



**THE THEORY OF THE DOUBLE SLIT**  
**JIM SCHOFIELD**

# Cracking the Double Slit

## 1. Introduction

The various phenomena involved in the famed Double Slit Experiment must be considered as a series of quite different processes, which the electrons go through in their multi-phase passage from **Source** to Final **Detector**.

The **First Phase** to be considered must be their Source, and exactly how this produces them (as a set possessing a co-ordinated distribution of speeds over a given range perhaps?)

The **Second Phase** will involve a consideration of their passages through Space on their way to the Double Slits, and what exactly happens to them (and to that Space?) during that passage. These are, after all, negatively charged particles, and they are moving! And we know that moving charged particles produce magnetic effects.

Now, we might consider that this will not be significant as there is absolutely nothing there to be magnetically affected.

But is that true?

There is strong evidence to the contrary. Whether filled with gases or a complete vacuum that Space is entirely capable of reacting to any electro-magnetic disturbance, and effortlessly propagating it more or less infinitely, for that is exactly what happens when E-M radiation crosses such a Space. And in carrying out such propagation, Space is somehow passing on two closely linked features – the **electrostatic** and the **magnetic**, which are perpendicular to one another and are  $90^\circ$  out of phase. In addition, such disturbances have a frequency: for these features are oscillating about zero at a given number per second.

Now, for these complex features to be effortlessly transmitted across the supposedly Empty Space, there MUST be something there! So this Phase of the Double Slit phenomena cannot just be passed over without some careful consideration, can it?

The **Third Phase** will be the encounter with the Double Slit arrangement itself, and though this is usually ONLY concerned with the electrons themselves, we also MUST consider any disturbance in the just traversed Space that the electrons may have caused too. Both of these may interact with the Double Slits as they pass through.

The **Fourth Phase** is perhaps **the** most crucial part of this passage. If we were talking NOT about electrons, but about E-M disturbances (such as **Light**), it would be here, in this region of Space, immediately beyond the Slits that the imposed twin secondary sources (the slits) would deliver two disturbances instead of one, and which would interfere, and a much-transformed pattern of this radiation would thereafter proceed to the Detection Screen. BUT here, we are usually concerned only with two streams of electrons (one stream from each slit), and just how they get transformed into what we know arrives at the final Detection Screen. Now, the Copenhagen version of what ensues has each electron passing through **both** slits at the same time, and somehow interfering with itself in this post-slit region to produce that final pattern.

Definitely NOT! Something else has to be involved and it **could be** just that possible disturbance of Space caused by the passage of the charged particle. If such a disturbance **was caused**, it could only be in the form of E-M radiation, and it would pass through both slits and then **interfere** (as did Light in the Young's Slits version of this experiment). And it would do this well ahead of the oncoming electrons. So, in this penultimate Phase a maintained interference pattern, caused initially by the electrons, could after interfering affect the very things that caused it and produce the changed paths of the electrons.

NOTE: As this is merely an introduction, it doesn't, and indeed cannot, mention the whole contorted path to a final solution in all its diversions and cul de sacs. A detailed anti-Copenhagen strand in Physics, initiated by David Bohm and still existing and being developed further by his

disciples, was put forward, and this has been deeply studied by this author, and certainly has some things in common with the new alternative presented here. So much has been included in these studies that the task has straddled nine years, and led to many new suggestions and conceptions. These are all fully documented, but will not be apparent in the concluding form that will now be published as a **SHAPE Special**, which will concentrate on the final version of the Theory.

In addition, the object of this part of the research has also been clearly, and purposely, limited. It will attempt to explain this phenomenon without recourse to probabilities as **directors** of what actually occurs.

Indeed, this is an important task, as the Copenhagen Interpretation of Quantum Theory is NOT a progressive development in Science, but, indeed, a significant and very damaging retrograde return to an abandoned thoroughly idealist philosophical standpoint.

It is a standpoint that puts disembodied abstract laws as the primary movers of all the observed actions of Matter at this Level. It is profoundly incorrect, and as such will be found wanting in scientific terms alone. I Therefore, this author has set himself (at least) two objectives.

**FIRST:** To investigate this experiment using the materialist methods established by scientists over hundreds of years – in other words **classically** And

**SECOND:** To address the philosophical standpoint of the Copenhagen School directly and reveal its debilitating inadequacies.

Now, as this author is a fully qualified physicist and mathematician, this will be a serious undertaking. He is well aware of all the historical inadequacies of Classical Physics, which correctly precipitated the necessity for considering discrete quanta of Energy in preference to continuous waves, but we should NOT throw out the baby with the bathwater.

The total abandonment of Scientific Explanation for a sole reliance on Equations by this School was, and still is, incorrect! It was based upon an unforgiveable misunderstanding of the nature of Truth, which was imported **as is** from the World of Pure Form alone (Ideality), which is the realm of abstracted Mathematics. For in Pure Form there **can** be Absolute Truth, but that can NEVER be the case in the Real World (Reality), which has an entirely different **holistic** character. No real scientist (student of the Real) would, for a single moment, believe in Absolute Truth as being his task, but correctly would concentrate only on revealing ever more **objective content** by his experiments and his theories. Science does NOT primarily deliver Truth as its product, but enables a **valid path** towards that distant ultimate target. It is a sound and reliable methodology, which takes the serious student ever nearer to that distant objective, by better understanding, via ever improved and appropriate models. Every achievement by such means is only ever composed of Partial Truths. And the true scientist is well aware of this: it is his credo!

This brief introduction was written **after** the first Phase was successfully completed, and as a scientist, who is also a philosopher, this writer will, in following work, proceed to the second leg of the overall task: to expose the major philosophical errors of the Copenhagen School.

**Jim Schofield**

# The Theory of the Double Slit

## Special Issue 3

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WHY EMPTY PHOTONS?



# 3. Why Empty Photons

In a scientific world where speculation is rife, the idea of **Empty Photons** may well be considered to be yet another of the very same ilk, but that would not be accurate! Whereas the speculations of the modern Sub-Atomic physicists and cosmologists merely *simplify* their handling of seemingly contradictory phenomena in Science, this suggestion attempts to do the exact opposite.

It demands **explanations** for a whole “new” set of phenomena that can be drastically re-interpreted in terms of these “newly defined” entities. They have appeared because this author cannot stomach the idea that totally Empty Space can propagate such a complex thing as E-M radiation.

To have both **electrical** and **magnetic** oscillations at  $90^\circ$  to one another and exactly out of phase, AND for this “complex” to be totally handled and propagated through, and indeed by, **total Nothingness**, sounds like total nonsense to me. We can, *instead*, consider a Photon, which is a discrete entity having these particular qualities *within it*. Who doesn't subscribe to such an idea nowadays? And I *did* too! But let us be clear what such an entity has to be!

It has to somehow **contain** an oscillation of these two qualities and their necessary inter-relations, all packaged up in a defined bundle, which can deliver its energy-possessing content, and give it ALL up when encountering a suitable recipient. Now this is generally accepted without a qualm, but what is delivered is **only** energy, and we have to ask, “What happens to the **rest** of the Photon, when its gobbet of pure energy is given up and employed elsewhere? Does it just vanish into Nothingness?” And that is not the end of the conundrum. When something gives up energy, and this is propagated across Empty Space, do such Photons, as receptacles, merely appear out of Nothing, and thereafter deliver that content elsewhere?

Well that seems to be what is currently believed, with another unintelligible rider, of course. And that is the necessary motion of such a package across total Nothingness at the Speed of Light (the fastest speed of anything achieved anywhere, by anything). Handy that isn't it? But, all of this sounds very speculative to me!

Yet the actual facts cannot be denied. Clearly E-M radiation **is** propagated, and does seem to be transmitted in such “gobbits”, as demonstrated by the **Photo Electric Effect**, and also in the only plausible solution to the famed **Ultra Violet Catastrophe**. It is just our interpretation of how it all comes about that seems to be gravely inadequate, AND, very importantly, you can get the same explanations with this alternative idea of Empty Photons!

If Space is “paved” with Empty Photons (that is Photons containing NO energy) and these **never move**, the E-M radiation could just as easily be propagated by Photon-to-Photon induction. Indeed, with such a process, the constancy of the Speed of Light would be very easily explained. It would merely be the speed of induction of a single quantum between adjacent Photons. And what we often interpret as a single Photon careering across Space at the Speed of Light could be completely and adequately replaced by the repeated induction of a given disturbance across a sequence of totally static Empty Photons. All the necessary quantum effects would be replicated, in addition to the seemingly “wave effects” and propagation.

Now, when this alternative model came to this author's mind, he **knew** from the outset exactly what he had produced. He didn't consider that he had come across the Absolute Truth of the situations under consideration. But, he did see the idea as a **valuable model** that would fit very well indeed in a whole range of circumstances. It was certainly worth chasing as far as it would go, and, would at the very least, be an alternative model, which would deliver just as well as the old one. Yet, chasing this construct (in the same way as mathematicians chase “constructed” geometries) many fascinating extra features of the model were then exposed.

By far the most important of these was what would happen at the Edge of our Universe, where this “paving” (presumably produced by the Big Bang) would **terminate**! Surely, that boundary would **have** to mark the end of the propagation of any E-M radiation heading to **cross** that boundary?

And, if this were the case, what would subsequently happen to that radiation?

It was deduced that it could not simply vanish!

So, the only alternative was that it would carry on propagating, BUT only **within** the “paved” Universe itself. It could only be “reflected” by that boundary! Chasing such an idea further, it became immediately clear that extra **illusory sources** of such radiation would be caused by such reflections, as seen by observers receiving that light, and these would always appear to be **beyond** the actual Edge of the Universe.

In addition several different routes from any single source to a single observer would be possible, each inferring its own separate but illusory source, in a place where it could not possibly be. These would be in different directions and would have traversed different length actual paths, so they would be being seen from different **times** in the past.

Now, this is only a small taster of where such considerations finally led. Many other conclusions were also derived including a full explanation of the famed Double Slit Experiment with electrons.

This muse started to be very interesting indeed!

## 4. Oscillating Photons?

Let us consider an E-M oscillation within a single, discrete Photon.

Without any form of external interaction with this set up, there seems to be no reason why it should ever cease its internal activity. Just as in cycling electrons at given energies within an atom, which will continue in such a state “forever” unless some external interference causes a change. This being the case, there has to be, within our Photon, an oscillation of both E and M components both of which will be eternally oscillating yet locked permanently  $90^\circ$  out of phase with one another, at a **fixed** frequency,  $\nu$ , and a given gobblet of energy,  $h\nu$ . And this crucial frequency could be anything from an extremely high one (a short wavelength) to a very low one (a very long wavelength), and therefore capable of holding within this entity a similarly wide range of energies.

Yet, these Photons can give up their contents very easily in the correct circumstances. This is clearly demonstrated to happen in the **Photo Electric Effect**, where radiation alone can kick electrons out of their held positions in a metal and be available as a current given an applied potential difference. But, does that mean that the causing Photons are then rendered Empty? And, as such, does it also mean that they “cease to exist”? For if they do not vanish, could they remain, but have NO contained energy at all. Could there be **Empty Photons**?

Clearly, energy can be delivered to “fill” such a receptacle – say from an electron dropping into a lower energy orbit within an atom, and, somehow, **giving out** a precise quantum of energy, for then, such a “filled” Photon immediately appears. And this contains that exact gobblet of energy, at that defined frequency and can, thereafter, commence a potentially “infinite” journey, without any further external contribution. It is almost as if an inexhaustible supply of “empties” were **always** and **everywhere** available for instant filling as soon as any such energy was produced. If this were the case, these Empty Photons would have to litter the Universe in profusion (or could that be **“pave” the Universe?**).

**ASIDE:** If the Whole Universe were “paved” with Empty Photons, they would never have to even **move**! Propagation of such E-M disturbances would be merely, and easily, passed on from Photon-to-Photon by induction, and the effect would be exactly like a “moving Photon” carrying that packet of energy to some distant point. The always-present conundrum of what causes the Photon to **move** (what “impulse” starts it upon its way) is no longer both necessary, and yet unanswered.

Now, it is therefore possible for such Photons to propagate very different gobblets of energy entirely determined by the frequency of oscillation alone. And, if this frequency were incredibly LOW, the energy would also be very small, and perhaps such a Photon would appear **Empty** even though it wasn't!

Also, with the whole Universe “paved” with these Photons, and if they were in fact NOT empty, but merely very close –to-empty by containing only vestigial amounts of energy, they could indeed add up to a vast amount of total energy, that we would be totally unaware of!

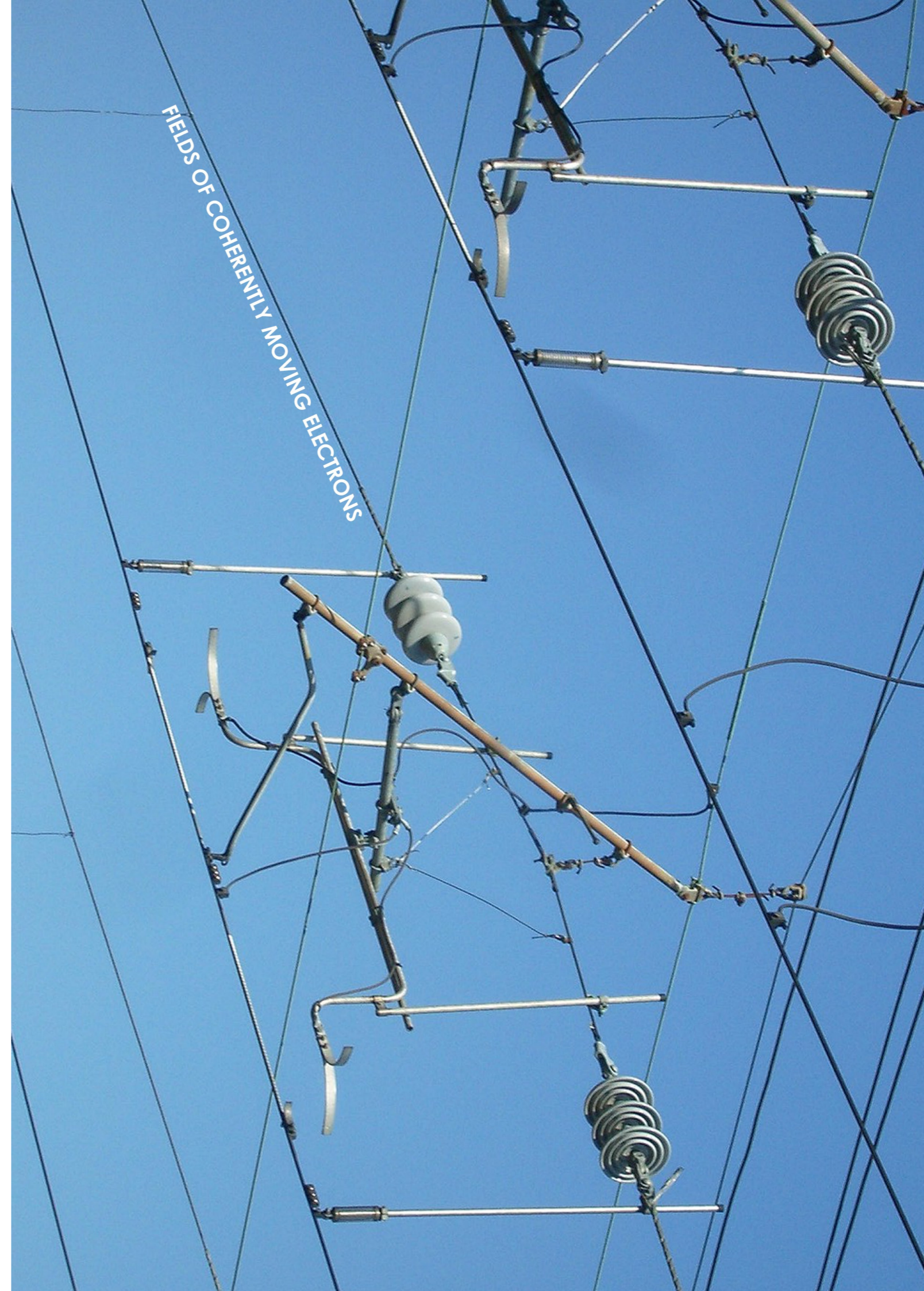
Therefore, any repeated process successively degrading the contained energy via slower and slower frequencies of oscillation, would seemingly make these Photons “disappear”?

Let us consider a hypothetical phenomenon in which “incoming” Photons (i.e. incoming energy propagated by Photons) is taken in and degraded, while subsequently energy (at a lower frequency) is given out. Such a phenomenon would concentrate vast amounts of energy (somewhere) while successively draining contributing Photons of that energy until they appeared EMPTY.

This could be crudely analogous to a kind of “greenhouse effect” where energy comes in at a high level, but is only thereafter emitted at a lower level and cannot escape, so that the place gets “hotter and hotter”. I have no idea what this phenomenon could be, but once again we have similarities with other known phenomena such as Black Holes, which take in Matter.

Now, as with everything we observe in Reality, such one-way processes cannot proceed forever. They always have limits beyond which they cannot continue, and the passing of such thresholds does not merely stop the process, but invariably triggers off an avalanche of dissociations, in which the "entity" is totally destroyed, and something wholly New appears out of the chaos.

So, in our hypothetical phenomenon, we might well get such an Emergence, and a catastrophic dissociation could be followed by the creation of a wholly New Level. It could even be the Birth of Matter!



# 5. Fields of Coherently Moving Electrons

Let us suppose that electrons are always moving! But, exactly how they move in their relations to one another may be very different dependent upon circumstances. In a non-metallic solid they will mostly be in some sort of orbits closely linked around the nuclei of their parent atoms. And the overall effect will be to neutralise their negativity with the balancing positivity of their proton dominated nuclei.

In a metal, however, the outermost electrons are not so well bound, and can move about easily switching between parent atoms. Indeed, they are so loosely bound that applied potential will (if a complete circuit path is available) cause them to flow as an electric current, whenever that potential difference is supplied. Indeed, loose binding allows them to be induced to crowd together more in certain localities, causing them to be negatively charged, and this is usually caused by other electrostatic imbalances brought into close proximity from outside, a charge is induced.

Now, we usually deal with such an overall change as a static electric field, even though the contributing electrons are in incessant (almost random) motion, and the effect is to establish an unchanging penumbra of induced overall changes surrounding the source of imbalance. Clearly, the collection of randomly moving electrons produces a static field. The individual motions effectively cancel out, and everywhere the effect is merely determined by the distance from the external inducing source.

The question arises as to what is different if the electrons are moving together in a coherent beam or stream (just as we have them in the Double Slit Experiment)? Now, we cannot ignore the direction of movement. Indeed, moving electrons in a stream (as in a current in a wire) always produce a magnetic effect too, though because it is always perpendicular to the direction of motion, it is a small effect all the way along the carrying wire. If we coil this wire in many turns around an axis, the contribution of all the electrons, all the time add up to a resultant magnetic field along the axis of the coil. And, if we, in addition, supply a “soft iron” core to the coil, the magnetic effect is further enhanced – we have an electro-magnet!

Now, all of this is to try to discern exactly what properties a stream (or beam) of electrons will have in the Double Slit Experiment. Clearly, there must be a magnetic field similar to that carried by a straight wire, but without the core-effect as described above, it will be rather weak!

Now, we have to be careful here for the Single Slit set up does NOT present any problems. Only when two slits are involved and they are within a certain very close distance from one another, do we get the behaviour, which is hard to interpret in terms of individual particulate electrons. With the Double Slit, the overall behaviour of the electrons as a set is indeed predictable, but **NOT** in terms of particulate electrons carrying a charge.

Also when bringing in the nature of Space itself in an attempt to explain this different behaviour, we again have the same “Space” composed of the same things (whatever they are). Clearly, the final contribution in this Experiment MUST be the telling one (i.e. at or beyond the pair of slits). The effect of the two close slits **must** be crucial.

Now, if we were dealing with a medium and a wave propagation, the explanation of the resultant fringes at the final detector screen would be obvious. Our problem is that these are particulate electrons and not waves in a medium. It is the interaction of the stream of electrons and Space itself with the closely situated slits that causes different behaviour.

If Space did have **Ether** – the old idea of a weightless, elastic medium distortable by various situations, we might be able to get somewhere by addressing the Space aspect, and this has been commenced by postulating that Space is NOT empty, but actually composed of so-called Empty Photons, which have full E-M properties though normally at zero amplitude, which can be immediately affected by any adjacent E-M disturbance and which will then propagate it.

We can thus get the required interference effects immediately beyond the two slits, due to any disturbance being divided by, and then recombined after, the pair of slits.

Finally, this interference field would involve patches, which could either deflect the charged electrons or NOT, and produce the fringes at the final screen. But such a classical theory is a **placeholder** only. It cannot be confirmed.

Careful study of the region beyond the two slits has found NO interference field, and indeed, there are problems with our usual conception of an electrostatic field, which requires oscillations about zero to interfere, which does NOT happen with static fields. We are left with the coherent motion of the electrons to explain a different field that actually oscillates.

# 6. Cause & Effect at the Double Slits

## And the Speed of Light

The conception of induced E-M disturbances caused by moving electrons in the Empty Photon “paving” of the Space within our Universe, produces some remarkable, and indeed surprising, effects. A moving electron (with its **affecting** negative charge) will transfer some of its energy of motion to the Empty Photons that it encounters, NOT to move them but to set off, **by induction**, a small E-M oscillation in each. Now, this will be immediately countered as impossible, but elsewhere in other papers in this series, it has been demonstrated that such things can, and do, happen, and examples are both described and explained to show that it is indeed possible.

Now, again elsewhere, this author has described how Radiation could be effectively propagated (at the **Speed of Light**) by these ubiquitous Empty Photons, so clearly, once set in oscillation by the electron, such a “wave” will be propagated ahead of its cause (the electron), because of the difference in speed of the wave and the electron itself.

Yet, we suggest that it is just such a propagated disturbance, which **interferes** on the far side of the Double Slits, and then affects the electron after it has come through to the other side.

Clearly, to maintain the interference pattern there must be a continuing replenishment at the position of the interference, right up to the point when the electron arrives.

But, this presents no problem, as that particle will be generating such disturbances throughout its traversing of the Empty Photons, right up to its arrival at the interference pattern. In addition, of course, there will be a whole shower of electrons involved all of which, and throughout their passages will be causing the same disturbances with the same effects.

Now, looking at this phenomenon from one angle, we could say that the “affect” appears (at the place of interference) ahead of its “cause” (which sounds very **Copenhagen**, does it not?). But, it is merely a feature of the differences in speed between propagating E-M radiation and that of a charged particle. For the former, via the Double Slit arrangement produces a **localised** interference effect, while after the delay caused by its slower speed, finally affects the following, causing electron! Normally we consider such an interference as produced by “continuous” and “infinite” wave motion, and hence do not **position** causes and effects in the same way, and therefore think nothing about it.

But here we have a localised result, which ultimately affects the very discrete particle, which caused it! Clearly, it is by the re-interpretation of the propagation of the E-M disturbances as being by induction from Empty Photon to Empty Photon, which changes things in this experiment. And this therefore means that (though giving the same effects as we get by continuous wave motions), these are clearly a sequence of individual events in a series of Photons.

Now, the reader might wonder why such an odd re-interpretation was considered necessary here. It seems to be a speculation too far when its only justification would be in this single special circumstance. But that is not the only reason for this idea.

This turns out to be a very important aspect of “classical” Science, for it “throws light” on the even weirder contortions of the Copenhagen Interpretation of Quantum Theory in its insistence on probabilities to cope with anomalies in the Sub-Atomic area of Physics.

The use of “overall” cumulative methods to cope with such phenomena occur because many phenomena cannot be explained solely in terms of either classical wave or classical particle conceptions. To them there is a **Wave/Particle duality** involved, which they cannot deliver by the old models. They therefore explain the “pattern” of results by probabilities and abandon the “particular” for dependence on the “general”!

CAUSE AND EFFECT

AT

THE DOUBLE SLIT





You can easily see where these ideas come from – classical Science frequently uses such methods in areas such as the Gas Laws, where instead of dealing in individual trajectories of molecules, they can instead accurately predict overall, combined effects.

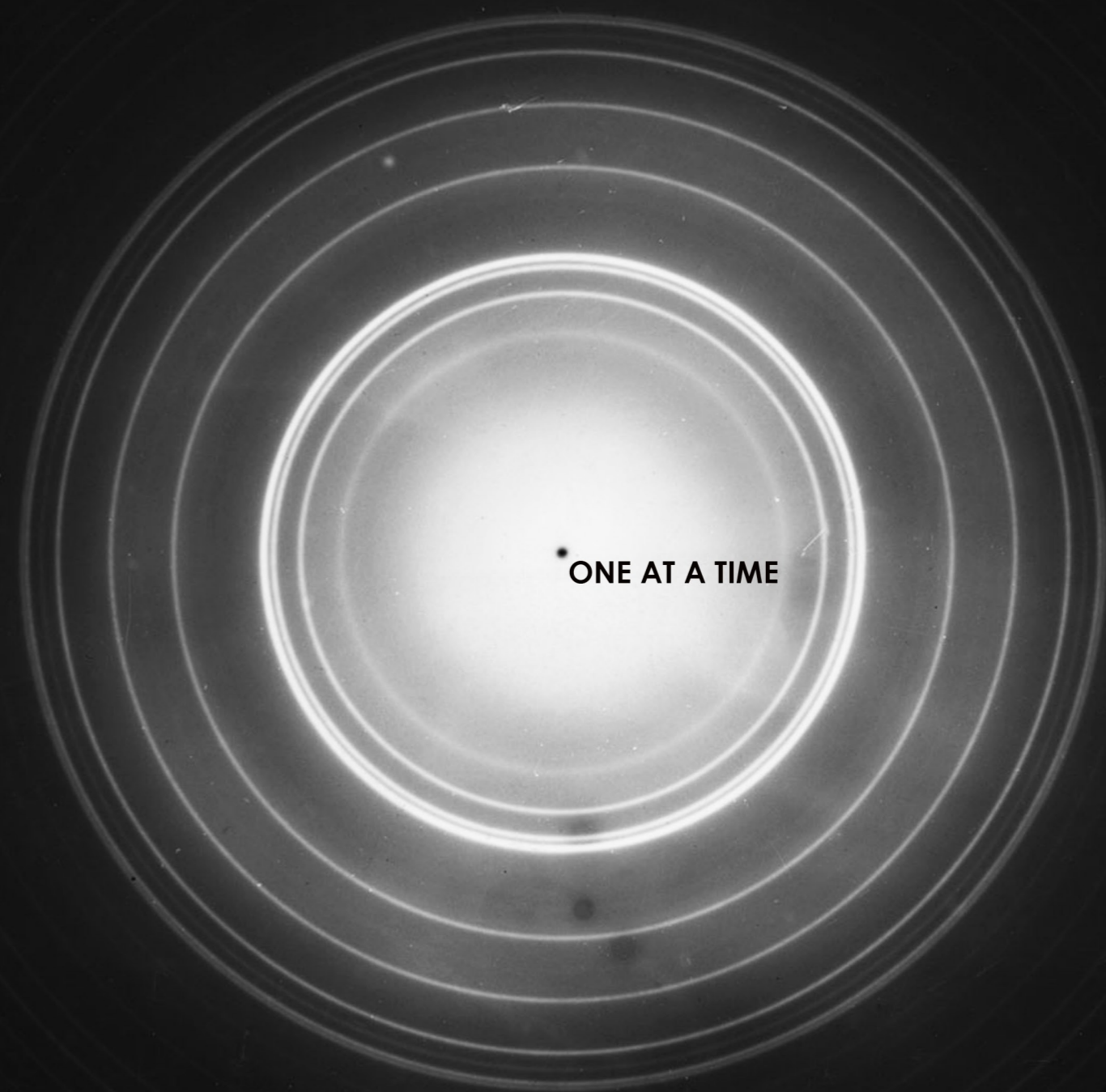
The techniques are known! So the Copenhagen School bathes contradictory phenomena in such a unifying probabilistic view too.

Yet surely, this should not surprise us!

In a holistic World, where everything affects everything else, our pluralistic (The **Whole** and the **Part**) assumptions and methods cannot cope in many areas, so they are removed from the particular events into the general overall view, and use the well-established methods for that approach.

Of course, the equations that result from such an approach can tell us absolutely **nothing** about actual **causes**. They are the most formal of all encapsulations from phenomena. Their **explanatory** content is absolutely nil. They are **descriptive/predictive** in nature derived directly from data: they are a succinct alternative to that data, and NOT a theory at all!

“Why bother trying to Understand, when you can accurately Predict, and from this both Plan and Execute?”, say the pragmatic technologists who have abandoned Science!



# 7. One at a Time?

A seemingly crucial point was made (in passing) in Mark Buchanan's article in New Scientist (2648) of March 2008, which stated that in the famed Double Slit Experiment, the surprising fringe pattern produced by the stream of electrons passing through those Slits, was still built up in the same way, and with the same results, even if the electrons were sent "**one at a time**".

The main article was addressing the alternative ideas of the neo-Bohmians, who were continuing David Bohm's opposition to the consensus description of this experiment. It seemed that perhaps this alternative required the electrons to be sent as a continuous shower, and hence this revelation might scupper their alternative as an acceptable explanation.

Now, that observed phenomenon seems incredible if the electrons were truly independent of one another, for the third alternative explanation (by this author) has the a given relationship between all the electrons involved due to their **common source** and **mode of production**. The only point about the one-at-a-time version would be if there could be absolutely NO relationship between the electrons employed. It could even be interpreted as meaning that if individual electrons (with entirely separately arrived at speeds) were sent through the system, they would still produce the exact same effects. For example, you could send a sequence of electrons all with exactly the **same speeds**, and yet they would be differently dealt with to give the usual pattern.

In the third version, presented by this author, a predictable pattern of speeds for the set of electrons as a whole was assumed to be crucial in how each was subsequently and predictably affected overall by the apparatus. And because of this determined pattern, the behaviour of the whole set would be expected to reflect these relations, and hence a predicted pattern would be possible.

This initial pattern of distribution was considered to be a Gaussian one with most electrons around a central average speed, with those below and above decreasing as they differed from that average.

An overall diffraction pattern depending on speed was thus determined for the set of electrons as a whole, and this was a crucial part of the final, overall explanation of the observed results.

Now, on investigating further, the one-at-a-time restriction was found to be irrelevant in this third explanation based on the idea of space being "paved" with Empty Photons, which were disturbed by the passage of the negatively charged electrons into E-M oscillations. For these would be propagated **ahead** of the electrons, and which, on passing through both slits, would interfere on the other side to establish a pattern of effects. And these would be **continuously maintained** until each electron finally reached the interference where it would be differently deflected (or not deflected at all) depending on the speed-determined diffraction patterns on exit from a slit. Clearly, the one-at-a-time stream may undermine the Bohmian version, but it would have no effect on the one based on Empty Photons.

Clearly, it has to be asked exactly how were the individual electrons sourced and selected when delivered in this one-at-a-time manner? It is clear to this observer that if the selection were by some sort of random sampling of a common source, it would not change the predicted results by the third (Empty Photon) explanation. For the method employed to select one-at-a-time would not negate the assumptions involved as to the range of speeds and distribution of these from a given source.

As to the consequences for the neo-Bohmian version of this experiment, I am not in a position to say, and as that alternative has been rejected along with the usual version, it is hardly worth arguing the case on their behalf.

There is major difficulty with David Bohm's pilot wave as it was presumed to (somehow) be **accompanying** the electrons. For if you consider a single electron, no wave could accompany it, as the wave would presumably travel at the Speed of Light, while the electron would be very much slower. Perhaps though, if a continuing shower of electrons was necessary the pilot wave would be a product of **all** the electrons and the above flaw would no longer be the case.

The continual disturbance of ever-newly disturbed Empty Photons by a moving electron in this author's version makes these criticisms inappropriate!

And as with all good theories, this third version of an explanation can suggest exactly how it might be either confirmed or denied by appropriately designed experiments. These would be mainly delivering very different speeds of electrons by unrelated methods, and the effect on overall results investigated.

## 8. Showers of Disturbances

### SHOWERS OF DISTURBANCES

If the basic theory of Empty Photons holds up to cover all the basic experiments, which led to the Quantum Theory, we will be replacing both waves of light, and even showers of light photons, by disturbances in a stationary paving of the Universe – the ever-present **Empty Photons** with E-M properties, and to instead simply state that **Space itself** has these properties. And this is, despite what Einstein said, NO explanation!

The paving of the Universe with these Empty Photons is NOT the same as the usual supposition (Einstein) of an elastic medium (as with the previously postulated **Ether**), nor is it a system of particles of light, propagating by their actual movement.

It is a space-filling field of E-M endowed yet “empty” static entities (Empty Photons), which will produce both “wave-like” effects **and** concentrated transfers of gobbets of energy, formally only associated with focussed (indeed **particulate**) collisions. For instead we will have an E-M disturbance being picked up by an Empty Photon and transferred **by induction** to another such entity, so that the result of a series of such transactions can look very like a path of a moving photon-particle.

Yet, also a number of such disturbances, affecting simultaneously several Empty Photons in close proximity, would give an effect of a shower of disturbances, and these would appear very like a wave, and indeed could deliver many wave-like effects, such as **interference**.

So, the seemingly contradictory phenomena, such as the **Photo Electric Effect**, the **Ultra Violet Catastrophe**, **Compton Scattering** and the **Double Slit Experiment**, will all be accommodated by these new entities, but without the usual contradictions.

But, there is another very important side to all this!

The macro World and the sub Atomic Realm are nor derivable or analysable one from the other, because they exist at Different **Levels** of Reality. In a sense, the probabilistic-predictive possibilities, which occur throughout this area, are exactly what you can get instead of direct, causal deterministic connections. These always come up when we attempt to causally traverse **Emergences**: when we expect to explain the phenomena at the higher Level from those at the prior Level, in the same ways that we can do it “within-a-Level”.

Now, this does not mean that real processes do not occur in these revolutionary transitions. Indeed they do! But, our historically determined methods are inadequate to deal with such complete overturns. Our methods cannot connect the necessary precursors in a prior Level with the actual emerged features of the New.

The actual process of revolution is not understood!

Try as they might, researchers equipped only with methods suitable for phenomena within a stable Level, cannot address the **change** over! They get closer and closer to the Emergence Event **from below**, or they delve down deeper and deeper towards that Event **from above**, but all their discoveries are **in one Level** or the other and do NOT traverse the actual transformation. Now this analysis does not preclude the study of such transitions forever. But it does show that it will be impossible using only the usual methodology involved in within-Level researches.

And this is not mere speculation.

The weaknesses of our current methodology can be clearly exposed, and, when they are, they can be put down to our **banker** assumptions, namely **Plurality** (the Whole and the Part) and **Reductionism** (the possibility of explanation right down to fundamental particles and their Laws. These are THE methods for analysis within a stable Level, but they have absolutely no hope of dealing with radical Qualitative Changes, which are of an entirely different nature.

What has been possible however is indeed prodigious in **appropriate** contexts.

There is a methodology which mathematicians were able to provide for situations when direct causal means were **unavailable**. And these crop up wherever multiple, individual contributions cannot be accessed, but

only the **overall, summated result**. The **Gas Laws** are a very clear example. So we should expect that fitting up outcomes using such statistical/probabilistic methods would be possible.

These remarkable interludes of major qualitative change (Emergences) can be dealt with, but NOT by our usual methods. The reason for this is that in assuming Plurality we are foisting a fiction upon Reality, which can be made approximately true in a Stable Level, but ONLY if it is extensively and rigidly constrained into a much narrower state, conducive to the isolation and extraction of relations between a small number of the involved parameters.

We call this the **Pluralistic Experimental Method**, and its results **Pluralist Science**. We get to both **predict** and **produce** required outcomes, as long as we remain within these engineered **Domains** of Applicability. But our assumption that it is these exactly identical relations, which also act in totally unfettered Reality to deliver what happens there, turns out to be **wholly incorrect**.

And this means **first** that our relations cannot be used perfectly in Reality-as-is, and **second** that Emergent Transitions can never be tackled by these methods.

Pluralist Science is not equipped to deal with either unfettered Reality or the inner phases and complete trajectory of any Emergences. Indeed, between the last moves in a prior Level, and the first moves in a subsequently Emerged Level, a surprising sequence of phases is traversed!

The first is a cataclysm of dissociation of the prior stability, with the most important and indeed necessary destruction of all self-maintaining and defending processes, which had preserved the prior Level. And, following the resultant **Nadir of Dissociation**, a new creative/dissociative oscillation occurs with increasing stability at each succeeding cycle, until finally a final Stability persists, and a wholly New Level has emerged.

All of this happens between the two sets of overt phenomena described above, but which are not available (as they are) by pluralist methods.

## 9. Ships in a Harbour

Let us consider an enclosed harbour with shipping passing to and fro within it. Let us allow the ships go rather fast and hence produce bow waves, which move right across the harbour and bounce off the harbour walls that surround the space. The harbour will very soon be a nexus of such disturbances, which will constantly be interacting with one another and producing an extensive mix of interference patterns everywhere. The effect on the enclosed shipping will sometimes be quite alarming!

Waves can, of course, cancel out producing momentarily very quiet patches of water, while elsewhere the contributing disturbances can add up into quite big dramatic waves.

A small boat will suffer a diverse set of conditions from pond-quietness to open-sea tumult, and the boat's pilot would have to be constantly alert to ensure the safety of his little craft.

Indeed, we don't have to limit such phenomena to a harbour. A recently repeated Horizon T.V. programme on the so-called **Killer Wave** in open sea, which alone could destroy a perfectly sea-worthy ship, confirms that the interference of wave patterns can produce **the** most dramatic local circumstances.

But, we are so used to one-way causality, with a **cause** producing a **consequence**, which we don't like to consider reciprocal consequences, where a cause can produce an effect, which then reacts back onto the cause, and changes its nature too. We consider that we are getting something for nothing by making such considerations, if only because such a cycle could lead to infinite regression. But, of course, such things are never infinite, but they can very often incur some cycling between cause and effect.

But, our unwillingness to consider these circumstances is because we condition ourselves by our subscription to the assumption of **Plurality** – where the division of everything into its containing **Wholes** and their own contributory and separable **Parts**. And to achieve this, which is well nigh impossible in unfettered Reality, we purposely constrain our experimental conditions so that such assumptions are much closer to being true. The holistic alternative does not impose such a straight jacket upon our thinking. For, with that view of Reality, causes can certainly be changed by their own effects. Indeed, there causality is never only bottom-up. It can also be side-to-side, with other causes intervening, and even top-down, where the consequences of a cause can react back and change the very context that produced it.

Now, though we frequently have to constrain our experimental conditions in order to allow anything to be extracted with certainty, any relations so attained will NOT be the same as the actual relations in unconstrained Reality. WE get away with this problem only using our extracted "truths" by limiting their use to within the exact same conditions in which they were originally achieved. But when such control is unobtainable by our efforts, the real situation will be in force and the above described complex sets of iterative relations will indeed be in force.

Perhaps our electrons, ploughing through their "sea" of Empty Photons, can set up similar iterative relations? As the negatively charged electrons set up their own induced effects in the surrounding Empty Photons, which can later, after traversing **both** slits, react back on the electrons to influence their subsequent trajectories?

# 10. The Transcendent Results of a Single Blow

In considering the Double Slit conundrum, I have followed a meandering path of investigations in my attempts to transcend the dead-end conclusions of the Copenhagen theorists in Quantum Physics. But, I am now a long way from the usual considerations. I am thinking about Energy, and how it can be transformed into very different forms.

**Kinetic Energy** is when some source of energy is embodied in the subsequent movement of a body at a given Speed, while **Potential Energy** occurs when it has acted-against forces to the extent that the energy involved is both invisible, yet stored in the final position of the body involved – rather like that stored in an extended elastic string, for example. But perhaps the crucial extension of this latter idea is when some balanced equilibrium has energy inserted into it. For in some such circumstances that system can **oscillate** or involve **orbits** of its parts, thus effectively storing that energy. And the nature of such tightly constrained motions is entirely governed by the system, which stores the energy.

These systems have **natural modes of oscillation**, which are independent of the **impulse**, which delivers the involved energy. We can even get such oscillations indirectly picking up energy and increasing the amplitude, which we term **Resonance**.

Now these cases are most interesting!

If we merely hit such a system, the energy transferred cannot be turned into either Kinetic Energy (K.E.) or Potential Energy (P.E.), but it **can** simply and easily be sucked into a natural oscillation of the system. The key factor here is that though the “hit” may have its own characteristics, they are not significant in what ensues. That is entirely governed by the nature of the “struck” system. The direction of the hit is also irrelevant, and the natural oscillation about a “rest state” ensues. There could be a cumulatively **zero** to-ing and fro-ing in the original hit, but the result within the system can still be entirely of that nature.

Now, the long and arduous trek to seek a semi-classical (or neo-classical) explanation of the Double Slit experiment involving electrons may be in sight. The stream of electrons (negatively charged) coursing through a Space “paved” with Empty Photons (with full E-M properties, though normally quiescent) must be like the hits on equilibrium systems described above. Each disturbed Empty Photon will naturally oscillate (in E-M terms) about zero.

Thus, though the electrons are only negative, the resonance in the Empty Photons can be both **negative and positive**, and the energy can be transferred from a kinetic form of a moving negatively charged particle, over to a normally rest-state Empty Photon, to kick it into positive/negative oscillations. NO charge is transferred only energy, so that is entirely consistent with the photons oscillations about zero: it **only** needs **energy!**

If this is the case, when the Empty Photon disturbance is passed on in a bucket-brigade fashion, it will go through BOTH slits and will then emerge as TWO secondary wave sources on the other side. And hence, they could **interfere!**

Thus, the usual sort of problems of interference could be set up. Now, our initial sources of all this, the negatively charged electrons, can (as we know) be deflected by such fields or not if the opposing influences of the two secondary sources have added or cancelled out. Thus, in traversing this field, the electrons can be selectively affected to finally show fringes on the detection screen.

# 11. One Electron - Many Waves

The problem of interference beyond the Double Slit, which turns out to be absolutely essential to affect following electrons passing through, is that it requires E-M waves to have been created previously, which, after passing through both slits will interfere.

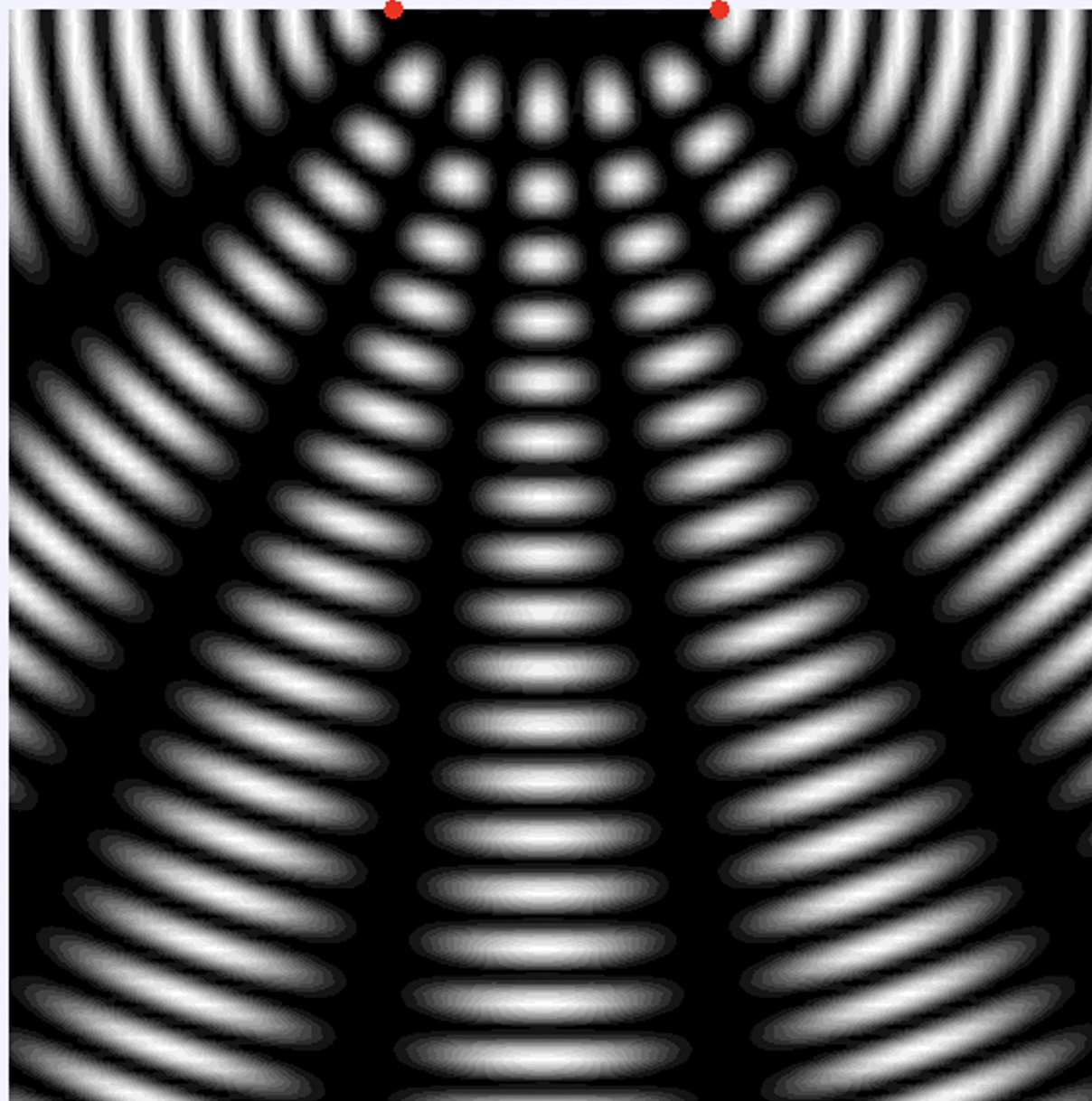
Without this interference there could be no consequent production of the pattern of the electrons at the final detection screen. And the counter argument to **David Bohm's** suggested explanation for this phenomenon was based on the fact that even if the electrons were sent one-at-a-time into the Double Slit, the same phenomenon resulted.

The difficulty of "associated" waves passing through both Slits and the linked electron passing through just one of those slits seemed impossible to explain. But, with the recent alternative explanation of this author, which relies on the whole of Space being paved with static, E-M capable, yet normally quiescent, **Empty Photons**, solves this problem quite easily.

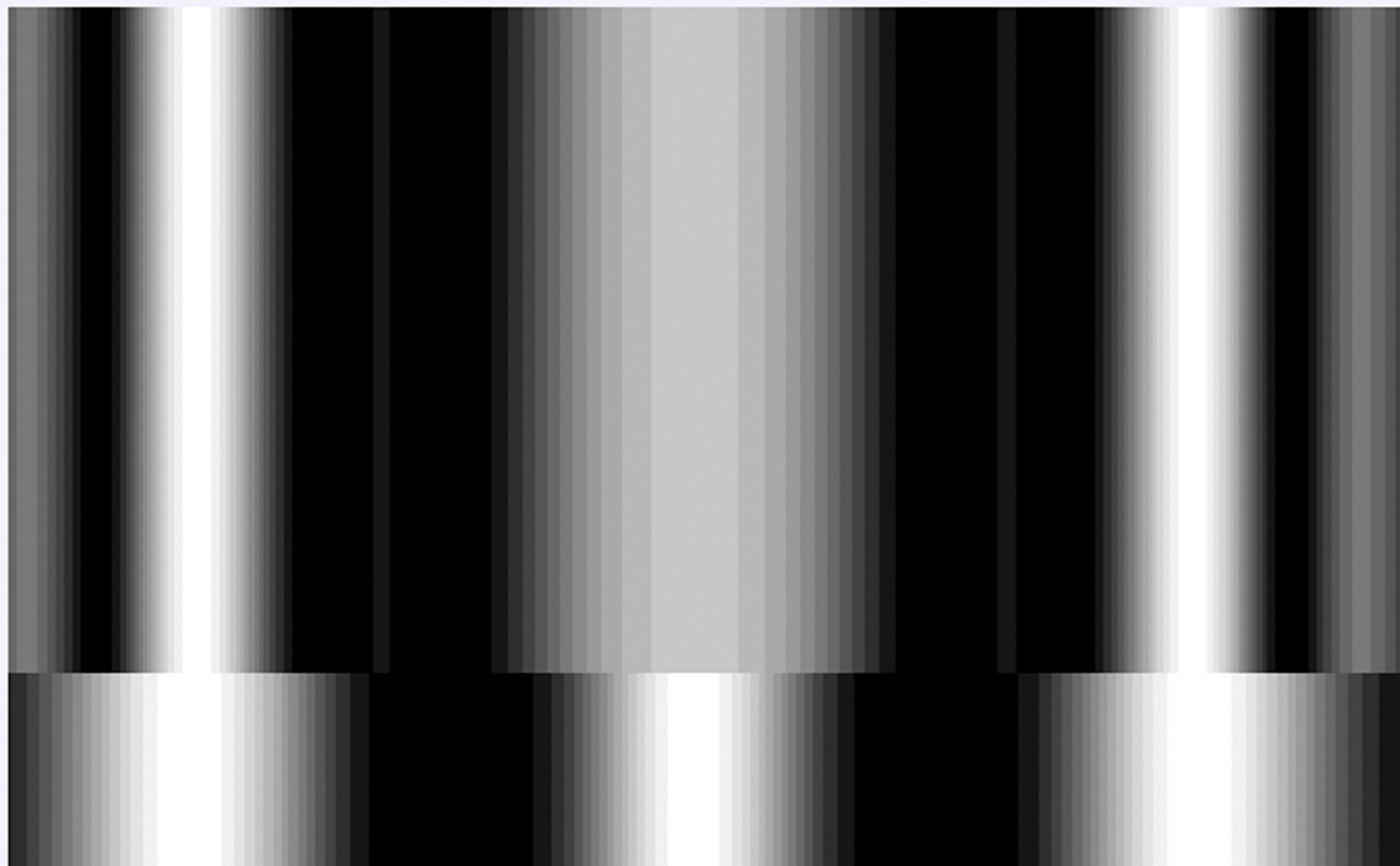
Elsewhere, in a series of papers, I have shown how the moving electron is constantly setting up induced oscillations in the Empty Photons it encounters as it moves from the Source to the Slits, and these oscillations will then be immediately propagated (in the usual way, and at the Speed of Light), but by inductance from Photon-to-Photon. They, therefore, zoom well ahead of their causing electron towards the Slits.

Now, the electron can only set into oscillation an Empty Photon, which is not already affected. So, the positions of these newly affected Photons will not always be straight ahead, And as long as these are close enough to be affected, they will be, and this will certainly cause (even with quantum-defined bucket-brigade sequences) disturbances in ALL directions, as the electron moves along, and hence these will certainly get to BOTH of the Slits.

This being the case, it is no problem for them to arrive **continually** at both Slits all the time the electron is coming up from behind, and thus an interference pattern will be set up, and **maintained**, beyond the Slits until the electron finally arrives, passes through a **single slit** and is affected accordingly by the interference pattern.



ONE ELECTRON - MANY WAVES



## SORTING THE DOUBLE SLIT ELECTRONS

# 12.Sorting the Double Slit Electrons

One crucial argument concerning the Double Slit Experiment was to do with how a single electron, passing through one or the other of the two slits, could actually "**know**" exactly where to go in conformity with all those that had gone before it, and those still to come, to complete such a well-ordered overall pattern at the final detection screen.

What, or who, kept a count and a record, so that each following electron could fit perfectly into such an overall pattern? There certainly was a very orderly overall final pattern (as if it were caused by a wave), and because of this, results could be reliably predicted using the Copenhagen theorists Wave Equations and their consequent probabilities. And YET, we certainly seemed to be concerned NOT with a linked and organised system, but with a sequence of individual and, indeed, wholly **independent** electrons. How could that be?

Well, there are two problems here, and the Key one is to explain that final fixed, yet surprising, pattern from these components. But, the other problem, as to the overall performance of the whole set of electrons as a co-ordinated group, is much simpler to address.

Indeed, all we need is some kind of filter to organise the stream into a precisely defined and related group. And the place to start must be with the initial **Source** of the electrons!

First, we must assume that the Source produces electrons according to a given process, which, because of its nature, delivers individual electrons with different, yet related, energies (speeds). Indeed, the most likely pattern of speeds will all be around some central average, where most of the products will be, but tailing off, both above and below this speed, to give something akin to a Gaussian distribution of speeds. And, if this were the case, all that would then be needed, was some form of filter to affect the electrons differentially in proportion to their speeds.

And this could be provided by the edges of a Slit!

Presumably, the amount of **Diffraction** at the edges of the Slit will be in inverse proportion to their individual speeds: the swiftest will be the least deflected, while the slowest will be the most deflected. The Slit will reveal that Gaussian distribution of speeds via a physical "**fanning out**" according to the above relation. And with a Single Slit ONLY that fanning out would consequently appear on the final detection screen.

Hence, no-one is needed to keep a tally. It is unnecessary! Each electron has its own speed in a given distribution of an ordered set, and that is **all** that is required.

Two factors will affect any given electron:-

- How near the edge of the Slit it is on passing through
- Its individual speed.

Clearly, electrons of all speeds well away from the edge will tend to go straight through without deflection, but for those nearer to the edges, the slower ones will be deflected more than the faster ones.

Thus a single slit will deliver a predictable fanning out. No mystery here! Yet in this particular case there is still the major question of how we get these clearly particulate electrons to thereafter be affected to give a fringe pattern at the detection screen when TWO slits are employed. And that is quite a different problem!



# 13. Self-Deflecting Electrons

## The Theory of the Double Slit

In our extensive deliberations on the Double Slit, the position we have reached thus far seems to require an interaction between - the Electron Stream, the Pair of Slits and, perhaps surprisingly, **Space itself**. So, before we go off on yet another muse, let us briefly list what possible contributions we have so far uncovered.

**First**, we must consider what effect the **Source** must have upon the overall properties of the initial Stream of Electrons. We could, with justice, assume a range of speeds with a Gaussian distribution about some Median value, though it might be more helpful to consider the stream with a maximum speed and a range of lesser speeds below that value. The reason for considering it in that manner is that the effect of each of the Double Slits on the directions of the electrons beyond them, could well be related to these speeds - the slower speed electrons being easier to diffract than those at higher speeds.

Thus, the **second** contribution to be considered would be such **Diffraction** at the edges of those Slits, which may well turn the slowest electrons through the biggest deflections. Such an interaction would “fan out” the stream, and this would be imposed upon them as they emerged from each of the two slits. Confirmation of this could be achieved by studying a single slit arrangement and noting any such “fanning”. Such observations do indeed confirm an overall picture that we **do** get the fastest going straight through such an opening, with a gradual tapering of the slower ones to either side. Our explanation of this separated out feature would then be that the slower the electrons are the more they would be deflected by this process.

Now at this point we get the **third** contribution - the fact that there are TWO slits. In some way the two fanned out streams are made to “interact” with something and thereafter produce our interference fringes at the final detection screen. The question is, “What is involved in this interaction?”

Now, most of the culprits that I have so far considered have been concerning the properties of **Space itself**, and an hypothesis has been put forward that it is in fact “packed” with **Empty Photons** - having full E-M properties, but in this quiescent state, normally “empty of energy”.

NOTE: This suggestion is an extensive subject in itself, and was not merely invented to play a role in these considerations. For example, the ideas are also of importance in many other areas of sub atomic Physics and also in Cosmology.

So, in these researches, we considered that the passage of the stream of electrons must always induce oscillations of E-M amplitudes in these Empty Photons, and these, thereafter, will course swiftly ahead of each single moving negatively charged electron as E-M radiation.

A stream of such electrons will therefore generate a whole set of such disturbances, which create a continuous “moving propagation caused by the stream, and THIS will hit both slits **together** and “go through” both. We then have to separately consider each individual following electron, which will some time later go through only one slit or the other, and encounter what the previous disturbances have created. Perhaps surprisingly, it doesn’t matter which slit is traversed!

But clearly, the induced disturbances will have definitely gone through **both**, and it is the emerging secondary waves on the other side, which then **interfere** to generate a field **beyond** the slits. Then, the fanned out, multidirectional set of electrons are **deflected** (or **not deflected**) depending upon their directions and the nature of the **patches of interference** through which they pass.

Now, this is explained elsewhere in a whole series of other contributions in more detail (but without the combined effects suggested here) so the understanding of a full theory will require that those be read too.

Now, those “E-M waves (induced by the moving electrons) mutually interact and deliver an interference pattern,

which will then selectively divert electrons depending on what patches of interference they traverse. But the question is how does this come about. It may not yet be entirely obvious!

So let us, in the second part of this paper, consider carefully how this might occur!

### How can we get the necessary Cancellations?

In spite of several recent attempts, I have yet to crack the origins of the “interference field” established (somehow) within the Empty Photons and beyond the slits. Without such a force field, there is nothing to deflect (and not deflect) the electrons into the clear resulting interference-type pattern at the detection screen. The Copenhagen School physicists can be as clever as they like with their mathematical equations and thus “predict” that pattern, but it is merely a purely formal frig – a form-matching exercise only! It is STILL nothing like an **explanation**.

And all the philosophical contortions, which they proffer as justification don’t wash either. We are scientists, and our job is to **explain**. If all we can do is **predict**, then we are mere **technologists**. It just won’t do!

Now, in attempting to deliver an explanation, this too will be condemned as untenable, because the Copenhagen School insist that all the problems were there from the beginning in the classical way that scientists “explained” **all** phenomena. They say that all such “explanations” are nothing more than rationalising self-kid.

Now, in many past theories such a criticism could well be valid, but NOT in **all** of them. That would be throwing out the Baby with the Bathwater. And to replace explanation in this area with all their “probability stuff” is, in my view, very **much** worse. At least, all past explanatory theories did contain that vital thing **objective content** – containing real fragments of Truth. To dispense with that, dispenses with Science. So, we will once again address the difficulties with the Double slit.

None of the new analogies are sufficient as I have described them thus far, and the main reason is that my initial induced electrostatic penumbras in the surrounding Empty Photons were **all one way**, and to get interference we must have BOTH **positive and negative** effects which, when they cross, will **interfere**. The trouble is that negatively charged electrons set up static fields (**one way only**). Now my use of “bow waves” of moving ships seemed to suggest a useful analogy, but, of course, it isn’t so easy if we consider only static electrostatic fields simply moving along with the electrons.

But why do bow-waves in water occur from the single-direction movement of the ship?

Is it because disturbance of the water molecules can only be oscillations about their normal positions as parts of an integrated “liquid”? And the disturbance from the moving ship though seemingly uni-directional, manages to produce this oscillation? If you were to carefully analyse the actual disturbance of the ship it would appear to have only:-

a forwards motion and

a much smaller sideways motion (pushing the molecules to the side)

How could either of these produce the actual motions of the Bow Wave, which are essentially up-and-down? We have to see how disturbances can affect those situations, which have their own **natural oscillation** capabilities!

Can almost any kind of disturbance, in whatever direction, set such a natural system into its own preferred mode of oscillation? The answer seems to be, “Yes!”

So, in the case of the moving ship, its mere passage, with whatever involved direction of its own motion, could indeed set off oscillations of the molecules of water, which are mostly performed in its own **natural** and **implicit** modes.

Something similar **must** happen when disturbances set guitar strings into oscillation, (without them being physically plucked) by means of **sympathetic resonance**. Whatever the disturbance then, it is the **Energy** that is transferred to the strings, which then oscillate in their own directions and even their own natural frequencies!

Now, if this is accurate, we may be able to transfer the same sort of things to the Empty Photons, when disturbed by the passage of the charged particles. Though the causing disturbance is very different from the natural oscillations, of which the E-M functionalities of the Empty Photons are capable (as evidenced by the **propagation** of such waves), the energy transferred is the **key thing**, and the Photons then oscillate in their own natural way – that is between both positive and negative limits, taking in **only** the required energy from the moving electrons

Now, we are still not there with a full explanation, for **fields** are not oscillations. They are static one-way potentials (much closer to the previously considered Potential Energy). But, we are **not** dealing with stationary electrons, setting up static fields, but indeed **moving** electrons. This **must** be the key!

Instead of setting up a static one-way electrostatic field, which simply remains as normal, but “moves” along with the causing electron, we must instead have oscillations natural to the affected Empty Photons.

This is NOT pure invention! The muse about ships and Bow Waves and resonating Guitar strings shows that something similar is quite possible.

Let us think about why we get such surprising results in this celebrated Experiment. It is because Energy is transferred from the moving electrons to the naturally E-M endowed Empty Photons of Space itself as disturbances both **positive** and **negative** oscillations about zero.

These, if in totally uninterrupted Space will have no appreciable further effect. Neither will they do anything significant when a single slit has to be traversed. BUT, when TWO slits divide the disturbance, it will emerge from the slits, each of which will produce a usual fanning out of the directions, and these two will **interfere** where they cross!

Now, there is another important factor, which distinguishes the Double Slit case from ships with bow-waves. Any induced oscillations in the Empty Photons will propagate at the **Speed of Light**. The “bow-wave” in the Empty Photons will advance well ahead of the **causing** electrons. So this will arrive and pass through the slits well ahead of their actual causes.

The emerging, following electrons will, thereafter, be traversing this post-slits, interference pattern within the Empty Photons, and where cancellation occurs they will pass **straight through**, but where the two contributions add together they will be **deflected** to one side or the other. The result will be exactly what we detect on the final receiving screen.

So, after something of a wandering muse, we may have finally settled on the answer to the Double Slit phenomenon in this paper, and this theory does not use probabilities or the Wave/Particle Duality at all. It is a classical solution, and was made possible by the hypothesis that Space is “paved” throughout with E-M capable Empty Photons.

And this is only a precursor to the Real Theory of the Double Slit, which will involve a very different philosophical standpoint to that of the Copenhagen School, and will also totally disagree with the usual assumptions, which form the whole basis of BOTH the usually considered alternatives. That contribution is already well advanced. Indeed, it preceded this explanation, and in fact was the reason for undertaking this particular path. Can you see why?

There is an animation available to better visualise this new theory, it can be found at the URL below:

**<http://www.e-journal.org.uk/shape/images/blog/doubleslit.html>**

# 14. Credits

## And other Information

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