

The Universe in my pocket No. 6

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Cover image: a composite image of the massive elliptical galaxy NGC 5532 (shown in blue) and of the jets of the radio source 3C296 (shown in red). The radio map was created with the Very Large Array of radio telescopes. Other images in this booklet are from HST, CXC, SAO, Spitzer and UKIRT.

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The discovery of quasars

Although quasars are the most luminous objects in the Universe, they were only discovered about 60 years ago.

Radio signals from many celestial sources had already been recorded at that time. When astronomers tried to find visible light matches to the radio sources, they discovered that the central zones of many extended radio sources were occupied by faint, stellar-like blue objects.

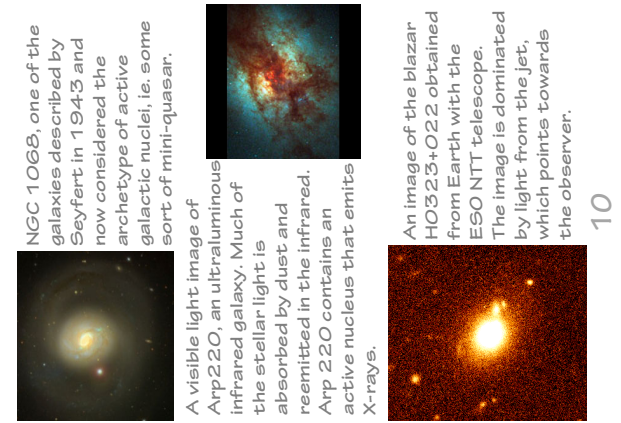
The spectra of these objects revealed that they were very far away (well outside our galaxy, more distant than many known galaxies) and they were not stars. They received the name of quasars (for quasi-stars).

How quasars work

Typically, quasars radiate as much energy per second as 1 000 galaxies, but from a region a million times smaller than one galaxy. How can this be? Clearly the origin of the radiation cannot be stellar.

It is now accepted that quasars host in their center a supermassive black hole, that attracts whatever matter lies nearby. Before falling into the black hole, the matter spirals down onto an 'accretion disk', where it is heated to very high temperatures, producing ultraviolet light and X-rays. More massive black holes are more luminous.

This radiation interacts with the surrounding gas, producing the characteristic spectra of quasars.



Other monsters

Before quasars were discovered, we already knew that some galaxies have especially bright nuclei and unusual spectra. Such galaxies were named Seyfert galaxies. They belong to the class of 'galaxies with active nuclei', which also includes quasars and blazars. In all cases, a central black hole is accreting matter from its surroundings, but quasars are more massive and more luminous.

Recently, infrared observations of the sky revealed a population of galaxies very bright in the infrared but hardly detectable in the visible. Many of these are thought to contain active galactic nuclei.

