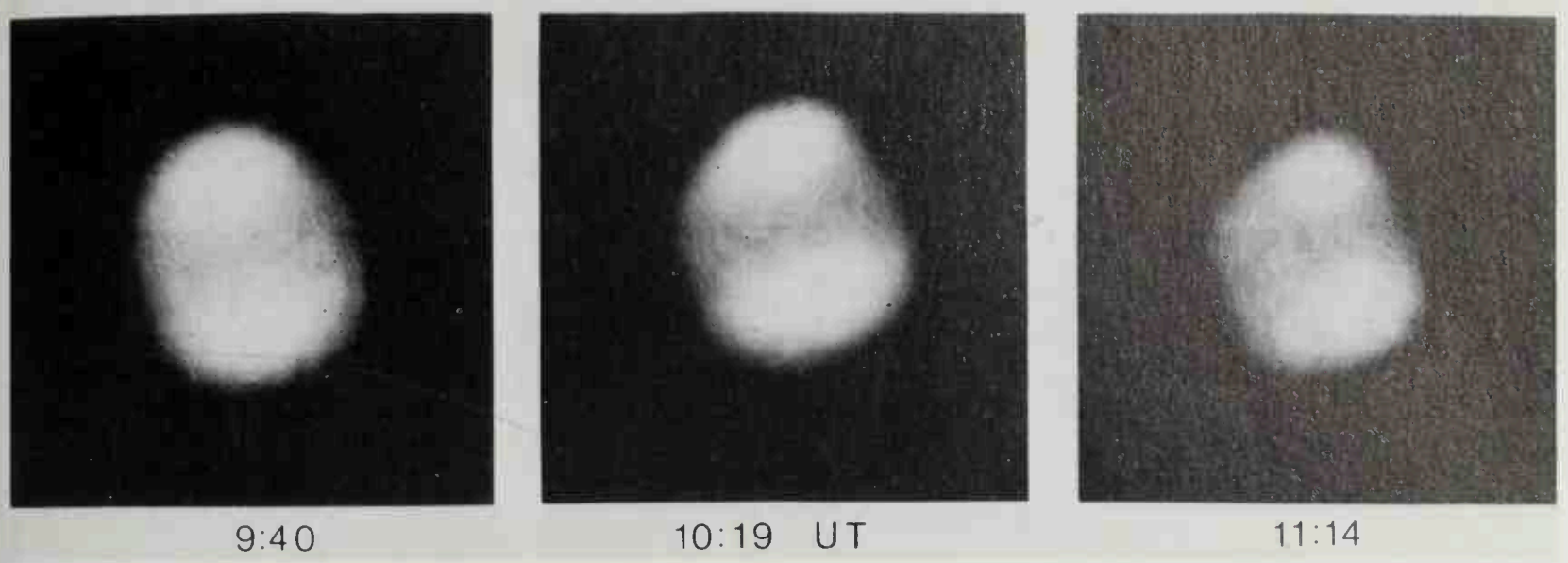

Very few details can ever be detected on Neptune, but these methane-band photographs, taken with CCD equipment (see page 235), do appear to show slight changes in the high cloud cover.

stability of such narrow, low-mass rings. Measurements show that the particles are very dark, having an albedo of less than 5 per cent, so that they are presumably neither formed of ice, nor ice-covered (unlike Saturn's ring particles). Similar measurements have established that the larger satellites of Uranus, although probably composed mainly of icy materials, are also fairly dark, and may thus have been covered in low-albedo material.

The discovery of rings around Jupiter and Uranus as well as Saturn has intensified the search for comparable features around Neptune. As yet there is only rather tenuous evidence that a ring could exist rather close to the planet (between 28 500 and 32 500 km from the planet's centre). However, experiments have produced evidence that Neptune may have a third satellite, perhaps 180 km across and orbiting about 50 000 km from the planet. Confirmation is likely to be difficult as the expected brightness is only around magnitude 20, which is too faint for direct detection so close to the planet. Unlike Saturn's rings which are thousands of kilometres wide, the width of the four inner rings probably does not exceed 10 km. The outer ring may be rather wider, or possibly even be double, and may not lie in the same place as the others. Later results suggest that there may be as many as nine rings around the planet.

Neptune's large satellite Triton also poses some problems. Its highly inclined retrograde orbit is very hard to explain if it is assumed to have formed at the same period as the planet. It would be expected to have a fairly eccentric elliptical, rather than perfectly circular orbit, if it had been captured later. It has been suggested that Pluto could be an escaped satellite of Neptune and that this could have affected Triton's orbit, but this is now considered to be unlikely, especially since the discovery that Pluto has a large satellite. There are conflicting reports about the existence of a methane atmosphere on Triton, although as it is certainly comparable in size with Pluto it seems possible that such an atmosphere could exist. Its confirmation, or evidence for its non-existence, will have to await further research.

Table 5·17 **Uranus – Neptune – Earth comparative data**

	Uranus	Neptune	Earth
equatorial diameter (km)	50 800	48 600	12 756
sidereal period of axial rotation	16_h?	$18_h 12_m \pm 24_m$	$23_h\ 56_m\ 04_s$
inclination to orbit	97° 53′	28° 48′	23° 27′
density (kg per m^3)	1 270	1 700	5 517
mass (Earth = 1)	14·6	17·2	1·0000
surface gravity (Earth = 1)	1·11	1·21	1·0000
escape velocity (km per s)	22·5	23·9	11·2
albedo	0·93	0·84	0·36
mean distance from Sun	19·181843 au	30·057984 au	

Table 5·18 **Satellites of Uranus and Neptune**

number	name	distance (km)	sidereal period (d)	inclination	eccentricity	diameter (km)	magnitude
Uranus							
V	Miranda	130 400	1·41349	0·0°	0·00	300	16·5
I	Ariel	191 700	2·520384	0·0°	0·0028	800	14·4
II	Umbriel	267 100	4·144183	0·0°	0·0035	600	15·3
III	Titania	438 300	8·705876	0·0°	0·0024	1 100	14·0
IV	Oberon	586 200	13·463262	0·0°	0·0007	1 000	14·2
Neptune							
I	Triton	355 200	5·876844	159·9°	0·000	3 700	13·5
II	Nereid	5 562 000	359·881	27·7°	0·7493	300	18·7