ANYONE CAN DISCOVER A COMET—

But the Early Riser Stands a Better Chance than Most

HALLEY'S COMET, as it appeared in 1910. All over the picture are the tiny "star trails"—the images of stars blurred on the plate as the camera follows the comet

Written for "The Listener" by G. T. RAILTON

FROM time immemorial men have been awed by the appearance of great comets with their tails stretching across the sky. Their terrifying size and weird form made them a source of fear and superstition to men of earlier ages. Probably the best-known reference to comets in literature is that in *Julius Caesar*, before the assassination. Caesar's wife, Calphurnia, is not above the suspicion that portents of nature presage danger to him, and, when he brushes her fears aside, she says:

> When beggars die there are no comets seen,
> The heavens themselves blaze forth the death of princes.

Milton likened Satan to a comet, "huge in the arctic sky," which "from its horrid hair shakes pestilence and war."

Of recent centuries there has been less awe (if not less war) as the telescope has revealed more knowledge of comets and their ways, but it is certain that belief in the connection between comets and human affairs is by no means dead. We may be sure that there are New Zealanders who, gazing on our recent visitor in the south-west sky, have wondered what it portended.

Nowadays we don't have so many unannounced comets appearing suddenly in the sky, as naked-eye objects, because all over the world amateur and professional astronomers strive with friendly rivalry to see, or discover, the greatest number of new comets. But our 1947 comet has touched off the interest of astronomers everywhere.

The amateur astronomer uses a telescope to sweep the sky, looking for fuzzy objects that may be moving among the stars while the professional astronomer relies on photographs taken with his patrol cameras to show up any comets that may be about. From these two sources we get warning, as it were, of the approach of most of them, but occasionally we have one sneaking up from behind the sun and then we may have the thrilling spectacle of a large naked-eye comet suddenly appearing unheralded in our evening skies—as happened the other day in New Zealand. Every year up to 10 or 12 comets may be found, but most of them are telescopic objects only, and about a third of them are possibly the return appearance of a previously discovered comet.

When it is first discovered the average comet appears in the telescope as a faint spot of light—perhaps a little blurred—not so clear as neighbouring stars. Gradually, as it approaches the sun, it increases in size and brightness and, as it comes within the earth's orbit and swings round the sun, a comet may go through a number of rapid and startling changes. It will generally increase in brightness and may grow a large tail or a number of them. It may even break up into two separate comets.

All the *best* naked-eye comets have tails. One of the most remarkable of modern times, the comet of 1811, had a tail of upwards of 100 million miles in length. This particular comet was visible for about 17 months. Another great comet, that of 1744, had six huge tails, which stretched across the sky even though the head of the comet was well below the horizon.

Head and Tail

Through a telescope the head of a comet appears as two distinct parts, a bright sharp nucleus surrounded by a large nebulous coma. The nucleus does not appear to be solid, but just a closer condensation of the particles that make up the head. Indeed a comet, Halley's, has been observed to pass between us and the sun, yet not the slightest shadow of the comet would be seen on the sun. The coma is just a luminous envelope round the nucleus, and gradually fades away into nothing. Comets' heads are generally tens of thousands of miles in diameter, some even are larger than our sun, but there is little risk of damage occurring to the earth if we were to run into one, for what we see as a beautiful comet with a tail stretching across the sky may be described as a "bag full of nothing." Even a large comet has a mass less than one ten-thousandth that of the earth, and this amount of matter spread out into a space the size of the sun is certainly scattered enough to be harmless. The worst we could expect from a close approach to a comet would be perhaps an intense display of shooting stars such as appeared on November 13, 1833, when thousands of such stars an hour were observed.

The tail of a comet consists of tiny particles of dust and gas that are actually "blown" off the head of the comet by the pressure of the light from the sun. The tail always grows as the comet approaches the sun and diminishes as the comet recedes and we always find that the tail points away from the sun. Although, or rather because, the tail may stretch out for millions of miles, its density is probably far below that of the best vacuum we can make, and so we need not worry if some astronomer detects the deadly carbon monoxide or cyanogen gas in the tail of our 1947 comet.

We Have Passed Through Them

The earth has at times passed through the tail of a comet, but apart from the night sky being a trifle brighter or the daylight being a trifle duller, we were not otherwise aware of the fact.

COMETS were a source of superstitious fear to men of earlier ages. Here is how Halley's Comet (which appeared in 1066) was depicted in the Bayeux Tapestry

There is no evidence as yet that comets come from the space between the stars, but rather there is evidence that they all belong to our solar system. The questions of their complicated orbits we can leave to the computors, but we can note that periodically a comet returns along its previous path. The period may vary from about three to 10,000 years. Halley's comet—last seen in 1910—has a period of 75 years. The time-table for the short period comet can be worked out in advance, and amateur astronomers are always on the look-out for the return of the old favourite. Comets may vary in appearance and brightness at each appearance. Occasionally a comet gets lost. It cannot be found at the expected time or place and we are forced to believe that either the comet has been deflected from its regular track by one of the larger planets, such as Jupiter, or that the comet has just gone to bits in its trip out into space. The rapid rush around the sun loosens up a comet's head and it may disintegrate and disappear—as a comet. The material of the comet, though scattered widely, may continue on along the path that the comet had been previously following and instead of a comet we are sometimes confronted with a shower of meteors. All meteors do not come from comets, but many of the meteor showers observed can be associated with or attributed to a comet now perhaps several centuries extinct.

A Way to Immortality

It will be realised that anyone can discover a comet. Keen comet-seekers have the best opportunities with their telescopes, but the keen-eyed early-riser has also a good chance. Comet hunting has its rewards. In addition to the peace of mind that comes from the continued contemplation of the universe, there is the more worldly satisfaction of having one's name attached to a new comet—that is, if you happen to be the first person to discover it, and are prompt enough in getting your report telegraphed to the nearest observatory. Comet Jones and Comet Geddes recall the names of two observant New Zealanders who discovered new comets. In addition there is always the chance of getting the Gold Medal which is awarded by some Astronomical Societies to successful comet seekers.

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and each has a power of 7.5 kilowatts. As only two frequencies can be used at once (one on each transmitter), a study of forecast reception conditions over the transmission path is made before deciding which two of the six available frequencies will be chosen. These may be changed from day to day or from hour to hour, as reception varies.

To get greater efficiency shortwave broadcasts are usually "beamed," that is, transmitted in a particular direction instead of being radiated in a circle from the aerial as in the case of a station like 2YA. With transmitters of the relatively low power of 7.5 kilowatts a reliable service can be given only to near-by countries, and for this reason it is contemplated that the shortwave service will begin with programmes for the New Zealand Dependencies in the Pacific and for Australia.

To cover these areas at least two directive aerial arrays will be required and one of these has just been completed. This one is directed towards Australia and was used for the recent tests. Work is proceeding on the construction of a second array, which will be directed approximately towards Samoa and will give better reception in the Pacific Island area.