

# **International Workshop on Redshift Mechanisms in Astrophysics and Cosmology (Clonakilty-Cork, Ireland, May 15-18, 2006)**

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An extraordinary event took place recently in Ireland. A group of independent and professional researchers met to discuss an old heterodox topic with important consequences in astrophysics and, especially, in cosmology: possible causes of the redshifts in the spectra of astrophysical objects other than a Doppler or expanding universe mechanism. Many decades of work have been devoted to this kind of research, most of it forgotten by the greater part of the astrophysical community nowadays. But the question is still open, the debate is still alive, as was shown by the participants in the present Workshop. There is no smoke without fire, and the existence of many facts and theories on alternative origins of redshifts may point to some new pathways in physics that deserve further attention. This was precisely the aim of this meeting.

Observational facts were presented by Tom Van Flandern (Meta Research, Sequim, WA, U.S.A.), Chris Fulton (James Cook University, Australia; in collaboration with Halton Arp, MPIA,

Germany), William M. Napier (University of Cardiff, U. K.) and myself (Martín López-Corredoira, IAC, Tenerife, Spain, in collaboration with Carlos M. Gutiérrez of the same institute).

Tom Van Flandern sketched “A User’s Guide to the Universe” to illustrate the fact that the problems with the Big Bang are numerous and basic, starting right from the ideas that redshift implies expansion or that the microwave radiation is from the “background”. In particular, the supernova data, once thought to provide the best evidence for expansion, now appears to leave no room for expansion after correction for “Malmquist bias” – the tendency to find only the brightest members of any class of objects at the greatest distances. And Eddington already showed in 1923 that the natural “temperature of space” was 3 K because of radiation from distant star-and-galaxy light. There was a lively discussion with further presentations on the evidence for expansion of the universe, in which Bill Napier defended the idea that expansion is evident with the current proofs, while Tom Van Flandern and I adopted a more skeptical attitude.

My presentation (López-Corredoira) was about the statistical correlations of high-redshift QSOs/galaxies and nearby galaxies, and an excess of QSOs along the minor axes of these galaxies. Gravitational lensing would seem insufficient to explain them. Some of these cases may be just fortuitous associations in which background objects are close in the sky to a foreground galaxy, although the statistical mean correlations remain to be explained and some lone objects, which can even show bridges connecting four objects with very different redshifts, have very small probabilities of being a projection of background objects.

Bill Napier talked about the current situation of the Tifft and Karlsson effect. A galactocentric periodicity of 37.5 km/s has been claimed to exist in the redshift distribution of nearby spiral galaxies. This phenomenon was further investigated using both the original

dataset of 97 galaxies, and a further two datasets, namely 42 galaxies with high-precision redshift measures, and  $\sim 102$  galaxies within 500 km/s. The galaxies in the latter set have less precisely measured redshifts but have photometrically measured distances. The periodicity is seen in all the datasets examined. Using the distance information, there is some evidence that the periodicity is not strictly with respect to a fixed galactocentric velocity vector, but is referred to a vector which varies with increasing distance. With respect to the centre of the Galaxy, the Hubble constant is found to be  $61.1 \pm 5.0$  km/s with intercept  $-4.7 \pm 18.2$  km/s, with a remarkably small dispersion. Earlier claims of a 72 km/s periodicity in the redshifts of the Virgo cluster, and of a 0.089 periodicity in  $\log_{10}(1+z)$  for QSOs close to active spiral galaxies, were also reviewed.

With reference to QSO redshift periodicities, Chris Fulton discussed his custom computer program to detect quasar families in the entire 2dF deep survey area. The program uses the positions, redshifts, and magnitudes of all galaxies and quasars, applies various empirically derived constraints to these data, and produces a catalogue of galaxies for which at least four or five quasars pass all applied constraints and are consequently identified as members of a family with real physical associations.

It is normally objected that the observed anomalies are not sufficient to support the existence of non-cosmological/Doppler redshifts because there is no theory that can explain them. Yet this is not true. In the recent workshop, a few hypotheses were presented among the broad range of theories which are available in the literature. These are due to Henrik Broberg, Amitabha Ghosh (Indian Institute of Technology, Kanpur, India), Tom Van Flandern (Meta Research, Sequim, WA, U.S.A.), David Roscoe (Sheffield University, U. K.), Jacques Moret-Bailly (University of Bourgogne, Dijon). In addition, Sisir Roy and collaborators (Malabika Roy and Menas

Kafatos, all of George Mason University) sent a contribution via e-mail since they were unable to attend.

Some theories are based on heterodox ideas about gravitation. Henrik Broberg, for example, pointed out that a comparison between a quantizing scheme inherent in the Schwarzschild metric and observed redshifts from quasars shows that the contracted distances in the gravitational field are quantized in terms of gravitational radii of the gravitating objects responsible for the field, while non-contracted distances are not so quantized. This observation, in Broberg's view, might be as important for modern quantum physics as the Michelson-Morley Experiment was for the introduction of Special Relativity. Quantization, therefore, appears in systems with significant relativistic contraction (gravitational or Lorentz-contraction), such as de Broglie waves or, in the extreme case, photon energy packets at the speed of light. In generalised terms, this would mean that quantum physics has its origin in relativistically contracted fields, while the gravitational field can be scaled to particle dimensions, with a surface energy density constant ( $\Lambda$ ) as the invariant parameter in the process. This might, for example, lead to the possibility of a topological transformation from the gravitational force to the strong nuclear force.

Amitabha Ghosh, meanwhile, proposed a phenomenological model of dynamic gravitational interaction between two objects that depends not only on their masses and the distance between them, but also on the relative velocity and acceleration between the two. These velocity- and acceleration-dependent interactions are termed "inertial induction." The velocity-dependent force leads to a cosmic drag on all objects moving with respect to the mean rest-frame of a universe treated as infinite and quasi-static. This cosmic drag results in the cosmological redshift of light coming from distant galaxies without any universal expansion. This force model leads to the exact

equivalence of gravitational and inertial masses and explains many not well understood observed celestial and astronomical phenomena.

Tom Van Flandern demonstrated how a friction between gravitons and photons might be responsible for the redshift ( $z$ ) because it provides an energy loss mechanism not subject to the usual problem of making distant galaxy images fuzzy, and because it varies with  $(1+z)^{-2}$  which is closer to the observed rate of decrease of surface brightness than any Big Bang model. He also showed that if we adopt premises from deductive logic that need no miracles instead of interpretations arrived at through inductive guesswork from observations, we develop a more plausible way to understand and describe the universe than is available from the miracle-based Big Bang. The “principles of physics” imply properties of dimensions and forces consistent with classical concepts. Perhaps the single, most important difference from current views, notes Van Flandern, is that the universe has no speed limit—consistent with extensive experimental evidence that the propagation speed of gravitational force is many orders of magnitude faster (in forward time) than the speed of light.

Instead of new ideas on gravitation, David Roscoe sought to cast new light on classical electrodynamics. After abstracting from certain well-known symmetries of classical electrodynamics and showing that these symmetries are alone sufficient to recover the classical theory exactly and unadorned, he found that the classical electromagnetic field is then “irreducibly” associated with a massive vector field. This latter field can only be interpreted as a classical representation of a massive photon. That is, it was demonstrated that existing classical theory is “already” compatible with the notion of a massive photon. He was then able to show that, given a certain natural assumption about how we should calculate the trajectories of this

massive photon, the “quantized redshift phenomenology” can be understood in a simple and natural way.

Other new ideas rested not on new physics or new reinterpretations of old theories, but on effects predicted at present with standard physics. Jacques Moret-Bailly said that the Karlsson periodicities observed mainly in the spectra of the quasars could be understood using the CREIL effect (Coherent Raman Effect on Time-Incoherent Light): neutral atomic hydrogen is pumped by Lyman alpha absorption to the 2p state, producing a redshift which renews the intensity at the pumping frequency if the initial intensity is sufficient. An absorbed line almost stops the redshift, so that the Lyman beta and gamma are strongly absorbed; then the redshift restarts. It now appears that a Lyman absorption in cold molecular hydrogen can produce the Tift-Napier periodicity of 72 km/s.

Another possible way—say Sisir Roy et al.—to explain the frequency shift of the spectral lines involves induced correlations in a random, inhomogeneous medium, as discovered by Emil Wolf. The shift mimics the Doppler mechanism even if there is no relative motion between the observer and the source. Sisir Roy and his collaborators have formulated a Dynamical Multiple Scattering (DMS) Theory based on Wolf’s idea to account for the frequency shift in light coming from distant sources, such as quasars. Recent observations of molecular gases around quasars with high redshifts suggest that this medium is suitable to produce DMS.

I feel this workshop was extraordinary in two important respects: in the challenge posed by the topic chosen; and in the relaxed way in which participants could exchange ideas, discuss, debate, and think creatively in an atmosphere of true passion for science. It is reminiscent of the golden era of physics when a few people would meet for hours and hours in friendly discussion of new ideas; something far removed from the typical scientific meetings organized

nowadays in which hundreds of participants have a few minutes each to rush through expositions of boring work, often without any novelty (much less any challenge to accepted ideas), or they are led by few orthodox organizers to secure support for their own credos. Was it a dream, or perhaps an illusion inspired by nostalgia for times when the physics was not as dead as it is now? Certainly too beautiful to be true. It would be a bonus if some of the discussed ideas in the workshop were shown to be correct. This would mean that it is still possible to do first rank physics, rather than the usual second or third class science. Unfortunately, whether these ideas are correct or not, the scientific community is probably not yet ready to change its mind and abandon its dogma of Doppler/expansion redshifts, so we cannot know at present how much truth they contain. We will have to wait for the future, for Nature's answer. We should also bear in mind that Nature does not care about our illusions; the truth is independent of our nostalgias.