The Christmas comet begins yielding data

The comet Kohoutek is coming, and as it approaches, human watchers are becoming better and better acquainted with it. Kohoutek has been called the comet of the century, and astronomers around the world are readying themselves for its arrival. The National Aeronautics and Space Administration has assembled an armada of instruments on earth, aircraft, rockets, satellites and Skylab to study its passing (SN: 7/14/73, p. 25).

Comet Kohoutek should be visible to the naked eye by about the third week of November, but it has already passed well beyond the smudge stage:

- On Sept. 29, Elizabeth Roemer of the University of Arizona confirmed the presence of a tail comprised of a "substantial" amount of dust.
- On Oct. 8, the first infrared radiations were detected from the comet by Frank Low, also of Arizona, a sign that Kohoutek was already feeling the warmth of the sun more than 180 million miles away.
- On Oct. 15, the substance of the comet began to respond to spectrographic analysis, as Tobias Owen of the State University of New York at Stony Brook made the first identification of one of its components, a carbon-nitrogen molecule called cyanogen.
- Sweeping sunward millions of miles per day, the former smudge has been coming within range of smaller and smaller telescopes, until Stephen P. Maran, head of NASA's Operation Kohoutek, reports that it has recently been seen through a pair of mere seven-power binoculars.

Although Kohoutek has long been in orbit around the sun, Maran believes that this may be its first really close passage. Millions of years ago, he says, its orbit was a huge one whose closest passage to the sun was outside the orbit of Jupiter and whose most distant point was "a significant fraction of the distance to the nearest stars." Then, about two million years ago, the gravitational field of a passing star nudged the comet so that its orbit reached within the orbit of Mercury and out to four or five trillion miles from the sun. It would have taken Kohoutek some four million years to complete a single circuit of its new orbit, but, says Maran, it never made it. On its first sunward journey along the new path, the gravitational fields of the outer planets disturbed the comet again, reshaping its orbit into its present form, which will bring it to about 13 million miles from the sun (Mercury never gets closer than 28 million miles). It is expected to return in about 75,000 years.

Astronomers are not yet certain just how big Kohoutek is, although Roemer has estimated that its head may be about 25 miles across. This would make it a large comet indeed, although it may still be too small and fast-moving a target for the three radio telescopes (Goldstone, Haystack and Arecibo) with which researchers are hoping to study Kohoutek by radar reflection.

Kohoutek may just swing around the sun and back out again, but a number of strange other things may happen, and the astronomers, with their long advance warning, hope to have anticipated them. The comet may, for example, simply disappear. There is less than a chance in a hundred of this happening, says Maran, but the nearness of the sun will expose the comet to temperatures of more than 1,000 degrees C., which just might be enough to melt its frozen head and dissipate the resulting dust and gases into space.

Another unlikely, but not unknown, possibility is that heating and stress could cause the head to split into two parts. Among the hundreds of comets that have been observed, there are 13 such cases known. Or, the comet's dust tail may split in two. It could even develop an "anti-tail," a much smaller, spike-like streamer pointing at the sun. (A comet's main tail points away from the sun all the time, whether the comet is moving toward or away from the sun.) There is also an extremely remote chance that on Dec. 3, when the earth is closest to the comet's orbit (but not to the comet itself—that will not happen until about six weeks later), there could be a meteor shower, as debris left in the orbit from previous passages hits the earth's atmosphere. But if astronomers are correct that Kohoutek has never come around on its present path before, the shower would be quite a surprise. □

'Intelligent' signals probably from satellite

A network of radio receivers set up in the Soviet Union to look, among other things, for possible signals from intelligent beings elsewhere in the universe recorded a series of radio bursts last week that led to speculation that they might be from such beings. The signals were first received by Samuel Kaplan of Gorky University and later picked up on the rest of the net.

The true explanation is probably much more prosaic. In the first place the signals were not received in the United States. If they came from a distant world, they should have been. Second the power received was extremely high for a distant source. Thus the feeling is that they probably came from somewhere near the earth. Specifically a satellite is thought to be the culprit, though both the Soviet and the American military are said to have denied it was one of theirs. Nevertheless any connection with extraterrestrial intelligences seems remote.

Electromagnetic waves from a nonmoving charge

According to classical physics, electromagnetic waves are produced whenever an electrically charged body undergoes an acceleration. Although this idea has to be given up when one considers microscopic systems like atoms, where accelerated electrons do not radiate classically, it appears to work universally on the macroscopic level.

Now an exception to the rule is proposed by a group of physicists at the University of Utah, D. M. Chitre, Richard H. Price and Vernon D. Sandberg. It is a theoretical instance in which a charge that is not even moving, let alone accelerated, can be responsible for the emission of electromagnetic waves. It arises, they say in the Oct. 15 PHYSICAL REVIEW LETTERS, from the theory of general relativity and a consideration of how gravitational and electromagnetic fields affect each other when there are gravitational perturbations, that is, moving massive bodies, in the neighborhood of an electric charge.

The particular case that the Utah physicists calculate is a nonmoving charged body with noncharged bodies rotating around it. This configuration is what would arise in the case of an electrically charged black hole with other bodies rotating around it. (It is not specified here how a black hole can come to be electrically charged, but it is a possibility that some astrophysicists' minds have begun to play with.) The Utah group finds that electromagnetic waves will be emitted in such a case, that the radiation will appear qualitatively similar to synchrotron radiation and that it will be emitted at frequencies much higher than the orbital frequencies of the moving bodies. It also should be confined to small angles from the orbital plane.

It is well known that electromagnetic radiation cannot escape from black holes, and Chitre stresses that this is not escaping radiation. It is rather radiation generated by the distortions of the electric field around the black hole produced by the gravitational fields of the moving bodies. Nevertheless it could manifest the presence of a charged black hole. □