velocity of light is no longer a constant. And, km/s is a concession to the Expanding Universe tribe.]

A slower atomic electron inter-orbit transition would, of course, result in less energetic e.m. radiation, hence the intrinsic red-shift. The greater the mass of the source, the greater the intrinsic red-shift.

As the aethereal medium (actually the negative energy) is compressed ever more within the galaxy, one may assume that a point is reached where it is re-transformed into matter, and that because the aether was negative the matter thus formed will be negative. As the aether was spinning with the galaxy the newly formed matter will continue to spin the same way, of course, but being negative, will generate an electromagnetic field exactly opposite to that of the parent galaxy. Being massive objects they cannot simply flip ends (as two magnets in the lab.) so will repel, with the smaller being ejected along the axis of the larger, perhaps splitting in two in the process, if the action takes place in the center of the galaxy.

These ejected objects are from the core of the parent galaxy and so are greatly compressed. As they move into the regions beyond the galaxy the compressive forces are gradually relieved and, consequently, the objects expand. As they expand the intra-atomic aethereal medium becomes less dense, the orbital jumps become easier and faster, and the redshift decreases. So, we get a lessening of the redshift, as you do, but from a cause other than increasing electron size.

The quantization is presumably as you describe, an inherent delay in the change of an orbital jump until the force for change reaches certain levels.

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Open Questions in Relativistic Physics—A Pluralist Viewpoint

This volume is a collection of papers presented at an international conference in Athens in June, 1997, and the publisher, Apeiron, has produced to a high professional standard a softback conference volume. The volume is well produced and well edited by the eminent Franco Selleri. The papers are collected into sections: "velocity of light," "history and philosophy"; "structures in space and time"; "cosmology and astrophysics"; and "quantum theory and relativity". There is no indication of the price on the volume but it is probably far less than other contemporary publishers in science. Therefore Apeiron does a great service to pluralist theoreticians open minded and bright enough to understand the contents. In more conservative circles we would have to wait up to two years for the volume to appear with an astronomical price tag, and the subject matter would be less pluralistic and less interesting.

The standard of presentation is mixed, some papers are inevitably more thoroughly prepared than others. However, the conference organisers have had the liberality of outlook to invite papers from "non-professionals," and the volume is none the less important for that. There is a commensurate variety of hypothesis, underlying the basic tenet of natural philosophy, that any hypothesis being the product of imagination and therefore subjective, is always provisional, and can partially describe nature at best. A plurality of thought, clearly and professionally presented in one well produced volume such as this partially eliminates the dogma that has ossified late twentieth century physics fundamentals in conservative (mainly academic) circles and turned it too often into a dull, ill informed, rejection of good ideas. However, dogma is also to be found in radical thought, and must similarly be rejected as completely as possible.

The opening paper, by Fleming, is an interesting example of the open minded, or Boltzmannian pluralist, approach to the Sagnac effect, of which there are many explanations. Fleming suggests a neat, well presented, explanation based on finite photon mass and the concomitant existence of *both* wave and particle, the Einstein/Bohm/Vigier theory. It is argued that the photon behaves as does the electron or neutron in the Sagnac effect, and therefore carries mass if particulate. Unfortunately he does not mention the explanation (published in 1995) of the same effect by Barrett, using non-Abelian electrodynamics, which leads, if applied *in vacuo*, to the $B^{(3)}$ field, $O(3)$ electrodynamics and the possibility of photon mass. This would have strengthened his own argument. In this context an excellent index allows one to cross refer to page 227, where Hofer derives the Maxwell equations without accepting them as "axiomatic". This is a misuse of the term "axiom" by physicists. In Logic, an axiom has two definitions: it is either an undemonstrated proposition concerning an undefined set of elements, properties, functions, and relationships, or it is a self evident or accepted principle. Nothing in natural philosophy is self evident, least of all special relativity, as the many different interpretations in this volume show. An axiom in natural philosophy must lead to a statement about nature, and therefore cannot be self evident or permanently acceptable. The Maxwell equations as found in textbooks should be interpreted only in the first sense of an axiom in Logic, as undemonstrated propositions in the sense that they can only partially describe nature, and by no means without internal inconsis-

tency and paradox. The "Maxwell equations" were in fact derived by Heaviside. The originals were twenty equations in quaternions of effectively $SU(2)$ symmetry, not vectors in $U(1)$ gauge symmetry. Only by continuously rejecting the "self evident" will any subject evolve, as demonstrated by Hofer. It is now known beyond reasonable doubt (but not of course beyond conservative or radical dogma) that the $U(1)$ electrodynamics based on the Maxwell equations are paradoxical, and that electrodynamics may be written more self consistently and less paradoxically in a higher, non-Abelian symmetry, such as $SU(2)$, $O(3)$ or even $SU(3)$. This leads back to the Barrett explanation of the Sagnac effect and the possibility of photon mass as discussed by Fleming. If the Maxwell equations are axiomatic in the sense of being self-evident, any development from $U(1)$ violates the axiom, and no progress will ever be made.

Similarly we find dogma being dismissed in two papers by Arp and Roscoe, based on data and extensive scholarly experience in cosmology. These data lead to the rejection of the Big Bang theory in what appears to this reviewer to be the high ground of natural philosophy, empirical data, reduced by logic and without prejudice. The conclusion by Arp is that flat spacetime can and should be used in cosmology. This is the result of a lifetime of scholarship but is rejected almost completely by the adherents of general relativity in cosmology. Rejection takes place despite the data, and so strays outside the bounds of natural philosophy if the data are accurate and properly interpreted and reduced, as seems to be the case with both Arp and Roscoe.

However, "the rejection of the self evident" *without* scholarship can only replace dogma by dogma, and we can see this process occurring in some of the poorer papers of this volume. This process leads to outright intellectual destruction rather than the evolution of thought, for example rejection occurs without anything being put in its place, as in the dark ages in Europe. The great synthesis of thought that went into special relativity and quantum mechanics is well reviewed by the better historical and philosophical papers in this volume and it would be a pity if this synthesis were to be destroyed by radical dogma, i.e. ill-conceived criticism. In order to reject a theory one must first learn all about it. Ill-conceived dogma results in the flooding of the e mail system with warnings about the eclipse of special relativity and the end of spacetime, in physics without equations and so on. Fortunately we are spared this to a very large extent in this volume because it is a pluralists' volume. At its worst, radical dogma can degenerate into solipsism, the reinstatement of absolute space and absolute time at all costs by fishing out obscure bits of data in favour of the hypothesis, however riddled with flaws. There are one or two papers like this in the volume, others which make a better argument for galilean principles applied to special relativity, self-contradictory as that may seem at first. One can only try to fish out the reasonable ideas if one is a pluralist oneself.

Selleri himself presents an interesting paper on the lack of a true inertial frame in physics, (precise opposite, apparently, of the galileans), and logically works out the consequences, showing what he claims to be a "discontinuity" in relativity theory. He may be right, the logic of his argument seems to be free of flaws, and leads to a velocity of light not equal to c, as in the theory of finite photon mass. The latter can be cross referenced to red shifts as long studied by Arp and others in meticulous detail, and long ignored by the "establishment," the mysterious, unelected elite of modern physics, as ossified as Lot's wife. This is what comes from looking backwards, a danger to radical and conservative alike. The middle ground then must rely on volumes and conferences like this, which circumvent the remarkably censorious nature of modern physics publishing while rising far above the end of millenium junk on the physics internet. This is no doubt due to Selleri's careful editing. Another interesting consequence of his argument, and that of other good papers in the speed of light section, is that it may lead ultimately to an explanation of the non-null result of the Michelson Morley experiment, following a recent re-analysis of Vigier. This analysis is not without its critics, but was recently published in *Apeiron*, and elsewhere. A.G. Kelly, for example, discusses some related matters and the need for an ultra-accurate test of Michelson-Morley and related effects. The "establishment" in physics would reject (again) Vigier's argument outright, and again, despite the data.

This conference proceeding is then far ahead of the average textbook in accepting and discussing a variety of primitive concepts in relativistic physics, including Einstein's own, and their evolution. The pluralist approach has its clear merits but can lead to some violent contradictions as ideas develop in a historically transitional stage. For example Kapuscik in one paper attempts to develop generally covariant electrodynamics in arbitrary media (with a field tensor remarkably reminiscent of non-Abelian electrodynamics, but in curved spacetime), while Arp and Roscoe try to demolish general relativity in other papers, and apparently, reduce it back to special relativity (the one used in general gauge theory and non Abelian electrodynamics). Still others seem to deny special relativity and replace it with absolute space and time, while Selleri does the very opposite,

denies the existence of the inertial frame: "...no perfectly inertial frame exists in practice..." Fleming discusses the very high accuracy to which the equations of special relativity have been tested, using muons in an accelerator ring, so the interpretation of these equations is the issue in many instances, surely, rather than the equations themselves. Where it seems to me that these various examinations fall far short is their inability to construct a better general gauge theory in special relativity, one capable of predicting all the observed quarks in nature better than the Yang Mills theory in $SU(3)$ gauge symmetry. (There appears to be no mention of gauge symmetry in the whole volume, and Wesley, for example, is known to dismiss the whole lot, quarks and all, reminiscent of Erasmus' *Praise of Folly*.) Unless they do the quark thing better, they will remain quirks or tinkerers on the edges, to the vast majority of physicists. (Human nature being what it is, grossly blinkered.) This reviewer is far from being unsympathetic to the contributors in this fine volume, but if one is to criticise the most successful theory in twentieth century physics, Yang Mills gauge field theory based on special relativity, one must surely put something in its place at least as powerful. This effort does not even exist in this particular volume, despite the fact that quarks are products of special relativity, i.e. of gauge theory, and despite the fact that *every* quark in nature is now known empirically. Perhaps this is why there is also no mention of non Abelian electrodynamics, the critics themselves appear to adhere rigidly and dare one say, dogmatically, to the Maxwell equations, actually Heaviside's creation. The name "Heaviside" is missing from the index and there is no progress beyond the $U(1)$ in this volume. This is perhaps a counsel of perfection by the reviewer.

On the more philosophical level there is a particularly useful paper by Bastos Filho, who uses the Compton effect as an illustration of correspondence and commensurability, thus improving on the difficult abstractions that are the philospher's lodestone and making them comprehensible to the everyday physicist. Other papers in this section are impressive but heavy going to the uninitiated due largely to lack of illustration, i.e. giving examples, as in metaphor.

There are also interesting papers on the internal structure of the photon and electron, again ideas which would be rejected by *Physial Review Letters*, and therefore interesting ideas. I like in particular the one by Bozic on this subject, but there are several more. I believe that Malcolm MacGregor was ostracised for life for suggestions along these lines for the electron, showing again the effect of contemporary dogma. MacGregor detailed some of these happenings to me at Vigier One, and I know some effects first hand. It seems amazing that an objective profession such as physics can be so unobjective, and therefore one must finally salute the courage of the Editor, the Publisher, and all contributors, whatever their views.

This volume should be on the shelves and libraries in every leading research University worth the name and worthy of Periclean Athens at her best.

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