Astronomy

Stellar motions provide hole-y data

By tracking the speed of stars close to the center of our galaxy, astronomers over the past 5 years have established that a black hole with a mass equal to 2.6 million suns lurks at the Milky Way's core (SN: 1/24/98, p. 59). Now, researchers have measured for the first time the acceleration of three stars near the core. By determining how much the orbits of these stars' are bent by the tug of the black hole, the scientists have more precisely calculated the beast's location and mass.

To measure acceleration, Andrea M. Ghez and her colleagues, all of the University of California, Los Angeles, used the Keck I telescope atop Hawaii's Mauna Kea to take a series of infrared images of the Milky Way's nucleus. The scientists periodically observed the stars from 1995 to 1999 and report their results in the Sept. 21 NATURE.

The researchers took thousands of exposures—each about one-tenth of a second—during each observation. These freeze-frame images avoid capturing the jitter from turbulence in Earth's atmosphere.

Although, the stars whiz around the galaxy's core at speeds of about 1,350 kilometers per second, the black hole has a huge effect on the shape of their orbits, says John Kormendy of the University of Texas at Austin.

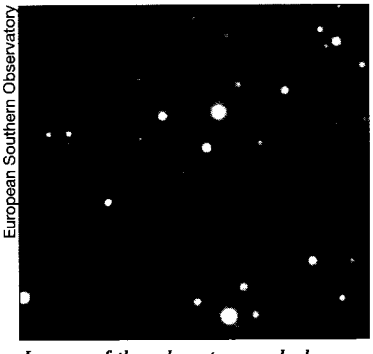
Each of the trio of stars accelerates at a rate similar to that experienced by Earth as it moves around the sun (3 to 5 millimeters per second per second). Moreover, this change in speed is directed toward a compact radio source, called Sagittarius A*, that lies at the presumed location of the black hole.

The new measurement "strengthens the association of Sagittarius A*" with the inferred black hole, Kormendy writes in a commentary accompanying the NATURE report. Ghez' team also finds that the unseen material exerting a gravitational tug at the Milky Way's center has a minimum density nearly 10 times what previous observations had revealed. This result negates the idea that the core is merely a throng of dim, ordinary stars, rather than a black hole, Kormendy notes.

At least one of the three stars may have an orbit as short as 15 years, Ghez and her colleagues say. If so, the team could eventually track the star for an entire rotation about the galactic center. "There is something quite grand in the realization that we can expect, with good health and a little luck, to see the [stars at the] galactic center rotate at least once in our lifetimes," Kormendy says. —*R.C.*

Gang of four: Debut of a big telescope

In the desert of northern Chile, a new telescope has opened for business, completing a quartet of instruments collectively known as the Very Large Telescope. Each instrument gathers light with an 8.2-meter mirror and is designed to work both independently and as part of a single, giant telescope.



European Southern Observatory

Image of the planetary nebula Hen 2-428 taken with the newest member of the Very Large Telescope quartet. Planetary nebulas are the outer layers of gas cast off by dying, sunlike stars.

The fourth and final detector took its first official images on Sept. 3 at Paranal Observatory in the Atacama Desert. Next year, researchers will begin using some of the four 8.2-m telescopes in concert, combining the light they collect. The resulting image, they predict, will give a startlingly clear view of the heavens—one never before possible with visible light. —*R.C.*

Biology

Kookaburra sibling rivalry gets rough

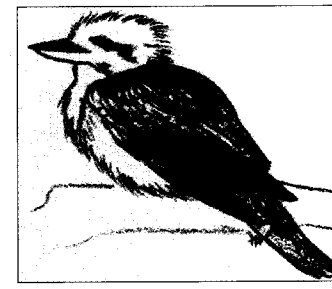
Kookaburras may have the most famous laugh in the bird world, but life for their nestlings doesn't sound particularly funny.

The chunky Australian kingfishers usually lay three eggs in a nest. The older two hatchlings commonly kill the youngest, reports Sarah Legge of the Australian National University in Canberra. In the September BEHAVIORAL ECOLOGY AND SOCIOBIOLOGY, she describes two ways that older sibs do in the youngest.

First, Legge observed the two elder siblings attacking the third sibling outright. They hacked at the youngster with a hook on their upper beaks, which Legge calls "a rare example of a morphological specialization for sibling rivalry." The youngest birds died of such injuries in a third of all the nests she observed. The other big danger for the youngest kookaburra comes from slow starvation. In a fifth of Legge's nests, the older siblings hogged the food.

In the starvation scenario, one risky circumstance was hatching into a nest where there were no extra adult males pitching in on child-rearing duties. Moreover, an eldest brother followed by a sister made an especially dangerous nest for a third hatchling, Legge reports. Kookaburra females quickly grow larger than males, and when sis surpasses big brother, it destabilizes the nestling dominance hierarchy.

Legge blames starvation in the nest, in part, on troubled kookaburra mothers. Females in poor condition are less likely than thriving females to have extra male helpers hanging around. Also, a stressed mom may be unlikely to create a healthy third egg and incubate it for fast hatching.



Kookaburra that survived sibling rivalry.

Because the circumstances of starving junior nestlings fit such a consistent pattern, Legge calls it "kookaburra siblicide syndrome." —*S.M.*

Whatever that is, it's scary

After 9,000 years of thriving in the absence of mammalian predators, tammar wallabies still startle at some signs of dangerous mammals, according to an Australian study.

No mammal has threatened the wallabies *Macropus eugenii* on the unsettled part of Kangaroo Island since the island separated from the Australian mainland. The scientists presented caged wallabies with sights and sounds that might signal unfamiliar but dangerous predators.

The sight of a taxidermist-prepared fox stopped the wallabies from foraging and sent them into a frenzy of thumping their hind feet and peering around. The sight of a similarly stuffed cat likewise interrupted dinner and provoked vigilance, report Daniel T. Blumstein and Christopher S. Evans of Macquarie University in Sydney and their coauthors in the September BEHAVIORAL ECOLOGY.

In contrast to the sight of a potential predator, recordings of dingoes howling didn't evoke much reaction, especially when compared with the calls of a familiar danger, the wedge-tailed eagle.

The wallaby experiments suggest that wariness about things that look like mammalian predators has endured, while concern about their sounds has faded, Blumstein and his colleagues propose. They say that the wallaby reactions demonstrate an evolutionary quirk called relaxed selection. When changing circumstances reduce the pressure for an animal to maintain some adaptations, such as wariness around predators, those adaptations linger for generations and then fade away in parts (SN: 10/9/99, p. 237). —*S.M.*