

This page is an historical introduction to my first but hitherto unpublished document on my development of CT (Continuum Theory) entitled:-

"A medium theory of physical nature
(preliminary synopsis of the proposed paper)

by

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the full text of which follows this page.

[For comparison with the developed status of CT, as at January 2018, please see all those 25 CT-listed publications on this website having numbers from No 121 onwards.]

In 1959, at aged 34, I was appointed by the leading UK aircraft manufacturer A.V.Roe & Co (Avro) to participate in the militarily secret development of a high-flight-altitude astronavigation equipment for use in daylight. I was to lead a small team for the development of a star-detection system with the necessary capability.

The primary problem was to pick the image of any navigationally-chosen star out of the daylight sky brightness background. Our analysis of prior security-protected comprehensive US observations of that brightness at all solar positions, to which we had access, showed that at heights of 20,000 - 35,000 feet it actually departs importantly from the habitual physicist assumption of Rayleigh scattering. We found that this discrepancy becomes even more marked, the higher the altitude (ruling out dust) and after subtraction of the expected Rayleigh contribution. So we were looking for an entirely new physical mechanism for scattering of the daylight electromagnetic waves.

Coming from my earlier background in radio communication, I proposed to my team that we investigate the idea that the electromagnetic wave-propagating medium is in random motion linked to the random motion of the gas particles forming the atmosphere. To our delight this worked extremely well in all the respects we had noted.

This finding was enthusiastically received by the two senior physicists, one being a director, in the AVRO management, as being in observationally supported conflict with Einstein's rejection of the aether in Special Relativity 1905. So they secured board-level funding, away from our project, for me to pursue these findings for a further period of 9 months and to write a full report on them. With the aim of testing our findings further, without breaching the UK Official Secrets Act, which we had all signed, they asked me also to write a version of our reasoning, concentrating on the science but stripped of all reference to the secret project within which the work was undertaken.

That document is the one recorded here. Note that in it I already embrace the idea of continuous creation, as had Hoyle, from whom the name 'BigBang' had derisively originated and was set out in the Bondi, Hoyle & Gold, 1948, paper *-The Steady-State Universe*. But in their case, the steady state was to be achieved by invoking a 'creation field' sufficient to counteract the expansion which they accepted as indicated by the cosmic redshift. Note also in particular my starting-point hypothesis that the aether is an ubiquitous continuum of electric charge. That has survived as the foundation upon which all my subsequent work on Continuum Theory (CT) has proceeded.

Copies of the document were sent to four famous physicists, inviting comment. To emphasize its already peer-reviewed quality, those invitations were signed by the two Avro physicists who had achieved the funding of my work on it.

The four physicists to whom it was sent were Hermann Bondi, Fred Hoyle, WH (Bill) McCrea and Erwin Finlay-Freundlich. Bondi never replied; Hoyle replied that it all sounded very preliminary but potentially very interesting if the work were given the necessary mathematical development; McCrae, after some delay, posted the document back unread, saying he had no time to read unpublished documents; Erwin Finlay-Freundlich, who had himself, in cooperation with Einstein, written about the redshift-generation problems, replied that the data I had emphasized were 'important' but that he didn't agree with my proposed mechanism for their origin.

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A MEDIUM THEORY OF PHYSICAL NATURE.

(Preliminary Synopsis of the Proposed Paper)

by

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JUNE, 1960.

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A MEDIUM THEORY OF PHYSICAL NATURE.

A Preliminary Synopsis of the Proposed Paper.

1. INTRODUCTION

The following pages summarize the results of an investigation which began when the author, an engineer by training, realised that physicists at present, while accepting (on suitable occasions!) both the Maxwell concept of electromagnetic waves and the idea of a considerable field extension beyond the "geometrical" limits of an atom, nevertheless neglect to consider any of the effects that might arise from the interaction of these fields except in the crude case of "direct hits". The author's familiarity with electrical noise phenomena and rudimentary knowledge of the statistical aspects of thermodynamics led him to study first the effects of random atomic motion. It became clear almost at once that the theory of relativity was necessarily under attack, a fact which was confirmed by the clear and complete interpretation of the observed solar red-shift, to which these studies led. If this was so, then, through the observed fact of the orbital precession of the planet Mercury, gravitation was involved also. From this point the full medium theory given here, with its interpretation of the phenomenon of mass, was conceived and tailored to fit a wide range of evidence accumulated by the author. Evidence discovered subsequently has not shaken the theory. Rather has it appeared to increase its scope.

2. THE BASIC IDEA.

The theory proposed is essentially an ether theory. However, it differs fundamentally from all ether theories that have preceded it in that it asserts that, pervading the entire universe, there exists an ultimate continuum, or fluid, which under certain conditions becomes observable to us as matter and electromagnetic waves. As a hypothesis for study it is proposed that the continuum is a charge continuum, local excess density of which constitutes (say) positive charge while density deficiency represents (on the same convention) negative charge, and that mass (i.e. gravitational interaction) is observed when such charge excesses or deficiencies rotate

about their centres, the angular velocity at the centre probably determining the amount of mass observed. Maxwell's concept of electromagnetic waves, transverse vibrations of an elastic polarizable ether, is built into the present theory without alteration, except that the concept of elasticity as a property of the continuum is examined and may require reinterpretation as pressure, variations of which are propagated at finite velocity.

It is suggested that in primaeval times the continuum was in slight random motion, giving rise to eddies, which, by selection, formed themselves into stable systems (atoms). Gravitation then increased the relative velocities of such systems, resulting, by "collisions", in raised temperature. At all observable absolute temperatures the random motion of the interatomic (and, within atoms, the inter- "particle") continuum is assumed to be now determined by the motions of neighbouring atoms and "particles" and any electromagnetic waves that may happen to be being transmitted by it, the original, or primaeval, random motion being now quite negligible. Thus, under all observable conditions, electromagnetic waves are propagated by, and with respect to, a randomly moving medium whose motion is intimately related to the (observable and mainly understood) motions of neighbouring atoms.

The term "medium" is used to refer to all of the ultimate continuum that has not yet formed into "particles" or atoms.

3. LIGHT.

Electromagnetic waves are our most important source of physical information. Any effects upon those waves, due to the random motion of the medium, ought therefore to have been observed already. A major part of the study has been devoted to this question. A simple analysis shows that random transverse acceleration of the medium, relative to the direction of wave propagation, results in an increase of mean wavelength which, to a first approximation, is directly proportional to distance travelled. Random longitudinal acceleration of the medium results in wavelength dispersion (spectral line broadening), and if, by analogy with macroscopic media, the velocity of propagation of disturbances in the medium is assumed to vary with the density of the medium, the dispersion process becomes a non-linear modulation process involving the production not only of sum and difference frequency components but also of components at the modulating frequency. It is shown that in appropriate circumstances the latter has a most probable wavelength falling in the radio range. Random rotation, or swirl, in the medium produces scattering of the direction of wave propagation. It also introduces depolarization.

All four effects, red shift, line broadening, radio wave generation and scattering, are independent of wavelength. They are found to have been widely observed, exhibiting a correlation, both among themselves and with the light intensity, temperature*, and path length, which points strongly to the correctness of the theory. Further, the broadening of an absorption line in a spectral continuum should follow an effectively different law, compared to an emission line, since the dispersion then applies, not to the absorbed waves, but to the remaining waves in the spectral continuum on each side of the line. This too is shown to have been observed in appropriate astronomical circumstances, but has hitherto been ascribed exclusively (often with embarrassing implications) to stellar rotation and turbulence in the absorber.

The new theory is shown to fit all the astronomical (red-shift) evidence put forward by Freundlich (1, 2, 3) as unaccountable under existing theory. Analysis of this evidence by ter Haar (4, 5), Born (6, 7) and McCrea (8) showed that a mechanism proposed by Freundlich could not be supported but that the evidence was significant. Considerable further evidence is now

* as measured by direct contact, by molecular excitation spectra, or by colour temperature.

discussed, much of it more recent than Freundlich's original contribution (1954), which enables the opinion of Burbidge and Burbidge (9), that the evidence was either dubious or adequately accounted for, to be largely discounted. It is of particular interest that Born (loc. cit.) noted a correlation between red-shift and radio noise emission and formed the opinion that the effect might eventually be traced to interaction between the waves and the neglected field extensions of electrons. The new theory shows he was right, but perhaps not quite in the manner he envisaged.

Ter Haar's criticism (4) of Freundlich's proposed red-shift mechanism, that the sharp outline and surface detail of the sun would be blurred by the associated scattering, is proved not to apply when the number of individual actions is very large, even when the associated total attenuation is considerable.

It is shown that the new theory apparently leads to a clearer understanding of almost the entire gamut of solar phenomena. This includes all temperatures, from the photosphere to the outer corona, limb darkening, magnetic fields of sunspots and of the sun as a whole (including cyclic reversal), the sunspot cycle and certain aspects of latitude migration,

prominences, red-shift, radio emission (both quiet and active sun), and deflection of starlight. For example, the inner corona is found to possess a temperature that is little above that of the photosphere. The high energy coronal emission lines are attributed to ionization by X-rays derived from wave-wave cross modulation. (The existence of such cross-modulation is inferred from the other solar data.) This mechanism accounts for apparent thermal disequilibrium. The possibility of identifying the remaining coronal lines arises. A detailed discussion is given.

In every likely case that has been investigated so far there is evidence which appears to support the theory. Apart from those already quoted these include:-

- a) Scattering of light in the zodiacal light and in the sunlit sky, and the origin of the gegenschein,
- b) Apparent duplicity of the measured value of c ,
- c) Discrepancies between measurements of ionospheric temperatures by different methods,
- d) Apparent high temperature but absence of thermal neutrons in recent experiments on thermo-nuclear fusion (ZETA and SCEPTRE III).

In a few cases the results are obtained in conjunction with the gravitation results given later.

4. COSMOLOGY.

The cosmic red-shift is shown to be wholly attributable to the action of the intergalactic medium. The absence of a general expansion appears, on thermodynamic grounds, to require that the universe is infinite in extent. Accordingly there is no reason why the cosmological principle should apply stringently to the observable part. This is shown to remove the difficulty presented by the small, but apparently significant, difference in Hubble's constant derived for the northern and southern galactic hemispheres by Humason, Mayall and Sandage (10). In fact it may be construed as evidence of "local" disequilibrium which must exist even in an infinite universe. The absence of expansion also removes a time-scale restriction which has not always proved convenient in studies of the ages and evolution rates of stars and star clusters. Similarly it is not unreasonable that there is a lack of apparent structural differences between the nearest and most distant galaxies. The apparently systematic increase, with distance, of the ratio $\frac{\text{radio power output}}{\text{visible power output}}$ for the more distant galaxies, reported by Minkowski (11), is also in accord with the new theory. The problem arising from the

apparently positive total energies of several clusters of galaxies is removed when the general expansion is removed. The possibility of continuous creation is inherent in the theory.

5. FORCE.

It is proposed that all Observable force results from a tendency of the continuum to reduce any density gradients that arise in it. It is also proposed that the "spin" of fundamental particles represents a mechanism whereby continuum is pumped along the spin axis. This is shown to be in accord with the observed "non-conservation of parity". The spin axis tends to align itself with the direction of maximum continuum gradient under stationary conditions, or with the direction of relative motion of particle and continuum. On this basis a unified interpretation of electric, magnetic and gravitational force is obtained. The velocity of propagation of density changes in the continuum is tentatively given as Qc , where Q may be affected by the presence of particles (rotational disturbances of the continuum) along the route, and c is the terrestrially-measured ratio of the electrostatic and electromagnetic units.

Following Brown (12, 13), inertial force is attributed to the retarded action of gravity forces from an extended region of the universe, although the extent of that region is here defined by considerations other than mere observational limits. This interpretation of inertia implies that it is a property which accrues to the ultimate continuum when it "spins". If the continuum otherwise possesses no inertial properties there is no difficulty in explaining why spinning continuum remains compact. Unfortunately other difficulties then arise (see "Rotation").

The recent observations of Allais (14), together with a number of the gravity effects he quotes as having been observed by others, are found to be consistent both with the propagation of gravity at a velocity of the same order as c and with a very slight alignment of particle spin axes with the direction of the gravity force.

6. ROTATION.

To account for observations of the Sagnac, Michelson-Gale, and Dufour-Prunier type under the new theory seems to require that the propagation vector has inertial properties, i.e. that an inertial force resists any

action which tends to change the direction of wave propagation. This is contrary to the previous result and represents a difficulty which has not yet been resolved. The experimental evidence is taken to indicate a fault in the theory as regards the precise nature of "spin", and accordingly is preferred to that particular extension of the theory. This result, that the continuum experiences forces of an inertial type, can be deduced also from the common force mechanism proposed in the new theory.

7. ORBITAL MOTION

The hypothesis of a common force mechanism provides crude justification for the unified study of orbits, regardless of whether the central force is apparently electric, magnetic or gravitational. In the theory of relativity the unified study of orbits is justified on the basis of the similarity of the observed velocity patterns involved rather than of the force mechanism responsible for those patterns.

Two important effects are shown to result under the new theory. Assuming only retarded action with propagation velocity Qc there arises an orbital precession similar to that given by relativity and observed in the orbital motion of the planet Mercury and of several binary star systems. The fine structure of spectral lines is another widely observed example.

The second effect is exclusive to the new theory. It is a first-order effect and of correspondingly greater importance than the precession effect. Assuming inertial properties for the "spin" vector and that the force is due to a reduction in continuum density between the two bodies, there results an orbital condition whose stability depends upon the angular velocity of the intervening medium. If the medium moves with the orbiting body, the body and the medium will spiral outwards until dilution with non-orbiting medium has reduced the angular velocity of the medium to a certain fraction of that of the body. The body orbit is then stable. Further slowing of the medium causes the body to spiral inwards until stability is achieved again. In the co-moving condition the radial velocity associated with the spiral motion is shown to be inversely proportional to orbit radius. This is in accord with the observation that a number of galaxies have expanding nuclei and particularly with the observation of van Woerden, Rougoor, and Oort (15) that our own Galaxy is expanding faster near the galactic nucleus than at the radius of the sun's position.

The surprisingly high ionospheric densities deduced by Champion and Minzner (16) from the radial decrement of the orbits of artificial earth satellites may be further evidence of this gravitational effect.

8. GALACTIC AND SOLAR SYSTEM EVOLUTION.

The above first-order effect, due to the angular velocity of the medium, together with a consideration of axial accretion in fluid rotating systems provides the basis for the development of an evolutionary scheme for galaxies, without resort to magneto-hydrodynamics. This scheme provides a satisfying qualitative account of all the observed galactic configurations, including barred spirals and double spirals.

As a result of evolution under the scheme, spiral galaxies are shown to comprise, basically, a single column of matter rotating about its axis and provided with secondary rotation about a perpendicular axis. Differential action of the secondary rotation winds up the spiral, Interference between the oppositely-rotating adjacent arms brings about detachment of matter from the arms, seen in the familiar "branching" of the spiral arms. The Davis-Greenstein theory of interstellar polarization, requiring long particles to be magnetically aligned by spiral arm magnetic fields and untenable in the absence of a satisfactory theory of a field-producing mechanism, is now replaced by the proposal that the long particles align themselves with the gravitational gradient associated with the matter in the arm. Radio noise "emission" observed from the Galactic halo and nucleus is in accord with the scheme. Here again, magnetic fields are not required under the new theory.

The evolutionary scheme as a whole is shown to be in accord with a large amount of additional evidence. The evolution of the solar system is considered on the basis of the disc-growth effect resulting under the new theory, It is shown that this provides an entirely satisfactory mechanism whereby the evolutionary scheme, proposed by Hoyle (17), but which then lacked a satisfactory driving mechanism, could have been enacted. The solar rotation rate and the retrograde motion of the outer satellites of Jupiter and Saturn are among the facts accounted for. The zodiacal light is identified as the disc remnant. By considering the interplay of the accretion stream from the direction of the solar apex (modified according to the positions of the principal planets) with the material in the inner zodiacal light and by taking the angular velocity of solar rotation into account, preliminary study shows that there emerges a remarkably clear picture of sunspot activity and of much that is associated with the sunspot cycle.

9. PARTICLE PHYSICS.

In its application to particle physics the theory gives a second-order reduction of the electric or magnetic force acting on a moving particle, This result is indistinguishable in practice from the relativistic concept of increase of mass. To achieve this identity, electric and magnetic force have to be assumed to be propagated with velocity c . This can be construed under the theory as evidence that $Q = 1$. Support for this may exist in the evidence that the velocity of neutrinos is close to c . It is argued that the increasing diversity of "fundamental particles", observed with the aid of higher and higher energies and shorter and shorter time measurement, represents merely a reversal of the selection process based on a stability criterion whose operation since primaevial times now leaves us with a great preponderance of protons and electrons. The cosmic preponderance of hydrogen containing no neutrons suggests that neutrons were formed at a later stage as a result of proton- electron-wave interactions. The increased lifetime of fast mesons is seen as evidence of the reduction of (disruptive) forces acting on fast particles. A connection between mass and energy is as natural under the new theory as under the theory of relativity, although the relativistic implication that electromagnetic waves possess gravitational mass is entirely impossible under the new theory.

10. QUANTUM THEORY.

The quantum theory, as applied to electromagnetic waves in transit between source and ultimate absorber, is abandoned under the new theory. It is noted, however, that apparently quantum effects have (and can) only be observed where the emitter and/or absorber is a stable or quasi-stable resonant system, namely an atom or molecule, in which both the frequency and the energy associated with a given vibration amplitude are related to the binding force and hence to each other. However, a satisfactory derivation of the character of black-body radiation has not yet been achieved under the new theory.

The validity of the new theory's orbital stability criterion in the case of electric force cannot be argued with complete satisfaction on the basis of the concepts provided so far. Nevertheless it seemed worth while to enquire into the consequences of some such criterion arising in this case. An obvious possibility is that of accounting for the observed separations of electron orbits and for the numbers of electrons in each. The vibrational excitation of orbiting electrons by electromagnetic waves from outside could be attributed to a disturbance of the angular velocity of the medium in the

neighbourhood of the orbit. A momentary increase or decrease in this angular velocity should cause the electron to move inwards or outwards respectively. This is proposed as the mechanism both of absorption of wave energy and of photo-ionisation. The red-shift in Compton scattering may be accountable in terms of the radial acceleration thus imparted to the dislodged electron. The diffraction of electrons may also be found to be accountable under the new theory. The various so-called "two-quantum" actions, particularly Rayleigh scattering, which are a cause of difficulty in quantum theory, appear to find ready interpretation under the new theory. Mention has already been made of the orbital procession term that arises for non-circular orbits and is qualitatively suitable for giving an account of spectral fine structure.

The suggestion that the velocity of disturbance propagation depends upon continuum density, so successful in its account of cosmic radio noise, leads to a non-linear cross-modulation process between the natural vibration frequencies of vibrating electrons (or atoms, in a molecule). This mechanism leads directly to a form of Ritz's Combination Law. It is not yet clear whether the statistical aspect of quantum mechanics, which leads to the "selection rules" and relative line intensity values, can, under the new theory, be given a satisfactory account in terms of geometry and continuum densities deduced from orbital stability considerations. The shell model for atomic nuclei may find justification in the full exploitation of the orbital stability criterion.

11. THE THEORY OF RELATIVITY.

Nineteen years ago Ives and Stilwell (18) performed some experiments on the medium propagation of waves from a relatively moving source. Their results, in complete agreement with a simple calculation given by them, contradict flatly a statement usually made in defence of the special theory of relativity, namely that a medium theory does not introduce separable second-order effects upon both apparent length and apparent time (or frequency). Hence it is shown that the whole so-called "empirical basis" of the special theory applies equally to the new theory and so cannot be decisive.

The results of the recent, and continuing, experiments to test the validity of the principle of equivalence, are examined carefully in the light of the new theory and are shown to be completely indecisive in their present coverage of the factors involved. Reasons are given for suspecting the effect to be peculiar to the wavelength range employed in the experiments.

12. CONCLUSION.

It is submitted that the universal applicability of the theory, a goal towards which physicists have long been striving and the superficially apparent validity of its results in almost all physical domains, render it worthy of further study. As a competitor with the present combination of relativity and quantum mechanics the new theory draws strength from the variety of apparently exclusive evidence that is available. In particular it is the first theory to be inherently capable of leading to a direct understanding of how galaxies, planetary systems, atoms, and, perhaps, atomic nuclei came to have their observed configurations.

The introduction of a new set of parameters, those of the medium, into every physical problem must inevitably reduce the number of cases in which it is possible to give a precise quantitative prediction of an effect. By the same token, however, observation promises to tell us incomparably more about our surroundings than is possible under current theories.

The failure to provide a satisfactory picture of the continuum pumping mechanism represented by the spin property of "particles" is not very surprising at this early stage in the development of the theory. However, if the theory is to retain its essential physical interpretability, the elucidation of this point must not be too long delayed. This would achieve the author's philosophical aim - that of demonstrating the essential simplicity of Creation.

MFO/JAC.

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