The Planet That Never Was?

In November 1995, a sensation was caused when it was announced that a four-day cycle had been detected in the radial velocity of the star 51 Pegasi, which was interpreted as a reflex motion induced by a planet with half the mass of our Solar System's Jupiter orbiting very close to the star.[1] The variations were soon confirmed by others and announcements of Jupiter-mass companions close, or very close, to seven other Sun-like stars quickly followed.[2] To the astronomers it now appeared that our Solar System, with giant planets in decade-long orbits, was exceptional, and that most giant planets lie close to their parent stars, in some cases even closer than Mercury is to the Sun (see Figure 1). Theoreticians promptly offered plausible explanations.[3]

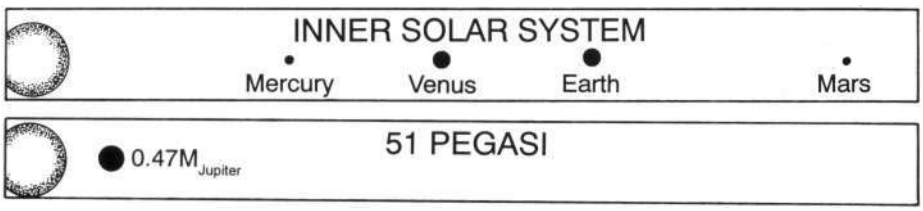

Figure 1. *The star-hugging planet, of almost half Jupiter's mass, inferred from a wobble in the spectrum of star 51 Pegasi, compared with the planets of the inner Solar System.*

51 Pegasi is too far away from Earth, of course, for anyone to see directly any planet that might be orbiting it.[4] Indeed, no planet outside our Solar System has yet been directly observed — it is impossible to take a direct image. What Mayor and Queloz of the Geneva Observatory (Switzerland) had spotted in 1995 were shifts in the positions of spectral lines of radiation coming from the star with a period of 4.23 days. The orbiting planet hypothesis is thus only an interpretation, not a direct observation, in spite of the media attention this 'discovery' attracted.

However, the hopes of the planet-seekers have now been dashed by claims of mistaken identity. Gray, who specialises in studies of stellar spectra at the University of Western Ontario,[5] has sounded the false alarm with a paper showing that the 'planet' is really just a blip in the behaviour of the parent star.[6] From observations made at higher spectral resolution than in any of the 'discovery' programmes, Gray found a four-day variation in the shape of the spectral lines of 51 Pegasi, with enough amplitude to mimic the signature of reflex motion, and so concluded that the planetary companion hypothesis is unnecessary.

'The planetary hypothesis simply can't explain the observations', says Gray. *'It's gone. Period!*

Mayor and his co-workers have of course attempted to respond. At the centre of the dispute are the dark absorption lines in the spectrum of 51 Pegasi — 'valleys' in its spectrum that result as elements like nitrogen, iron and calcium in the star's atmosphere absorb specific wavelengths of light coming from below. The planet searchers had monitored hundreds of these lines for a minute Doppler shift, indicating that the star was wobbling toward and away from the Earth. Because the data showed a perfectly sinusoidal Doppler curve, this was interpreted as due to an orbiting planet tugging it to and fro. However, Gray monitored just one iron line at much higher resolution — 39 measurements over about seven years — and found that it seemed to change its shape and its depth over the same 4.23-day period as the wobble the planet searchers had identified. The wobble due to a planet might shift the wavelength of the line without altering its appearance, but only the star itself could be responsible for changes in line shape.

So what is Gray's explanation? This, he says, is just what would be expected if the star itself were pulsating in and out. *It explains everything'*, says Gray. However, Gray's explanation relies on complex surface oscillations never before seen in a Sun-like star — massive, persistent upheavals of the star's surface roughly analogous to ocean swells. At some level, all stars are variable. In the case of the Sun, large upwelling flows with typical velocities of 1 km per second can be modified by magnetic fields and spots, and differential rotation causes the spots to migrate. The Sun also resonates like a huge bell over a broad range of frequencies around five minutes. Although the net effect of all these variations is only a few metres per second, other stars are known to have more vigorous convective modulation, and some solar-type stars may be prone to longer-period, larger-amplitude pulsations.

A mechanism connected with rotation might explain what Gray has detected, but there is indirect evidence that 51 Pegasi's rotation period is about a month, far too long to cause the four-day variability. Radial oscillations of its surface, on the other hand, would cause brightness fluctuations greater than those seen (51 Pegasi's overall brightness stays constant to within 0.04 per cent). Non-radial oscillations akin to those on the Sun would have too short a period and 51 Pegasi is virtually a twin of our Sun, so there is no obvious way to explain any oscillation with a period of around four days. Still, there has been ample evidence for some time that solar-type stars have a stable, low-amplitude velocity variability, with periods from days to years, which exactly mimics the signature of planetary reflex motion.

Other astronomers think Gray's critique of the 51 Pegasi planet deserves at least a hearing, and that oscillations like the ones he is invoking — if they really occur — could be a confounding factor in other planet searches. *'It raises an alarm bell of sorts'*, says Wolszczan of Pennsylvania State University. '*… it sort of suggests an alternative explanation*', says Cochran of the University of Texas, Austin.

Gray admits that the phenomenon is puzzling.

We don't understand where it comes from', he says. *'But ignorance is no excuse. Nature does what it does whether we understand it or not'.*

Precisely! In spite of the initial media 'hype', the 51 Pegasi planet could be the planet that never was, and several of the other new planets subsequently 'discovered' could likewise be figments of stellar oscillations. Not only should we remember that appearances can be deceiving, but pronouncements about scientific evidences are never final, because science is subject to change.

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A. A. Snelling

Cope's Rule and the Fossil Record

There have been a number of 'laws' concerning evolution and the fossil record, which have been put forward and generally accepted in their time. One of these was Dollo's law, stating that evolution was irreversible.

Creationists would tend to exercise a high index of scepticism towards any law purporting to express a universal tendency in the fossil record, since they do not view it as a progression of vast time sequences, nor a record of biological evolution at all. Thus, it is no surprise to find that it is a long time since Dollo's 'law' was regarded as universally true by palaeontologists.

Cope's Rule (or Cope's Law, as it is sometimes referred to), however, is another matter altogether. Put forward by E. D. Cope in 1871, it states that within any particular lineage, the body size tends to increase with time. I recall being taught it several decades ago, and seeing references to it from time to time in the evolutionist literature. It has been stated authoritatively for more than half a century that it applies to all groupings of organisms — single-celled, multi-celled, invertebrates, vertebrates, marine and terrestrial.[1]

It is regarded as one of the indisputable 'givens' of palaeontology, even among those who dispute evolution. I recall hearing a creationist palaeontologist cite it as factual in the early 1990s. Of course, he would not have not viewed the fossil record as a long-time sequence, but he nevertheless assumed that Cope's Rule was a valid generalisation of the nature of the record. That is, if one viewed the fossil record from bottom to top as a time sequence (though representing rapid sequential deposition during the Flood), then there was a tendency within each grouping of organisms for the body size of the fossils deposited to get bigger in the upper layers, and hence this was something which needed to be explained within a Flood model.

Now it appears that Cope's Rule has failed its first serious test. In a major survey, David Jablonski of the

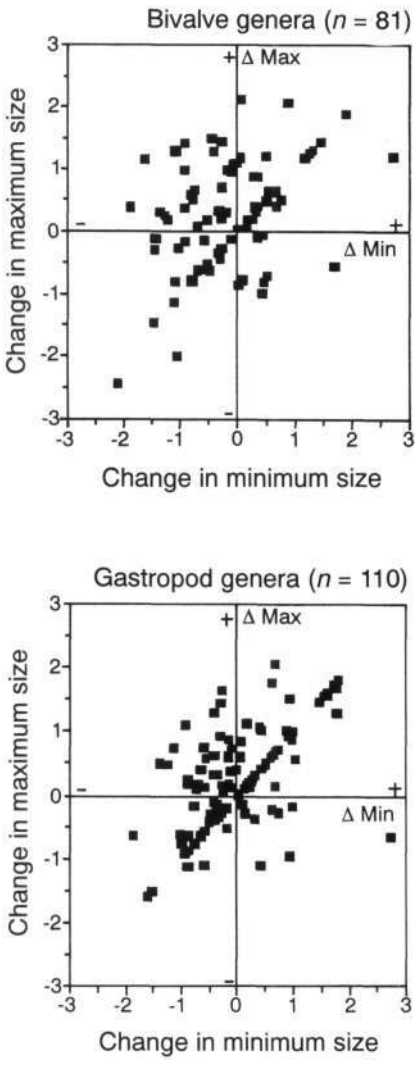

Figure 1. *'Evolutionary' patterns of size change in genera and subgenera of Late Cretaceous bivalves (top) and gastropods (bottom) supposedly over 16 million years. Sizes were log_2-transformed, so that, for example, an increase of unit 1 represents a doubling, and a corresponding decrease a halving, of body size. A max equals change in upper bound of adult size: A min equals change in lower bound of adult size (after Jablonski).*[2]