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Einstein, Ether and Unified Field

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1. Introduction

Einstein derived his theory of Special Relativity (SR) from the philosophy of Positivism. However he derived his theory of General Relativity (GR) from a different philosophic point-of view than positivism. Yet, Quantum Mechanics (QM) was still derived from the Positivist point-of view. This led to conflict between the ideas of Quantum Mechanics and General Relativity.

Einstein wanted a quantum theory based upon the same philosophic point-of-view as General Relativity; so that then both theories could be combined into one; this was what was called the Unified Field Theory (UFT), and was still within the old classical physics tradition.

This means that the Unified Field is really just an evolution of the ether concept.

However, there are philosophic problems (caused by Logical positivism) and psychological problems with making this deduction. Namely, a scientist working from the philosophy behind how Quantum Mechanics was first created, is not used to thinking about things in the old classical way; this can cause a mental block.

(It should be noted that Quantum Mechanics is now attempted to be interpreted from different philosophies; but in its original formulation it was based upon Positivism. So, what I am referring to here in this article is the original formulation of the philosophy behind Quantum Mechanics.)

2. Ether evolved into the Unified Field

The Unified Field is really just an evolution of the ether concept. This was noticed by such people as Dewey Larson in his book "The Neglected Facts of Science."

Dewey Larson has his own personal theory that he is promoting, something to do with a six dimensional theory, but he notes:

"The concept of the field originally evolved from the earlier concept of an ether, and to those who follow the original line of thinking a field is essentially an ether stripped of most of its physical properties. It has the functions of an ether, without the limitations. The ether concept envisioned a physical substance located in, and coextensive with, space.

The school of thought generally identified with the name of Einstein has replaced this ether with a field that is located in and coextensive with space." [1]

Dewey then quotes Einstein:

"There is then no 'empty' space, that is, there is no space without a field." [2]

He then says that: "The change from ether to Unified field from Einstein's point-of view seems to be mainly semantic." [3]

He backs this up by quoting Einstein: "We shall say: our space has the physical property of transmitting waves, and so omit the use of a word (ether) we have decided to avoid." [4]

i.e. from this quote Einstein would seem to be saying stop using the word "ether", because "space" now has that property. However other quotes seem to have him not dropping the term "ether".

Dewey Larson then continues: "The greatest weakness of the ether concept, aside from the total lack of observational support, was the identification of the ether as a "substance." This established it as a physical connection between objects separated in space, and thereby provided an explanation for the transmission of physical effects, but it required the ether to have properties of an extraordinary and contradictory character. Calling this connecting medium a "field" instead of an "ether" eliminated the identification with "substance," without putting anything else in its place, and enabled the theorists to ascribe patterns of behavior to the medium without the limitations that necessarily accompany the use of a specifically defined entity. Nevertheless, those who visualize the field as a purified ether still see it as "something physically real."" [5]

Again quoting Einstein:

"The electromagnetic field is, for the modern physicist, as real as the chair on which he sits." [6]

And:

"We are constrained to imagine — after the manner of Faraday — that the magnet always calls into being something physically real in the space around it, that something being what we call a "magnetic field" . .. The effects of gravitation are also regarded in an analogous manner." [7]

Dewey Larson then continues: "Field theory is the orthodox doctrine in this area at present, but there is no general agreement on details. Even the question as to what constitutes a field is subject to considerable difference of opinion." [8]

As an example of something very different from Einstein, he quotes Marshall Walker:

"A *field* is a region of space where a test object experiences its specific force." [9]

Dewey Larson then says: "Here we see that the field is equated with space — "a field is a region of space" — whereas Einstein saw it as something real *in* the space. The difficulties

in defining the field concept, together with others involved in its application, have raised many doubts as to the validity of current ideas." [10]

He then quotes David Park's assessment:

"This does not mean that the ultimate explanation of everything is going to be in terms of fields, and indeed there are signs that the whole development of field theory may be nearer its end than its beginning." [11]

Dewey then goes on to say that he thinks that the present views of field (presumably) by the Mainstream are incorrect, and tries to talk about it in terms of his personal theory.

Dewey Larson says: "A field is not a physical entity like the physicist's chair, nor is it a region of space. It is the force aspect of a distributed scalar motion, the quantity of acceleration, and it has the same relation to that motion as an ordinary force has to a vectorial motion." [12]

Unfortunately his use of the term "scalar" is peculiar only to his theory and is not the Mainstream use of that term; so what he means by "scalar motion" is difficult to understand. He has similar peculiar uses of other terms, making his theory unclear. However, that should not deflect from the fact that essentially he is correct about the connection of the ether idea and the unified field idea, and it is a question of semantics. Einstein was talking about things in a certain way, and if we decide to agree with the way that he is talking about things then part of what was the ether idea has evolved into the unified field idea.

Dewey is thinking about things by a classical way, and hence makes the connections between Ether and Unified Field, which was Einstein's way of thinking about things.

Thinking about things from a philosophy connected with Quantum Mechanics it is less obvious.

I shall pick up the ether issue again later, but for now I shall now look at Einstein's thinking process in his theorising.

3. Einstein: Positivism and the Unification Principle

Einstein's approach seems to be: Special Relativity (SR) formed from philosophy of positivism, General Relativity (GR) formed in part from unification principle from Spinoza.

3.1. Einstein's Philosophy

Leopold Infeld says:

“Einstein is regarded not only as a great physicist but also as a great philosopher. He too regards himself as a philosopher. Often he has said to me, "I am more a philosopher than a physicist." Years ago, I listened in Prague to Professor Sommerfeld's lecture at a Physical Society meeting. He spoke to a large audience; "I asked Einstein, whom I consider as the greatest living philosopher, `Is there any reality outside of us?' And Einstein answered, `Yes, I believe in it.' " [13]

“To say that Einstein is a philosopher is not sufficient. The statement may be misleading, for the word philosophy is often used in at least two different meanings. First it stands for the speculative philosophy which was the only philosophy up to the nineteenth century and its history is connected with names like Kant, Hegel and Bergson. This philosophy has very little if anything to do with Einstein. It is based on the belief that some questions about the existence and nature of our external world are not meaningless-that there is sense in talking about being, not being, that some statements are "synthetic a priori." These philosophers use long words discussing intuition, imagination, the thing in itself, trying to express in words the inexpressible world of experiences and beliefs.” [13]

Kant - reasoning from a priori
Hegel - using logic?
Bergson - theory of memory.

3.2 Logical Positivists

“But there is also another meaning of the word philosophy accepted by the school of modern philosophers known under the name of logical positivists, or logical empiricists. According to this school, philosophy is not a science in itself but an activity of clarification and there are no purely philosophical problems. They either belong to other regions of human thought or they are meaningless. Traditional philosophy, that is, the speculative philosophy, dealt, in the old times, with those problems that were later absorbed by science, by physics, mathematics, biology, psychology. To the logical positivist a philosopher in the modern sense is a man interested in the foundations of our knowledge, in the clarification of its basic concepts.” [13]
“It is only in this sense that Einstein can be called a philosopher, and in this sense he is one of the greatest that ever lived.” [14]

i.e. he seems to be labelling Einstein as a Logical Positivist.

He does not indicate whether he asked Einstein about this, so it could be his interpretation.

Maybe he is reading his own interpretation into physics, thinking positivism connected to QM and then believes Einstein was a positivist?

Einstein had a change of philosophy approach when changed from the theory of SR to the theory of GR. Einstein developed SR by Positivism and then changed his philosophy for GR, because according to Karl Popper :

“Einstein’s own views on the philosophy of science changed considerably during the course of his life. In his earlier writings there are many traces of positivist and conventionalist ideas. Especially noticeable is the influence of Ernst Mach, and also that of the great mathematician

Henri Poincare, who was, indeed, one of the fathers of the special theory of relativity. Einstein said things which contributed much to the positivistic doctrines of 'operational definitions' and meaningful analysis' - doctrines that were largely based on his own famous analysis of simultaneity. In his later years, however, Einstein turned away from positivism and he told me that he regretted having given encouragement to an attitude that he now regarded not only as mistaken but as dangerous for the future development of both physical science and its philosophy. He saw more and more clearly that the growth of knowledge consisted in the formulation of theories which were far removed from observational experience. I admit, of course, that we attempt to control the purely speculative elements of our theories by ingenious experiments. Nevertheless, all our experiments are guided by theory and cannot be interpreted except by theory....." [15]

The philosophical influence on Einstein, Whitrow says are:

"According to Einstein's own account, the philosophers who helped him most develop his critical powers were David Hume and Ernst Mach. Hume influenced Einstein by his penetrating criticism of traditional common-sense assumptions and dogmas. Mach's influence was more direct and at the same time more complex. For Einstein was not at all in sympathy with Mach's general philosophy of science based on the doctrine that the laws of physics were only the summaries of experimental results. Instead, Einstein believed that these laws also involve factors contributed by the human mind. Nevertheless, Mach influenced Einstein by his criticism of Newton's ideas concerning space and time and also by his critical examination of Newtonian mechanics." [16]

If we consider Einstein's positivist period, then we have from Yehuda Elkana:

"The positivist basis is to act as if complete objectivity in describing the world of experience were possible. Such a view is essentially religious: it presupposes the existence of an absolute external framework in which absolute criteria of truth and validity hold and in which results of translation from one language or conceptual framework to another can be compared in order to find out which is the true translation. In short, it assumes a third world where Truth resides. This view is religious because a framework independent of social and cultural contexts is above all other frameworks, and thus it amounts to a way of thinking of God. It is not an accident that all absolutist philosophical views were at one time admired or denounced, as the case may be, as religious. Einstein was not a positivist of this kind, and if religion is so understood, he was not religious either." [17]

He also says:

"Yet with Einstein, epistemological matters are never simple or unambiguous. Gerald Holton rightly notes "that positivism and its antithesis were also dialectically intertwined in Einstein's writings." Moreover, referring to the 1905 relativity paper, Holton notes: "we find there both positivism of the instrumentalist and operationalist variety, which Einstein uses in defining the concept, and on the other hand, the rational realism inherent in the a priori declaration of the two basic principles of relativity."...." [18]

The opposite to positivism he explains as:

"The exact opposite to positivist objective certainty is the subjective attitude: we cannot claim completeness or certainty in our cultural analysis; therefore, whatever we tend to claim is equally reasonable. This view recently gained some popularity in Paul Feyerabend's version that "anything goes." (In his book Against Method, 1975) It amounts to relativism unhindered." [19]

It seems to me that Einstein after starting off as a Positivist ended up as following some of Relativism philosophy. Relativism is after all about Relativity. And Einstein as he went deeper into the development of his Theory of Relativity, might have also been proceeding along some type of Relativism philosophy. (However N.B. - Relativity does not necessarily lead to Relativism. [20])

Back to Relativity:

3. 3. Relativity

Infeld says:

"Problems on which philosophers had idly speculated, problems of time, space, and geometry, were absorbed into the field of physics because of Einstein's work. The foundations of physics became clearer; meaningless concepts of ether and of an inertial coordinate system were discarded." [21]

I disagree - "inertial coordinate system" is not meaningless, and the "ether concept" was not entirely abandoned by Einstein. Infeld I think is confused. The "ether concept" in new form got incorporated into Unified Field theory.

Anyway, Infeld continues:

"Physics became more rational, and empty philosophical speculations were exposed. In this sense Einstein's work belongs to philosophy, and in this sense there is hardly a well-defined line of demarcation between physics and philosophy..." [21]

"Einstein regards all physical concepts as free creations of the human mind. Science is a creation of the human mind, a free invention. This freedom is restricted only by our desire to fit the increasing wealth of our experiences better and better into a more and more logically satisfactory scheme. This dramatic struggle for understanding seems to go on forever. The history of science teaches us that although through revolutions progress we may solve old difficulties, in the long run we always create new ones." [21]

"We move from complexity towards simplicity because of new and unexpected ideas. Then the evolutionary process begins again, leading to new difficulties and new contradictions. Thus we see in the history of science a chain of revolutions and evolutions." [21]

Infeld is foretelling what was to become Kuhn's ideas about the paradigm of science. [22] May be Kuhn got his ideas from this?

Infeld continues:

“But there are no retreats! As though travelling on a spiral, we reach higher and higher levels of understanding, through the consecutive steps of revolutionary and evolutionary changes.” [23]

“What does our science express? Is it the structure of our external world? Is there an external world? The idealist would say, "No, the external world radiates from my mind," The realist would say, "Yes, an external world exists." The logical positivist would say, "The question is meaningless and I refuse to answer meaningless questions."” [23]

“What would Einstein's answer be? We do not need to guess because we have it in his own words. In his essay The World As I See It Einstein wrote in 1929: The most beautiful thing we can experience is the mysterious. It is the source of all true art and science. He to whom this emotion is a stranger, who can no longer pause to wonder and stand rapt in awe, is as good as dead: his eyes are closed. This insight into the mystery of life, coupled though it be with fear, has also given rise to religion. To know that what is impenetrable to us really exists, manifesting itself as the highest wisdom and the most radiant beauty which our dull faculties can comprehend only in their most primitive forms-this knowledge, this feeling, is at the center of true religiousness. In this sense, and in this sense only, I belong in the ranks of devoutly religious men."” [24]

3.4. Einstein’s ideas have affinity with Spinoza

There is an affinity between Einstein and the ideas of Spinoza:

“Einstein is well aware that from the purely rational point of view the sentence, "What is impenetrable to us really exists, is meaningless. But such a sentence has meaning if raised from the rational level of beliefs and convictions to the emotional level of experiences and religious feelings. It is impossible to talk rationally on this level, and all I can do is to quote Einstein s words. Indeed, they represent Einstein's religious beliefs which have some affinity to those of Spinoza.” [25]

“To be more specific: I worked for a few years with Einstein and during this time I had the unforgettable experience of observing and admiring him. I believe I know and understand him as well as anyone does.....” [26]

Which takes us from SR formed from positivism, GR formed in part from unification principle from Spinoza, and to continue using the unification principle leads to the Unified Field Theory.

This was Einstein’s thinking process, in regards GR and Unified Field Theory, it was opposed to the way of thinking from the philosophy that was behind Special Relativity and Quantum Mechanics.

I shall now deal with the opposition that Einstein had to Quantum Mechanics.

4. Einstein versus QM

Einstein did not abandon his theory of light quanta, he only rejected the later additions to quantum theory, by what was called the Copenhagen Interpretation. According to the Copenhagen Interpretation developed by Niels Bohr and Werner Heisenberg, the observer has to be brought into the quantum picture in a fundamental way; where it was meaningless to talk of the fine structure of matter without specifying the instruments and means by which observations of quantum phenomena are to be made. Bohr tried quite deliberately to blur the line between the measuring instrument and the object measured: "The finite magnitude of the quantum of action," he said, "prevents altogether a sharp distinction being made between a phenomenon and the agency by which it is observed." The reason for this was that the act of observation changes the object. Pascual Jordan put it, "Observations not only disturb what has to be measured, they produce it... We compel [the electrons] to assume a definite position ... We ourselves produce the results of measurement." Or, as John Wheeler later expressed it, "No phenomenon is a real phenomenon until it is an observed phenomenon." [27]

Einstein didn't like this stuff, and he used to say: "When a mouse observes, does that change the state of the universe?" For him, things out there in the world had whatever properties they had, and they had them whether or not you were looking. This held true on the large scale, and he wanted it to be true on the small scale as well, on the scale of quanta. For Einstein, no technical scientific doctrine could override the more fundamental philosophic notion of "objective reality," the principle that things possess all their properties independent of and prior to the act of observation. For Einstein, the act of observation creates no properties. [27]

According to Einstein quanta can be understood to have properties that are definite and objective as any in classical physics. [28]

Einstein did not like Heisenberg Uncertainty Principle; whereby Heisenberg claimed that quantum attributes come in pair, such as position and momentum, or energy and elapsed time, and that these pairs - "conjugate variables", they're called - are so related that you cannot now them both with perfect accuracy in a single experiment..... [29]

Einstein did not believe that reality ceased to exist when not observed, and asked Abraham Pais (who followed the Quantum doctrine of reality exists only when observed) whether Pais really believed that the moon exists only when he looked at it. [28]

It is this philosophic point of view of Positivism that Einstein was objecting to. I will now look at the problems raised by looking at physics from a positivistic point-of view.

5. Logical Positivism and Scientism

I now claim that Modern Physics/Science has been corrupted by a philosophical movement called Logical Positivism, which is not Logical and is not Positive, which led rise to Scientism a pseudo religion that pretends to be a Science. The followers of Scientism, do not realise it is Scientism that they follow, and mistake it for Science.

In Unwin Hyman Dictionary of Philosophy, Logical Positivism is described as:

“the doctrine of the Vienna Circle, so called because it recognises only the positive sciences (as against systems of metaphysical speculation) as valid sources of human knowledge, and in this process attends to the logical structure of scientific (that is, acceptable) statements. Thus, the doctrine insists on the empirical approach (Empiricism), in some ways continuing the tradition that goes back to Locke and Hume. However, the thoroughgoing rejection of abstract theorising went too far: theoretical science seemed itself inadmissible.” [30]

Science likes to see itself as being Empirical, hence the Logical Positivism Movement tied itself to that, making it seem a Scientific Philosophy upon that matter. But Logical Positivism went too far and rejected Theories that went beyond what was directly provable by Empiricism. This Philosophical Movement which became powerful in the 1920s, the same time as Modern Physics (Relativity and Quantum) were taking hold, started to reject the parts of those theories that were not directly proven by experiment.

It is very unfortunate that this rejection happened, because it was a rejection of ‘Proper Science.’ Physics as started by Galileo and Copernicus, and extended into the Newtonian Research Program, was never anything more than a Working Hypothesis, which culminated in Boscovich’s theory that was predicting phenomenon that was beyond experimental testing when that theory was created. Logical Positivism then sought to destroy that Theory (that connected Relativity and Quantum ideas) as speculation, leaving unconnected pieces of theory. Physicists such as Bohr were working from the Unified Theory of Boscovich, but the Positivists rejected the unified theory, leaving only the bits of that theory which had so far been tested.

What is worse, the Positivists in their rejection of ‘Proper Science' (of the Newtonian Research Program) then rewrote history to suit what they wanted to believe. If one looks at what is said about Boscovich in the mainstream physics history, he is dismissed as an anomaly, when previously he was very prominent in the development of Modern Physics. Positivists corrupt everything, so that their point of view seems to be the only point of view, and the way they do this is to ignore the evidence that indicates that they are wrong. Anything that does not fit into their point of view, is either dismissed as an anomaly or there is found some other reason to reject it. Compare this to what Galileo faced. He tried to get the intellectuals of his day to accept his telescopic observations for the Copernican theory, but many of the intellectuals wanted to reject the evidence as anomalies. Logical Positivism is thus a reinvention of the biased religious beliefs of the medieval intellectuals, and is thus a pseudo religion. In hung onto science like a parasite, and converted much of that science into what is called Scientism. Many scientists follow Scientism, in the mistaken belief that it is Science.

(N.B. I am referring to a specific use of the term “scientism” in this article which should be clear; sometimes people use “scientism” to mean other things.)

Dr Denis Alexander, Chairman of the Programme of Molecular Immunology at the Babraham Institute and a Fellow of St Edmund’s College, Cambridge, gives more information on Logical Positivism and Scientism in his book Rebuilding the Matrix: science and faith in the 21st Century. Science should be based on rational thought. But Alexander notes:

“..... sociological insights suggest that the adoption of many of our beliefs occurs, in the first instance, not by rational argument at all, and least of all by evidence, but by a very different set of social processes.” [31]

i.e. Beliefs such as Scientific Beliefs are often not based on rational thought.

When Scientists are informed of this, their response is:

“Scientists are generally wary of sociologists, and often downright hostile. The reasons for such hostility are not difficult to unravel. Sociologists who study science sometimes give the impression that the acquisition of scientific knowledge can be explained in purely sociological terms. Thus it appears that the main determinants of scientific theories are not the properties of the universe around us, but rather the power wielded by a certain school of scientists, or their ideological concerns, or economic forces which control scientific programmes. According to such sociological accounts, scientific knowledge is just one more type of human construct which has no more claim to our assent than any other form of knowledge. Not surprisingly, scientists become rather huffy when they read such material, for virtually all scientists believe that, in carrying out their research, they are gradually generating better descriptions of the physical world .....” [31]

i.e. Scientists like to believe that they are involved in discovering the ‘truth’, and do not like to be told that they are in fact adopting a Belief System that has no more validity than other Belief systems.

Many scientists recognise that their Belief System is incomplete, but believe that they are getting closer to the ‘truth’ as time passes.

“..... [Scientists believe that Science] while certainly incomplete, over time correspond more and more closely to reality. Those descriptions are certainly not complete, but they are improving. Scientists point out that, while it is quite clear from the history of science that all kinds of economic, political and religious factors have played important roles in determining the direction of science, and even the content of some scientific theories, nevertheless, ultimately, scientific knowledge does provide reliable `maps' of the world around us. Science is not merely a social construct.” [31]

The main point of my web site is that Modern Physics was working to a Unified Theory (under the Newtonian Research program), which was the ‘truth’ (from the point-of-view of the scientific revolution initiated by Copernicus), but then all the sociological, economic, philosophical factors etc., came into operation and science moved away from that ‘truth.’ A fact that many scientists would probably distasteful. But that is the way things are.

Alexander has an interesting comment about passionate emotions influencing belief:

“It is sometimes thought that the beliefs which are held most strongly by societies are those which are expounded with great passion. But a moment's thought will show that this is not the case, Passionate beliefs tend to be minority beliefs. The smaller your voice, the louder you need to shout in order to make yourself heard. The really strong beliefs in societies are those which are tacitly maintained, The strength of the belief is in direct proportion to the degree to which discussion of it is felt to be unnecessary The assumption that the belief is true runs so

deep that to unearth it and critically discuss it would be like digging up the foundations of the Tower of London to show that the stones underneath were really as big as everyone knew they must be anyway." [32]

"How do we come to accept such deeply held assumptions? Most of them are simply 'given' to us at the earliest data of our lives. At the beginning we are presented with a language in which everything is already labelled. Language is not a matter for discussion, only something to be learned. Yet language is not a neutral medium to express meanings about objects and concepts that exist in the world around us. Words are loaded in different directions by connotations that derive from their use against the background of a particular history and/or geography The word `wicked' to my generation means something quite different from its meaning for my students." [32]

The influence of Logical Positivism has run so deep that the basic science and the language that we now speak, has been altered, so as to try to lead itself to the Belief System of the corrupted Science.

(N.B. the word "wicked" to the old generation meant "wicked", but a new generation arose to use that word and use it to mean the opposite namely "good".)

Alexander tells us about Logical Positivism:

"According to Logical Positivism - an anti-metaphysical movement influential in the earlier half of the 20th century, promoted in Britain by A.J. Ayer in his Language, Truth and Logic (1936) - a sentence can only be true or false either it can be justified as being true on the basis of sensory experience, i.e. it is empirically verifiable, or it can be shown to be true or false on the basis of meaning alone, i.e., it is logically consistent, The `scientific method' came to be the arbiter of what was designed as rational. The Positivists had a field day in declaring to be nonsense (in the strict sense of that term) all kinds of claims and statements that did not seem meaningful according to these stringent criteria, not least in the arts and in religion."[33]

This must have been when they were also deleting the parts of Physics, that they did not like. But after inflicting such damage, they then found:

"... they finally found themselves hoist by their own petard with the realisation that their own stringent criteria for meaning; rendered the criteria themselves meaningless as they could not be empirically supported. As it happens, the more extreme tenets of Positivism proved very stale for science, as men like Mach tried to eliminate reference to all unobservable entities from scientific discourse, a process that would rapidly reduce most laboratories to a state of complete silence!" [33]

i.e. Logical. Positivism was nonsense, but was discovered too late, after it had inflicted its damage to Science.

Alexander continues:

"Although Positivism as an organized philosophy is no longer with us, its ghost still lives on in popular culture under the label of 'scientism'" [34]

And Scientism is the corrupted science that masquerades as Proper Science. Alexander explains that:

“a view of scientific knowledge which lingers on in popular culture and which is also actively promoted by some scientists and philosophers of science, This comprises a rather amorphous mixture of beliefs, the mixture varying somewhat in emphasis depending on who is propounding it, but the beliefs are linked sufficiently to subsume them under the general title of 'scientific naturalism' or less formally, `scientism', In a way this latter term is, an unfortunate title since it implies that this is a philosophy which is inherent in the scientific enterprise itself whereas it would be far closer to the truth to say that 'scientism' is parasitic upon science but certainly not part of it, Scientific naturalism, or scientism refers to the view that only scientific knowledge is reliable and that science can, in principle, explain everything.” [35]

And Scientism has a strong hold because it enforces that things should be discussed in only that it deems fit, with many science journals following Scientism beliefs rather than Proper science. Alexander tells us:

“It has been suggested above that the price to be paid for the construction of a body of universally reliable scientific knowledge, fit to be published in reputable scientific journals, is the imposing of certain restrictions - restrictions on the type of questions addressed, restrictions on the language employed and restrictions on the methods used.....” [35]

The corruption of science runs very deep, creating ‘Scientism’ and then the corruption sets up its defences, by denying the evidence that proves that ‘Scientism’ in all its many forms is wrong. Hence why we have dropped out from the Proper Science of the Newtonian Research Program.

6. Debunking, Logical Positivism and Modern Science

The book An Introduction to the Philosophy of Science, by Rudolf Carnap, is recommended by Arch - Debunker of UFO related topics Martin Gardner. [36] In this book Carnap explains what he claims to be the Scientific method as used by Modern Science, and how concepts that add nothing new to a subject are dismissed as pseudo science nonsense.

This is highly significant because it seems to be the philosophy that the debunkers such as Gardner uses. Martin Gardner is author of such books as Fads and fallacies in the name of science: where Gardner attacks first some obviously cranky ideas such as the Earth being flat, but then proceeds to lump together these obviously cranky ideas with ideas he disapproves of, but which are not so obviously cranky. For instance he mentions Einstein being interested in telepathy, but that does not stop him attacking the idea of telepathy without giving it proper consideration as to whether it might be possible. i.e. he attacks ideas that he disapproves of, by his personal preference of what he wants to believe in, instead of from the merits of those ideas. Any data that is suggestive of ideas that a debunker disapproves of, are if possible ignored and dismissed.

The interesting point is that Rudolf Carnap was a Logical Positivist. [37] So, the debunkers following such a philosophy, are following the philosophy of Logical Positivism and that philosophy is well known as a fallacy. So, these debunkers are trying to uphold a false understanding of science. (For instance the Philosopher Karl Popper attacked the fallacious beliefs of Logical Positivism.)

Carnap admits that effects can sometimes get overlooked (in his Philosophical version of Science). He gives the following example:

"..... We can draw on our knowledge of nature to rule out many factors. An astrologer may come into the laboratory and ask: "Have you checked where the planets are today? Their position may have some influence on your experiment." We consider this an irrelevant factor because we believe the planets are too far away to have an influence." [38]

If a scientist was so say measuring the speed of sound in air, he would not necessarily think that this measurement had some connection to the position of the planets, and hence would ignore those planets. He would ignore anything that he thought irrelevant to the experiment that he was conducting. (The mention of the planets' influence on experiments is to try to make such an effect sound like astrology, and debunkers think astrology is nonsense. So, he trying to make out that the effect is nonsense.) Carnap continues:

"Our assumption of the irrelevance of the planets is correct, but it would be a mistake to think that we can automatically exclude various factors simply because we believe they have no influence. There is no way to be really sure until experimental tests have been made." [38]

Carnap is almost correct in what he says here. In the case of 'measuring the speed of sound' experiment, it is unlikely that the positions of the planets would have much effect. It would be assumed that there was no connection, because of not being able to conceive how such disparate phenomenon would be related. If there was some relationship, then certainly it would be most likely beyond any ability to measure. However, if one were saying measuring the rate of a falling object: a question about gravity. The planets positions have an influence on gravity questions, so one would expect an influence on such an experiment. The influence of the planets' gravity would be exceedingly small in comparison to the other causes of gravity, so for most experiments it could be ignored as non measurable. But if a person were able, hypothetically to improve the sensitivity of his measurements without limit, then he would surely notice the effect of the planets gravity on his measurements.

Carnap continues, and gives an example of how an effect can be overlooked:

" Imagine that you live before the invention of radio. Someone places a box on your table and tells you that if something sings at a certain spot, one thousand miles away, you will hear the apparatus in this box sing exactly the same song, in the same pitch and rhythm. Would you believe it? You would probably reply: "Impossible! There are no electric wires attached to this box. I know from my experience that nothing happening one thousand miles away could have any effect on what is happening in this room."" [38]

He then points out:

“That is exactly the same reasoning by which we decided that the positions of the planets could not affect our experiments.....” [38]

So, he is admitting that the methodology of ignoring small effects can lead to mistakes. He is trying to debunk an astrological type of effect on experiments, by a certain reasoning. But that same reasoning he admits can lead to ignoring an effect he considers ‘genuine.’ So, he says:

“ It is obvious that we must be very cautious. Sometimes there are influences we cannot know about until they are discovered. For this reason, the very first step in our experiment - determining the relevant factors - is sometimes a difficult one. Moreover, it is a step that is often not explicitly mentioned in the reports of investigations.....” [38]

This points out a major problem in the Positivists methodology. Positivism is still a failure, but added to that -- if a person using it fails to point out what is being ignored, then their conclusions can be erroneous, and the person can fail to even use that methodology properly!

A person using Positivism needs to state what effects they consider do not exist, and what they are ignoring, whenever they make their statements. If they do not do this then they use their methodology incorrectly, and a person listening to them does not realise that the statements they make are not ‘absolute truth’ but instead rather 'approximations' with conditional clauses.

Logical Positivism has tried to attach itself with science. The Modern Scientific method seems to have adopted many Positivist opinions. But before Modern Science (i.e. before 20th century), there was not this Positivist influence on Science, and the Old Science followed a different philosophy. The Old Scientific Method seems based on unification, and would not make the mistakes that Positivist would make.

A further complication is that science graduates are rarely taught any philosophy, and they are certainly never told about any of the philosophical ideas that underpin the science that they are being taught. Instead, they are given the impression that they are being taught hard facts and science without any philosophical input. Thus they are unaware of the Positivist influence on the science that they are being taught, and become Logical Positivists without knowing it.

Modern science when based on Positivism has become like a religion in its own right. It is a methodology that now prevents anything offensive (to these Positivists) from being proven, because it takes as its starting position the assumption that such offensives things do not exist. It prevents any lone scientists from solving the puzzle of anomalies and upsetting these religious fanatics, because the proof that he must provide to get any piece of the jigsaw accepted by the Establishment is unreasonable.

The UFO Cargo Cult mentality scenario is based on the hypothetical 'what if’: If we were visited by aliens, then some of our ancestors mistakenly converted this into a religious cult based on mistaken ideas. Then their descendants would vigorously defend such a set of ideas, and impose it upon their children in State Education. (This example does not mean that we were really visited by ETs, it is a 'what if’, meant as illustration only.) In modern terminology the set of beliefs would be called a ‘meme’, and people would follow a ‘meme’ no matter whether the ideas of that ‘meme’ were false and defend it fanatically.

The Establishment's Status Quo Beliefs are now based on a UFO Cargo Cult mentality, because of Modern Science's alliance with Positivism, we have a false set of ideas 'meme' that fanatics believe to be science and vigorously defend, and try to teach to the next generation.

One can chart how the nature of science has changed by looking at the History of the subject. It jumps from a philosophical method of unification up to the 19th and early 20th century. And then in the 20th century there is sudden adoption of Positivist influence into science, and the unification is broken.

Modern Physics is founded upon Boscovich, an 18th century genius that was deemed to be the successor to Newton, because he looked at the problems that Newton left and proposed the solutions that led to Modern physics. But then the Positivist influence took hold and rejected the unified approach to physics, leaving Modern Physics corrupted, as per their method the Positivists ignore anything that does not fit in with their religious beliefs, and unification is definitely not part of their religion.

7. Psychological Problems

Part of the problem is the neglect of History that Physics people show to their subject. There are three main types of physics theories traditions (or more, if one counts a different way):

I Aristotelian physics tied to geocentric hypothesis

II Classical physics rejection of geocentricism: IIa Newton-- absolute space
IIb Einstein -- relative space

III Quantum physics: Copenhagen interpretation: rejection of classical physics

All of these styles of physics theories are valid to some extent, because they can be shown to match certain observations.

Of course sometimes a theory can fail to match some observations, and then the idealised approach is that the physicist should then change his theory; but this does not take into account the psychological nature of the physicist who by the foibles of human nature might just merely ignore the evidence of the inadequacies of his pet theory. And if a theorist recognises his theory not being adequate might simply choose to modify it a bit to match the new observations. (For instance - if one frees Aristotelian physics from the geocentric hypothesis then it is an even better fit with observations.) That's why I say that all of these three or four or more theories (depending on other classification schemes) can be used to build upon and develop a greater and greater description of physical reality.

Unfortunately the description built within one scheme creates a collection of words, and these words do not necessarily have the same meaning as the same words used in the description from a different theoretical scheme. So, we have conflict of semantics; this leads to a lot of confusion.

In particular the Theoretical History of Einstein's UFT (unified field theory) is ignored. Einstein's objections to Quantum Mechanics was that he did not believe in the Copenhagen Interpretation, his approach to the quantum ideas was still based upon the classical physics schema, and there were a great many scientists working upon this Theoretical tradition before Einstein. (After Einstein, the number of scientists working on UFT was reduced to only a few in the West, one of the main ones was Baranski.) The main scientists of the UFT tradition being:

Boscovich -> Einstein -> Whyte -> Baranski

This History of Einstein's UFT is a forgotten part of physics. [39]

As noted earlier by Dewey B Larson in this schema the idea of "ether" was replaced by that of the "unified field" and the change from the use of the word "ether" to the use of the word "field" is mainly semantic, and the problem that people have with the idea is -- whether there is a physical substance in space or not. According to Einstein there is no space without a field.

The mathematics of the ether is rather trivia, [40] however without the correct philosophic point-of-view the existence of the ether as concept evolved into field is not recognised.

So, there we have it-- the problems being:

1. The neglect of the history of UFT: Boscovich ->to -> Baranski.
2. The problems of semantics.
3. The psychological problems of the physicists that prevents them from working in a supposedly idealised way.
4. The psychological problems of the physicists trying to comprehend the subject.

8. Einstein's Ether

After having addressed these problems of philosophy and psychology I shall now tackle the ather/ether issue again.

Rudolf v. B Rucker says of the aether:

"The whole puzzle was dissolved by the Special Theory of Relativity in 1905 with the abolishing of 'space aether' in favour of 'space-time aether.'" [41]

These terms "space aether" and "space-time aether" are Rucker's names for two different types of aether. Physics text books are so badly written, that they do not tell you that there are

two types of aether, and when referring to Special Relativity and Einstein, they say the ‘aether has been disproved.’ What the fail to do is say - the ‘space aether’ has been disproved, while the ‘space-time aether’ has been proved!

Charles Hinton was a professional mathematician of the 19th century, [42] who nowadays we would say was investigating relativistic type ideas before Einstein.

Rucker in discussing Hinton, says that Hinton believed that we were not ‘in’ in the aether, but ‘on’ the aether, and he had good reason for believing that in his day, because the observations of his day suggested that the aether (medium of light) was a solid, and we cannot very well be moving inside a solid, so we must be ‘on’ it. [41]

The observations in Hinton’s day were of course found to be inadequate. (Because of the results of the Michelson Morley experiment etc.)

The difference between being ‘on’ and ‘in’ the aether can be summed up by Rucker and Hinton talking of the ‘space aether.’ (The ‘space aether’ hypothesis is that we are ‘on’ the aether, while the 'space-time aether’ of Special Relativity we are ‘in’.)

Hinton suggests that:

“A being able to lay hold of the ‘[space-] aether’ by any means would, unless he were instantly lost from amongst us by his staying still while the earth dashes on - he would be able to pass in any space direction in our world. He would not need to climb by stairs, nor to pass along resting on the ground.” [41]

Rucker explains this better:

“In other words, if one only had some 4-D pitons [i.e. magical pitons], then one could climb up the face of the ‘[space-] aether’ to float a hundred feet above the ground. But a marker driven into the ‘[space-] aether’ would supply an absolute standard of rest - which is ruled impossible by Special Relativity...” [43]

Finally Rucker with his interpretation of there being two types of aether, interprets what Einstein has to say about aether as:

“However, as Einstein pointed out in his essay ‘Ether and the Theory of Relativity,’ the very notion of the space-time metric tensor’s existence in empty space-time serves to validate the notion of ‘space-time aether.’” [44]

i.e. according Rucker’s understanding of Einstein and the Special Theory of Relativity - the 'space-time aether’ exists, but the ‘space aether’ does not exist, and the difference between the two aethers is - we are ‘in’ the aether and not ‘on’ the aether.

Of course one problem with Einstein was that Einstein did not clearly state that there were two types of aether.

And the two types of aether is not what is taught to physics students!

Instead they are taught that the aether does not exist. Which is so gross a distortion of what Einstein was really saying.

The 'nonsense' that is paraded to physicists leads to the following:

Group A denies the existence of all aethers, and ridiculing any group that talks of the aether as being real.

Group B believes in the existence of Einstein's version of aether, but being taught that Einstein disproved the aether, does not recognise that they follow Einstein's physics and believes that Einstein is wrong.

Group C keeps insisting that the space-aether exists, but does not recognise that there is another aether concept.

Group A happily ridicules groups B and C and any variations of B and C, failing to recognise as all these groups fail to emphasise that there are at least two types of aether.

Result: continual argument between these groups that leads nowhere whenever they meet, hence whenever possible any specific group likes to ignore the other groups.

In other words Communication Breakdown over the many different meanings that have been smudged into the word 'aether'.

9. Charles Hinton

Charles Howard Hinton was a professional mathematician - he took the master's degree at Oxford, taught at Princeton, and published pure mathematics related to work of Morley, Hamilton, and Cayley - but for him formal mathematics was never an end in itself. [45]

Hinton's touchstone was, rather, direct and intuitive knowledge of four dimensional space. The bulk of his writings are aimed at developing in the reader the power to think about 4-D space; and the rest of his work focuses on using a knowledge of higher space to solve various problems in physics and metaphysics. [45]

Hinton was born in London in 1853, the first son in his family. He was schooled at Rugby, and matriculated at Oxford in 1871. From a letter written to him by his father in 1869, we learn that already while at Rugby, Hinton evidenced an interest in "studying geometry as an exercise of direct perception." [45]

His first published essay, 'What is the Fourth Dimension?', appeared in 1880 in the Dublin University Magazine, was reprinted in the Cheltenham Ladies' College Magazine of September 1883, and finally was published as a pamphlet, with the subtitle 'Ghosts Explained', by Swann Sonnenschein and co. in 1884. [45]

Hinton attempted to explain static electricity as a twisting of matter in 4-D space. As pointed out by Martin Gardner in The Ambidextrous Universe, Hinton came remarkably close to anticipating the modern notion of antimatter. [45]

The Kaluza - Klein five dimensional theory (that unifies electromagnetism and gravity) in some sense formalises the ideas of Hinton. [45]

(From other sources: Such people as Aleister Crowley were interested in the connections of Hinton's work with ghosts.)

10. Unification of Physics and the Paranormal

Note the connections that have been mentioned - unification of gravity and electromagnetism, aether, ghosts. Suddenly one hits upon ideas that a certain group of people (with their prejudices) would like to treat as taboo/ forbidden. So it is convenient for such people to take leadership of Science Institutions, and then instigate bad teaching practice for science. They can then get words such as 'aether' ill-defined etc. Hence blocking as much as possible anyone seeing the connections between these taboo topics. And if some people do see such connections, well then ridicule can be easily arranged against them by the majority who have been taught Orwellian double-speak.

I shall now deal with what Einstein had to say about the Unified Field theory.

11. Einstein on Unitary Field Theory

In an address to the general public on February 3, 1929, Einstein talked about the Unitary Field Theory and its connections with Relativity, [46] presenting his ideas in terms that he thought the average person could understand; unfortunately they are not; so I will attempt to clarify.

First he talked of the History of Field Theory:

"While physics wandered exclusively in the paths prepared by Newton, the following conception of physical reality prevailed: Matter is real, and matter undergoes only those changes which we conceive as movements in space."

What he is thinking of here is the Newtonian descriptive Framework of matter moving in space. He tries to clarify this by saying:

" Motion, space and also time are real forms."

i.e. motion, space and time really exist in the Newtonian Framework.

"Every attempt to deny the physical reality of space collapses in face of the law of inertia. For if acceleration is to be taken as real, then that space must also be real within which bodies are conceived as accelerated."

This is a hard to understand statement, because he has not reminded us what the law of inertia is, namely an object will continue in uniform motion or stay at rest unless a force acts upon it. An everyday object such as a thrown ball, will after being thrown fall back to earth, and stop; its motion is not uniform, because the force of gravity is acting on it, and we should note that there is also resistance in the air. If the ball had none of these forces acting on it then it would continue in uniform motion forever. So, force is real. Saying things like: "Every

attempt to deny the physical reality of space collapses in face of the law of inertia." I think is very unhelpful.

After his two very unhelpful sentences, he says Newton understood these sentences:

"Newton saw this with perfect clarity and consequently he called space "absolute"."

He continues:

"In his [Newton's] theoretical system, there was a third constituent of independent reality; the motive force acting between material particles, such forces being considered to depend only on the position of the particles."

Einstein has already said that in the Framework of Newton's physics is - motion, space and time as really existing, now he says there is a third thing that's real, namely force; but that is a fourth thing; Einstein acts like he miscounts; once again this is extremely unhelpful. The forces on the particles depending on the position of the particles is referring to Newton's law of gravity where gravity strength on particles depends upon their distance apart.

He continues:

"These forces between particles were regarded as unconditionally associated with the particles themselves and as distributed spatially according to an unchanging law."

i.e. he is referring to Newton's law of gravity.

Einstein: "The physicists of the nineteenth century considered that there existed two kinds of such matter, namely, ponderable matter and electricity. The particles of ponderable matter were supposed to act on each other by gravitational forces under Newton's law, the particles of electrical matter by Coulomb forces also inversely proportional to the square of the distance. No definite views prevailed regarding the nature of the forces acting between ponderable and electrical particles."

In other words, there was particles with mass interacting through Newton's law of gravity, and particles of electric charge interacting through Coulomb's law, at the end of the 19th Century; but scientists were unsure how these two theories connected together. It is unfortunate that Einstein does not mention Boscovich here, because that was the main proposal.

Still talking within the context of physics up to the 19th Century physics:

"Mere empty space was not admitted as a carrier for physical changes and processes. It was only, one might say, the stage on which the drama of material happenings was played. Consequently Newton dealt with the fact that light is propagated in empty space by making the hypothesis that light also consists of material particles interacting with ponderable matter through special forces."

What is being referred to here is a descriptive of light propagating through empty space, minus the concept of field, thus the descriptive needing the idea that a type of particle is emitted. It is unfortunate once again that Boscovich is not mentioned. What is being referred to is a description within Newton's theory for light, minus the field concept. The Field concept was added to Newton's descriptive theory later by Boscovich, as an extension to Newton's theory; the original theory of Newton had no field concept (or rather the field

concept was muddled over the issue, being partially accepting it and partially not). [Newton did not want to offer a hypothesis as to how gravity operated over empty space, this was then in a sense a rejection of the field concept as explanation. However, Boscovich showed that Newton's Third Law required the Field Concept. (See my article: Boscovich and Newton's Third Law. [47]) Hence Newton's theory in its original form was partially "for" and partially "against" the Field concept.]

Einstein continues:

" To this extend Newton's view of nature involved a third type of material particle, though this certainly had to have very different properties from the particles of the other forms of matter."

What is being referred to here in the Newton descriptive theory (minus the field concept), has a particle of light, which was called "corpuscle" by Newton, and that "corpuscle" (Newton's particle of light) had very different properties from particles of matter.

Einstein goes into details about this:

" Light particles [of Newton] had, in fact, to be capable of being formed and of disappearing."

This is surprising - Newton's version of light particles is in agreement with how Modern Physics looks upon light particles.

Einstein next gets onto the problematic issue of light speed/velocity:

"Moreover, even in the eighteenth century it was already clear from experience that light travelled in empty space with a definite velocity, a fact which obviously fitted badly into Newton's theoretical system, for why on earth should the light particles not be able to move through space with any arbitrary velocity?"

This issue really needs a lot of explanation, but Einstein does not go into this issue.

He continues:

"It need not, therefore, surprise us that this theoretical system, built up by Newton with his powerful and logical intellect, should have been overthrown precisely by a theory of light. This was brought about by the Huygens-Young-Fresnel wave theory of light which the facts of interference and diffraction forced on stubbornly resisting physicists. The great range of phenomena, which could be calculated and predicted to the finest detail by using this theory, delighted physicists and filled many fat and learned books. No wonder then that the learned men failed to notice the crack which this theory made in the statue of their eternal goddess."

What is being referred to here is that Newton's particle theory of light was replaced circa 18th Century by a wave theory of light. I note the poetic type of language that Einstein uses, he says "eternal goddess" - a poetic term like that in a physics discussion is not very useful; precision of terms is needed; it gives a hint as to why Einstein can be so unhelpful when he tries to explain things.

He continues:

" For, in fact, this theory upset the view that everything real can be conceived as the motion of particles in space."

He is referring to the wave theory of light upsetting the theory of Newton with his particles of light.

He continues:

“Light waves, were, after all, nothing more than undulatory states of empty space, and space thus gave up its passive role as a mere stage for physical events. The other hypothesis patched up the crack and made it invisible.”

Einstein is jumping ahead of himself here. When he is talking about waves of light being undulatory states of empty space, he is referring to space acting like a medium for light waves. However, before that idea came the idea of ether; where space was filled with an ether in which the light waves travelled using the ether as a medium. He backtracks and now talks about ether:

“The ether was invented, penetrating everything, filling the whole of space, and was admitted as a new kind of matter. Thus it was overlooked that by this procedure space itself had been brought to life.”

Saying that space was brought alive is also very unhelpful, what is meant was space had ether in it, and had phenomenon (namely light) happening in it, so it was not an inactive thing.

“ It is clear that this had really happened, since the ether was considered to be a sort of matter which could nowhere be removed. It was thus to some degree identical with space itself; that is, something necessarily given with space.”

What is meant is that ether and space was becoming viewed as one could not have space without ether filling it, so that ether and space were almost as “one”.

“ Light was thus viewed as a dynamical process undergone, as it were by space itself. In this way the field theory was born as an illegitimate child of Newtonian physics, though it was cleverly passed off a first as legitimate.”

Meaning the idea that space and a type of ether were connected together as one inseparable thing was the Field concept. Talking about illegitimate and legitimate is also unhelpful. What is meant is that Newton’s original theory did not have the field concept properly incorporated into it. It required the extension to Newton’s theory by Boscovich to properly incorporate field.

“To become fully conscious of this change in outlook was a task for a highly original mind whose insight could go straight to essentials, a mind that never got stuck in formulas. Faraday was this favoured spirit. His instinct revolted at the idea of forces acting directly at a distance which seemed contrary to every elementary observation. If one electrified body attracts or repels a second body, this was for him brought about not by a direct action from the first body on the second, but through an intermediary action. The first body brings the space immediately around it into a certain condition which spreads itself into more distant parts of space, according to a certain spatio-temporal law of propagation. This condition of space was called "the electric field." The second body experiences a force because it lies in the field of the first, and vice versa. The "field" thus provided a conceptual apparatus which rendered unnecessary the idea of action at a distance. Faraday also had the bold idea that under appropriate circumstances fields might detach themselves from the bodies producing them and speed away through space as free fields: this was his interpretation of light.”

Einstein misses out mentioning that the idea that objects influence themselves through forces which operate through empty space was proposed by Boscovich, and it was an idea taken up by Faraday and called field.

“Maxwell then discovered the wonderful group of formulae which seems so simple to us nowadays and which finally build the bridge between the theory of electromagnetism and the theory of light. It appeared that light consists of rapidly oscillating electromagnetic fields.”

Maxwell was working on the experimental work of Faraday.

“After Hertz, in the '80s of the last century [i.e. 1880’s], had confirmed the existence of the electromagnetic waves and displayed their identity with light by means of his wonderful experiments, the great intellectual revolution in physics gradually became complete. People slowly accustomed themselves to the idea that the physical states of space itself were the final physical reality, especially after Lorentz had shown in his penetrating theoretical researches that even inside ponderable bodies the electromagnetic fields are not to be regarded as states of the matter, but essentially as states of the empty space in which the material atoms are to be considered as loosely distributed.”

Not everyone has however properly grasped this idea that empty space acts like a medium for electromagnetic waves.

Einstein then talks about there being a Dual theory left by this, namely that there exist two things Field and Particle:

“At the turn of the century physicists began to be dissatisfied with the dualism of a theory admitting two kinds of fundamental physical reality: on the one hand the field and on the other hand the material particles.”

That is basically the Unified Field Theory, namely particles influencing themselves through various fields, and the summation of all these fields being the unified field.

He then gets onto some peoples’ dissatisfaction with this Unified Field Theory, namely some people did not like the dualism between field and particle:

“It is only natural that attempts were made to represent the material particles as structures in the field, that is, as places where the fields were exceptionally concentrated.”

He then talks about the failure to unify these two things:

“ Any such representation of particles on the basis of the field theory would have been a great achievement, but in spite of all efforts of science it has not been accomplished. It must even be admitted that this dualism is today sharper and more troublesome that it was ten years ago.”

And he was saying this in 1929, so he means troublesome in unifying these two things between 1919-1929.

“This fact is connected with the latest impetus to developments in quantum theory, where the theory of the continuum (field theory) and the essentially discontinuous interpretation of the elementary structures and processes are fighting for supremacy.”

What Einstein is revealing here is that he is thinking of a field as a continuous thing; what he calls continuum, and quantum theory as dealing with discontinuities. So, he is wondering how to connect a continuous thing such as a field to a theory dealing with discontinuous things.

He does not want to go into that issue, because he then says:

"We shall not here discuss questions concerning molecular theory, but shall describe the improvements made in the field theory during this century."

i.e. he means lets skip issues of quantum theory.

I will however briefly cover the issue. In the way that Einstein is thinking about things the field concept is represented by a continuous line with no gaps, so that its an interval represented by a real number, and the quantum theory is dealing with discrete numbers and is discontinuous. This connects to the issue of wave-particle duality, where the wave is an interval represented by a real number so that its continuous, while a particle is discrete maths. There are various ways out of this problem. In Born's interpretation - the wave of quantum mechanics is a probability wave of discrete particles, and collapses from continuous maths to discrete maths when an observation is made. Other ways around this is to say that a cluster of point-particles of a probability wave can itself look like a particle with extension. A line with a wiggle in it is a wave, but that line is made up from points. The universe I think is fractal, so that if we look at a particle which we think is a point having no extension we find that it does have extension if we look close enough. In this way a wave is made of particles and particles are made of waves and this pattern is at all scales of size. It is just that on a simple level we can represent from maths that everything is made of point-particles; just once we try to see such a point-particle we keep getting objects with extension.

The improvements to field theory he assigns to relativity as he says:

"These all arise from the theory of relativity, which has in the last six months entered its third stage of development. Let us briefly examine the chief points of view belonging to these three stages and their relation to field theory."

The three stages, are as he reveals Special Relativity, General Relativity and Unitary Field Theory. Each stage is building upon the previous, hence General Relativity deals with more phenomenon than Special relativity, and Unitary Field Theory deals with more phenomenon than General Relativity; and the link between these theories is the development of the Field concept.

"The first stage, the special theory of relativity, owes its origin principally to Maxwell's theory of the electromagnetic field. From this, combined with the empirical fact that there does not exist any physically distinguishable state of motion which may be called "absolute rest", arose a new theory of space and time. It is well known that the theory discarded the absolute character of the conception of the simultaneity of two spatially separated events. Well known is also the courage of despair with which some philosophers still defend themselves in a profusion of proud but empty words against this simple theory."

What he is saying here is that Special Relativity arose from an insight into Maxwell's electromagnetic field theory, and resulted in discarding the idea of an absolute reference frame (Newton's absolute space).

“On the other hand, the services tendered by the special theory of relativity to its parent, Maxwell theory of the electromagnetic field, are less adequately recognized. Up to that time the electric field and the magnetic field were regarded as existing separately even if a close causal correlation between the two types of field was provided by Maxwell's field equations.”

Once again he says that Special Relativity comes from Maxwell’s theory; that Maxwell’s theory is its parent. In Maxwell’s theory a changing electric field creates a magnetic field, and a changing magnetic field creates an electric field; hence in that theory both fields are connected.

“ But the special theory of relativity showed that this causal correlation corresponds to an essential identity of the two types of field. In fact, the same condition of space, which in one co-ordinate system appears as a pure magnetic field, appears simultaneously in another co-ordinate system in relative motion as an electric field, and vice versa.”

By Maxwell’s theory - an electric charge at rest has an electric field, but no magnetic field. When there is velocity of an electric charge then this creates a magnetic field. Now by Special Relativity we have to consider relative motion, so a charge in one frame of reference can appear at rest, but in another frame at a constant velocity the charge is not at rest; hence different frames of reference are viewing the magnetic and electric fields differently. What one frame observer observes as solely electric field, another frame observer might observe as mixture of electric and magnetic fields; hence theses fields are even more intimately connected in Special Relativity.

After this he says:

“Relationship of this kind displaying an identity between different conceptions, which therefore reduce the number of independent hypotheses and concepts of field theory and heighten its logical self-containedness are a characteristic feature of the theory of relativity. For instance, the special theory also indicated the essential identity of the conceptions' inertial mass and energy. This is all generally known and is only mentioned here in order to emphasize the unitary tendency which dominates the whole development of the theory.”

So basically he’s saying E = mc squared. Next he goes onto General Relativity:

“We now turn to the second stage in the development of the theory of relativity, the so-called general theory of relativity. This theory also starts from a fact of experience which till then had received no satisfactory interpretation; the equality of inertial and gravitational mass, or, in other the words, the fact known since the days of Galileo and Newton that all bodies fall with equal acceleration in the earth's gravitational field.”

The equality of inertial and gravitational mass, which connects to the idea that a force applied by external means such as a rocket, is equivalent to a similar force applied by gravity is given the name Equivalence Principle.

“The theory uses a special theory as its basis and at the same time modifies it: the recognition that there is no state of motion whatever which is physically privileged - that is, that not only velocity but also acceleration are without absolute significance - forms the starting point of the theory.”

Special Relativity in its original form created by Einstein only dealt with speed/velocity and not acceleration. Subsequently, others have produced modified versions of Special Relativity

dealing with acceleration. Anyway, the way Einstein deals with relativity is to say that Special Relativity deals with speed/velocity and not acceleration, while General relativity deals with speed/velocity and acceleration.

“It [acceleration] then compels a much more profound modification of the conceptions of space and time than were involved in the special theory. For even if the special theory forced us to fuse space and time together to an invisible four-dimensional continuum, yet the Euclidean character of the continuum remained essentially intact in this theory. In the general theory of relativity, this hypothesis regarding the Euclidean character of our space-time continuum had to be abandoned and the latter given the structure of a so-called Riemannian space.”

By Riemannian space is meant non-Euclidean geometry of both positive and negative curvature.

“Before we attempt to understand what these terms mean, let us recall what this theory [General Relativity] accomplished. It furnished an exact field theory of gravitation and brought the latter into a fully determinate relationship to the metrical properties of the continuum. The theory of gravitation, which until then had not advanced beyond Newton, was thus brought within Faraday's conception of the field in a necessary manner; that is, without any essential arbitrariness in the selection of the field laws. At the same time gravitation and inertia were fused into an essential identity. The confirmation which this theory has received in recent years through the measurement of the deflection of light rays in a gravitational field and the spectroscopic examination of binary stars is well known.”

Faraday’s conception of the field of course comes via Boscovich. Next Einstein talks about Unitary Field Theory:

“The characteristics which especially distinguish the general theory of relativity and even more the new third stage of the theory, the unitary field theory, from other physical theories are the degree of formal speculation, the slender empirical basis, the boldness in theoretical construction and, finally, the fundamental reliance on the uniformity of the secrets of natural law and their accessibility to the speculative intellect. It is this feature which appears as a weakness to physicists who incline toward realism or positivism, but is especially attractive, nay, fascinating, to the speculative mathematical mind. Meyerson in his brilliant studies on the theory of knowledge justly draws a comparison of the intellectual attitude of the relativity theoretician with that of Descartes, or even of Hegel, without thereby implying the censure which a physicist would read into this. However that may be in the end experience is the only competent judge.”

What is being said is that scientists of a positivistic point of view don’t like Unitary Field Theory. Now, positivism has been shown to be not a very good philosophy, so we need not follow it, hence we can stick with a Unitary Field Theory approach to physics.

Einstein gives his defence of Unitary Field Theory against positivism, which I think is rather feeble:

“Yet in the meantime one thing may be said in defence of the theory. Advance in scientific knowledge must bring about the result that an increase in formal simplicity can only be won at the cost of an increased distance or gap between the fundamental hypothesis of the theory on the one hand and the directly observed facts on the other hand. Theory is compelled to

pass more and more from the inductive to the deductive method, even though the most important demand to be made of every scientific theory will always remain: that it must fit the facts."

A better defence is given by someone like Frank Tipler [48] who points out that a positivistic approach to science means that one is unable to generalise the results of experiments. i.e. one cannot that philosophy hinders one from forming a generalised theory. Now, the Unitary Field Theory is a generalised theory, so naturally in order to pursue that theory one needs to throw away a philosophy that would hinder it.

Einstein then proceeds to the problem with Unitary Field Theory:

"We now reach the difficult task of giving to the reader an idea of the methods used in the mathematical construction which led to the general theory of relativity and to the new unitary field theory."

"The general problem is: Which are the simplest formal structures that can be attributed to a four-dimensional continuum and which are the simplest laws that may be conceived to govern these structures? We then look for the mathematical expression of the physical fields in these formal structures and for the field laws of physics - already known to a certain approximation from earlier researches - in the simplest laws governing this structure."

I think what he is basically referring to is that the problem is constructing the relevant mathematics, i.e. mathematical structure for the general descriptive of a unified field. He then goes onto talk about the Riemannian metric:

ds squared = g_11 dx squared + 2 g_12 g_21 dx dy + g_22 dy squared

(note: Riemannian metric in 2 dimensions)

[Note rather than the equation given above, the article gives ds squared = g_11 dx squared + 2 g_11 g_22 dx dy + g_22 dy squared; I think this is a mistake!]

He seems to be wondering what form this Riemannian metric should look like, namely what values these quantities g_11, g_22, g_21, g_12 should have.

He says that by the law of the propagation of light it is possible to show that the space - time continuum has a Riemannian metric, and that the quantities g_11, g_12, and g_22 , determine the metric of the continuum, and also the gravitational field.

"This theory having brought together the metric and gravitation would have been completely satisfactory of the world had only gravitational fields and no electromagnetic fields."

i.e. in the way that Einstein's General Relativity has been conceived the Riemannian metric in that theory deals only with the gravitational field and not the electromagnetic field; so he wonders how both these fields can be combined within the maths of Riemannian metric.

"Not it is true that the latter can be included within the general theory of relativity by taking over and appropriately modifying Maxwell's equations of the electromagnetic field,..."

He is saying that Maxwell's equations can be altered to include gravity, however:

"... but they do not then appear like the gravitational fields as structural properties of the space - time continuum, but as logically independent constructions."

i.e. the gravitational field and the electromagnetic field do not look mathematically similar in form; which he further tries to clarify:

"The two types of field are causally linked in this theory, but still not fused to an identity."

Then says:

"It can, however, scarcely be imagined that empty space has conditions or states of two essentially different kinds, and it is natural to suspect that this only appears to be so because the structure of the physical continuum is not completely described by the Riemannian metric."

i.e. he does not like the way that such a theory would connect the two fields.

He then proposes the Unitary Field Theory where both fields have the same type of mathematical appearance, namely being a part of space-time:

"The new unitary field theory removes this fault by displaying both types of field as manifestations of one comprehensive type of spatial structure in the space-time continuum. The stimulus to the new theory arose from the discovery that there exists a structure between the Riemannian space structure and the Euclidean, which is richer in formal relationships than the former but poorer than the latter."

At 1929 Einstein was working on the Unitary Field Theory from the following idea:

"The new unitary field theory is based on the following mathematical discovery: There are continua with a Riemannian metric and distant parallelism which nevertheless are not Euclidean. It is easy to show, for instance, in the case of three-dimensional space, how such a continuum differs from a Euclidean."

He was thinking at the time that this led to the correct field laws, and may lead to the simplest and most natural conditions which a continuum of this kind could obey, giving unitary field laws for gravitation and electromagnetism.

Of course there was further development of this type of theory since then. However because there has not been a clear history of this subject taught to students, various people have started afresh to this type of theory and reformulated things in different ways peculiar to themselves. While the next clear historical development from this theory after Einstein by Lancelot Law Whyte, Baranski and others has been mentioned, and articles about this are at the Observer Physics website.

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