

An illustration to show how asteroid movement can be spotted

FOR the first time ever, Indian scientists working from an Indian observatory have spotted four new asteroids in our solar system. Project Kalki of the Indian Institute of Astrophysics (IIA) at Bangalore, launched in first quarter of 1987, detected about 30 asteroids last year. Four of these have turned out to be new.

These astrophysicists hope that they will discover a new tenth planet beyond Pluto in the course of their observations! The existence of a tenth planet has been speculated upon for decades now. It has been noticed that the magnetic field of the earth gets reversed once in 27 to 33 million years. Researchers have noticed that the mass extinction of species like the dinosaur show the same periodicity.

A Dutch astronomer said that there was a reservoir of comets at a distance of 50,000 astronomical units (the distance from the earth to the sun is one astronomical unit) that are gravitationally linked to the earth. An unknown tenth planet disturbing the inner region of comets could cause some of those planets to rush towards the sun. The collision of the earth with some of them could produce cataclysmic repercussions, may be change the earth's magnetic field. This could result in fissures in the earth's crust, continental drift, sea floor spreading, lava flow and the rising of debris that would cover the atmosphere, prevent the entry of the sun rays, and affect photosynthesis. In other words, life in this world, as we know it, would come to an end.

The project team would like to call this tenth planet Kalki, if they happen to discover it. This is because the incarnations of Lord Vishnu suggest the steps of evolution of life on our planet. The next (and tenth) incarnation of the Lord is to be Kalki. This planet would appear so small from earth that any change in its position will be only about one-fifth of a millimetre on photographic plates exposed on consecutive days. Although it would be brighter than the 18th magnitude, Kalki would still be a very faint star-like object.

ASTRONOMERS and astrophysicists all over the world are becoming increasingly interested in asteroids, especially those that are relatively close to the earth. There are several reasons for this. The most important one is the realisation that near-earth asteroids could be potentially dangerous to us. An object that was a few centimetres wide hit a part of Siberia in 1908. Fortunately, it hit the surface of the earth at a point that was absolutely

# Hunters in the skies

by M. D. Riti

uninhabited. This tiny object decimated trees for hundreds of kilometres all around and the noise of its collision was heard across vast distances. Its smoke and debris rose for about 20 km in the atmosphere.

Astrophysicists point out that if an asteroid a few kilometres in width hits the earth, the impact would be catastrophic. Consequently, the search for near-earth asteroids has become more important. The idea is that if a potentially harmful asteroid is discovered, the super powers could perhaps get together and blast it or change its path, to avoid a collision.

The possible role of asteroids in evolution of life on this planet is another reason for interest in asteroids. Their physical and chemical conditions could well be clues to the history of the solar system.

The last time new asteroids were spotted from Indian soil was more than a century ago. Government astronomer N. R. Pogson sighted five asteroids from Madras between 1861 and 1891. The five new minor planets he discovered are 67 Asia, 80 Sappho, 87 Sylvia, 107 Camilla and 245 Vera. Pogson was, of course, an Englishman.

The new project to spot asteroids and comets makes use of the 45 cm Schmidt telescope at the Vainu Bappu observatory at the IIA at Kavalur. Professor Tom Gehrels of the University of Arizona, who partially conceptualised the observation scheme, estimated that this project would turn up one or two new asteroids approaching earth, possibly two Mars crossers and one comet per annum.

ACCORDING to IIA Director Dr. J. C. Bhattacharya who started this project, 30 asteroids were sighted between March and June 1987, during a trial run of the project. Observations came to a temporary halt after that because of the monsoons. The months between December and May are considered the best for such observation in South India, so the hunt for new asteroids and

the mysterious tenth planet are on again now.

The project is headed by Dr. R. Rajamohan, with K. Kuppaswamy, V. Moorthy and Aravind Paranjpye making up the rest of the team. The business of asteroid detection is laborious and painstaking. A photographic plate is exposed for about 40 minutes at night. Each exposure covers about nine square degrees of sky. The observers get about six or eight plates per night. Observation is only undertaken on moonless nights. Five nights immediately preceding and succeeding the full moon are avoided. Actual observation begins either before the moon rises or after it sets.

The task of comparing photographic plates to detect changes is by far the most tedious. According to Dr. Rajamohan, it takes an experienced person about four hours to "blink" a pair of plates — that is, compare them using the blink apparatus. Astronomers of the Bangalore Amateur Astronomy Association are also participating in this study. Association President Dr. P. N. Shankar of the National Aeronautical Laboratory, has become an acknowledged expert in blinking plates.

The angular speed of asteroids is more than that of stars. The relative speed of their motion is what makes it possible for observers to spot them. Plates exposed on a particular day are compared with those exposed the previous day. Any changes in the location of objects is noticed and followed up thereafter. The co-ordinates of any object that has moved are measured. Its orbit is determined.

There are about 3,600 known asteroids. The process of determining whether an asteroid is new or has already been sighted by someone else is like this: as soon as an observer or observatory spots an asteroid, a message is sent to the Centre for Minor Planets of the International Astronomical Union (IAU). Whoever first informs the IAU about a possible new asteroid gets credit for having discovered it.

THIS is where competition creeps in. An astronomer who spots a new asteroid will not get credit for having sighted it first unless he or she also manages to be the first person to report the sighting. Skills like

speed in calculating co-ordinates and blinking plates become important, as also the dedication of the people involved in such a project. Quick data analysis is the key factor.

Two asteroids that the IAU agrees are probably new were sighted from Kavalur on March 22, 23 and 24 last year. "When a new minor planet is discovered, it is assigned a provisional designation, which is used until the object has been re-observed... enough... to allow its orbital elements to be determined," writes Christopher Spratt, a keen amateur astronomer who works as a gardener at the University of Victoria. "Temporary designations for new asteroids are based on a division of the year into 24 parts. Each half month is assigned a capital letter, I and Z not being used."

The first two possibly new asteroids sighted from Kavalur were assigned the temporary designations 1987 FY 1 and 1987 FZ 1. Two more spotted on April 20 and 21 last have been designated 1987 HQ 2 and 1987 HR 2. Astrophysicists and astronomers will now have to study and establish the orbit of these asteroids. Once that is done, the Minor Planet Centre will assign unique numbers to these asteroids. The small hitch here is that of the 3,600 already known asteroids, about 1,000 do not have specific orbits. The question that has to be answered is whether these four asteroids are actually any of those 1,000.

Once the asteroids have been numbered, the privilege of naming them is given to the discoverer. "The name of a place or a famous scientist or artist of the country from which it was seen is usually chosen," says Dr. Rajamohan. "We normally avoid the names of politicians and war heroes!" There are three asteroids named after Indians so far. Professor Gehrels named two asteroids that he discovered after the almost legendary space scientist Dr. Vikram Sarabhai and his danseuse wife Mrinalini. Richard West of Chile called an asteroid Vainu Bappu.

Just where do observers start looking for asteroids in the limitless expanse of space? "Most of the planets are on the same plane," says Dr. Rajamohan. "More than 99 per cent of the asteroids are within an inclination of 20 degrees of that plane." Project Kalki expects to cover about 4,000 square degrees of sky per year with pairs of plates. They work 20 nights in a month. Possible future uses of asteroids could be mining them to extract metals and minerals, and landing on them to get samples that could be analysed on earth. Perhaps this will be possible in the next century through projects like Kalki.