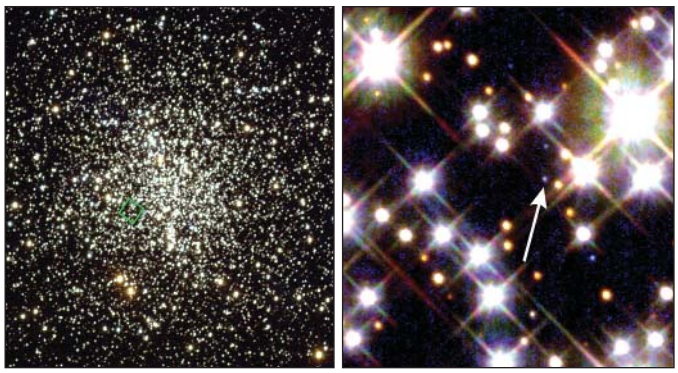
ASTROPHYSICS

Ancient Planet Turns Back the Clock

The discovery of a giant planet amid a cluster of primitive stars is challenging one of astronomers' pet notions. The planet, which orbits a tight pair of stars—including a rapidly spinning pulsar—suggests that some planetary systems were born billions of years before most astrophysicists thought the universe had spawned the raw materials needed to make them. "It's a big shock," says astrophysicist Steinn Sigurdsson of Pennsylvania State University, University Park, lead author of a report that appears on p. 193.

The formation of rocky planets is supposed to require a healthy dollop of "metals"—elements heavier than hydrogen and helium—swirling in the gas and dust around a baby star. Even giant planets like Jupiter assemble a rocky core of silicon, iron, and other such elements before they gather gas, according to the most popular model of planetary formation. Metals arise in the nuclear furnaces of stars, whose death throes, notably supernova explosions, then spew them into space. New stars incorporate this debris, and over several generations enough metals build up to form the rocky grains from which planets arise.



Unlikely home. Globular cluster M4 hosts a pulsar circled by a white dwarf (arrow, *right*) and a Jupiter-sized planet orbiting both.

CREDIT: (LEFT) NOAO/AURA/NSF; (RIGHT) NASA AND H. RICHER/UNIVERSITY OF BRITISH COLUMBIA

By that logic, globular clusters, swarms of metal-poor stars as old as our galaxy, are the last place you'd expect to find planets. Indeed, a recent search of more than 34,000 stars in the globular cluster 47 Tucanae exposed no giant planets (*Science*, 23 June 2000, p. 2121).

But Sigurdsson and colleagues think they have clinched the case for a planet in M4, a 12.7-billion-year-old globular cluster with just 1/30th the metal content of our sun. The team reports observations of the stars near a famous pulsar in M4, called PSR B1620-26. The pulsar itself is invisible to optical telescopes, but radio telescopes see it as a compact neutron star—the stellar corpse left by a long-ago supernova—that whirls nearly 100 times each second.

By timing the pulses from PSR B1620-26 with exquisite precision, astronomers realized about a decade ago that two companions tug the pulsar to and fro. One is a white dwarf in a tight 191-day orbit. Its more distant partner, according to images from the Hubble Space Telescope newly analyzed by Sigurdsson's team, is an unseen planet with about 2.5 times the mass of Jupiter.

The white dwarf's color and brightness suggest that it's a star that ran out of fuel and lost its outer atmosphere only about 500 million years ago. The dwarf's youth and tight orbit, says Sigurdsson, argue that it probably started out as an independent star with a primordial gas-giant planet orbiting it. Then, the star strayed too close to the old neutron star, which orbited with its own binary companion somewhere in the cluster's crowded core. Computer models suggest that the interloper cast out the neutron star's original companion and settled into a tight orbit. The planet hung on in a large, century-long orbit around the new binary while the recoil from the interaction hurled the system into M4's more sparsely populated outskirts. When the planet's parent star ran out of fuel, it expanded and shed gas onto the old neutron star—spinning it up into the whirling dervish seen today.

Theorists find this scenario plausible, and they are delighted with the inferred ancient planet. "If you find one, there must be large numbers of them," says astrophysicist Frederic Rasio of Northwestern University in Evanston, Illinois. "Clearly this would suggest that planet formation does not require high-metal environments." One controversial theory posits that giant planets might not need rocky cores if they form directly from unstable whorls of gas in the nebula around a young star (*Science*, 6 June, p. 1498). M4 is so metal-poor that theorists may have to swallow hard and take that model seriously, Sigurdsson notes. What's more, he adds, ancient planets would mean that life has had 5 billion or 6 billion years longer to appear than astronomers expected.

–ROBERT IRION

ScienceScope

Canada Awards Training Grants

Fifty-four teams of Canadian health researchers will share $40 million over the next 6 years to train hundreds of graduate students and postdocs in priority fields. The Canadian Institutes of Health Research (CIHR) announced the awards last week, marking the second round of a government initiative to improve the nation's health care system. "CIHR is trying to mimic what NIH has been doing so successfully for years," says Hugh Wilson, head of York University's Centre for Vision Research, which plans to use its $1 million grant to bolster stipends and support for some 10 graduate students and seven postdocs a year.

Wilson, who moved to York in 2000 after more than 30 years at the University of Chicago, says that the program will allow Canadian universities to compete for the best young talent from around the world. "We'll be able to fly in prospective students for a 3-day recruitment visit," he crows. "Unfortunately, it'll have to be in the winter."

–JEFFREY MERVIS

Japan Gives Up Sub Search

Marine researchers are in a deep funk over the loss of one of the world's deepest diving submersibles. Japan's marine science agency last week called off the search for the instrumented rover attached to *Kaiko*, an unpiloted submarine, after an expert panel concluded that the odds of finding it were slim. The rover broke free from its mother craft while diving off Japan in late May (*Science*, 13 June, p. 1639). The government must now decide if it will replace the craft, which could cost $10 million or more.

–DAVID MALAKOFF

Budget Fight Shuffles Grants

Researchers funded by the National Institute of Allergy and Infectious Diseases (NIAID) may feel the impact of a high-level budget skirmish after all.

In February, NIAID officials said they would have to trim grants in order to spend $233 million on procuring a new anthrax vaccine. But last month, after protests from researchers and congressional allies, the agency reached a compromise with White House budget officials that appeared to spare grants, at least in the short run (*Science*, 27 June, p. 2017). But agency officials last week told *Science* that the deal will still bring change: They plan to shorten 5-year grants by 6 months and add a few months to 4-year grants in order to streamline grants management. It won't be clear if researchers have actually lost funds, however, until this fall, when budgeteers tally up the fiscal year's accounts.

–JON COHEN