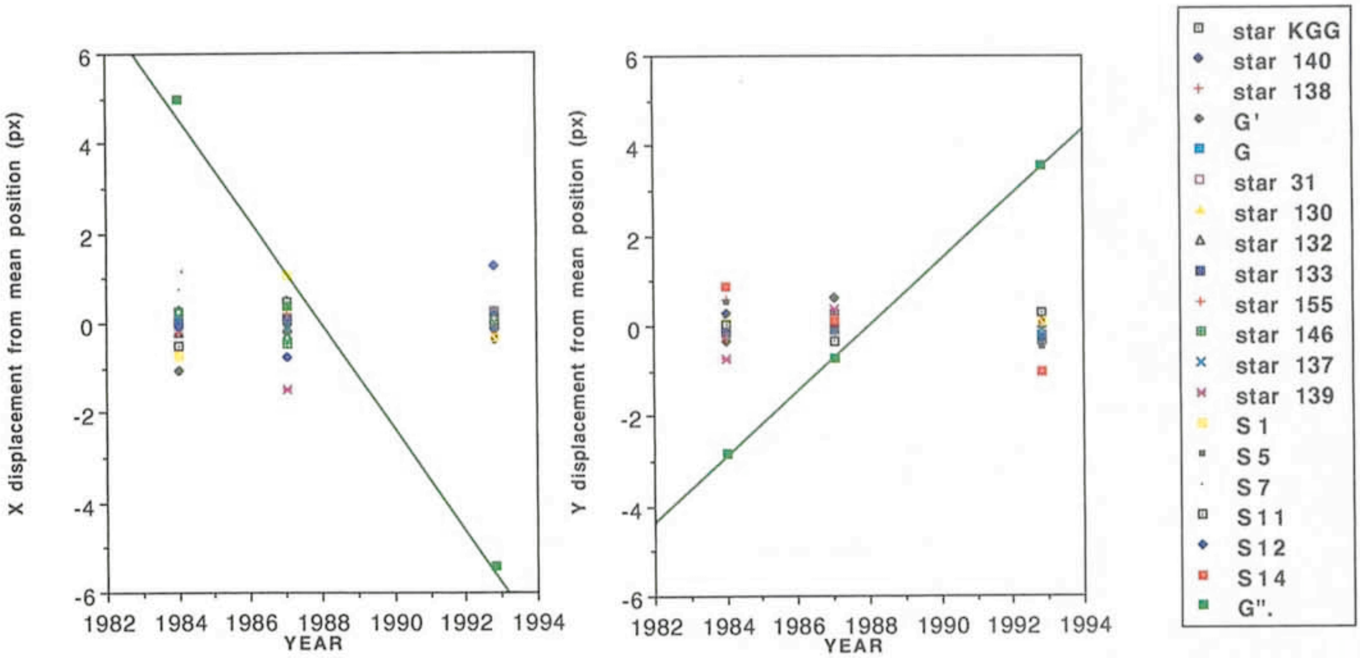

Figure 2: *X and Y displacements (in units of 0.13″ pixels) from the mean position of G″ together with 19 faint comparison objects. These are stars G, G′, 31, 130, 132, 133, 137, 138, 139, 140, 146, and 155 (following the numbering given in Halpern and Tytler, 1988), plus other fainter ones visible in our three data sets. For each object, the positions obtained in the three frames were averaged and the three X and Y deviations from such a mean were computed and plotted in a and b.*
No systematic motion is present for the comparison objects, whose deviations appear to lie well within the centring errors (typically < 1 pixel) in each image.
G″ (■) stands quite apart showing a clear NE displacement. The linear fits to the X and Y displacements of G″ from the mean are also shown.

for Geminga an optical duty cycle similar to that of the Vela pulsar, as has been seen to be the case at higher energies. This yields an M_V ~28 which would place Geminga at ~ 3 pc.

The observed motion of G″ could also have a bearing in explaining some of the difficulties encountered recently with the timing parameters of the object (see IAU Circ 5649). In particular, the second derivative of the period, when computed over a long time history to include both GRO and COS-B data (1991-1975), might be affected not only by period glitches, but also by a different position.

What next? The parallax measurement (e.g. 0.02″ for 100 pc) is then the next challenge awaiting the Geminga aficionados.

Director Discretionary time has been granted for the observation of Geminga with the Planetary Camera on the HST. The observation is planned for December, with the purpose of pinpointing the position of G″ to the best possible accuracy allowed by the current PSF. Repeating such measurements six months apart, something which cannot be easily done from the ground, might conceivably lead to a parallax measurements, thus also bringing to an end the distance problem.

So far, 1992 has been a magic year for the understanding of Geminga and December should bring more crucial data.

According to Trimble (1991), 20 years are not an unreasonable time between the discovery and the understanding of an astrophysical phenomenon. Are we at the end of our quest?

References

Bailes M., Manchester R.N., Kesteven, M.J., Norris R.P., and Reynolds J.E. *Ap.J.* **343**, L53 (1989),

Bertsch et al. *Nature* **357**, 306 (1992).

Bignami, G.F. and Hermsen W., *Ann. Rev. Astr. Ap.* **21**, 67 (1983).

Bignami, G.F., Caraveo, P.A., Lamb, R.C. *Ap. J. Lett.* **272**, L9 (1983).

Bignami, G.F., Caraveo, P.A., Paul, J.A., Salotti, L. and Vigroux, L. *Ap.J.* **319**, 359 (1987).

Bignami, G.F., Caraveo., P.A. Paul J.A. *Astr. Ap.* **202**, L1 (1988).

Bignami, G.F., Caraveo., P.A. *Ap.J. Lett* **325**, L5 (1988).

Bignami, G.F. and Caraveo P.A. *Nature* **357**, 287 (1992).

Caraveo P.A., Bignami, G.F., Mereghetti S., Mombelli M. *Ap.J. Lett* **395**, L103 (1992a).

Caraveo P.A., Bignami, G.F., Mereghetti S. Mombelli M. *The Messenger, No. 68, 30 (1992b).*

Halpern, J.H. and Tytler D. Ap.J., **330**, 201 (1988).

Halpern, J.P. and Holt S.S., *Nature* **357**, 222 (1992).

Lyne A. G., Anderson B., Salter M.J. *M.N.R.A.S.* **201**, 503 (1982).

Middleditch, J., Pennypacker, C.R. and Burns, M.S. *Ap. J.* **315**, 142 (1987).

Monet D.G. et al. *A.J.* **103**, 638 (1992).

Ogelman H., Koch-Miramond, L., Auriere M. *Ap.J.* **342**, L83 (1989).

Pacini, F., *Ap. J. Letters* **163**, L17 (1971).

Pacini, F., and Salvati, M., *Ap.J.* **321**, 447 (1987).

Trimble V. in "Gamma-Ray Bursts" eds. Ho, Epstein and Fenimore, p. 479 (1991).

New Object at the Edge of the Solar System

R. M. WEST and O. HAINAUT, ESO

A new object, which is probably a minor planet, has been found in the outer solar system. Although the available observations do not yet allow an accurate determination of the orbit, it appears that it is situated at the record distance of about 41 AU, i.e. just outside the orbit of Pluto.

Discovery and Follow-up Observations

The new object, which received the provisional designation *1992 QB1*, was

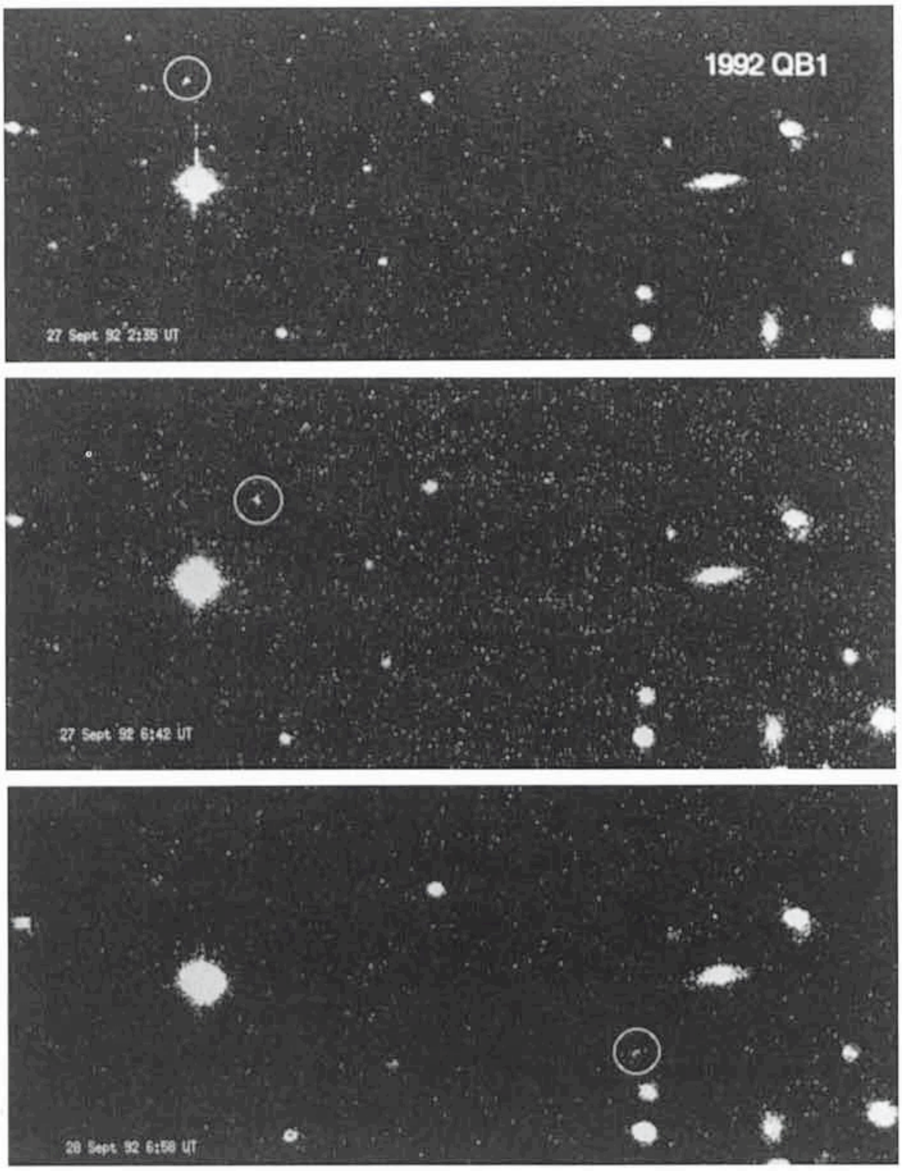

Figure 1: *A composite of three 5-min exposures of 1992 QB1, made on September 27 and 28, 1992, with EMMI at the ESO 3.5-m New Technology Telescope at La Silla by Alain Smette (ESO) and Christian Vanderriest (Observatoire de Meudon, Paris). The faint image of the 23-magnitude objects is indicated by circles. North is up and east is to the left.*

first seen by David Jewitt and Jane Luu, working with the University of Hawaii 2.2-metre telescope at Mauna Kea. They noticed the faint, moving star-like image on August 30, 1992 and again on the two following nights, in the constellation of Pisces. The brightness was about 23 and the colour was reddish.

An excellent extrapolation of the motion by Brian Marsden of the IAU Minor Planet Centre permitted renewed observations of 1992 QB1 after the full-moon period in mid-September. At La Silla, Alain Smette (ESO) and Christian Vanderriest (Observatoire de Meudon, France), obtained three EMMI CCD frames with the 3.5-m New Technology Telescope on September 27 and 28. These frames are shown in Figure 1. The brightness was about the same as at the time of the Hawaii observations, one month earlier.

These images were transmitted via the permanent satellite data link to the ESO Headquarters in Garching, where we measured the accurate positions of the slowly moving planet. With the help of the new positions, including some further ones from Hawaii, Brian Marsden was able to confirm the great distance of 1992 QB1.

Was 1992 QB1 Observed in 1930?

At one moment, it was thought that 1992 QB1 may possibly have been observed already in 1930, on a pair of photographic plates obtained at the Heidelberg Observatory in Germany. Brian Marsden found that it was possible to "connect" the measured position and motion of the once-observed object 1930 DV with those of 1992 QB1 in 1992. In that case the orbit would have been extremely eccentric and the heliocentric distance would have been only about 8 AU in 1930.

Lutz Schmadel of the Astronomisches Rechen-Institut in Heidelberg forwarded these plates to us. They were photographically enhanced in the ESO photographical laboratory in Garching by Hans-Hermann Heyer. Alas, a closer inspection then showed that on one plate, the image of "1930 DV" was pointlike and therefore did not move at all. It did not correspond to any object on the Palomar Atlas, but since there are other similar images in the vicinity, it is probably a plate fault. On the other plate of the pair, the "trail" was too faint to be measurable and could very well be the result of some slight emulsion unevenness. The reality of 1930 DV is therefore very doubtful and it would not be reasonable to try to identify it with 1992 QB1.

The Nature of 1992 QB1

On the assumption that 1992 QB1 moves in a circular orbit around the Sun, Brian Marsden estimates its distance from the Sun to be about 41 Astronomical Units (AU); this would correspond to a period of revolution around the Sun of 262 years. However, it cannot be entirely excluded that 1992 QB1 moves in an eccentric orbit and that the period is therefore significantly different. At this distance, and at this very slow rate of motion, it may take another couple of months, before accurate astrometric observations will be able to tell the difference.

Assuming a reasonable albedo (5 – 10%), the diameter of 1992 QB1 may be estimated at around 200 km. Although it is initially classified as a minor planet (the provisional designation shows that), it cannot at this moment be entirely excluded that the new object is an extremely distant comet that may have undergone an outburst, similar to that of Comet Halley in early 1991. It might even be the first ever observed object belonging to the hypothetical inner comet cloud, known as the Kuiper belt.

Whatever it may be, there is no doubt that 1992 QB1 is an extremely interesting object and that it will be intensively observed with large telescopes during the coming months, at ESO as well as at a few other observatories.

Latest News (December 4, 1992)

1992 QB1 was observed again with the NTT in late November. Pending further observations, it now looks as if small-to-moderate perihel distances can be ruled out but the orbit may still be Uranus-crossing.