THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

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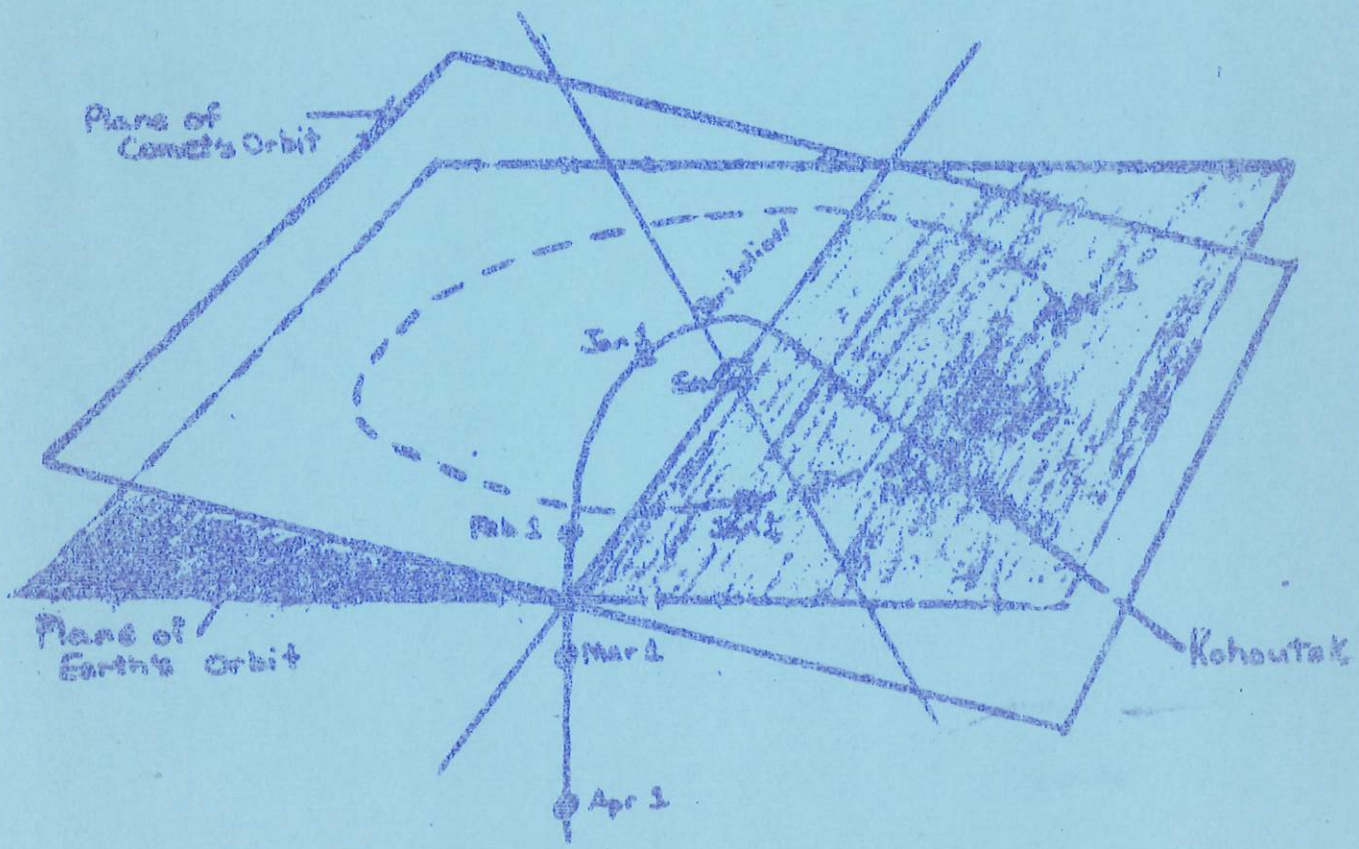
# NewsLetter




## COMET KOHOUTEK

# COMET KOHOUTEK 1973f
# Disappointment of the Century

Blaire Beatty

You have probably seen an article entitled "Sky Spectacular of the Century". This unfortunately it wasn't. To astronomers who tried to view Kohoutek through telescopes--it faded in brightness, but to radio telescope astronomers it was a paradise of information. It gave an insight into the birth of our solar system. It gave scientists and astronomers a chance to really find out what our solar system and maybe the universe was made from.

As you may know, comets are usually to bring the downfall of an empire, a fall of a political figure, drastic floods or disasters. When this comet was discovered it was predicted that it would bring floods and even one predicted that it would crash into the U.S.A. and destroy it. It did not crash into the U.S.A. but it may have caused Edward Heath, former Prime Minister of England, to lose the election. Also there were terrible snowfalls across Canada which may cause the consequent floods.

The Comet Kohoutek was the sixth comet discovered in 1973, and was first noticed on a film plate by Dr. L. Kohoutek on March 7th, 1973, at Hamburg Observatory, Hamburg.

The comet had been sighted 480 million miles from the earth and barely within the orbit of Jupiter. (Halley's comet had not been found on its last approach until it was some 180 million miles closer to the earth--even though astronomers knew where to look for it.) Never before had a comet been detected at such a great distance. The comet is unique in that it was discovered four times as far from the sun as any other comet. This may indicate that Kohoutek is quite larger than Halley's comet or any other comet recorded. Its orbit around our star indicated that it was going to pass close to the sun at a perihelion of approximately 13 million miles and would be quite a bright comet. Astronomer Elizabeth Roemer, of the University of Arizona, estimated Kohoutek's nucleus is about 25 miles in diameter, far larger than most comets. Other astronomers calculated Kohoutek's weight at about one trillion tons. Perhaps most important of all, astronomers describe it as a "dirty" comet, one with an outer layer of dust that has probably never been st stripped off by solar heating. That will give scientists a chance to study the structure of a material that has never been heated, and thus is largely unchanged from its premordial state. That layer however may have prevented the comet from becoming as bright as predicted.

Because Kohoutek was spotted much earlier than most comets, astronomers had an exceptionally long lead line to prepare for a thorough examination. They were taking full advantage of this opportunity. In addition to the conventional telescopes of every size and variety following the comet, NASA's big radio telescope in the Mojave Desert was aimed at Kohoutek in attempt to bounce

radar signals off the comet's nucleus (these echoes may tell astronomers more about the size and character of the nucleus.) M.I.T.'s Haystack Radio Observatory tried a similar experiment in reverse: to study radio waves from a far-off radio source (possibly a quasar) after they pass through the comet's tail, in hopes of finding the spectral "signatures" of water or ammonia. If they succeed, the M.I.T.astronomers will have gone a long way toward Whipples' theory of an icy-snowball.

Much work was conducted under the aegis of NASA's operation Kohoutek, directed by astronomer Stephen P. Maran. Involving hundreds of scientists and millions of dollars in hardware, the observations are largely from above the atmosphere(which will block ou the ultraviolet and infra-red frequencies) useful in gathering data about the comet's composition and structure. At least five sounding rockets and two balloons were to be launched to view Kohoutek. Other information will be gathered by Copernicus, NASA's orbiting astronomical observatory, and OSO-7 (Orbiting solar observatory). The Venus-Mercury bound Mariner 10 may be used to high resolution TV pictures of the comet while either Pioneer 6 or 8 now orbiting the sun, try to determine the density of the comet's tail by probing it with radio signals.

The comet had been watched by the astronauts of Skylab 3. The astronauts observed the comet by means of many kinds of optical telescopes and spectrometers to spectrograph the tail and head. Skylab has an array of optical instruments to study the comet, as well as a number of still and movie cameras.

Observations of the comet at radio wavelenths show that it contains the "exotic" molecules of methyl cyanide ($CH_3CN$) and hydrogen cyanide (HCN). Since molecules of this kind form in interstellar clouds, their presence supports the hypothesis that comets originate in such an environment.*

One of the theories to explain why the comet did not live up to itself is that it did not vapourize as it was supposed to. Another, that I have mentioned earlier, is that it was a "dirty" comet, one with an outer layer of dust that has not probably ever been stripped off by solar heating, which then did not permit dust particles to excape. Maybe next time it comes around it will live up to itself!

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Guide to Kohoutek's Orbit as drawn on the cover os this issue: The orbit of comet Kohoutek(arrowed line) is shown with respect to the orbit of the earth (borken circle). Kohoutek's orbit is an extremely elongated ellipse whereas the earth's orbit is nearly a perfect circle. The plane of the comet's orbit (unshaded) is inclined at an angle of only 14° to the plane of the earth's orbit (shaded). At perihelion comet Kohoutek was some 13 million miles from the sun. Dates along the two orbits indicate the position of the comet and the earth with respect to each other at various times.*

* Taken from Scientific American

# PRESIDENT'S MESSAGE

In the February issue of the Journal you will find some information and a form regarding the General Assembly that is to be held in Winnipeg this year. If you wish to go to Winnipeg, don't forget to fill out page L3 in the Journal and sent it to the University of Manitoba (the address is on the same page) as soon as possible. If you want to participate in any kind of exhibit at the Assembly please come forward with your ideas.

Also in the green pages of this issue is an article on a bookelt called "How to Observe". Something like this would by handy especially for beginners and I would like to recommend that you buy it.

The renovations are progressing in the Observatory and it may take another few weeks to finish, hopefully to be completed by April 23. Starting on that date the Observatory will again be open on Sundays as well as Wednesdays. The hours on Sunday will be from 3:00 p.m. through evening.

To you and your family: Happy Easter Holidays.

Your President,
Wendel Frenzel

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# GENERAL MEETING

DATE: Tuesday, April 16, 1974

TIME: 8:00 p.m.

PLACE: Room B110, Health Sciences Bldg
(across from Observatory)

PROGRAM: Regular Business
Film: Space Navigation

# SPACE SHUTTLE

Danny McClean

The Space Shuttle is designed to take off vertically and land horizontally. As it is planned as a vehicle for all space payloads, it will open the frontier of space as the railroads opened the west.

It will be used for future Earth operations to provide such long range benefits as weightless manufacturing in space, mineral and oil prospecting from space, satellite repairs, environment surveillance, staging stations for interplanetary journeys and low cost transport.

Each shuttle craft can be used up to 100 times. The Shuttle can reduce the expense of space travel to less than one tenth that of today's costs. In the late sixties and early seventies it cost NASA $1000 a pound to put a satellite in orbit, but with the shuttle this cost could be cut to $100 a pound.

The booster will separate from the Shuttle craft at an altitude of about thirty miles. The craft will then continue its flight into orbit under its own power. Using airline-type turbofan cruise back engines, the shuttle craft lands like a conventional jet aircraft. The shuttle is about the same size as a DC-9.

NASA officials decided upon a single set of designs. Probably the most crucial decision was to adopt a delta wing version of the shuttle. The Space Shuttle was designed for a vehicle with crossrange capabilities of about 1,100 miles. In other words the Shuttle can fly about 1,100 miles on its way to landing. Cross-range capabilities allows the craft to maneuver laterally during re-entry. Wider lateral capabilities means fewer landing sites are needed. It means also that the craft can return to the launch site at the end of the first Earth orbit if a problem arises.

The Shuttle booster stands about 300 feet high on the launch pad, compared to the Saturn V which stands 365 feet. The delta configured shuttle is 208 feet long from nose to tail tip and has a wingspan of approximately 107 feet. The cargo bay is 15 feet wide and 60 feet long. The Space Shuttle will likely have a crew of four. The spacecraft will use liquid oxygen and hydrogen similar to the Saturn family of rockets.

The orbiter will have two engines, each producing 620,000 pounds of thrust. Twenty nine thrusters will be used to control the shuttle's movement. The plane's on-orbit space engines must be capable of restarting in space. Another set of engines are used for approching satellites in orbit. Once the Space Plane returns to the Earth's Atmosphere, four air breathing engines will take over and gulp down Kerosene-like fuel, called JP until safe landing.

The shuttle booster will use a cluster of twelve engines which will produce 6.5 million pounds of thrust for about three minutes. The first stage of the Saturn V uses a cluster of five engines producing a total of 7.5 million pounds of thrust.

The shuttle mission could last for one to thirty days in Earth orbit. A typical space shuttle mission would include:

1) Placement and retrieval of satellites
2) Delivery of propulsion stages
3) Satellite maintenance
4) Rescue of disabled spacecraft
5) Space station support

With design now focused on a delta wing configuration, early data indicates that development cost, exclusive of the cost of fascilities, probably will fall in the $8 to $9 billion range, spread over several years.

After the first manned orbital flight tentatively scheduled for 1978, operation cost will drop to an estimated $2 million per mission. Compare this with an operation cost of slightly over $95 million for the Apollo 15 flight to the moon.

The Space Shuttle will also allow smaller countries like Canada to get more actively involved in space exploration.

## MINUTES OF THE GENERAL MEETING
Saskatoon Centre, R.A.S.C.
Held in the Health Sciences Building
March 19, 1974, 8:00 p.m.

Present:
Wendel Frenzel, President
Melodie Andrews, Secretary
Ron Waldron, VP/PR
Milton Phenneger, Programming
Halyna Kornuta, Editor
Gordon Patterson, Activities
Hugh Hunter, Library
F.A. Holden, Representative

Absent:
Alan Blackwell, Treasurer

| Item | Detail | Action |
|---|---|---|
| 33. | The meeting was opened at 8:00 p.m. | |
| 34. | Motion for adoption of February Minutes. Lee Warner, Doug Beck. CARRIED | |
| 35. | The February and April 1973 issues of the R.A.S.C. Journal are needed by Dr. Ian Halliday (Toronto Centre) to complete a program on Copernicus. If you do not need your copy please give it to the Secretary. | |

| Item | Detail | Action |
|---|---|---|
| 36. | Dr. Phenneger presented two films: Sea of Infinity and Satellite Astronomy-- Progress and Promise. | |
| 37. | The meeting was adjourned. CARRIED | H. Kornuta<br>D. Fraetupa |

## MINUTES OF THE EXECUTIVE MEETING
Saskatoon Centre, R.A.S.C.
Held in the Observatory, 7:30 p.m., April 1, 1974

Present:
- Wendel Frenzel, President
- Melodie Andrews, Secretary
- Halyna Kornuta, Editor
- Gordon Patterson, Activites
- Ron Waldron, PR/VP
- Hugh Hunter, Library

Absent:
- Alan Blackwell, Treasurer
- Milton Phenneger, Programming

| Item | Detail | Action |
|---|---|---|
| 38. | The meeting was opened. | |
| 39. | The treasurer's brief financial statement was read: Cash $281.00; Members: 34 Adults, 18 juniors. | |
| 40. | Minor adjustments have been completed on the telescope brake. | |
| 41. | Sunday opening of the Observatory: April 28. | |
| 42. | It is requested that you do not use the new dark room until the counters have been waxed to protect the tops from staining.<br>Purchases being looked into for the dark rooms:<br>a) bulk film loader<br>b) Master Darkroom manual<br>c) Darkroom thermometer. | |
| 43. | Publicity in the future will include the dates and times of our meetings in various media publications. | |
| 44. | The National Research Council is lending $200.00 worth of meteorites for our new display cabinets. | |
| 45. | A solar mobile is to be place in the Observatory soon. | |
| 46. | The meeting was adjourned. CARRIED | W.Frenzel<br>R.Waldron |