Electronic bloodhounds
Track down "sky stones"

Man's experience with meteorites probably dates back to the dawn of civilization. It was natural for him, because of his upright posture, to turn his eyes to the night skies glimmering with incomprehensible celestial mysteries. The presence of a "shooting star" must have been a moment of deep spiritual revelation. Ancient records tell of "stones from the sky", "thunderbolts" and "sky stones", which most likely referred to the arrival of meteorites on earth.

The earliest recorded mention of meteorites is found in early Chinese annals, dated between 98 B.C. and 25 A.D., during the Han Dynasty, when instances of death were cited by "stones from heaven". It is claimed that the sacred stone built into the Muslim Kaaba in Mecca fell from heaven. Archeologists uncovered an ancient ruin of Montezuma Indians in Mexico and found the great Casas Grandes Meteorite wrapped like a mummy. The Iron Creek meteorite was highly revered as a medicine of great potency by the Cree and Blackfoot Indians and it is said that pilgrimages were made to its resting place on top of a hill in Alberta.

Today, man no longer worships meteorites, but his interest in them has not waned. In fact, it is increasing with the development of a Meteorite Observation and Recovery Project (MORP) by a team at the Astrophysics Branch of the National Research Council of Canada's Radio and Electrical Engineering Division. The team has established a network of 12 tracking stations on the prairies to aid in the rapid recovery of meteorites by photographically recording their fall to earth from at least two stations. The 12 pentagonal observatories, spaced about 120 miles apart, are each equipped with five cameras that scan 250,000 square miles of prairie night sky.

MORP makes Canada the third country in the world, besides Czechoslovakia and the United States, involved in tracking meteorites by photographic methods. NRC researchers hope that by surveillance of solar system activity, valuable clues will be found concerning the origin and evolution of the universe.

The earth encounters millions of meteors as it rotates daily. Every day, roughly 200 million meteors are capable, upon entering the atmosphere, of making a flash bright enough to be seen at night. The largest number of meteors are seen after midnight because the observer's side of the earth is facing in the direction of the earth's motion as it revolves. The faster meteors appear and disappear higher in the atmosphere than do the slower ones. Of the meteor velocities investigated, no meteor is moving rapidly enough to escape the sun's gravitational field, hence all meteors appear to be part of the solar system.

MORP's semi-automatic camera tracking stations — two in Manitoba, seven in Saskatchewan and three in Alberta — were located on the prairies because of the comparatively clear skies and easier travel on flat land in search of meteorites. The initial MORP installation expense of $500,000 makes meteorite tracking an expensive gamble, since most meteors burn before reaching the earth. At least 300 of the estimated 500 meteorites, which survive annually, land in the ocean. It is possible that only one or two meteorites land on the prairies in a year.

Dr. Ian Halliday, officer in charge of the MORP project, says the purposes of MORP are to improve meteorite recovery in Canada and to determine a meteor's velocity and the location of its orbit before it entered the earth's atmosphere.

"We had a significant meteorite fall near the town of Bruderheim, Alberta, in 1960, which made scientists aware that if the same thing were happening elsewhere it could have gone unnoticed," he says. "This led to the formation of the NRC Associate Committee on Meteorites, whose main purpose is to improve the system of meteorite recovery in Canada.

"In the past, we had to rely on reports of visual observations of bright meteors which might have dropped a meteorite but it is difficult to determine an accurate impact point from these chance sightings. The meteor light is extinguished at an altitude of about 12 miles and we are left with the problem of determining the meteor's path from that point to earth. For these last few miles a meteor travels too slowly to be luminous and is seldom hot and never burning when it strikes the ground. The biggest uncertainty is the drift of the meteor due to the upper atmospheric winds. Meteorites appear to be confined to the slowest range of meteor velocities with average speeds near 10 miles per second when they hit the top of the atmosphere. If the initial speed is more than 14 miles per second it is unlikely that much will survive," Dr. Halliday says.

When a meteoric particle enters the earth's atmosphere, it collides with upper atmospheric air molecules causing friction, heat and a glowing gas. As the meteorite candidate descends lower into the atmosphere it is decelerated by atmospheric friction and the possibility of salvaging a meteorite may be estimated by observing the speed of the object when the light ceases. If this occurs at speeds between two and three miles per second, it is very hopeful that one or more meteorites will reach the ground. On the other hand, if the speed is six miles per second or more when the light goes out, there is probably no appreciable mass remaining to fall as a meteorite.

Canada now has approximately 40 meteorites in its own collection of Canadian meteorites. Dr. Halliday says there are some 2,000 meteorites "in captivity" and since meteorites are an international phenomenon, Canada participates "in a very good, informal, but rather effective foreign exchange." Most of Canada's meteorites were discovered by luck and publicity. However, by photographically tracking a meteor's terrestrial plummet, computations may be made to locate the meteorite's impact point within one or two square miles.

The MORP program is relatively new and a meteorite has not yet been photographed and recovered. The American network has photographed several and recovered one; the Czechs have photographed many and recovered one.

The five-sided MORP tracking stations are perched on concrete pedestals in rural prairie areas and are heated and air-conditioned year round. The windows are heated to insure clear vision for the wide-angle cameras which are loaded with 70 mm. Kodak Plus-X pan film.

"The time exposures can easily be a couple of hours if it is a moonless night and there is no aurora," Dr. Halliday says. "The tracking stations' cameras are operated automatically by two photometers. One watches a 60-degree cone of sky and produces a series of pulses which, after a certain number of pulses, photographs the time and advances the frame to avoid fogging the film. The second photometer is a meteor detector that sits on top of the observatory. It consists of a photo-