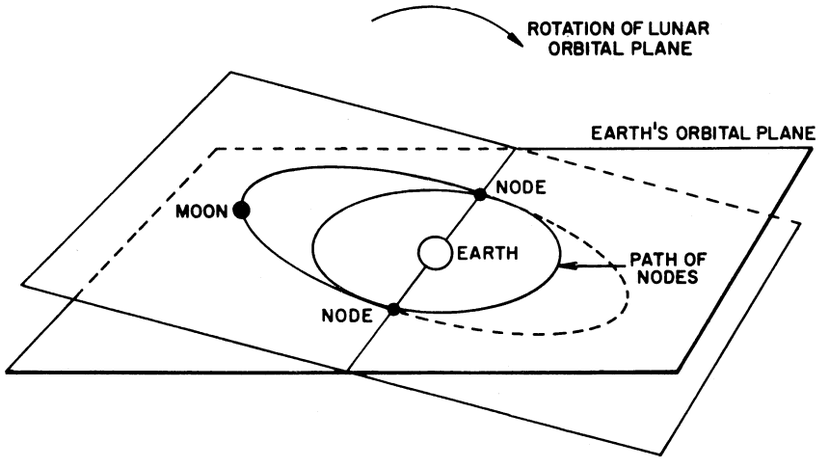

IBM

MOON'S ORBIT RECALCULATED—The diagram shows the path of the moon's orbit around the earth and points where the moon intersects the plane of the earth's orbit, the nodes. Astronomers have found that the motion of the moon's nodes is a sensitive indicator of the forces acting on the moon. Lunar theories can be tested by comparing the theoretically calculated motion of the nodes with the observed motion.

ASTRONOMY

Moon's Orbit Computed

A new calculation of the moon's orbit corrects the astronomical time standard by three-tenths of a second and indicates heavy material exists near the lunar surface—By Ann Ewing

➤ THE MOST PRECISE calculations ever made of the moon's orbit have now been completed using a giant computer.

They result in the correction of a fluctuating error of three-tenths of a second in the astronomical time standard every three years. The computations also result in making more mysterious an already deep puzzle—does the moon really have a very heavy outer shell, growing lighter toward the center?

Such a distribution of dense and light material would be the reverse of the earth, which has a very heavy core, with material becoming lighter in layers toward the surface. Many scientists believe that an outer heavy shell is a very unlikely structure for the moon and would like to find some other explanation for the extremely slight wobbles in the lunar orbit.

These wobbles amount to only a very minute fraction of one percent of the moon's total motion.

The new precise orbit for the moon was calculated by Dr. W. J. Eckert, director of the International Business Machines Corporation's Watson Laboratory at Columbia University, and H. F. Smith Jr., a graduate student at Columbia.

The computation provides a hundred-fold increase in accuracy in what astronomers call the "main problem" of lunar theory. The main problem describes the motion of the moon resulting from gravitational forces among the earth, sun and moon, neglecting the effect of the planets, the shape of the earth and moon, and the effects of relativity. These factors are added later as small corrections to the main problem.

The differences between the newly calculated and observed lunar motion can be explained on the basis of present knowledge by assuming that the moon has a very heavy outer shell.

Dr. Eckert said it is time to reexamine other factors that have been considered well established but have not been computed to the accuracy of the main problem. These include the motions and masses of the other planets, the shape of the earth and moon, and some aspects of libration.

Although the existence of high-density material near the lunar surface seems implausible, it is not entirely out of the question. According to some theories of lunar cosmology, it could be explained from accumulation of heavy meteoric material. Observations of the lunar libration indicate that the moon is rigid, unlike the earth, so that such heavy material might remain near the surface.

Controversy over the distribution of mass in the moon is not new, but in the past no definite conclusions could be drawn because other factors in the computation were not known precisely.

In 1908 Dr. E. W. Brown whose lunar computations have been the standard for more than 40 years, assumed that the distribution of weight within the moon was similar to that of the earth.

• Science News Letter, 87:261 April 24, 1965

ASTRONOMY

Youngest Sky Object Yet Found by Radio Waves

➤ THE YOUNGEST natural object in the sky ever discovered has been spotted from the radio waves it broadcasts into space.

A Russian astronomer, Dr. F. Shklovsky of the Sternberg State Astronomical Institute in Moscow, suggests 100 years as the age for a source of radio waves known only as 1934 minus 63. These figures pinpoint its position in the southern sky.

The next youngest object broadcasting radio waves is called Cassiopea-A, the strongest known source of radio waves from the heavens. It is about 300 years old and is named after the constellation in which it was found.

The strength of the radio waves the newly discovered youthful object broadcasts is decreasing, which gives earth-bound astronomers a good chance to check on its size and age by making "precision observations," Dr. Shklovsky reported in Nature, 206:176, 1965.

Its age is dated from the time a cloud of radiating particles, traveling at almost the speed of light, was thrown into space by a violent stellar explosion.

Even if the 100-year age is not exact, Dr. Shklovsky concluded that the "1934 minus 63" source is "very young" and its output of radio waves is decreasing very rapidly.

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ASTRONOMY

Pluto Larger Than Previously Estimated

➤ THE PLANET PLUTO may be much larger than has been thought.

Measurements of changes in the sunlight reflected from Pluto have shown the planet's light increases for about four days, then drops in about two days.

The simplest explanation for such a wavering light curve is that Pluto is brightest at its center and darkest toward its edges. This would mean Pluto is larger than heretofore believed, by an amount still to be determined.

However, the finding does remove a puzzle that had plagued astronomers about Pluto—how to reconcile its supposedly small size, about 3,600 miles in diameter, with the very dense core needed to account for the effects it had on Uranus and Neptune, leading to its discovery in 1930.

The light measurements were made by Dr. Robert H. Hardie, now visiting the Dominion Observatory in Ottawa, while at Vanderbilt University's Dyer Observatory, Nashville, using the 24-inch telescope there.

The new, larger size weakens the theory that Pluto is an escaped satellite of Neptune. It could be that Pluto may be considerably bigger than the earth, instead of much smaller.

Dr. Hardie also determined the apparent time, as seen from the earth, that Pluto takes to rotate once. It is 6 days, 9 hours, 16 minutes and 54 seconds, with a possible error of plus or minus a minute.

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