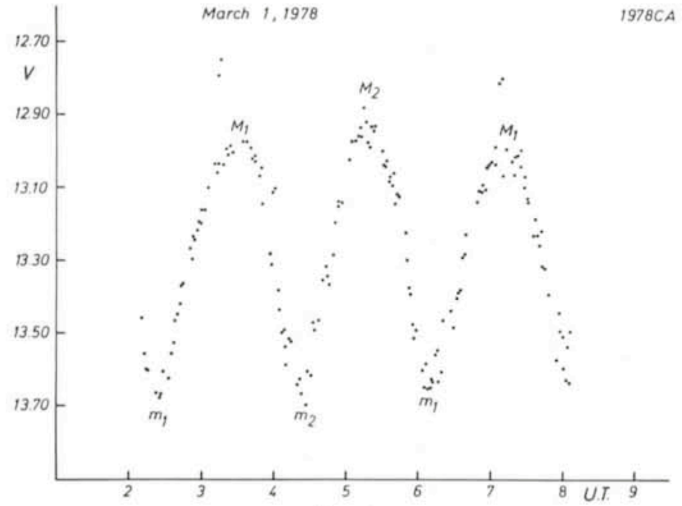

Fig. 1.

day, a complete, periodic light curve could be recorded within 3 hours and 45 minutes. Figure 1 shows these photometric observations in the equivalent Johnson V filter. Such a smooth light curve, nearly symmetric, and with large variations ($\Delta V \simeq 0.8$ mag) is easily interpreted as due to the scatter of sunlight by a spinning, elongated object (rock, ...) around a fixed axis in space (see below!). Roughly, the light minima (m_1, m_2) reflect the two smallest projected areas of the tumbling asteroid, while the light maxima (M_1, M_2) correspond to the two largest areas as seen by a terrestrial observer. The extremely short period of rotation, $P \simeq 3^h 45^m$, places 1978 CA as the third fastest rotator among all known solar objects. "How short are the nights and days!" would have exclaimed Saint-Exupéry's "Le Petit Prince".

The colour indexes of 1978 CA appear redder than one would expect from a Sun-like star, $(B-V) \simeq 0.90$ and $(U-B) \simeq 0.48$. The reader will notice the three humps located at around 3.2^h, 4^h and 7^h U.T. in the light curve of 1978 CA. These are associated with the frequent encounters of field stars very close to the trajectory of 1978 CA. As a matter of fact, one encounter even turned out to be a real occultation!

Observations performed on March 2, 1978 resulted in the light curve of 1978 DA (see Figure 2). Because some time was lost when identifying this fast-moving asteroid and because 1978 DA turns around its axis much slower than 1978 CA, we were not able to monitor the light changes

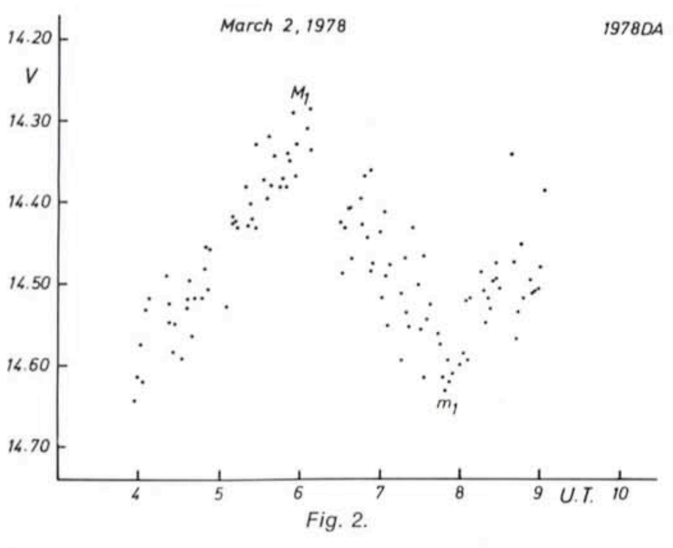

Fig. 2.

during one full cycle of rotation. The colour indexes were found to be B-V = 0.83 and U-B = 0.41.

Asteroid Models

Finally, we shall present below a rapid view on a model which allows an explanation of the light curve of 1978 CA. Simulating the rotation of an asteroid by a three-axis ellipsoidal model and describing the scattering properties of a small surface element by an adequate relation (Hapke-Irvine's), Figure 3 presents several light curves computed at different positions of an asteroid along a hypothetical trajectory. The ellipsoid was turned around its shortest axis and, for the given example, the adopted axis ratio a:b:c was taken to be 5:3:1. Furthermore, all light changes shown in Figure 3 neglect the distance effects (the geocentric Δ and heliocentric r distances were taken as 1 A.U.

Generally, the shape of a light curve will depend not only on the adopted geometrical form of the asteroid, the reflection law of sunlight, etc., but also on the configuration of the observations. For instance, the light curve labelled No. 1 in Figure 3 is that reflected by the spinning ellipsoid as it is viewed pole-on rather than when the pole axis is appreciably inclined to the line of sight (light curves Nos. 9, 10 and 11).

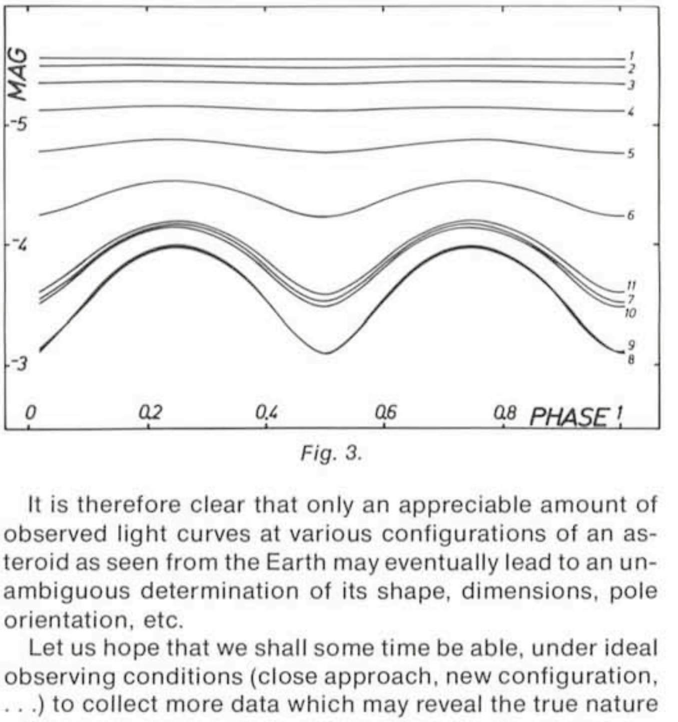

Fig. 3.

It is therefore clear that only an appreciable amount of observed light curves at various configurations of an asteroid as seen from the Earth may eventually lead to an unambiguous determination of its shape, dimensions, pole orientation, etc.

Let us hope that we shall some time be able, under ideal observing conditions (close approach, new configuration, ...) to collect more data which may reveal the true nature of these very unusual asteroids!

List of Preprints Published at ESO Scientific Group

January – April 1978

19. G. CONTOPOULOS: Higher order resonances in dynamical systems. January 1978. Submitted to: *Celestial Mechanics.*
20. A. C. DANKS, J. W. HARTSUIKER: uvbyR Surface photometry of the 30 Doradus region II. February 1978. Submitted to: *Astronomy and Astrophysics, Suppl. Series.*
21. J. BREYSACHER, B. E. WESTERLUND: Wolf-Rayet stars in the Small Magellanic Cloud. March 1978. Submitted to: *Astronomy and Astrophysics.*
22. I. J. DANZIGER, P. G. MURDIN, D. H. CLARK, S. D'ODORICO: Spectra of supernova remnants in M33. March 1978. Submitted to: *Monthly Notices of the Royal Astronomical Society.*