other hand, has a perihelion distance of 2.5488 AU; its relatively low density suggests that it is slightly beyond the "Ice Frontier." Of course these values are subject to some variation with time, but not to a significant extent.

At first sight Vesta seems to present something of a problem. Its perihelion distance of 2.1528 AU is only slightly greater than that of Pallas, yet its mean density suggests it is more like Ceres in composition. The small difference in perihelion distance is not likely to be significant. More important is the fact that Vesta has an unusually high albedo (0.21) for a minor planet, compared with a more normal albedo for Pallas (0.08). (Cf. Cruikshank and Morrison, Icarus 20, 477-481 (1973)). Since Vesta is a much better reflector than Pallas it will reflect more solar radiation back into space, and will therefore be cooler. This doubtless would aid in ice retention. (Using a rather standard formula for the temperature of the illuminated hemisphere of planets without significant atmospheres (cf. Motz and Duveen, Essentials of Astronomy, p. 202) Vesta is found to be about 12° Kelvin cooler than Pallas when each is a perihelion. Local albedo variations could, of course, alter this result). This temperature difference may seem small, but it might prove significant in relation to the freezing point of water and the retention of interior ice.

(It will be of interest to see how this rather speculative investigation of minor planet interiors will hold up in the light of subsequent improvements in our knowledge. One important way in which some of the uncertainty can be removed is by occultation observations of these planets by Section members. Such observations are possible with modest equipment, and can lead to very accurate diameter determinations — Editor).

THE ROTATION PERIOD OF 18 MELPOMENE

By: Douglas Welch, Rick Binzel

and Joe Patterson

Abstract: The results of photoelectric observations of minor planet 18 Melpomene are briefly reported. The period of rotation is found to be $11^h\ 50^m$, exactly five-sixths of the formerly reported value.

Minor planet 18 Melpomene came to a favorable opposition in August 197. In an effort to improve knowledge of its rotation characteristics, we made photoelectric observations totalling 14 hours over 4 nights. A rotation period of $14^h\ 12^m$ had been reported for this asteroid in 1962 by T. Gehrels and D. Owings (cf. Astrophysical Journal 135, 906), based on two nights of photoelectric observation in February and March 1958 which involved a separation of a full three weeks.

It is interesting that from spot observations of the asteroid in July and August we had detected a periodicity of 71 hours, and we assumed that this confirmed the old value of $14^h\ 12^m$ until we made the consecutive-night observations (involving 3 full nights) in August.

The telescope used was a 35.6 cm (14-inch) f/11 Schmidt-Cassegrain. The phototube was an uncooled 1P21 working with a conventional DC amplifier, with the numbers read from a microammeter. All observations were done at Camp Uraniborg, a summer camp in astronomy and physics located near Big Bear Lake, California, U.S.A., at an elevation of 2,250 meters (7,400 feet). Observing conditions at Camp Uraniborg are generally excellent with extremely dark night

skies prevailing, and excellent seeing and transparency being the general rule. During the three consecutive full nights of observation the same comparison star was used since it remained within one degree of the planet.

Now that 18 Melpomene has been observed during 2 oppositions photoelectrically, it is possible to determine roughly the direction of the rotation axis. Since the asteroid varied by 0.35 magnitudes in 1958, and by only 0.18 magnitudes in 1974, it is clear that the rotation axis must have a fairly high inclination (if the axis were perpendicular to the ecliptic, the variation would always be the same). The longitude can also be determined to lie near 150°, so that this asteroid reinforces the case for alignment of asteroids' rotation axes (cf. T. Gehrels and D. Owings, Astrophys. J. 135, 906 (1962)).

It is expected that a more detailed discussion of these observations of 18 Melpomene will be published in a major astronomical journal. Discovery of the new rotation period underlines the importance of closely spaced observations.

EDITORS NOTE: Messrs. Welch, Binzel and Patterson are to be commended for their fine work on 18 Melpomene. All are subscribers to MPB, and we are happy that the attention given to observing Melpomene in Dr. Gunter's Tonight's Asteroids and in these pages of MPB prompted their investigation and discovery.

In a letter to the Editor, Joe Patterson, Director of Camp Uraniborg, wrote the following:

"I want to emphasize that this project was conceived and executed entirely by amateurs, and the two observers (Douglas Welch and Rick Binzel) were 15 year old high school students. Although few amateurs have access to photoelectric equipment, construction of a photometer is a feasible project for many clubs... A photometer transforms any telescope into a powerful research instrument, and a tremendous wealth of observing opportunities opens up. When you have run out of asteroids, you can always start in on the stars..."

For intending photoelectric observers Mr. Patterson recommends Photoelectric Astronomy for Amateurs by Frank B. Wood, and Manual of Photoelectric Photometry published by the American Association of Variable Star Observers, Cambridge, Massachusetts, U.S.A. in 1967.

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SECTION NEWS

1974 MA (OBJECT KOWAL). Many Section members responded to the appeal made in July for observations of planet 1974 MA (known preliminarily as "Object Kowal"). This fast-moving minor planet with an Earth-crossing orbit has its perihelion near the orbit of Mercury, and therefore is of special interest. Unfortunately the appeal came at a time when many of our observers were away on vacation. For example, Prof. Pilcher of Illinois College was climbing in the Rocky Mountains; Mark McConnell was away in Florida. Ed Tedesco reported from New Mexico that an extended period of bad weather hindered his efforts completely; much the same problem was encountered in July in the Washington D.C. area according to June LoGuirato. Alain Porter in Narragansett, Rhode Island thought that he had found 1974 MA one night, but a check of the area later showed that he had found "Object Porter" instead, which, according to Dr. Brian G. Marsden was an unidentified asteroid with a more normal orbit. "Object Porter" was not seen again unfortunately. Other observing attempts were made by some of Joe Patterson's crew at Camp Uraniborg with negative