# Cloud links quasars to Seyfert galaxies

Quasars invite superlatives – brightest, farthest, strangest. Though no larger than a single solar system, they shine with the energy of trillions of stars. Now, the quasar known as 3C273 has contributed another distinction: the first indication that a hydrogen cloud exists near a radio-loud quasar.

This discovery, reported in the Sept. 21 NATURE, strengthens the link between quasars and Seyfert galaxies, their more mundane cousins. Less active than quasars, Seyfert galaxies emit X-rays, radio signals and characteristic light spectra. Scientists classify Seyferts as Type 1 or Type 2 by their radiation and spectra.

But in recent years, astronomers have speculated that Types 1 and 2 represent the same thing viewed from different angles (SN: 6/25/88, p.404). They found evidence that a thick torus, or doughnut, of gas surrounds a Seyfert's center and obscures its activity when viewed from the side. It may also fuel the galaxy's activity.

Quasars share many characteristics with Seyfert galaxies, but until now scientists had no evidence that gas clouds accompany or fuel quasars.

In a general survey of hydrogen in the universe, three astronomers have found infrared emissions showing that 3C273 contains molecular hydrogen. Kimiaki Kawara and Minoru Nishida of Japan's Kyoto University, working with Brooke Gregory of the Cerro Tololo Inter-American Observatory in Chile, used a novel eight-channel detector for the study.

"It shows that the molecular emission observed in 3C273 is the same type that seems to be emanating from the central engines of Type 2 Seyferts," says astrophysicist Mitchell C. Begelman of the University of Colorado at Boulder. "It's the first direct evidence that there is molecular gas subject to intense heating."

The find indicates not only that quasars may have the same type of structure as Seyfert galaxies but also that the galaxies surrounding quasars may differ from expectations. Like most quasars that give off strong radio signals, 3C273 is thought to lie at the center of an elliptical galaxy, which should contain little hydrogen, says astronomer Joseph S. Miller of the University of California, Santa Cruz.

"This is new information about an object we don't know much about," he says. "It shows there is a large amount of neutral hydrogen in this radio-loud quasar, and that indicates that in a giant elliptical, things are very different than we thought." – *A. McKenzie*

# Rats yield active clues to drug addiction

Researchers have begun to develop an animal model of drug addiction that takes into account individual differences in the propensity to ingest drugs. The new approach may lead to a better understanding of the biology of animal and human vulnerability to addiction, according to neurobiologist Pier Vincenzo Piazza and his co-workers at the University of Bordeaux, France.

Like humans, some rats avidly self-administer amphetamine when given the chance, while others abstain. Piazza and his colleagues found they could predict responses to amphetamine among 30 rats by first placing each animal in a novel environment – a circular corridor – and tracking its movement for two hours. Photoelectric cells embedded in the corridor detected the animals' activity.

Half the animals were classed as having a low activity response to the novel situation; the rest responded with high activity levels.

The next day, researchers again placed the rats in the corridor and injected each with a low dose of amphetamine. Activity levels increased significantly more among the high-response rats, indicating they were more sensitive to the drug than were the low-response animals.

The researchers then divided a second group of 40 rats according to high or low activity in the unfamiliar corridor. Half the high-activity rats and half the low-activity rats received four injections of amphetamine to accustom them to the drug's effects. The remaining animals received saline injections.

A catheter connected to a pump-driven syringe was then inserted in each rat. Brief amphetamine injections were triggered when a rat poked its nose through a hole in the side of its cage.

High-activity rats that received saline injections developed a strong taste for self-administered amphetamine, whereas saline-treated low responders did not, the scientists report in the Sept. 29 SCIENCE. However, both low and high responders who first received amphetamine injections acquired a strong preference for self-administered doses of the drug, suggesting previous contact with amphetamine critically enhances the drug's addictive powers.

The researchers say the rats' varying activity levels in response to novelty may relate to differences in their response to stress and may also reflect neurobiological mechanisms that foster drug use. – *B. Bower*

# Orange you glad? Fido sees the blues

Gerald Jacobs was more than a little surprised a few years ago when a popular television science program casually stated that dogs lack color vision. An experimental psychologist at the University of California, Santa Barbara, Jacobs had spent a good part of his career seeking color vision in animals, and to his knowledge the question remained far from settled for canines.

A literature search confirmed that the most recent investigation – a 1969 study finding some evidence of color discrimination in dogs – was less than complete and that previous findings were split about fifty-fifty. So, with colleagues Jay Neitz and Timothy Geist, Jacobs embarked upon the most definitive study to date.

Armed with a sophisticated, computer-controlled apparatus that measures spectral thresholds, analyzes wavelength discrimination and delivers beef-and-cheese-flavored food pellets, the researchers enlisted a couple of greyhounds and a poodle in a series of behavioral experiments. Now they report their results: The faithful companion fetching your daily newspaper can indeed see some beauty in those Sunday comics.

"These experiments lead to the straightforward conclusion that dogs have color vision," the team writes in the September VISUAL NEUROSCIENCE. But unlike people, whose color-sensitive retinal cells detect blue, green and red, man's best friend paints the world with a two-tone palette. Indeed, the researchers find, canine color vision resembles that of humans with deuteranopia, or red-green colorblindness. One in 100 U.S. males inherits this syndrome, which leaves them unable to discriminate among green, yellow, orange and red. Blue stands out well from these other colors. "What it does effectively is divide the spectrum in half," Jacobs says. In comparison, normal humans and most primates construct their visual world from three basic colors; recent research suggests some birds use four.

Jacobs cautions that the experiments reveal little about how the world actually appears through a dog's eyes. For example, a dog may literally see red (that is, what humans would call red) when looking at Garfield the cat, who seems orange to normal humans and who often looks yellow to deuteranopes.

"What these experiments measure is the animal's ability to make discriminations. But we have no way of knowing what the experiences are associated with those discriminations," Jacobs says. Colors, he notes, "come with a lot of semantic baggage." – *R. Weiss*