A NEW EARTH-APPROACHING ASTEROID, 1982XB. E. F. Helin, A. W. Harris, J. W. Young, E. F. Tedesco, L. A. Lebofsky*, D. Tholen*, R. P. Binzel*, and N. D. Hulkower, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109.

On the night of December 13, Eleanor Helin, assisted by Amara Graps and Steve Swanson, obtained a pair of films of the same field on the Palomar 18" (46 cm) Schmidt telescope in the course of a systematic search for near Earth asteroids. Upon examination the next evening, she discovered a trailed image on each film, indicating the presence of an asteroid with the remarkably fast motion of ~ 4 degrees per day and photographic magnitude of 14.5. After extrapolating a position for that night, additional films were promptly taken from which the discovery was confirmed. Before retiring for the "night," she phoned Brian Marsden, of the IAU Central Bureau for Astronomical Telegrams, to report the discovery positions, and also relayed approximate positions to Alan Harris at JPL in order that other observers would have early notice of the discovery. During the day, Harris alerted observers at Lowell Observatory (Edward Bowell, Lowell), Table Mountain (Jim Young, JPL), Steward Observatory (Dave Tholen, University of Arizona), and Mauna Kea (Ed Tedesco, JPL, and Larry Lebofsky, University of Arizona). On the next evening, less than 48 hours after the first film was exposed and exactly 24 hours after the trail was discovered, Helin took an early exposure at 6:27 p.m. which was quickly developed, examined and from the still wet film an approximate position, only 45 minutes old, was relayed to Harris. This position, while inadequate to find the asteroid directly, was used by Young at Table Mountain to obtain a larger scale photograph of the field containing the object. Using the wet plate as a finding chart, Young was able to locate the object in the 24" telescope. Before beginning photometric observations, Young relayed the asteroid's coordinates, as read from the telescope dials, back to Harris. This position, accurate to ~ 2 arcminutes, was relayed to Tholen at the Steward Observatory 90" telescope on Kitt Peak, who was able to locate the object almost immediately near the edge of the 2 arcminute field of view. The more precise dial coordinates from the 90" were then relayed to Lebofsky and Tedesco at the IRTF on Mauna Kea, which has an even smaller field of view, just under one arcminute. Thus by a series of successive improvements, it was possible to produce an ephemeris of sufficient accuracy to locate the asteroid with even the largest telescopes, with small fields of view. By the morning of December 16, the new asteroid, designated 1982XB, became one of the most thoroughly studied asteroids, literally overnight. Tholen measured the spectrum in five colors in the range 0.36 to 0.86 μm, Lebofsky and Tedesco measured the spectrum from near to far IR (1.25 to 20 microns: J, H, K, L, M, N, and Q bands), and Young continued observations in one color to measure the variation with time, or lightcurve. From these physical observations, continued over the next few days, 1982XB was found to be an "S" type asteroid, similar to 1566 Icarus, with a diameter of only 350 meters and an albedo of 0.22. A rotation period of 9.0 hours, with an amplitude of variation of ~ 0.2 magnitudes, was deduced from Young's lightcurve observations. Additional photometric observations by Tholen at Kitt Peak and Richard Binzel at U. of Texas McDonald Observatory (36") confirm this result. Helin's films, after precise measurement by R. Scott Dunbar, JPL, at the Mt. Wilson and Las Campanas

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Observatories headquarters in Pasadena, yielded a good orbit with the following elements: a = 1.868 au, e = 0.4555, i = 3°.94. The current perihelion distance, q = 1.017 au, just outside of the Earth's orbit, places the object in the Amor orbit class. Owing to the effects of planetary perturbations, 1982XB's orbit undoubtedly crosses the Earth's orbit at some times. A preliminary analysis of the orbit by Neal Hulkower revealed that 1982XB is the second easiest (least energetic transfer) target for an asteroid rendezvous mission.

The importance of the above exercise is that, over the years, very few of the near-Earth asteroids discovered by Helin and others have been subjected to the variety of physical observations necessary to deduce the physical characteristics of these unusual objects. This is largely because, due to their rapid motions, precise positions, orbits, and ephemerides must be promptly determined, and although the discovery may become known, observers may not be scheduled at the telescope for realtime followup. One solution to this problem is to maintain an informal network of observers willing to devote time from their regular observing programs when alerted of a new discovery. Over the last year or two, we at JPL and Caltech have endeavored to make such contacts and be ready to alert observers on short notice. The results for 1982XB are the most successful to date and exemplify the value of the effort.

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