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Cover: The composition of meteorites tells scientists much about the nature of our solar system. Under the microscope, thin sections such as this one (of the Shelburne meteorite found in Dufferin county in 1904) reveal the fine details of the body's structure. Pink colored bars of the mineral olivine are seen embedded in a grayish matrix of orthopyroxene. (The area shown is less than 1 mm<sup>2</sup>.) On rare occasions, this information is complemented by knowledge of where the meteorite originated from in space. (Story page 4.) Photomicrograph courtesy Dr. George Plant, Energy, Mines and Resources and David Gillan, NRC.

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## Sir Bernard Lovell Exploring the universe



Mansell Acres, NRC/CNRC

**Sir Bernard Lovell**

During the past two decades our picture of the universe has been revolutionized. Astronomers who once contemplated a serene and explicable cosmos are now trying to understand events of stunning violence: the primeval fireball from the "big bang" with which everything began; black holes, collapsed stars so dense they swallow their own light; quasars, the most remote of all known objects, receding from us at speeds close to that of light; pulsars, tiny stars flashing bursts of energy as they whirl around. These bizarre phenomena have been revealed by radio astronomy, one of whose founders, Sir Bernard Lovell, recently spoke at NRC.

Traditionally, astronomy has been limited by what we can see; but visible light is only a small segment of the spectrum of energy radiated by objects in space. Now, using instruments sensitive to invisible radio waves, radio astronomers explore the universe much as optical astronomers do with telescopes.

Sir Bernard's interest in this technique grew from his wartime work on radar. His major contribution was to organize, despite considerable obstacles, the building of a giant radio telescope at Jodrell Bank in England. This pioneering instrument, for many years the world's largest, has a bowl-shaped antenna 76 m in diameter, cradled in a steerable mounting that allows it to track a radio source as the earth moves. In Ottawa, Sir Bernard described current observations

from Jodrell Bank which are challenging conventional theories.

Using their telescope as a time machine to view the far reaches of the universe billions of years ago, Jodrell Bank astronomers have been searching for the clouds of hydrogen gas which, according to the postulate of two Russian cosmologists, should be out there, condensing into galaxies. The clouds, however, could not be found, forcing refinements to the theory.

Pulsars, strange stars which emit bursts of energy (with such precision that their discoverers considered the possibility that they were intelligent signals from life elsewhere in the universe) are considered to be the remains of supernovae explosions. But a Jodrell Bank survey of pulsars in our galaxy questions this explanation by providing a conservative estimate of the birth rate of pulsars three times larger than that of supernovae.

Why did Sir Bernard never use Jodrell Bank to search for extraterrestrial civilizations? Because the probability of the factors that led to life evolving on this planet being duplicated elsewhere was very close to zero. We are the product of an extraordinary series of unlikely accidents.

The techniques pioneered by men such as Sir Bernard Lovell for exploring the universe have enormously extended our sphere of observation, revealing things which our theories are still inadequate to explain. □