Astronomy

More planets

Astronomers have deduced the presence of one, or possibly two, additional planets orbiting nearby stars, bringing to 12 or 13 the number of known extrasolar planets.

Using a spectrograph on the 1.5-meter telescope at the Whipple Observatory atop Mount Hopkins, Ariz., one group of researchers monitored the motion of the star Rho Coronae Borealis. The star moves back and forth along the line of sight to Earth every 40 days, with a peak velocity of 67 meters per second, suggesting that an unseen planet tugs on the star.

Estimated to be slightly more massive than Jupiter, the planet would lie about 38 million kilometers from the star, a distance slightly less than Mercury's closest approach to the sun. The body would have a surface temperature of 300°C, too hot for water to exist as a liquid.

Nearly identical in mass to the sun, Rho Coronae Borealis lies 50 light-years from Earth in the constellation Northern Crown. Robert Noyes of the Smithsonian Astrophysical Observatory in Cambridge, Mass., and his colleagues report finding the planet in an upcoming ASTROPHYSICAL JOURNAL LETTERS.

Another team, led by John Mattox of Boston University, analyzed the motion of a very different type of star, an extremely compact X-ray and gamma-ray emitter known as Geminga. The rapidly rotating remnant of a supernova explosion from 300,000 years ago, Geminga acts like a lighthouse beacon, regularly beaming radiation toward Earth.

Combining 1970s observations of Geminga taken by the COS-B satellite with new data taken by the Compton Gamma Ray Observatory, Mattox found a tiny variation in the arrival time at Earth of gamma rays emitted by the compact body. The fluctuation indicates that the star swings toward and away from Earth through a distance of 3,200 km every 5 years. A planet orbiting Geminga with a 5-year period could account for the variation, he suggests.

He also notes, however, that the variation could be caused by changes in the rotation rate of Geminga. An interaction between the core of Geminga and its surface could slow or speed the remnant at irregular intervals. If observations continue to show a periodic fluctuation, then the planet hypothesis is more likely, he adds. —*R.C.*

Gamma-ray burst mystery continues

Just when astronomers thought they were about to solve the mystery of the origin of gamma-ray bursts—flashes of high-energy radiation that vanish without a trace—a new interpretation of a recent pair of Hubble Space Telescope images has revived controversy.

In March, researchers reported that ground-based telescopes had detected the first known optical counterpart of a gamma-ray burst. A week later, the counterpart was too faint to be seen with telescopes on the ground, supporting the notion that it represented a cooling fireball associated with the burst. Many researchers believe that the counterpart lies in another galaxy, clinching the theory that gamma-ray bursts originate outside our galaxy (SN: 3/22/97, p. 174).

Hubble images from March 26 and April 7 reveal that the faint visible-light source has two components, a pointlike object and an extended feature, report Kailash C. Sahu of the Space Telescope Science Institute in Baltimore and his colleagues in a March 31 circular of the International Astronomical Union (IAU).

In an April 17 IAU circular, Patrizia A. Caraveo of the Institute of Cosmic Physics in Milan and her colleagues report that the visible-light source appeared to move. Detectable motion implies that a source lies nearby, within our own galaxy.

Sahu and his collaborators say they find no evidence of motion. A third Hubble image may be needed to settle the controversy, he adds. —*R.C.*

Biology

From a meeting in Miami Beach of the American Society for Microbiology

What good is the cystic fibrosis gene?

A significant puzzle surrounding cystic fibrosis is its prevalence. The fatal respiratory disease results when a person has mutations in both of the body's copies of a gene called *cftr*. Yet even though in the past the disease killed people before they had reproduced and passed on their genes, about 1 in 20 white people of European descent are carriers of a mutant *cftr*.

Researchers have suggested that the mutant *cftr* gene persists so widely because of a heterozygote advantage. That is, having one mutant copy of *cftr* and one normal copy is somehow beneficial. For example, having two mutant copies of a certain hemoglobin gene results in sickle-cell anemia, but possessing one mutant and one normal gene bestows resistance to malaria.

What might the heterozygote advantage of cystic fibrosis be? In recent years, some investigators have proposed that it offers protection against the bacteria causing cholera or similar diarrheal diseases. Other scientists have poked holes in that theory. Cholera does not seem to have reached Europe until the 1800s, too late to explain the high frequency of the mutant *cftr* gene, say population geneticists.

Gerald B. Pier of Harvard Medical School in Boston and his colleagues now suggest that *cftr* mutations protect people from typhoid fever. Earlier work by this group indicated that the cell surface protein encoded by *cftr* helps lung cells eliminate *Pseudomonas aeruginosa* by latching onto these bacteria and internalizing them. The lungs of cystic fibrosis patients, in contrast, are almost always flooded with *P. aeruginosa*.

The group has now found evidence that *Salmonella typhi*, the bacterium that causes typhoid fever, depends upon the *cftr* protein to invade cells of the gastrointestinal tract, normally the first step in its journey into the bloodstream. Compounds that bind to the *cftr* protein, for example, block the bacterium's entrance into those cells. Moreover, the protein from the most common mutant form of *cftr* is unusable by *S. typhi*, the researchers found.

Such data argue that the apparently widespread incidence of typhoid fever throughout European history may explain why so many people of European descent harbor one mutant *cftr* gene, says Pier. Before antibiotics, the disease killed up to 15 percent of those infected. Mutations in *cftr* that repel *S. typhi* could offer people protection, thereby improving the survival odds of their genes, he says.

While "fascinating," the typhoid fever hypothesis is far from proven, says Michael Swift of the New York Medical Center in Hawthorne, who in 1995 proposed that cystic fibrosis heterozygotes are more resistant to asthma than other people. The most persuasive evidence, he says, would be a study showing that people with one *cftr* mutation are more likely to survive typhoid fever than those with none. —*J.T.*

Bacteria that don't say no to cocaine

Cocaine-loving bacteria might provide the next weapon in the war against trafficking in this dangerous drug.

Several species of bacteria have evolved cocaine-specific enzymes that degrade the narcotic into chemical components from which they can easily derive carbon molecules, notes Matthew M. Bresler of the University of Cambridge in England. He and his colleagues, for example, have identified such bacteria in the soil surrounding coca plants. They have now isolated from the microbes an enzyme that splits cocaine into benzoic acid and ecgonine methyl ester.

Their goal is to use this enzyme to create handheld sensors that detect particles of cocaine in the air, says Bresler. Benzoic acid is a relatively common compound, so the researchers plan to look for a simple method to sense ecgonine methyl ester. —*J.T.*