

INTERESTING DYNAMICAL ASPECTS OF 1989b, A NEW SHORT-PERIOD COMET, E. F. Helin, Jet Propulsion Laboratory, Pasadena, Ca 91109

Although comets continue to be discovered at an ever increasing rate, Comet 1989b is noteworthy for its unusually low inclination and low eccentricity. There is strong orbital similarity to the Hilda asteroids, although its orbit is more circular and of lower inclination. Of the known short-period comets, there are only two with similar orbital characteristics, P/Oterma and P/Gehrels 3. It also appears that 1989b may well represent a fairly distant short-period comet evolving into an asteroid.

Comet 1989b was discovered by E. F. Helin on films taken by B. Roman, R. Crockett and herself on January 3, 1989 with the 0.46 M Schmidt Telescope at Palomar Observatory in the course of the Palomar Planet-Crossing Asteroid Survey. The new short-period comet, officially designated Comet Helin-Roman-Crockett has been observed for two weeks (1). It will take more time to lengthen the observational arc in order to determine a definitive orbit, but the preliminary orbit can be discussed in a general way. With the comet's large perihelion distance of 3.4 AU, low inclination of 4.3 degrees and its nearly circular orbit ($e = 0.14$), it will be observable almost continuously, with optimum time near opposition when the comet is at maximum brightness.

The dynamics of this comet are indeed provocative with a close approach to Jupiter in 1983 which probably moved it into its current orbit.

	a	e	i	q	Q	Period
*1989b	4.06	0.14	4.3	3.47	4.62	8.2 yr
P/Oterma	4.00	0.14	3.98	3.39	4.54	-8
P/Gehrels	4.08	0.15	1.07	3.42	4.73	8.25

*Preliminary orbit based on relatively short arc.

The similarity between this comet and comets P/Oterma and P/Gehrels 3 is evident. Both of the latter objects have in the relatively recent time since their discovery and even shortly (a few years) before experienced close encounters with Jupiter which significantly, even vastly changed their orbits (2,3). By Oterma's own calculations, P/Oterma's orbital period changed from eight years to nineteen years in 1962(2). However, this specific orbital change has not been confirmed by observation - nor was the comet observed in its previous orbit. It seems that an object in an orbit similar to P/Oterma can be in a chaotic orbit. P/Gehrels made a close encounter with Jupiter in 1972, three years prior to its discovery, which placed it in its present orbit. Since its

discovery, unlike P/Oterma, it has been recovered at each apparition, the last in 1984. Numerical integrations of its orbit show that it has been temporarily captured three times by Jupiter since 1783(2,4).

Could P/Oterma have been perturbed to impact the Galilean satellites or Jupiter itself? Are these three comets related? In any event, here is perhaps a relatively near term opportunity to follow and observe the gross dynamical processes of encounters in the solar system during our time. I leave it to the celestial dynamicists to project when and what will happen. This can almost certainly be directly observed since with some effort this new comet can essentially be continuously monitored by optical telescopes.

References:

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