ASTRONOMY

Compact Galaxies Found

Deceptively small galaxies, probably very old systems of stars, may have light-deflecting properties that will reveal to astronomers otherwise invisible galaxies.

➤ THE UNIVERSE is sprinkled with compact galaxies, relatively small stellar aggregations of only about a hundred million stars packed into a space only a hundred light years in diameter.

An average galaxy is a clustering of a hundred billion or so stars like the sun. The universe abounds in galaxies as far as the largest telescope can see.

The Milky Way galaxy of which the sun and its planets are a part, considered rather ordinary, is some 80,000 light years in diameter instead of the hundred light years of the compact galaxies.

Compact galaxies are assumed to be very old systems of stars, Dr. Fritz Zwicky of Mt. Wilson and Palomar Observatories told the American Astronomical Society meeting in Flagstaff, Ariz. However, under very rare circumstances they can give rise to the most tremendous eruptions of energy so far known in the universe.

Dr. Zwicky suggests that the original "match" for the eruption would be the outburst within a compact galaxy of a supernova, a star that suddenly and catastrophically explodes into space, pouring out several billion times its usual energy.

Such a supernova outburst, he said, could lead to a succession of events, including the "whittling down and partial disruption of neighboring stars, subsequent explosive escape of the trapped radiation from the core of these stars, collapse of the cores into denser bodies such as neutron stars."

The final outcome would then be a change from the luminous compact galaxy into a "darker, very compact galaxy," Dr. Zwicky reported. Such an avalanche of events could cause the release of amounts of energy so tremendous as to make the original supernova outburst resemble a tiny firecracker.

Astronomers have recently discovered strange heavenly objects, called "quasars," that are spending their energies at this previously unsuspected rate. They are the most powerful sources of radiation known, for radio waves as well as light and cosmic rays.

Dr. Zwicky said that because very compact galaxies and quasars have such a high amount of matter in such a small amount of space, some of them would be expected to deflect light moving at a tangent to their surfaces because they would act as gravitational lenses.

Therefore, the space around both compact galaxies and quasars is being scanned very closely, in order to detect double or doughnut-like images of very remote galaxies whose light could be seen only because of such gravitational effects.

If the otherwise invisible galaxies are discovered due to a compact galaxy or a quasar acting as a gravitational lens, this would provide a means of verifying one of the three predictions of Einstein's general theory of relativity.

Dr. Zwicky urged that a full-size "transparent objective grating" be constructed for the 48-inch Schmidt telescope atop Mt. Palomar in California. He said it would be "one of the most powerful tools imaginable in the search for very compact galaxies, for supernovae and for many other types of celestial objects."

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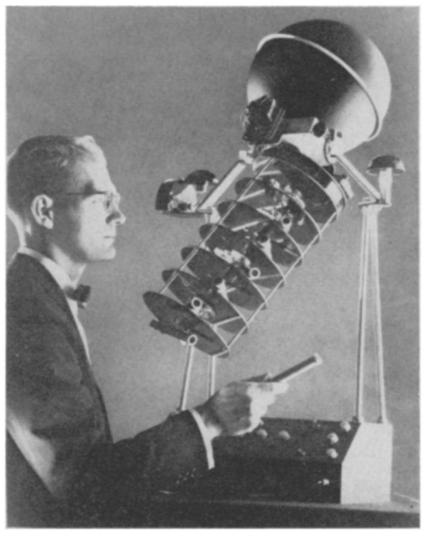

Nova Laboratories

CLASSROOM PLANETARIUM—The Nova III, a planetarium developed by Albert A. Faulkner, Nova Laboratories, Rosemont, Pa., is a complete instrument for teaching astronomy to high school and college students.

ASTRONOMY

Increase Telescope Power

➤ THE "SEEING" POWER of the world's largest telescope, the 200-inch giant atop Mt. Palomar in California, will soon be increased 50% to 60%. A telescope's seeing power is its ability to pick up the light from very faint, and therefore very distant, heavenly objects.

When the improvements are complete, the 200-inch will photograph objects of the 24th magnitude, Dr. Ira S. Bowen, former director of Mt. Wilson and Palomar Observatories, said. He told the American Astronomical Society meeting in Flagstaff, Ariz., that plans are under way to triple the focal length of the giant mirror, from its present 660 inches to 1,800 inches.

The focal length of its mirror is the limiting factor in how faint and distant an object a telescope of a specified size can see. The longer the focal length, the greater its ability to see faint objects.

The 200-inch can now see objects of 23rd magnitude, which is two and a half times brighter than the 24th. The higher the magnitude, the fainter the star.

The improvements will consist of lenses to increase the focal length. This method could also be used to increase the seeing power of other telescopes, Dr. Bowen said in the annual Henry Norris Russell lecture.

One observational aid is the image intensifier tube. It converts incoming light into electrons that are amplified and projected on a screen much like that of a television picture tube.

He noted that the most effective immediate answer to the problem of seeing farther into the universe lies in such auxiliary equipment, rather than in building bigger telescopes.

Nevertheless, Dr. Bowen said a 400-inch telescope could be constructed successfully. However, a battery of four identical 200-inch telescopes would accumulate information at the same rate for direct photography. For spectroscopic observations, the battery of telescopes would collect information at about twice the rate of the 400-inch.

Because of the savings in engineering and construction costs in building identical instruments, the total spent for a battery of four smaller telescopes would probably be less than for a single 400-inch instrument, Dr. Bowen said. However, the cost of either would probably run from $50 to $100 million and would take many years to complete.

Although equipment now being tested can increase the seeing range of existing large telescopes, there are only nine telescopes in the United States with a mirror larger than 50 inches. They fall "far short of being able to provide the observing time for astronomers already active in the field," Dr. Bowen charged.

He said the growing interest in space exploration has spurred a great increase in the number of students entering astronomy.

Therefore, he noted, "we are facing an exceedingly serious shortage of facilities that is certain to greatly curtail observational output and may be so discouraging to young astronomers as to eventually drive them into other fields."

Because it takes five to 20 years to design and build a major telescope, Dr. Bowen predicted that the shortage will become much more acute before relief can be expected.

California Institute of Technology, Pasadena, and the Carnegie Institution of Washington jointly operate Mt. Wilson and Palomar Observatories.

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