



Mt. Wilson and Palomar Observatories

**MOST DISTANT OBJECT**—*The arrow points to 3C-9, the most distant object known in the universe. The light that made this dot on the photographic plate left 3C-9 many billions of years ago. This quasar, one of the five recently discovered, is located in the constellation of Aries, the ram, which will not be visible until September. The quasar is far too faint to be seen even with a large amateur telescope.*

## ASTROPHYSICS

## Oldest Object Found

Five more quasars have been discovered, one of which, 3C-9, is the most distant and thus the most ancient object known in the universe today.

► FIVE STAR-LIKE objects, the most distant and therefore the oldest ever found, have been discovered by scientists from Mt. Wilson and Palomar Observatories, Pasadena, Calif.

The farthest of the five, known as 3C-9, is rushing away from earth at 149,000 miles a second, or at a speed of 80% that of light.

The ancient light we now see from 3C-9 left the object many billions of years ago, before the sun and earth were born, and when the expanding universe was only a third as large as it is today.

The five objects are quasars, or quasi-stellar radio sources. Their distances were determined by Dr. Maarten Schmidt of Mt. Wilson and Palomar Observatories using the 200-inch telescope atop Mt. Palomar.

Although all five quasars are many billions of light years away, their exact distances cannot be determined because this would require accurate knowledge of the evolution of the universe. What is known are the relative distances, Dr. Schmidt reported in the *Astrophysical Journal*.

Quasars were discovered only a few years ago, and now more than 40 are known. They are the brightest and most puzzling sources of intense light and radio waves known.

They are thought to have the mass of at least a hundred million suns, with an energy-producing core surrounded by two cloud layers.

The inner, visible layer is of luminous gas, while the outer, optically invisible layer is composed of fast-moving electrons that emit energy as radio signals as they spiral in a magnetic field.

The energy thrown into space by a quasar is some hundred times the total energy output rate of an entire galaxy, yet each object is one-sixth the size of a galaxy, or less.

Relative distances have been determined for only nine of the known quasars. The distances are found by measuring the amount of red shift in their light.

Red shift is the displacement of spectral lines toward the red, or lower frequency, caused by the motion of a light source away from earth. The relationship that has previously held is the greater the shift, the more distant the object giving off the light.

However, this relationship is not certain for objects more than a billion light years away, since at such distances the geometry of the universe is not known.

Dr. Schmidt obtained at least four spectral photographs of each of the five newly discovered objects. Two or more spectral

lines on each were required to determine the red shift. One of these is the Lyman alpha line of hydrogen, which has never before been observed from a ground-based observatory.

The five new red shifts obtained by Dr. Schmidt correspond to the following rates of recession: 3C-254—93,000 miles a second; 3C-245—113,000 miles a second; CTA-102—114,000 miles a second; 3C-287—115,000 miles a second; and 3C-9—149,000 miles a second.

The "3C" designation indicates a listing in the third Cambridge catalog of radio sources. The "CTA" stands for Caltech A list of objects emitting radio waves.

Previously the largest red shift measured was for 3C-147, corresponding to a recession rate of 76,000 miles a second.

In April, Russian astronomers reported that one of the five objects, CTA-102, emits a radio signal that varies in a 100-day cycle, claiming this as evidence for a super civilization.

U.S. astronomers were skeptical concerning this report, believing the variation results from a natural source. Dr. Schmidt's determination confirms the U.S. astronomers' belief.

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## ASTROPHYSICS

## Distant Space Probe Foreseen in Ten Years

► A DISTANT space probe that will range beyond the planet Jupiter to count cosmic rays in interstellar space may be launched within ten years.

The vehicle would travel more than 400 million miles from the earth. It would then be in interstellar space, so far from the sun that solar effects would be too weak to overcome radiation from outside the sun's system of planets.

Launching of this long-range investigation was foreseen in a report by the United States to the Committee on Space Research, or COSPAR, of the International Council of Scientific Unions. The report was made by Dr. Richard W. Porter, a General Electric scientist and vice president of COSPAR, who heads the 120-member U.S. delegation.

The past-Jupiter space probe could answer a fundamental question—how many cosmic rays exist in the vast reaches between the stars? Scientists now believe these cosmic rays play a significant role in determining how the universe is put together.

Before they can tell how the universe was born and developed, scientists need to know how many cosmic rays there are and where they come from. As far as is now known, only space vehicles probing beyond Jupiter can give a definite answer to these questions.

Concerning research much closer to home, U.S. scientists have detected what they believe is a gravity wave in the atmosphere. It travels from east to west at about 500 feet per second.

The wave was discovered using the 1,000-foot radio receiver at Arecibo Ionospheric Observatory in Puerto Rico, a facility of Cornell University, Ithaca, N.Y. The wave has a period of about two hours.

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