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Correspondence, conference threads and debate

The main problem of modern physics

In a recent, very interesting paper, Thomas E. Phipps, Jr. (1990) proposes a new expression for the force law for interactions between two point charged bodies:

$$\vec{F} = \frac{ee'\vec{r}}{r^2}\left(\sqrt{1-\beta^2} + \frac{r}{c\sqrt{1-\beta^2}}\frac{d\beta}{dt}\right) \qquad (1)$$

We know that motionless charges interact with one another according to Coulomb's law:

$$\vec{F} = \frac{ee'\vec{r}}{r^3} \qquad (2)$$

When one charge moves relative to the other, the interaction law changes, although no such law has been stated until recently.

In the Special Theory of Relativity (STR), the problem of interactions between charges has been resolved by the energy method and Lorentz contraction/dilation of distance and time. However, STR does not use the concept of a force. If a force law can be found for interactions between moving charges, we can solve all problems of electrodynamics without STR.

Many investigators have suggested expressions for an intercharge force law. If Coulomb's law depends on the distance between two bodies, in this case the force must also depend on the relative speed v between the two bodies. Ideally, we would want to measure this force directly, independently of relative distance r and velocity v. But this has not been done. Experimental laws are available, such as Ampère's and Faraday's laws, and others for the interactions between moving charges. In 1969, I derived an intercharge force law:

$$\vec{F} = \frac{ee'\left(1-\beta^2\right)\vec{r}}{\left(r^2 - \left[\vec{\beta}\times\vec{r}\right]^2\right)^{3/2}} \qquad (3)$$

I was convinced (Smulsky 1992) that this law was able to solve all the problems that are now solved by STR. Interestingly, the same expression (3) has been obtained by other investigators, although they used STR, and the expression has a different meaning. However, Thomas G. Barnes *et al.* (1977) derived the same formula on the basis of classical mechanics with a slightly different method from mine. They derived it as an electrical field E, and consequently I do not believe they viewed it as an expression of electrical force F.

In the Phipps law (1), the force depends on r and v, as well as acceleration $c\,{}^{d\beta}\!/_{dt}$. Phipps is able to avoid one of the defects of Weber's law. Yet both his law and Weber's should be expressed differently, since force depends on acceleration. In accordance with Newton's second law, the force is proportional to acceleration. As a result, the formula for the force should not contain acceleration.

I believe that Phipps's derivation (1986, 1990) is mathematically correct. But there is one important oversight. When force depends on speed, work A by force F at distance l depends on speed:

$$A = \int F dl = f(v)$$

In this case, we cannot use the concept of potential energy V, and the equality $F = -{}^{dV}\!/_{dr}$ (Phipps 1990, formula 5).

The excellent discussion by Phipps convinces us of this conclusion, especially when we see that the results of formula (5) do not coincide with formula (14). Our conclusion also applies to Weber's law and other laws containing acceleration.

I believe that the problem of the intercharge force is very important, and that further serious discussion is necessary.

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Doppler redshift versus tangent redshift

Hubble observed a regular decrease of the redshift of light from distant galaxies with increased distance. In search of an explanation, he reached out to the well-known Doppler effect, interpreting the redshift as due to higher and higher velocities at greater distances. Despite widespread acceptance of this interpretation by scientists, Hubble himself was never quite satisfied; he tried for years (as did Einstein) to find a more acceptable explanation, but without success.

In selecting the Doppler interpretation, Hubble "went off on a tangent"; not only as a figure of speech, but also quite literally as well—on the tangent of a circle. The tangent formula for galactic redshift is derived from the following assumptions:

1. The absolutely straight line is only a figment of mathematical imagination. It does not occur anywhere in nature. It is only an idealization: the limit of a curve as the radius of the curve approaches infinity.
2. Although space is not curved, all natural trajectories are curves, great or small, from the orbits of planets to the orbits within atoms, to the travel paths of light, to the propagation paths of gravitons.
3. The Hubble constant is adequate to describe distances to near galaxies. But the Doppler interpretation cannot be valid, because it is based on the premise that the light reaching us from galaxies has traveled an absolutely straight line.
4. What has been understood to be the straight-line distance to a galaxy is in reality only the tangent of the circular light-travel-distance to the galaxy. The presumed "radial recession velocity" is actually a rapid increase of the tangent with respect to the great curve of photon travel.

The Doppler redshift interpretation is based on the assumption that galaxies are receding at a velocity proportional to the distance from Earth, $V = HD$, where V is the velocity of the galaxy, H is Hubble's constant and D is the distance to the galaxy.

For redshifts up to about 1.3 ($z = 0.3$), the simple redshift formula is used, where the Doppler is just

$$\frac{\lambda_o}{\lambda_s} = 1 + \frac{v}{c} \qquad (1)$$

where λ_o is the observed wavelength, λ_s is the wavelength at the source, v is the presumed velocity of the galaxy and c is the speed of light. But for higher redshifts (observed in excess of 3), the simple formula would indicate a galaxy velocity greater than the speed of light. As a result, astronomers switch to the Special Relativistic Doppler redshift formula

$$\frac{\lambda_o}{\lambda_s} = \sqrt{\frac{c+v}{c-v}} \qquad (2)$$

The tangent formula and the Doppler agree to within one part in 100,000 out to a distance of 1 million light-years; and within one percent to a distance approaching 10^{10} light-years. Yet the distance measurements on which these formulae are based are valid only to about five percent.

The tangent redshift formula is written as follows

$$\frac{\lambda_o}{\lambda_s} = 1 + \frac{\tan(\frac{t}{T} 100 grad\ \theta)}{\sqrt{2}} \qquad (3)$$

where t represents the light travel time in seconds from source to observer, T represents the total time fo the full circle of possible photon travel time ($1/H = 10^{17}$ seconds (10^{10} years), where H is between 50 and 100 km/second/Megaparsec).

The simple formula is adequate for all photons we have so far encountered, ranging from 10^{-13} centimeters (neutron) to longwave radio at about 10^6 centimeters. However, we must assume that we are swimming in a sea of photons we have not yet detected. These may range from the Planck length of 10^{-33} centimeters up to the wavelength of the free graviton at 10^{28} centimeters (10^{10} LY)!

To provide for all possible wavelengths, we must use the more general formula

$$\frac{\lambda_o}{\lambda_s} = \frac{1 + \tan\left[\frac{t - t_s}{T} \cdot 100\right]}{\sqrt{2}} \qquad (4)$$

where t_s represents the time period of the source photon, λ_s / c.

If we accept the notion that on the large scale the path of light is curved very slightly in a full circle of 10^{10} LY circumference, we are led to a new view of the "universe". In this view, the "grand universe" is unlimited in space and time: it is infinite. Nevertheless, the view of each separate observer is limited to its "ponderable universe": the system of all circles of circumference 10^{10} LY passing through it. It also becomes apparent that a body of any "age" whatsoever, such as 10^{50} years, could drift within the line-of-sight of an observer. It is also apparent that each separate observer, such as only a few kilometers from another observer, is the centre of its own "ponderable universe". Thus there are "many universes".

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Beyond Lodz

In the closing session of the XIIIth Krakow Summer School of Cosmology, participants debated different approaches to the problem of opening up the media and the astronomy community to discussions of alternatives to the Big Bang. It was seen as deplorable that mainstream journals and the information media are reluctant to admit that alternatives to the standard model may exist, and in many cases deprive their readers of the opportunity to inform themselves about developments in this field.

However, it is by no means likely that this situation can be changed by the sheer will of a small critical faction. Indeed, it may be counterproductive to focus all one's attention on convincing the scientific community and the lay public of the failings of the Big Bang when there is an evident need—and an unparalleled opportunity—to forge ahead with positive work. A preoccupation with criticism of the prevailing model might only prolong the present impasse.

In the coming years, apart from constructing new theories of redshift and cosmology and devising empirical tests, initiatives should be encouraged in new areas of astrophysics. In this work, we may be guided by a number of "conservation principles" which can be inferred from the fact that the various parameters of matter remain constant on the cosmological scale in an equilibrium universe, even though they are known to change locally. In addition to posing a great challenge to cosmology, these cosmological conservation principles no doubt constitute a powerful tool for astrophysics. Imaginative application of such principles could lead to extraordinary developments in galactic, stellar and even planetary astrophysics.

The research presented at the conference in Lodz on alternatives to the standard model demonstrates that the possibilities for progress are vast indeed, potentially encompassing all of physics and astrophysics.

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XIIIth Krakow Summer School of Cosmology

On September 6, 1992, a violent storm raged over Poland. As its relentless rains turned roads into rivers, astronomers, physicists, mathematicians and students from 13 countries descended on the land of Copernicus to take up the challenge placed before science by the Canon from Torun more than 400 years ago.

The following morning, they assembled in the Physics Institute of the University of Lodz, where the local organizers—Wieslaw Tkaczyk of the University of Lodz and W. Borkowski of the Lodz Planetarium—officially welcomed the guests to the 13th Krakow Summer School of Cosmology, the theme of which was *Progress in New Cosmologies*. The papers presented in the ensuing five days of sessions conveyed a definite sense that the Big Bang had failed, making a new approach to cosmology inevitable. It is tempting to imagine that we are at the threshold of a second edition of the "Copernican Revolution"; the words of Copernicus in the preface to *De Revolutionibus* ring surprisingly true today:

> *Nor have they [the Mathematicians] been able thereby to discern or deduce the principal thing—namely the shape of the Universe and the unchangeable symmetry of its parts. With them it is as though an artist were to gather the hand, feet, head and other members for his images from diverse models, each excellently drawn, but not related to a single body, and since they in no way match each other, the result would be monster rather than man. So in the course of their exposition, which the mathematicians call their system,... we find that they have either omitted some indispensable detail or introduced something foreign and wholly irrelevant.*

Thus, the standard, expanding model of the universe was seen as increasingly discredited by the observational evidence. It was shown to stumble on element abundances (Lerner), on the formation of compact groups of galaxies (Sulentic), and on the origin of the Hubble effect in associations of galaxies and quasars (Arp). Newly discovered phenomena, such as redshift quantization (Napier) go entirely unexplained, while others—stellar cusps in galactic cores (Dokuchaev), gamma ray burst sources (Tkaczyk), active galactic nuclei (Triphonova), large scale redshift anisotropies (Hnatyk), dust clouds between chain structures (Wszolek) and the repeated violent ejection of spiral arms from galactic cores (Clube)—strongly suggest that the Doppler-expansion should be abandoned in favour of a non-expanding model. New definitive tests of the fundamental nature of redshift (Walker, Shtyrkov) are needed, while further theoretical work must be guided by a rigorous assessment of the implications and value of different cosmological "principles" (Rudnicki) and a reconsideration of the Copernican postulate of a static Universe, which was enunciated in *De Revolutionibus*:

> *... it would seem quite absurd to attribute motion to that which contains and locates, rather than to that which is contained and located....*

A viable replacement for the standard model of cosmology should account for the redshift phenomenon in its different manifestations, including cosmological (Miller) and intrinsic (Nieland) forms. Further investigation of the redshift effect should afford a deeper insight into the physics of the vacuum (Selleri) and the nature of light (Browne) and matter (Arp). A new conception of gravitation (Roscoe) and inertia (Ghosh) could yield an understanding of the connection between local phenomena and the matter in distant galaxies (Assis). A static cosmology might rely on an interplay of gravitational and plasma processes (Peter) in building and maintaining equilibrium states in the macrocosm (Jaakkola) and the microcosm (Broberg), and incorporate a hierarchical structure or dimension of scale (Van Flandern).

Much as Copernicus "tried to interpret Ptolemy rather than nature" (Kepler), the explorers of the new universe may seem to move too cautiously, with one foot still planted in an Einstein world. Still, the five days of the XIIIth Krakow summer School of Cosmology represent something of a milestone, since for the first time, a large international gathering attended by researchers from a variety of backgrounds, many of whom formerly worked in isolation from one another, consciously focused its attention on the practical problems of formulating a workable static cosmology. A new school, a new current of research, has risen to its feet and declared itself. It must now consolidate its gains by refining its concepts, publishing its findings in this journal and other magazines dedicated to new physics, and holding regular conferences to develop alternative ideas in cosmology. Like Copernicus, it can confidently say of its modest beginnings: "Though my present assertions are obscure, they will be made clear in due course."

The proceedings were dedicated to the memory of Fritz Zwicky, one of the first opponents of the universal expansion hypothesis and a lifetime critic of the standard cosmological model.

The Editor

UPCOMING CONFERENCES

INTERNATIONAL CONFERENCE ON SIR ISAAC NEWTON AND PROBLEMS OF THE MECHANICS OF RIGID AND DEFORMABLE BODIES

in honour of Sir Isaac Newton's 350th Anniversary
St. Petersburg, Russia, March 1993

Sponsors

Russian Academy of Sciences, Institute of Research into Radio-Electronic Complexes and Petrovskaja Academy of Sciences and Arts.

Topics

1. Analytical modelling in Astronomy, Physics, Geodynamics and Geophysics
2. Philosophical and historical problems connected with Newton's Heritage

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INTERNATIONAL CONFERENCE ON ALTERNATIVE THEORIES OF PHYSICS

Olympia, Greece, September 23-28, 1993

Sponsors

Commission of European Communities, Istituto Nazionale di Fisica Nucleare, Istituto Italiano per gli studi Filosofici, Università di Bari, City of Olympia.

Topics

- Alternative theories of Cosmology, Quantum Physics, Special Relativity and Geology

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