

## ASTRONOMY

# Small Fry of the Solar System

Not just nine, but thousands of planets are known to circle our sun. Most of them are tiny bits of matter, ranging from several hundred miles across down to a city block.

By MARTHA G. MORROW

► THERE ARE thousands of known planets circling our sun. Yet it is still quite right to say the chief planets are Mercury, Venus, our own earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto, arranged in that order outward from the sun. The other planets are little bits of matter, ranging from several hundred miles across down to a city block.

These small fry of the solar system, more than 1,500 of which have had their paths calculated, circle the sun in between the orbits of Mars and the giant planet Jupiter. Almost every month another minor planet or two is discovered.

The earth has never been known to collide with one of these mountains hurling through space, but it has come pretty close to some, astronomically speaking. In October of 1937, for instance, a baby planet discovered by Dr. Karl Reinmuth of Heidelberg, Germany, came within some 485,000 miles of the earth. This is believed the narrowest escape the earth has had within the period of astronomical observations. But the chances of a real collision with an asteroid are slight, astronomers assure us.

This minor planet, named Hermes, and only about a mile across, during its trips around the sun may some day come closer to the earth than the moon ever does. With a very elongated orbit, it swings within 220,000 miles of the orbit of the earth, whereas the moon is always at least 222,000 miles away. One of these days when the earth is nearby as this flying mountain makes its nearest approach, Hermes may conceivably come between the earth and the moon.

## Dumbbell Shaped

Eros, another baby planet was found in 1931 to be dumbbell-shaped. It varies noticeably in brightness as first the broad side, then the narrow end is turned toward the earth. Swinging within Mars' orbit as it gets near the sun, Eros can come within 16,000,000 miles of the earth. Its orbit is comparatively regular so that it can be followed in its trip away from the sun and a very accurate idea of its motion has been derived.

This little world has proved a particularly useful astronomical yardstick, helping astronomers by triangulation to determine the distance to the sun and major planets with great accuracy. Two decades ago,

during a close approach, Eros was used by Sir Harold Spencer Jones, Astronomer Royal and director of England's Royal Observatory, to determine the earth's average distance from the sun as 93,005,000 miles. Observations of Eros made from all parts of the world were employed in this study.

Last year Dr. Eugene Rabe of the Cincinnati Observatory announced the most accurate calculation to date of the mass of the planets Mars, Venus, Mercury and earth-moon. These values were made possible through use of a new, more accurate path for the asteroid Eros, which Dr. Rabe obtained by analyzing observations of the minor planet over a 20-year period. Noting how these planets pulled little Eros out of its calculated orbit, it was possible to tell, more accurately than ever before, just how massive each of these planets is.

## New Yardstick

Last year another minor planet was discovered which may replace Eros as a yardstick for solar distances. At its closest approach to the earth, it is only one-third as far away as Eros when it comes nearest our planet. Discovered at the University of California by C. A. Wirtanen, 1950 DA stayed in sight long enough for its path to be accurately computed by Dr. Leland E. Cunningham. Believed to be only about a half-mile across, this baby planet swings about the sun in an elongated orbit every two years or so.

Although the large majority of the minor planets travel in relatively circular orbits, and stay pretty much between the orbits of Mars and Jupiter, others go far afield. One daring asteroid, Hidalgo, follows a comet-like orbit of 14 years which sends it almost out to the multi-ringed planet Saturn.

The little world that gets closest to the sun is Icarus, discovered only two years ago. Both this and Hidalgo were found by Dr. Walter Baade, formerly of the Hamburg Observatory in Germany, and now on the staff of the Palomar and Mt. Wilson Observatories. Traveling in an elongated, football-shaped path of only 409 days, Icarus moves within the orbit of the sun's nearest major planet, Mercury, and comes within 17,000,000 miles of the sun. Then it swings out beyond the orbit of Mars, reaching a distance of 180,000,000 miles from the sun.

Several hundred asteroids discovered since the turn of the century have already

gotten lost. Some have not been spotted within the past decade. Others were never seen often enough for an accurate orbit to be calculated for them. So astronomers have banded together to appoint guardians for these stray sheep of the heavens. Japanese, German and Italian as well as American observatories have adopted these orphan planets.

Chairman of the search for minor planets, both old and new, is Dr. Paul Herget, director of the Cincinnati Observatory. The Observatory itself has become the international clearing house and publishing center for information about them.

When a new planet is discovered, with a few observations it is possible to compute its position in the near future. If observed for two to three months, its position when again near the earth can be calculated pretty accurately. But these tiny planets are easily pulled out of their path by large planets, particularly giant Jupiter. So they must continually be kept track of as they move across the heavens so they won't get lost or be mistaken for a new planet when spotted again.

At the Cincinnati Observatory the paths of 80 of these "lost planets" have been calculated so as to include the effect of Jupiter since the time they were discovered with the hope they may now be reobserved.

Using punch card machines, the pull of the planet Jupiter on these tiny worlds was computed for a total of 10,000 separate dates. The resulting predictions of where the minor planets will probably be found now have been sent by Dr. Herget to astronomers not only here in the United States, but in Japan, Spain, Germany, Africa and France, in the hopes that some will be rediscovered. Most successful in this search so far is the Goethe Link Observatory of Indiana University, where about 20 of the more seriously lost planets have been located.

## First Was Ceres

The first minor planet was discovered only 150 years ago. At the end of the 18th century after the discovery of Uranus, whose location fitted nicely into the rule of planet distances worked out by J. E. Bode, astronomers began to suspect that an undiscovered planet revolved in the space between Mars and Jupiter. On the first of January, 1801, the Sicilian astronomer G. Piazzi, looking for a certain star, noticed a pin-point of light moving across the heavens. This, the first known asteroid, he named Ceres.

Shortly after finding Ceres, the astronomer became ill and before he recovered or news of his discovery reached others, the earth had moved too far in its orbit



**BABY PLANET OVER MANHATTAN**—This artist's sketch shows how the tiny planet *Hermes* would probably look should the baby planet be pulled out of its orbit and crash into the earth at New York, although astronomers assure that there is little chance of this happening.

for the tiny planet to be spotted. There was danger that the little planet would be lost forever among the multitude of stars, but the German mathematician C. F. Gauss, then only 24, developed a method of determining a planet's path from only three observations and predicted Ceres' apparent position. Here it was rediscovered almost a year later.

The size of Ceres, less than 500 miles across, was most disappointing as astronomers had expected a much larger planet. Puzzling also was the discovery of Pallas, only about 300 miles across, the next year. Then in 1804 Juno, 118 miles in diameter, was found. Vesta, 248 miles across and the only asteroid visible to the naked eye, was spotted in 1807. By 1890 more than 300 were known.

Photography greatly simplified the job of searching for minor planets for, like comets, they leave a trail across the plate. Within the present century over 3,000 have been found, and around 400 have been discovered in a single year. But many asteroids are seen so fleetingly that only one in five has its path computed with enough

accuracy to warrant an estimation of its future location.

There are thousands, probably tens of thousands, and possibly hundreds of thousands of tiny planets still to be discovered with such telescopes as science has now placed at our disposal. But large ones a hundred miles or so across have probably all been found.

There are about 1,500 minor planets 25 miles or so across yet to be discovered, estimates C. H. Schuette of Munich, Germany. All these would be of 13th and 14th magnitude, and thus a good telescope would be needed to pick them up. Asteroids of the 15th and 16th magnitude yet to be seen number in the tens of thousands, Mr. Schuette calculates. All of these will probably never be found even though many much fainter will be picked up accidentally throughout the years.

Five to ten baby planets the size of Ceres were formed between the orbits of Mars and Jupiter about the time our earth was born, according to Dr. Gerard P. Kuiper of Yerkes Observatory of the University of Chicago. Several small planets

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were created instead of a single big one because of the disturbing pull exerted by the near-by giant planet Jupiter, which likewise was being formed from the cosmic cloud about that time.

Sometime within the past three billion years two of these minor planets bumped into each other, Dr. Kuiper reasons. Numerous tiny planets were thus created. Collisions between these baby planets became increasingly frequent until thousands of asteroids, flying mountains known to exist in this region today, had formed.

The nearest any of us will ever come to a minor planet is a meteorite, fragment broken off one of the baby planets. These cosmic bits flash through our atmosphere as fireballs, almost as bright as the sun and easily seen in the daylight. Thousands of these souvenirs of small neighboring planets have been found here on earth, and some actually have been seen to fall.

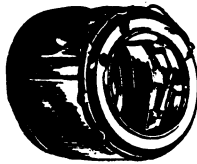
Science News Letter, June 9, 1951

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*Raisins* are good food for turkeys, California experts claim.

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## MEDICINE

# Polio Progress Report

Research in fight against infantile paralysis includes studies of vaccines, diet and ACTH, bacteriologists' meeting told.

► ADVANCES IN the fight against infantile paralysis range from studies of diets and vaccines to cockroaches and one of the famous anti-arthritis remedies, ACTH.

Here is the box score, as reported at the meeting of the Society of American Bacteriologists in Chicago.

1. Vaccination against either whooping cough or diphtheria or the combined vaccination now generally used does definitely lower the resistance to polio.

Laboratory evidence for this, from 19 experiments involving over 450 mice, was presented by Drs. Albert Milzer, Molly A. Weiss and Katherine Vanderboom of Michael Reese Hospital and Research Foundation, Chicago. This is expected to strengthen advice doctors have been giving to postpone whooping cough and diphtheria vaccinations until after the polio season each year.

2. Cockroaches are more likely to be spreaders of polio than flies. Laboratory evidence that they can "acquire, maintain and excrete" two strains of human poliomyelitis virus and one strain of Coxsackie virus was presented by Drs. Robert G. Fischer and Jerome T. Syverton of the Universities of North Dakota and Minnesota.

"The most probable explanation" of the way these viruses spread naturally, in the opinion of these two scientists, is from intestinal wastes to food or drink, as typhoid fever is spread. This suggests flies as spreaders of the disease but, the scientists point out, in many parts of the world cockroaches are more constantly and intimately associated with man's intestinal wastes and food than flies. Moreover, the long life, gregariousness and nocturnal habits of cockroaches give them opportunities flies do not have for acquiring viruses from excreta and transferring them to food.

3. Depriving mice of the protein building block, tryptophan, by feeding them a closely related chemical increases their resistance to polio, Drs. A. F. Rasmussen, Jr., P. F. Clark, Sam C. Smith and C. A. Elvehjem of the University of Wisconsin reported. While humans are not likely to get a tryptophan-deficient diet, the mouse studies seem to give a clue to the polio virus' nourishment requirements which may lead to a polio-fighting medicine. A similar clue comes from the Wisconsin group's finding that mice with underactive thyroid glands were less resistant to polio than normal mice.

4. ACTH, the pituitary gland hormone

which stimulates the adrenal glands to produce cortisone, failed to increase resistance to polio in monkeys and in fact made the animals more susceptible to the disease, Drs. J. D. Ainslie, T. Francis, Jr., and G. C. Brown of the University of Michigan reported. Their study was an attempt to learn more about the relation between the polio virus and the animal or human it invades. The possibility of glands playing a role in this relationship appears from their studies and those of the Wisconsin group with underactive thyroid mice.

5. Hope for an anti-polio vaccine seems to get some encouragement from studies reported by Drs. Hilary Koprowski, Thomas W. Norton and George A. Jervis of the New York State Department of Mental Hygiene at Letchworth Village, Thiells, N. Y., and the Lederle Laboratory, Pearl River, N. Y. These scientists adapted a monkey strain of polio to Swiss albino mice by injecting it into a mouse brain, recovering it from the first mouse, injecting it into a second, and so on for seven transfers, or passages. The same strain was also adapted to cotton rats.

When this rodent-adapted strain was used to vaccinate monkeys, it showed a very low degree of virulence for the animals and markedly increased their resistance to the original, unadapted strain of polio virus.

Science News Letter, June 9, 1951

## TECHNOLOGY

### Housewives Will Be Able To Cook on Glass Soon

► HOUSEWIVES WILL be cooking on glass in the future as the result of the development of a new infrared stove lamp that can be fitted into the standard space on electric stoves.

Very tough and heat-shock resistant glass of high silica content is used in the 1250 watt infrared lamp. Lead can be melted easily on the flat upper surface of the lamp and an ice cube can be vaporized quickly without danger of breaking the unit.

A red glass plate above the actual lamp with its gold reflector gives visual warning the instant the lamp is turned on.

Corning glass is used by Sylvania Electric Products which has just begun supplying this new lamp to range manufacturers.

Science News Letter, June 9, 1951