ASTRONOMY

Meteor "Speedometer" Tells Velocity of Shooting Stars

Sky-Patrol Cameras Located 24 Miles Apart, Trained On the Same Point in Space, Used to Plot Their Orbits

NEW proof that many of the brightest meteors that blaze through the atmosphere are not aimless cosmic "tramps" but are in reality minute rock planets traveling, like the earth, in orbits around the sun, was reported by Dr. Fred L. Whipple, of Harvard Observatory.

A feature of Dr. Whipple's investigation, it was revealed, has been the successful use of a "meteor speedometer" in recording the terrific speeds of these shooting stars during the few seconds when they blaze out against the friction of the upper air.

The complexities of computing the meteoric orbits also required the Harvard observers to undertake the intricate task of photographing the fiery paths of these bodies simultaneously in two widely separated telescopes.

In fifteen months of sky patrol, six of the bodies were "caught" by the two cameras, and data secured from which the distance, height, direction of motion, speed, and orbit, could be determined, Dr. Whipple said.

Computing the masses of the meteors through measures of the braking effect of the earth's atmosphere on them, as shown in his "speedometer," Dr. Whipple found that the bodies observed ranged from several pounds for the slowest meteor to an ounce for the fastest. Their speeds in the atmosphere varied from nine to fifty miles per second.

Orbital computations have been completed for five of the observed bodies, Dr. Whipple reported. Four of these, he found, had been moving in small elliptical orbits about the sun, and were therefore members of the solar system. The fifth body had been moving in a hyperbolic orbit, indicating an origin in interstellar space outside the solar system.

The hyperbolic meteor was calculated to have a speed of twenty miles per second before it came into the sun's gravitational attraction. This speed is only slightly greater than the average speed of the stars, Dr. Whipple pointed out.

Harvard's meteor cameras were located twenty-four miles apart, one at the Cambridge station, and the other at Oak Ridge, in Harvard, Mass. The telescopes are the regular sky-patrol type in common use, and for this study were both trained at the same point in space, some fifty miles above the earth's surface.

The "meteor speedometer," in the shape of an electrically operated "windmill camera," was attached to the Oak Ridge telescope. Main feature of this instrument is a set of fan blades revolving in front of the camera lens, interrupting the sky picture twenty times per second.

When a meteor flashed down in front of the lens, its trail was cut twenty times for every second it was visible, and measurement of the artificially produced segments in the trail provided a precise indication of velocity. Dr. Whipple said that the underlying principle of this "speedometer" has been understood for many years, but because of various difficulties involved in its use, precise results have not been obtained by this method before.

The great distance between the two observing cameras was necessary, Dr. Whipple said, to give a long enough "base" for geometric computations from the photographs of the position and movement of the bodies.

Dr. Whipple found that the midpoints of the visibility of the meteors came at altitudes ranging from forty to seventy miles. "The fastest meteors were observed at higher altitudes," he said, "which is exactly what we should expect because the greater air friction of faster moving bodies would cause them to become visible at higher altitudes where the air is rarer. The meteors photographed would have appeared brighter than Mars to the naked eye and were therefore much brighter and larger than the average."

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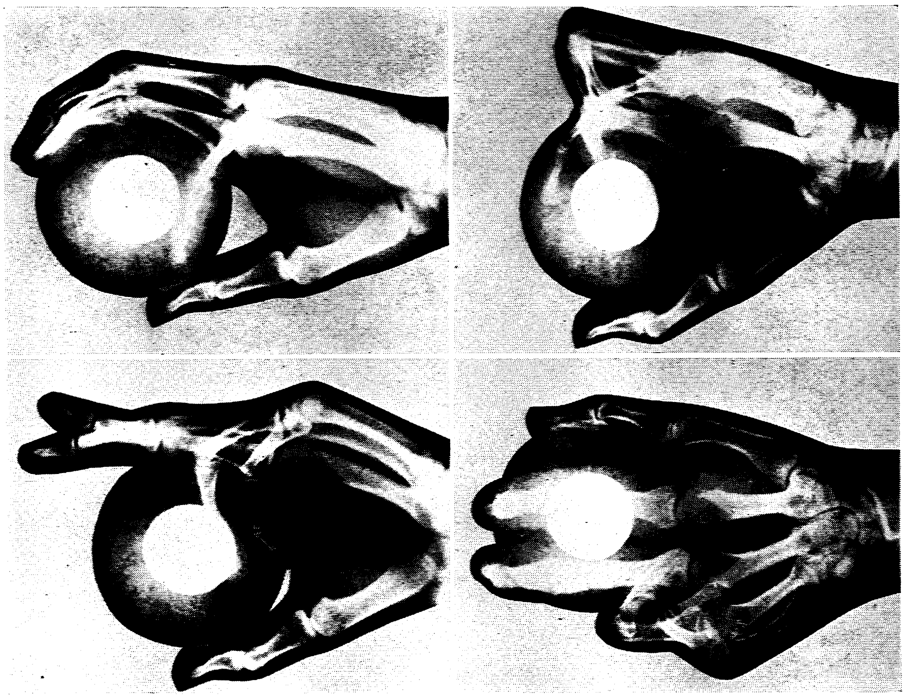

HERE IS HOW IT LOOKS

Top left: The X-ray camera of Miss Francis M. Davis catches the grip of a left handed pitcher for a fast ball, with a hop on it. Lower left: The change-of-pace, or slow ball, which the pitcher hopes will surprise the batter after the fast one. Top right: Grip on the famed knuckle ball that floats up to the batter without revolving and is difficult to bat for a long hit. And it's difficult to control, too. Lower right: Here's how a curved ball grip looks by X-ray. Miss Davis used a West Coast pitcher for her shadowgraph model.

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