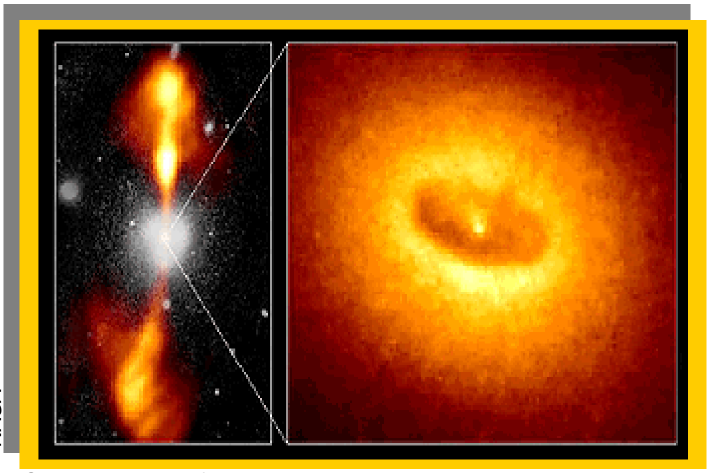
Quasars

By Christopher Boozer
Astrophysical and Planetary Sciences Department, University of Colorado, Boulder

One of the most common ways astronomers investigate objects is to study their **spectra**. They separate the different wavelengths of light from an object, and then make a graph of how bright each wavelength is. Once discovered, **quasars** appeared to be undistinguished stars, simple points of light, that were not particularly bright. Even with telescopes capable of resolving the shapes of distant spiral galaxies, no structure other than a point was apparent. But they could not have been just dim stars, since their spectra did not look anything like that of a star's. Thus, they were named quasi-stellar objects, or quasars for short.



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Quasar in center of distant galaxy

Then a startling explanation was suggested for their odd spectra. It had been known for a little while that the universe seemed to be expanding. That means that everything seemed to be moving away from everything else. When you look at distant objects, like other galaxies, you find that (unless they are very close) they are all moving away from us (and we from them). The farther away you look, the more rapid this expansion appears to be. So things that are farther away are receding (moving away) even faster than nearer objects. An astronomer named Hubble figured this out and became so famous that people named the Hubble Space Telescope after him.

His proposed explanation was that these spectra were actually similar to the spectra of galaxies, but were distorted due to a huge expansion speed (expansion of the universe, not the object), much larger than any measured before. This type of distortion was well known and is called **redshifting**. But that would mean that their distances were also much larger than anything yet known. In fact, they would have to be billions of light-years away. That's millions of times the size of our own galaxy.

Accepting these distances posed other challenges. For instance, to appear even as bright as they did, something that far away would have had to put out many times more energy than a galaxy of the kinds we knew about. What processes put out that kind of power?

But perhaps the most exciting aspects of quasars were in what they might mean to **cosmology**, the study of the beginnings of the universe and the things in it. You see, if a quasar were several billion light-years away, then the light we are detecting has been traveling for several billion years. After all, that is what a light-year means. So what we are seeing is the way that these things looked several billion years ago. Looking at light from far away is the same thing as looking into the past. Several billion years ago the universe was significantly younger than it is now. Our best estimate of the age of the universe is about 12-14 billion years.

We have more questions than answers about quasars, but they probably have a lot to tell us about how galaxies form in the first place. Are we seeing a "naked core" of a young galaxy? Do most galaxies go through a quasar stage in their lives, or is there something unusual about quasar galaxies? Are quasars still around, or did quasars burn out young billions of years ago? If they are now the "normal" galaxies that we see nearby, could a galaxy "flare up" into a quasar ever again? These are some of the open topics galactic astronomers and cosmologists are working on.