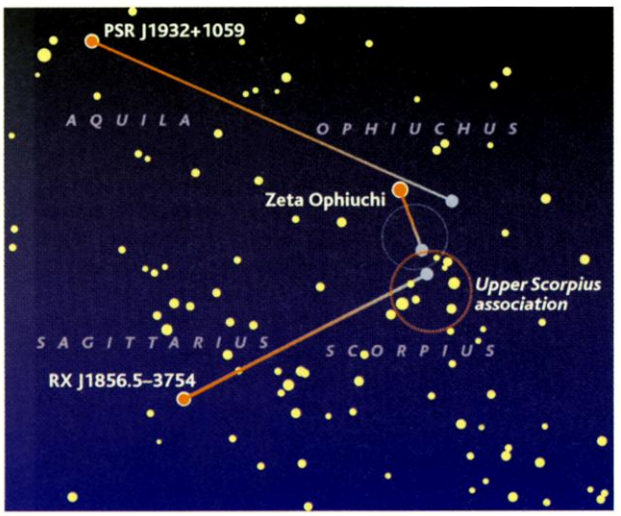
ASTROPHYSICS

Neutron Stars Linked To Celestial Runaway

A million years ago, in the constellation Scorpius, one of a pair of binary stars erupted into a supernova. Its nonexploding partner shot off into space and is now Zeta Ophiuchi, a bright, giant "runaway star" racing through the neighboring constellation Ophiuchus. The supernova has been harder to trace. Astrophysicists know it must have collapsed into a neutron star, but where it wound up has been anyone's guess. Now, however, astronomers are fingering two candidates, one of which is the closest known neutron star to Earth. The discovery, if confirmed, will give astronomers a better understanding of the dynamics of supernova explosions in binary systems and the origin of runaway stars.



Hindsight. Tracing star positions (red) back 1.15 million years (blue) pairs two possible partners with Zeta Ophiuchi.

The nearby neutron star, known as RX J1856.5–3754, was first detected by the German ROSAT x-ray satellite, and it was spotted in visible light in 1997 by Fred Walter and Lynn Matthews of the State University of New York, Stony Brook, using the Hubble Space Telescope. New Hubble images, taken in March and September 1999, enabled Walter to calculate both the faint star's distance from Earth—a mere 200 light-years—and its proper motion, or apparent path across the sky. Traced backward, Walter says, "the proper motion brings the neutron star from the general vicinity of the Upper Scorpius association"—the group of bright, young stars in which Zeta Ophiuchi was born.

In a paper scheduled for publication in the 10 January 2001 issue of *The Astrophysical Journal*, Walter theorizes that RX J1856.5–3754 is the collapsed core of the supernova that flung Zeta Ophiuchi into space. Because the neutron star's radial velocity (its movement toward or away from Earth) is unknown, astronomers can't tell whether the path leads into the association or passes in front of it. But Walter calculates that if the neutron star came from the association, it did so 1.15 million years ago—just when Zeta Ophiuchi made its own explosive exit. That timing matches evidence of the star's youth, Walter says. Lone neutron stars are expected to cool down over time, yet RX J1856.5–3754's x-ray brightness indicates that its surface is blazing away at more than 500,000 K. Such a hot neutron star, he concludes, must be young.

Some other astronomers, however, believe RX J1856.5–3754 may be far too old to have been Zeta Ophiuchi's companion. Marten van Kerkwijk of Utrecht University in the Netherlands and Shri Kulkarni of the California Institute of Technology in Pasadena announced this week that observations with the European Southern Observatory's Very Large Telescope in Chile show that RX J1856.5–3754 is trailing a small, faint cone of glowing hydrogen gas, supposedly heated by the star's intense x-rays. From the brightness of the glow, the scientists calculate that the gas near RX J1856.5–3754 must be about 100 times as dense as the galactic average. The gas would slam onto the compact star at half the speed of light, heating the surface and making it appear younger than it actually is.

With so much matter available to heat it, Van Kerkwijk says, RX J1856.5–3754 could well be billions of years old—thousands of times too ancient to have been born in Upper Scorpius. But Walter argues that if the star is that old, it would have attracted enough interstellar hydrogen to make its visible light hundreds of times brighter than astronomers observe.

Van Kerkwijk thinks a much more likely candidate for Zeta Ophiuchi's erstwhile partner is a radio pulsar known as PSR J1932+1059. Pulsars are spinning neutron stars that emit radio pulses. From the rate at which PSR J1932+1059's rotation is slowing down, Van Kerkwijk calculates that the pulsar is at most a few million years old. In another *Astrophysical Journal* paper, scheduled to appear in October, Ronnie Hoogerwerf, Jos de Bruijne, and Tim de Zeeuw of Leiden Observatory in the Netherlands show that PSR J1932+1059 also left the Upper Scorpius association 1 million years ago, assuming that its radial velocity—also unknown—is about 200 kilometers per second.

Walter agrees that PSR J1932+1059 could be the former binary companion of Zeta Ophiuchi. But he believes RX J1856.5–3754 is young enough to be a candidate as well. In any case, Walter says, it's perfectly possible that the hot neutron star and the young pulsar flared into being in the same part of the sky at about the same time. "There was at least one supernova in Upper Scorpius about 1 million years ago. Why not two?" **–GOVERT SCHILLING**

Govert Schilling is an astronomy writer in Utrecht, the Netherlands.

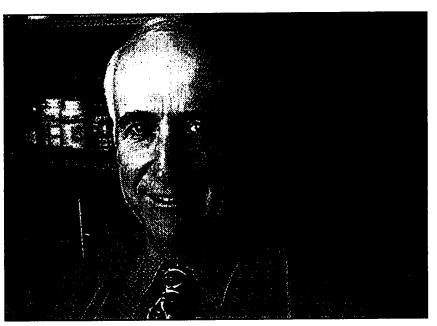
APPOINTMENTS

Salk Institute Goes North for New CEO

The revolving door at the top of the Salk Institute for Biological Studies in La Jolla, California, took another spin last week with the appointment of neuroscientist Richard Murphy as president and CEO. Murphy, director of the Montreal Neurological Institute (MNI), will become Salk's fourth chief executive in 4 years when he takes up the reins on 1 October. Murphy, 56, says his main job will be to raise enough money to keep the endowment-poor research institute in the scientific big leagues.

Founded in 1960 by polio vaccine developer Jonas Salk, the institute has become a dominant player in molecular biology and genetics. But Salk executives have had a difficult time translating scientific success into long-term financial health. Part of the problem is that Salk, dedicated exclusively to research, does not graduate students and is therefore not blessed with generous alumni. More recently, however, the institute's frequent changes in leadership have created another problem—a suggestion that the institute lacks a clear sense of direction.

Born and trained in the United States, Murphy says that he doesn't plan to run a research group at Salk and that "this will be a full-time job with all the fund raising involved." At MNI he raised more than $25



Money man. Richard Murphy says his top priority is to boost Salk's endowment.

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