantities themselves. The whole dynamic of a situation viewed holistically, MUST be dependant on just ***how*** changes are happening, for varying rates will lead to a different and **significant set of contributions**.

Different things will move in (or out) of dominance in a holistic nexus, and ONLY by this sort of study can significant ***qualitative change*** be explained.

Now, if this seems "way out", it isn't!

In verbal explanations we use such explanations all the time.

That is why verbal explanations get closer to the Truth than any equation. We are well used to changes of this kind. It happens all the time around us, and it also happens TO US. We change, mature, decline and die. We cannot, **and don't,** ignore holistic Reality.

Now, it should be clear, that what we can do in verbal explanation is different from what we have when we are about to use an equation. The question must surely be, **"Can we carry out Science holistically?**
Can we demote Plurality and attempt to restructure Science in a holistic way?"

 The main thing about any pluralistic experiment is that most things are held constant, leaving only a couple of important parameters to vary in relation to one another.

Thus we get a relation predicated on a nailed down context.

Whatever other variations present, that were still involved in the experiment, are averaged away by sound techniques. I say sound because almost every significant "systematic error" will usually have also been disposed of by extra rigid controls, leaving only small and ***mutually competing*** factors left to accompany the large and dominant parameters, so these end up as the **only** participants of the final relation and abstract equation. Everything else has been disposed of one way or another.

Now all scientists would admit that what we extract in such experiments is not the full story of what happens in Reality without constraints, but they would also insist that they have ***no choice*** in doing what they always do, if they are to isolate, extract and abstract the important relations in order to ***use them in production***.

That is, of course, perfectly true, but notice the trailing rider of that sentence, which is "use them in production". A holistic approach to Science would, first of all, insist that Reality is a totally interconnected Whole, with everything affecting everything else. When we start by "nailing to the floor", the majority of affecting elements, and averaging out the remaining competing small elements, we are effectively substituting a "constructed subset World in place of the actual World – Reality itself.

Now, you may consider that any consequent errors from these pluralistic methods are quite acceptable, for the great power we obtain by their use, but, I'm afraid, such a counter is by no means sufficient!

By such an approach, we are not ***exposing*** Reality as it is, we are restructuring some artificially delivered Part of it for pragmatic ends. What we are doing is **clever** Technology, NOT ***revealing*** Science.

Nowadays, most talk of "science" in the media is almost always about Technology.

Science is about Reality as it is, whereas Technology is about Reality restructured and bent to our purposes and needs.

They are NOT the same.

In Reality, the other (non dominant) factors in a given situation are **never** held constant. Their much smaller contribution compared with the dominant factors is due to the fact that the present conditions favour the dominants of the mix that produces the particular phenomenon. But, they are NOT held constant. They may be of less significance *currently*, but that is NOT a permanent situation.

Holistically everything affects everything else: none are totally independent, and in time the relative contributions will Change under the full set of influences until the relative contributions of the old-dominant and the old sub-dominant factors may indeed switch over, when this happens the equation ceases to cover what is going on. We say the equation has passed beyond its **Domain of Applicability**, and must be dumped.

Now, all of this may sound to be exactly what I have said many times before, but it differs in an important respect. From a holistic point of view, there is **never** a ***continuing situation*** where our pluralistic equation *always applies*. The actual situation is varying all the time. This being the case, an abstract, **timeless**, indeed *immutable* equation is not only untrue because of the usual "extensive restructuring" of the situation, but ALSO because the actual relation is always changing too. Not only are the values artificial, but they are also fixed!

Holistic Alternatives?

Now there is a way of restructuring a formula relating (say) to variables, so that it can become a pair (or more) of **iterative forms**, which take forms like:-

$$y_{n+1} = f(x_n, y_n) \quad \text{and} \quad x_{n+1} = g(x_n, y_n) \quad \text{where } f \text{ and } g \text{ are functions of } x \text{ and } y.$$

Now such forms are often used in computer programs, and particularly when the roots of an equation are to be determined. They are the backbone of many numerical methods of finding such things.

But, I am going to talk about their use in quite a different context, with very different reasons **for use**, and their effect **in use**.

With the above forms we start with some known values, let's call then y_0 and x_0, and we put these values into our pair of iterative forms which deliver y_1 and x_1 - a new pair of values. Now, this process can be repeated as often as necessary and each new pair can be plotted as a point on the graph of the original function.

Now, it is also possible to treat **non-linear equations**, which include *rates of change* as variables, in this way too and the plotting of the points on a graph of **y** versus **x** is possible. The positions generated are not, however, a continuous sequence of adjacent points on the curve of the formula, but indeed appear in widespread positions about the expected graph line.

Now underlying this process is the selfsame abstracted equation described earlier (with rate of change variables included), but frequently the order of the generated points is very interesting in themselves. They draw your attention to the patterns caused by their sequence of delivery. If they were like plotting an ordinary graph, the points would just follow one another as the values were stepped through, but here we obtain fascinating patterns as they are delivered from quite different areas of the function's curve.

Careful comparison of a normal graph obtained in the usual way, and that obtained using *iterative formulae* is very revealing. Certain parts are very similar in both forms, but in other areas, they can diverge markedly. It points up the value of the old forms in quite extensive areas, but their total inadequacy in other quite crucial areas too,

Sometimes these patterns actually produce deviations from what is expected in what are termed **Chaos** patterns (the meaning here being the mathematical form of Chaos and not the everyday meaning).

The main changes seem to occur when the original relations were **non linear** (as I have intimated). Hence, the most obvious cases happen when they involve ***Rate of Change*** **variables**. Now, wherever we have equations that involve rates of change of particular parameters, we can integrate to get another equation involving the basic parameters themselves, but it always includes unknown "constants of integration", which are to do with initial values of various parameters connected with in what conditions the rates of change are acting. Now, for such equations to be used, such constants MUST be evaluated. To find these values the users always substitute into the equations some known values of the variables involved. This transforms the equation into one where the only unknowns are the "constants", and these can then be evaluated. But, the then form of the equation is fixed for its whole applicable range. Mathematicians treat this as a **necessary frig**, to

give them concrete solutions, but we must be more PHYSICAL, and answer, "What are we importing to pin down these equations? Where do we get these values from?"

Well, mathematicians invariably take what we might call "boundary conditions" to insert. If I remember rightly, they were usually values such as 0. Whatever they were, they were bodily moving the action of the original equation to some specific position where these inserted values were true.
Thus, as physicists, we can assert that this mechanism invariably moved the action to "easy" places, wherein the constants were easily "assumed" and very often vanished altogether from our resultant equations.
This is obviously significant, and we must ask whether such substitutions are valid.

Now, we must consider the transformation of the original "rate of change" equations, in which there were NO unknown constants, into sets of iterative forms. The pragmatic purpose of these transformations was originally to allow easy approximate calculations (for they no longer contained rates of change), and if it could be demonstrated that they were "convergent", we could, with confidence, repeatedly use them.
The commonest use was indeed in the solution of such difficult equations, and the iterative forms were such as to allow a "homing in" on our required solutions.
But, I am forced to investigate these iterative equations from quite a different point of view.
The question has to be, "Is there more of Reality in the iterative forms, than in the integrated forms?"

I find that I can come to no other conclusion than to answer this question in the affirmative!
They MUST be closer to the truth!

Let us consider what this means.
When we insert values of the parameters in the iterative equations *from Reality*, we are inserting assured values. This being the case, and considering that no constants have been used, we can ask what will be the value of the new parameter values delivered by these equations? We have admitted the approximate nature of the equations, but we know that if they are "convergent", we will not get a march of succeeding values further and further from the truth, but on the contrary, they may well improve. Why is this?
One suggestion must be that by dotting rapidly about the possibility space of the situation, we are in some way minimising the build up of error to take us away from what is actually happening.
It is because each new set of values is derived from a previous "banker". It certainly looks as though we are on firmer ground *physically*, than is when we used the equations achieved from integration and substitution.
After all, if we define an initial state by our first substitution, we are imposing that particular state on our equations once and for all. Now, these iterative forms do NOT deliver new values close to the prior inserts.
On the contrary, the produced values are invariably far away from those inserted, and each subsequent application zigzags about producing a seesawing from one side to the other.

> NOTE: The iterative forms are *generated* from the original "non linear" forms involving rates of change, by replacing the actual values of change by increments, rather than going the extra step to **The Calculus** versions. These must be valid, as they were used in the original **establishment** of the Calculus by both **Newton** and **Leibnitz**. Thus, they "in the limit" were able to get *differentials* from the form involving varying parameters.
> That is how they arrived at the **differentials** and the whole of the Calculus is based on their assumptions and constructions. Their achievements have proved invaluable, but were a constant source for dissention in the ranks of mathematicians, because the whole method assumes *perfect continuity* down to the infinitesimally small. Indeed, the essence of the concepts involved, was that infinite sequences could be "completed", in finite times, and produce finite results. (see Zeno's Paradoxes)
> Thus, by using the original incremental forms, we are going back to the forms that *produced* the Calculus, instead of using the results *achieved by* the Calculus.

Nevertheless, we seem to be using a valid method, without using the final results of the Calculus, which, though admittedly approximate, do not cause cumulative errors, and hence might well reveal essential features that the Calculus hides.

Now, I have to admit that the case for what we are doing is by no means yet totally cracked, but it does seem to explain the sequence of values obtained from the iterative forms as being effectively produced direct from the original form and NOT from the integrated version with its initially unknown constants.

Could it be that the linear version using one, or more, constants leads us astray because the constants reflect ONE set of external conditions, so that by finding constants with a single position, we are NOT allowing for the external condition to change?
Is not this alternative more holistic?
Does it not constantly update holistic changes by its method, whereas the usual pluralistic method assumes **continuity** and hence requires only ONE such initiation for **all** general use?

In using the iterative versions of our rate of change forms, we are allowing EACH new position to influence things. We are depending **only** upon our rate equation for the effect of that on future positions, and also constantly including each new position as well. NO real constants are involved.
This seems to imply that our iterative forms are **truer** than the integrated forms. It is allowing the new positions to influence the relations at every iteration.
Now, it is fully admitted that these will be approximate.
All sorts of other assumptions are involved, as they always are when mathematical forms are isolated, extracted and abstracted from Reality, but we are trying to remove the effect of using the Calculus in these situations.

Some years ago, in a very productive collaboration with the Indian mathematician **Jagan Gomatom**, I wrote a series of computer programs for him, which laid out the results from using iterative forms derived from non linear equations. Now my colleague had his reasons, which I soon discovered for myself because his iterative forms delivered a whole galaxy of **Chaotic** results. The original equations when used with the Calculus did NOT in any way show these forms, but delivered a simple non-chaotic result. Gomatam knew his stuff, and wanted to fathom the physical meanings of this. The equations were developed from **Van der Pol**'s model of the human Heart, and our uses of the iterative forms produced both **fibrillations**, **heart attacks** and many other forms which the original forms did not show. The only conclusion was that the iterative forms were **more** accurate than the calculus forms, at least in certain crucial conditions.
Iterative forms were not merely pragmatic frigs. They could deliver crucial insights NOT available in the usual forms.

Returning to our more general case, "Can we choose such Easy positions for deriving our "constants of integration?" I am forced to conclude that we cannot always do this. There are circumstances where such *hides* the real content, and that we are forced to attempt to bypass the normal techniques and investigate more basic methods to reveal hidden truths NOT available by the normal methods.

By using fixed positions only **once**, and thereafter using iterative forms derived directly from the original non-linear form, we can investigate areas much closer to the truth. The Main Road of the Calculus seems to by-pass crucial areas that can only be investigated by using the old B routes of the back roads.

Let us return to the meanings of all of this.
A holistic Science seems to require that we stay closer to Reality by somehow using extracted forms, which **include** the full situation.

Now I *know* that this is impossible, but there are things that we can do, so we should use them for now, until we can reveal even better methods. The ones that have already been revealed but not understood, are the revelation of Chaos.
Mathematicians, as is their wont, have pounced on Chaos as another area of Mathematics, which they can explore to its very depths, whereas the real task is to understand Chaos as revealing something profoundly true about Reality.

This is by no means the last word, but the extractions of forms, which involve rates of change, seem to be genuine extractions. It seems the rates of change CAN be extracted as long as we are aware that we must treat them in a different way if they are to extend our reach in understanding Reality. We have to see rates as less dependant than most things we take from Reality, and the reason seems to be because they are the result of the SUM of all contributing elements. Now, if you think that this is contradictory, join the club, BUT let us briefly look at a quite different example.

Consider the Gas Laws! There are doubtless many, many things involved below the level of the gas laws, YET, at their Level, these Laws are solid and dependable. They would not exist if the multiplicity of all the causes did not by some means deliver a **simple** law. We can with confidence use such laws, because it is NOT the parameters of Pressure and Volume that cause these laws, but the underlying sum of all participating factors. Their result can be encapsulated in a law relating Pressure and Volume, but those are man-made concepts, which we have cleverly invented to "carry" the significant overall results of a holistic situation. Now this may NOT be the ideal example, but it shows what I am trying to establish: that relations produced in multifarious situations can produce simple relations as a solid overall result.

When we extract a non-linear form we are including many factors without knowing it, and when we use integration to get a useful form, we are effectively throwing away the cumulative nature of the original form, for a superficial form of relation, which the only factors that were captured are dependant on rates of change. In transferring to the individual parameters, it is like considering that everything was ***produced*** by volume and pressure alone in our gas situation. NO, they were the results not the cause!

Now, I am well aware that all of this is, of course, speculation, but it does NOT involve inventing things.
It is informed speculation.
It is a kite flying exercise, to see if the assumptions stay in the air, and not crash to the ground. Either way it will be a revealing exercise.

The inclusion of the evidence from Chaos must, in some related form to the way I have presented it, be valid. As in many areas, like Turbulence and the research into models of the human heart, they HAVE indeed added to our understanding. They do happen in Reality, but are not directly extractable as linear forms, but only in non-linear forms. Also, I believe that the sequence of generations from iterative forms is significant.
Instead of the pure continuity of a contiguous series of points along a function line generated by incremental changes of the variables, we instead get a surprising zigzagging sequence across the results space, and this sequence exhibits cyclic elements. The succession of points often moves away and then return to the previous locality, so that a series of non-contiguous points is produced. This must be of significance, because in our researches on the model of the human heart, it was precisely in these cyclic patterns that the deviations appeared, which led to data that matched the performance of Real Hearts in the Real World.

(4,787 words)