Pole Stars of Other Planets

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ABSTRACT

The north celestial pole of the Earth and the other planets is discussed. Right ascension and declination information on the location of the poles on the celestial sphere is summarized. The name of the brightest visible star near each pole is given and the special case of Uranus is discussed.

While Earth moves slowly in its orbit around the sun, it spins on an axis pointing constantly almost exactly to the star at the end of the Little Dipper called Polaris, or the North Star. As viewed from the rotating Earth, all of the stars except Polaris move across the sky, making trails on time exposure photographs.

If we were to move about in the solar system we would see the same sky patterns because the distances traveled would be really very small in comparison with the distances between the stars; but if we should travel to another planet, an interesting question would be, "What is the pole star of this planet, or is there a star on or near its celestial pole?" Table I summarizes the coordinates of the poles of the planets (Sturms, 1971).

In fact it is safe to say that the pole and the pole star, if the particular planet has a bright pole star, for all the planets should be somewhere on the star patterns not very far from the ecliptic pole or fairly close to the precessional path of Earth's spin axis; for all except Uranus. We will return to this interesting point later. Figure 1 shows the circle along which the celestial pole of Earth will move and also has points numbered to show the approximate location of the celestial poles of the other planets except Uranus. It will be noted that the pole of Saturn is nearer to Polaris than the pole of any other planet.

If we could move to Venus or Jupiter, the point directly above the equivalent pole (2 and 5) would be near the ecliptic pole (Fig. 1) because their orbits lie close to the ecliptic plane defined by the Earth's orbit and their spin axes are very nearly perpendicular to their respective orbits. Point 2 in Figure 1 for the planet Venus is actually the south celestial pole of the planet because of its retrograde rotation.

The planet Mars is tilted so that its north pole (4) points to a part of the sky not far from the bright star Deneb, the head of the Northern Cross, the tail of Cygnus the Swan. Cepheus is on one side of the Martian celestial pole and Cygnus is on the other. Indications are that, because of precession, the polar axis will point even more closely to the bright star Deneb in a few hundred years.

If we Earth people could wait around for a long time (about 10,000 years) the bright star Vega in Lyra would be near our North Pole, producing a beautiful north star for Earth inhabitants. Cygnus and Aquila and Hercules and the Head of Draco would then move as circumpolar objects around Vega.

All the polar axes of the planets point to the same general region of the sky, except the polar axis of Uranus. This planet "lies down" and spins with its axis very close to the plane of its orbit. In fact, the north pole of Uranus points to the head of Orion so that the stars of Orion, Taurus, Auriga, Gemini and Canis Minor would be prominent circumpolar objects (Fig. 2).
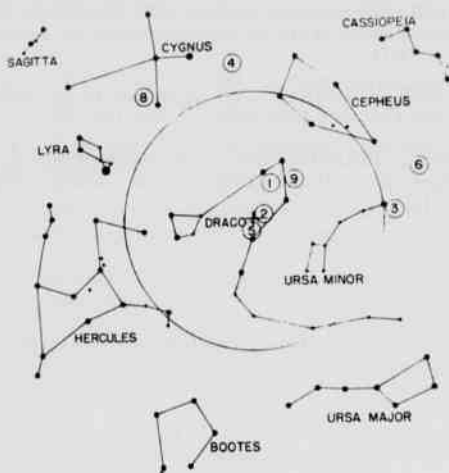

Figure 1. Numbers identify approximate locations of celestial poles of planets. Ecliptic pole is identified by + near the center of illustration.
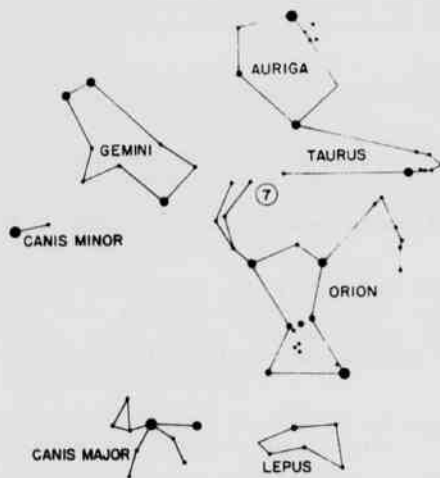

Figure 2. North circumpolar region for planet Uranus. Number identifies approximate location of celestial pole of Uranus.

LITERATURE CITED

STURMS, FRANCIS M. JR. 1971. Polynomial expressions for planetary equators and orbit elements with respect to the mean 1950.0 coordinate system. NASA Tech. Rept. 32-1508, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, January 15.

Table I. North Celestial Poles of the Planets (see Sturms, 1971)

1. MERCURY 18.7 hrs 61.4°.
   About 3° from the 4th magnitude star omicron-Draconis, in the direction of Polaris.
2. VENUS 18.5 hrs 69.0°.
   Near phi-Draconis. Actually the south celestial pole as Venus rotates retrograde.
3. EARTH
   Pole now within 1° of Polaris and will be at its nearest point, slightly less than ½°, about the year 2100.
4. MARS 21.2 hrs 53°.
   Will be near Deneb in the future.
5. JUPITER 17.9 hrs 64.6°.
   Near the ecliptic pole, a few degrees from zeta-Draconis. South celestial pole of Venus is also near the ecliptic pole as both Jupiter and Venus spin with their axes nearly perpendicular to their obital planes.
6. SATURN 2.6 hrs 83.3°.
7. URANUS 5.1 hrs 14.9°.
   Axis "lies down," nearly in the orbital plane; points to region of Orion's head just south of the ecliptic.
8. NEPTUNE 19.7 hrs 41.5°.
   Within about 3° of 2nd magnitude star delta-Cygni.
9. PLUTO 19 hrs 63.9°.
   Within a few degrees of delta-Draconis.
10. SUN 19.07 hrs 63.8°.

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