Gravity's ring: Hubble bags another lens

When it comes to gravity, some mirages are more nearly perfect than others.

In the 1930s, Albert Einstein predicted that a massive object can act as a lens, intensifying and bending light from a body that lies behind it. The lens typically generates multiple copies of a background body or stretches its image into an arc. In rare instances, when Earth, the lens, and the distant body are exactly aligned, the distorted image takes the shape of a complete circle.

Several of these circles, known as Einstein rings, have been found since 1987. Researchers say that an image unveiled this week is the first to capture an Einstein ring, as well as the galaxy responsible for this cosmic illusion, in a single visible-light or near-infrared image.

Peter N. Wilkinson of the University of Manchester in England and his colleagues reported the find at the National Astronomy Meeting in Saint Andrews, Scotland, and in the April 1 MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY.

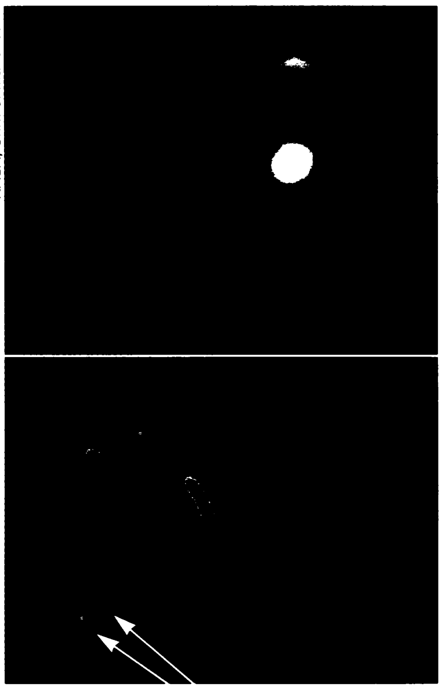
To minimize the blurring caused by Earth's atmosphere, many astronomers use radio telescopes to search for gravitational lensing. In their ongoing study, Wilkinson and his colleagues rely on several instruments, including the Very Large Array near Socorro, N.M., and the MERLIN network of radio telescopes spread across England, to examine thousands of distant galaxies.

A MERLIN image of a radio-emitting galaxy taken several years ago showed a partial ring, the apparent handiwork of a gravitational lens. Follow-up observations with NICMOS, the near-infrared camera on the Hubble Space Telescope, revealed a full ring as well as the lensing galaxy—a system known as B1938+666. The radio image depicted only a partial ring, notes Wilkinson, because the radio-emitting sources are not aligned precisely with the lensing galaxy.

"The scientifically interesting point is the important role NICMOS is playing . . . in detecting rings and partial rings," says Christopher S. Kochanek of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. The infrared camera is well suited to hunting lensed systems, he explains, because cosmic expansion shifts the visible light emitted by distant galaxies to infrared wavelengths.

Counting the lenses may be the best way to investigate the cosmological constant, an antigravity term introduced but later abandoned by Einstein. The term has since been resurrected to explain recent observations (SN: 3/21/98, p. 185). If the universe does have a cosmological constant, its distribution of galaxies would allow for a greater frequency of lensing. —R. Cowen

NASA, Univ. of Manchester



Top: Hubble picture shows an image of a distant galaxy distorted into a ring by a galaxy nearer Earth (center of ring). Bottom: MERLIN observation shows two radio sources (arrows) in the distant galaxy. The arc and the blob just above are lensed images of these sources.

Wild inbred butterflies risk extinction

Butterflies in the scattered meadows of Finnish islands are providing the most direct evidence yet that inbreeding contributes to extinctions in the wild.

Considered alongside a variety of ecological factors, inbreeding accounted for 26 percent of a butterfly population's risk of becoming extinct in the course of a year, report Ilik Saccheri and his colleagues at the University of Helsinki. Their analysis appears in the April 2 NATURE.

Glanville fritillary butterflies on the Åland Islands have fluttered into a long-standing argument about whether inbreeding matters in the real world. It clearly bedevils captive populations, enhancing expression of harmful recessive genes and hampering reproduction. Moreover, in laboratory experiments on colonies of fruit flies and mice, inbreeding increased extinction rates.

Although field studies have linked inbreeding to declines among song sparrows and adders, some researchers argue that, in nature, inbreeding proves trivial compared to crushing blows from weather changes, the demographics of a population, and especially human encroachment.

The island butterflies offered a powerful test case. Saccheri and his colleagues collected data over 4 years from some 1,600 meadows, each with its own, largely self-contained butterfly population. About 200 of these populations became extinct in any year, and wandering butterflies recolonized more than half of the vacancies.

The Helsinki team sampled genetic variability in butterflies in 42 meadows. The seven populations that disappeared during the next year had 28 percent less genetic variation than the groups that survived.

After factoring in such variables as original population size, meadow size, and abundance of nectar plants, the researchers still found genetic variability highly important.

Nevertheless, Saccheri emphasizes, "Man is the primary cause of population decline."

The statistical power of the butterfly study, with its many populations, may not be easy to match in examining inbreeding's effect on other extinctions. "Simply because people don't detect it doesn't mean it isn't going on," Saccheri warns.

Katherine Ralls of the National Zoological Park in Washington, D.C., says, "When I saw their data, I was a little jealous, speaking as someone who studies mammals." She welcomes the butterfly findings as important and convincing.

This and other field studies may nudge the debate on inbreeding versus environmental factors to a new level, says Tim Caro of the University of California, Davis. "It becomes an important issue as to which is the most important when you're trying to make a management decision," he says. Even though one of his specialties, the cheetah, became a poster child for inbreeding during the 1980s, Caro blames other menaces for the animal's rarity in the wild. "I think the cheetah was a false case of this phenomenon that is certainly now going on in nature." —S. Milius

Olli Marttila

On Finnish islands, many populations of the Glanville fritillary become extinct each year.