

A Critique of Modern Physics

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by

N. V. (Viv) Pope

1. The Need of a ‘New Physics’

This paper is a critique of the present state of Modern Theoretical Physics. There are two allegedly separate physical anomalies which have so far defeated every attempt at explanation in terms of current standard of physics. This is to the extent that a NASA spokesman has said that in order to explain these anomalies, a whole ‘new physics’ might need to be contemplated.

These anomalies are the well-documented ‘Pioneer’ and ‘Missing Mass’ anomalies. The fashionable approach to these anomalies is to contrive explanations for each one, separately, in terms of intellectually elevated theories such as those of ‘cosmological expansion’, ‘dark matter’, deviations from ‘Einsteinian gravity’ and so on. In opposition to that trend this paper seeks the simplest, most straightforward possible explanation of these anomalies in terms of plain commonsense logic, unencumbered by any over-sophisticated physics precepts. This critique goes right back to the very foundation of Modern Physics, the Newtonian theory of ‘gravitation’, according to which orbital motion is an opposition between two purely imaginary *in vacuo* ‘forces’, the one being a body’s obedience to Newton’s First Law of rectilinear or ‘inertial’ motion and the other a ‘gravitational force’ acting in opposition to that alleged tendency towards rectilinearity – the tendency familiarly called ‘centrifugal force’. Since, in orbital motion, these two equal and opposite ‘forces’ exactly cancel, they may be dispensed with altogether, not only as being logically redundant but also – and mainly – as unempirical.

An empirical alternative to Newton’s First Law of Motion, therefore, is simply to state the obvious, namely, the theoretically unembroidered observational fact that all purely force-free or ‘inertial’ motion is naturally curved, or *orbital*. This replaces rectilinear *momentum* with angular momentum, which is here shown to be sufficient in itself to explain the orbital trajectories of all mass particles, from planets and

¹ PIRT is the acronym for the biennial ‘Physical Interpretations of Relativity Theory’ conference held under the auspices of the BPS (British Society for the Philosophy of Science).

satellites to ‘electrons’ and ‘protons’. This obviates any need to postulate the existence of *in vacuo* ‘forces’ or ‘fields’ of any sort, micro- or macro-phenomenal.

The vital difference this makes is that unlike Newtonian ‘gravity’, as a conserved quantity angular momentum automatically includes the *spin* angular momentum of a body in its total account of force-free orbital motion. This offers a simple logical solution of the anomalous trajectories of NASA’s spinning space-probes as well as the allegedly unaccountable ‘missing mass’ of the universe of spinning planets, stars and galaxies. In this paper it is demonstrated that what is ‘missing’ in these traditional accounts is not some esoteric missing mass, but simply *missing spin*.

2. The Prospect of a ‘New Physics’.

Question: Is it likely that the account of the universe given by our contemporary Modern Physics and Cosmology is now completed? Has our scientific history now, eventually, reached its final format, so that all that remains is a relatively trivial matter of finalising the process, a ‘tying-up of loose ends’? If so, then no room can remain for any truly radical thinking, far less of the revolutionary, Copernican kind which changed the whole course of scientific history. In that case, the ancient law against ‘heresy’ should now be mobilised against radical critics of Modern Science in the same way that it was once mobilised against those who opposed the scientific teachings of the Medieval Church. This would make it a modern ‘blasphemy’ even to suggest that this culmination in our history of Physics and Cosmology may be, in truth, no more than a conceptual *cul de sac*.

But how many free-thinking scientifically-minded individuals, nowadays, are prepared to accept this current *status quo* as the ultimate truth of things, as Science’s historical finale, never more to face revolution or undergo any kind of radical revision? For most honest, uncommitted thinkers, especially in the present climate of theoretical mystification, that possibility seems hardly likely.

To speak plainly, Modern Theoretical Physics, with its elevated ideas of the ‘expanding universe’, the ‘Big Bang’, ‘black holes’, ‘dark matter’, the primeval ‘God Particle’ and so on, now appears to have become all but completely isolated from the constraints of commonsense logic. But, it will be said, what’s wrong with that? Is it not the business of Science to offer imaginative theoretical interpretations of nature and the cosmos in general? What’s *wrong* is two things. One is that these theoretical

ideas are now presented, not as *theories* – which they definitely are – but as actual incontestable *fact*. Authoritative statements about these ‘facts’ now appear in student textbooks of Physics and Astronomy, in scientific journals, the media and other organs of popular science, all prefaced by the definite article ‘*The*’, as in ‘*The* Big Bang’, ‘*The* Expanding Universe’, ‘*The* moment of Cosmic Creation’, ‘*The* God Particle’, *etc.*, all of which are based on a common fallacy, anyway. This is to assume that because all receding light-sources exhibit a spectral redshift, seeing a light-source, such as a distant galaxy, redshifted is the same as seeing that galaxy receding, with all that is inferred from that in terms of the ‘expanding universe’ and so on. But this is as false as assuming that because all cricketers are human beings, all human beings are cricketers – what teachers of logic call a ‘howler’. The suppression of this fallacy of galactic recession and the conspicuous omission of the word ‘theory’ clearly identifies that whole collection of theories called ‘Modern Physics’ as a *dogma*. Within the scope of that dogma just about any speculative idea, regardless of how fantastic, is acceptable, indeed welcomed, so long as it supports and embellishes the prevailing dogma – or, at least, so long as it is entertaining in that context and does not seriously threaten or fundamentally disturb that establishment mindset. Most intolerable in this sophistic context, is any suggestion that behind all these theories there is something called natural truth, and even less tolerable is it to suggest that this is what science should be searching for, with the end-aim of reducing all *theories*, if possible, to zero. For some people, this would be like seeking to destroy highly valuable works of art.

Worst of all, if course, is the tendency of some theorists to deify their scientific imaginings. For instance, in an article on the Large Hadron Collider which appeared in the Times Higher Educational Supplement (4th - 10th Sept. 2008), these are the words of a particle accelerator designer:

Contrary to stories in the media, many of these 'discoveries' will take years or may never occurthere is the issue of statistical uncertainty. Although the LHC sends billions of particles flying towards one another, they are so small that the chance of collisions occurring is very slim..... It takes time to understand the mind of God.

– hence, of course, the description of the aim of this experimental search for the Higgs Boson, as a search for the ‘God Particle’

This takes us to the other thing that is wrong with *laissez faire* theorisation, which is that in all this frenzied search for ‘interesting theories’ and or second-guessing the ‘mind of God’, the original commonsense conception of science as a

secular ‘search for truth’ has become all but completely lost. In modern physics and cosmology the ancient Protagorean maxim that ‘there is no such thing as truth but only opinion’ – only *theory*, in science contexts – has been reinvoked, so as not to appear ‘partial’ to any one theory in particular. So, in this sophistic scenario, to claim that science is a ‘search for truth’ is taken as a sign of pure ignorance as to what is the ‘educated’, or ‘professional’ aim of modern physics.

Nevertheless, it remains true, as ever was, that there has to be truth because to deny it and claim this denial as true is a flat contradiction. This is pure commonsense logic. Commonsense also is the view of science as seeking truth, not by building theory upon intellectual theory or presuming divine inspiration, but by the painstaking process of eliminating, by the process of experimentation and logical/linguistic analysis, interpretations of physical phenomena which are either logically contradictory or counter-factual – or, of course, both.

As it is, however, the present claimed release of modern theoretical physics and cosmology from the constraints of commonsense logic and language encourages a lofty compulsion towards more and more *theorising*, not so much about physics as about the *theories* of physics, and even *theories about theories*, each seeking to expand the dogma – or the fashion. rather – in all sorts of new, professionally approved, ‘interesting’ ways. What encourages this, of course, is the public appetite for novelty and the media’s commercial interests in pandering to it. This puts a premium on the selection of the most wacky ideas and the virtual suppression of any more sane and sensible ones.

But, of course, nothing is more boring than a simple logical solution to a captivating mystery. As in politics and advertising, ‘good logic’, it is said, ‘is bad psychology’. In other words, ‘truth is a bore’. In theoretical physics, this encourages the creation of more and more bizarre theories about physical phenomena instead of using plain commonsense logic and language to interpret these phenomena with a maximum of conceptual economy and a minimum intellectual overlay. The following is just one of *many* examples of how much more simple and effective our modern approach to Physics could be without that fashion for intellectualising and with the application of just a little bit of cool, critical – albeit perhaps boring – commonsense logic.

For a start, why have so many generations of physics students failed to see something which, surely, is absolutely plain and obvious? Newton was undoubtedly a

genius – no-one can take that away from him. However, his theories of motion were, quite understandably, based mostly on terrestrial experiments with bodies moving on flat surfaces, such as bench-tops, inclined planes and so on. In this way he conceived the idea of a body with no forces acting upon it as either stationary or moving in a straight line in an ideally Euclidean vacuum called ‘inertial space’. This, of course, was his famous First Law of Motion. Basic to his ideas of mechanics, therefore, was that of mechanical motion as the fundamentally rectilinear product of mass and velocity, called *momentum* (mv). All moving bodies, he declared (quite unempirically), travel uniformly in straight lines under their own momentum, *i.e.*, ‘inertially’, unless acted upon by an external force.

From this assumption it follows, logically, that any body moving in space *other than* uniformly in a straight line, such as, say, a cannon ball in its curved trajectory or a planet orbiting the sun – or an apple falling from a bough and accelerating towards the earth – must have some kind of invisible ‘force’ acting upon it. In this way was created the notion of ‘gravitational force’ as an unseen agency acting in the vacuum, dragging all bodies towards one another instead of allowing them to travel uniformly in ‘straight lines’ in the way Newton’s First Law decreed.

So Newton’s ‘gravitational force’ was never more than an *ad-hoc* artificial add-on to his original theory of motion. However, all he had to do in order truly (*i.e.*, empirically) to represent force-free motion was to include, in his definition of momentum (*i.e.*, the product of mass and rectilinear velocity, mv), the observed *radius* of the body’s orbital trajectory. Thus rectilinear momentum, which is unempirical, or unreal, becomes *angular* momentum, the product of mass, velocity *and* *radius* (mvr). This is automatically orbital and empirically real, as actually observed in the motions of all the bodies of the solar system and beyond. The fictitious ‘straight-line’ momentum and its allegedly opposing *in vacuo* ‘gravitational force’ then disappear like ‘Scotch mist’, revealing the phenomenon of force-free or ‘inertial’ motion in all its observational clarity as plain orbital *angular momentum*.

Now angular momentum is an automatically paired and reciprocally balanced relation between masses. The simplest formula for force-free angular momentum (in space) is therefore that of a *pair* of masses m and M in an automatically balanced (*i.e.*, immediately and instantly correlated) ideally circular angular momentum relation of magnitude L . The standard simple formula for this is as follows. Let M be the central mass, assumed for simplicity to be indefinitely larger than the other mass, m – like the

earth, say, compared to a GPS satellite or the sun compared to the earth. With v being the orbital (tangential) velocity, the formula is then

$$L = mvr = GMm/v \quad (1).$$

In this formula, G is the usual empirical factor conventionally named the ‘Gravitational Constant’. It seems a strange oversight on the part of so many generations of physics students not to have noticed that this formula is *sufficient in itself* to represent simple orbital motion with no need whatsoever of Newton’s hypothetical ‘gravitational force’ – or, indeed, any other *in vacuo* force, call it ‘electric’, ‘magnetic’, ‘nuclear’ or whatever.

But, of course, orbital motion in general, as for example, that of the moon around the earth and the planets around the sun, is not circular but elliptical in the way Kepler described. Nevertheless, this basic formula for simple circular motion sufficiently illustrates the principle that remains at the root of *all* spatial motion, regardless of how complex and convoluted^[2]. Note that in this elementary formula the size (radius) of the orbit is proportional to the magnitude, L , of the angular momentum. This formula for orbital motion is exactly the same as its Newtonian counterpart except for two vital differences. One is that there is no need to postulate any ‘gravitational force’ responsible for the orbit, and the other is that the empirical factor, G , has its standard textbook value only for orbiting bodies which are not spinning. For spinning orbiting bodies, G is a variable, as may be seen in due course.

What are the advantages offered by this change in conception from ‘gravity’ to *angular momentum* as the universal agency of orbital motion? These are as follows. In the ‘Pioneer’ case, the reason why the space-probes veer towards the sun is plain. First, it is because all these probes spin – they have to, in order to maintain the orientation of their antennae with respect to our earth. Second, according to the law of angular momentum conservation, for the total angular momentum of the probe to be conserved, the larger the amount of *spin* angular momentum, the smaller has to be the amount of *orbital* angular momentum; and the smaller the amount of orbital angular momentum, the smaller – by standard mechanics – has to be the orbit radius. So a spinning probe in solar orbit must, predictably, orbit nearer to the sun than if it were

² For the details of these non-circular orbits, see *Light-Speed, Gravitation and Quantum Instantaneity*, by A. D. Osborne and N. V. Pope, (2007). www.poams.org

not spinning, which is precisely what NASA have discovered with the ‘anomalous’ trajectories of their space-probes.

But, of course, angular momentum is also a directional (*i.e.*, vector) quantity. Superimposed on these magnitude differences due to spin, therefore, are additions and subtractions in these amounts of angular momentum allocated to spin and orbit due to the direction of the spin with respect to that of the orbit. So miniscule, however, are these magnitude effects due to spin, compared to the magnitude of the orbital angular momentum of the probe orbiting, say, the earth or the sun, that the vectorial additions and subtractions in these miniscule amounts are even smaller, so small, indeed, as to be, for present purposes, practically negligible. Besides, in the case of the NASA space-probes, the spin directions of the probes are all mostly at right-angles to those of their orbit (the ecliptic) so that the vectors sum practically to zero. In that case, the vectorial effects cannot, in themselves, explain the anomaly^[3]. In this present text, therefore, the vectorial details are ignored so as to concentrate on the magnitude effect of spin alone, which is the same regardless of the directional circumstances.

Now to the ‘Missing Mass Anomaly’. The fact to be noted here is that just about everything in the universe spins, from planets and satellites to spiral galaxies. However, as in the case of the space-probe trajectories, the computations of the accumulated masses of these astronomical objects are based on Newtonian ‘gravity’ theory, which typically neglects the effect of these spins on the orbital trajectories of those masses. This neglect is tantamount to presupposing that in the orbital equation, the so-called ‘gravitational’ factor, G , is a *constant* for all bodies regardless of spin. However, for spinning bodies, such as the spiral galaxies, *etc.*, that factor G has to be a *variable*. For instance, in our above equation (1) we have:

$$L = mvr = GMm/v \quad (1)$$

from which we obtain

$$G = v^2r/M. \quad (2)$$

Now according to the standard kinetic energy formula $K = \frac{1}{2}mv^2$, v^2 is K/m , whence (2) becomes

$$G = 2Kr/Mm \quad (3)$$

³ These vectorial additions and subtractions are as described in Osborne, A. D. and Pope, N. V: *Light Speed, Gravitation and Quantum Instantaneity*, (2007), Chapter 7, p. 133. Subsequent to publication, however, it was discovered by the authors of this book that the *magnitude* effect of spin angular momentum described above had been erroneously omitted, making it seem that the vectorial additions and subtractions were offered as the only ones concerned. This present footnote may be taken as a correction of that 2007 text, hence as fulfilling the true description of the effect of spin angular momentum on the orbital angular momentum of the bodies concerned.

(Note that in these equations all vector additions and subtractions are ignored since, on the statistical scale in question, they average-out practically to zero. In that case, the magnitude effect remains, here, the only effect to be considered,)

So now let the orbital kinetic energy be signified by K_O and the spin kinetic energy by K_S . The formula for G thus becomes:

$$G = 2(K_O + K_S)r/mM. \quad (4)$$

Plainly, with the same values for m and M as previously, in this formula (4) the value of G is greater than G in that previous formula, and the greater the value of G , the more closely the body orbits the centre of mass ^[4].

From this it follows that for the spinning galaxies, the average value of G must be greater than the standard value, so that these galaxies are more densely packed than if they were not spinning. This explains why these galaxies, plus all other spinning objects, appear to have more mass than they should have according to the traditional ‘gravitational’ account. So the simple reason for this ‘extra mass’ is not ‘dark matter’, ‘dark energy’ or whatever, but ‘dark spin’, where ‘dark’ simply means ‘neglected’.

So far as these anomalies are concerned, then, there is no anomaly in nature, to be explained by theories of any tortuously intellectual kind, theories which are often as short on plain logic as they are long on esoteric mathematics. The only anomaly one can discern lies in the failure of Newton’s ‘gravitational’ account of motion to include *spin* in the total angular momentum of an orbiting body. Extending Newton’s ingenious, seventeenth-century formalism to include spin brings him out of the age of falling apples and steam technology into our second-millennium space-age.

Newton famously stated ‘hypotheses *non fingo*’ (I make no assumptions). Little did he know that his biggest and most misleading assumption was that of his imaginative but purely fictitious *in vacuo* ‘gravitational force’, which became the conceptual pattern for other *in vacuo* ‘forces’, such as ‘Coulomb force’, ‘nuclear force’ and so on. In view of what Newton achieved by this means, he might be forgiven for foisting on us that inscrutable ‘force’ metaphysic. But why do we keep

⁴ Be it noted, in passing, that when K_S in equation (4) is made equal to the spin kinetic energy ascribed to the ‘electron’ by Uhlenbeck and Goudsmit (in our case, the esoteric ‘charge’ in coulombs cashed-out in mechanical units of joules), the proportion of spin angular momentum to orbital angular momentum, which is relatively small in the case of astronomical objects, becomes, in the case of the electron, extremely large, so that for the ‘electron’, $G = 1.5141713 \times 10^{29} \text{ N m}^2 \text{ kg}^{-2}$ (See Osborne and Pope, *op. cit.*, Chapter 7, p. 152.). This dispenses with ‘electrostatic force’ in the same way as with ‘gravitation’.

making such a Big Production out of a theory which, for all its fitness of purpose for its time, is now long past its 'sell-by' date? This is no purely academic matter because in pursuit of 'gravitation' and all the mystique it entails in the form of 'gravity-waves', 'gravitons', 'dark matter', and so on, billions of pounds and dollars, overall, are continually being squandered. That mystery of 'what gravity is', how it is transmitted, by what means, at what speed and so on is, no doubt, as intriguing and entertaining nowadays as once were similar puzzles about, say, the power-to-weight ratio of angels in flight or, notoriously, how many of these celestial beings could perch on the head of a pin.. But allowing that some of the most preposterous theories sometimes produce serendipitous results, shouldn't we now, especially in view of a clear commonsense alternative, ask ourselves whether in the interests of true scientific progress and a struggling economy, is all this modern intellectual extravagance really worth it?