asked all the right questions," a House staffer says. "I would rather have had a really strong scientist again," admits Linda Birnbaum, a dioxin researcher at EPA's health effects lab in Research Triangle Park, North Carolina. But she and others say they're relieved a nominee has finally been chosen.

Noonan must now be confirmed by the Senate. Her "first order of business," she says, "is to get to know the organization." EPA watchers and Noonan both agree she has a lot to learn. Her selection, she says, "is as interesting a choice for me as it is for them."

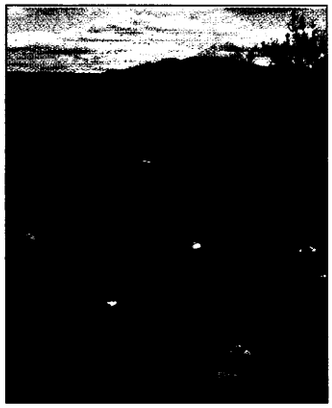
–JOCELYN KAISER

ECOLOGY

Vanishing Pools Taking Species With Them

Near the end of Noble Drive in San Diego, past a row of condos, the city has erected a chain-link fence to protect a patch of dried mud. To understand why, one must look beneath the surface—or wait a few months. Come winter, the rainy season, this sun-baked plot turns into a pond teeming with fairy shrimp and plants, some of which are on the federal endangered species list.

These unusual species spring to life in rainwater ponds, called vernal pools, that linger until late spring or summer every year before evaporating. But strategies to save these ecosystems are falling short, according to new data presented last month at a joint meeting of the Ecological Society of America and the American Society of Limnology and Oceanography in St. Louis. Surveys suggest that up to a third of vernal-pool crustaceans thought to have existed in California in the mid-1800s have gone extinct. "It's death by 1000 small wounds," warns ecologist Gordon Orians of the University of Washington, Seattle. "If we were to lose just one pond or one species, would it matter? Probably not. But the first one goes. Then, the next. And the next. Finally, the cumulative effect on biodiversity is devastating."



Going, going ... Ecologists hope to save this vernal pool at Miramar and *L. packardi* shrimp *(top)*.

LARRY SERPA

ELLEN BAUDER

The crustaceans are dwindling because the pools themselves are a vanishing breed. It is hard to track the ephemeral habitats, formed when rainwater collects in depressions lined with thick clay. But historical soil surveys in California's Central Valley suggest that a century ago, vernal pools occurred on 1.64 million hectares in this region alone, says Bob Holland, an ecologist who contracts for state agencies. Now, the pools return to less than 400,000 hectares in the valley, he says. Fueling the decline are development and agriculture, says Ellen Bauder, an ecologist at San Diego State University. In San Diego, she says, over 90% of vernal pools spotted in aerial photos 70 years ago no longer come back.

For years, hardly anyone noticed the pools were disappearing—until scientists started counting species. Bauder first documented the decline of vernal pool plants, 13 of which are now endangered. Then in 1992 and 1994, a team led by biologist Marie Simovich of the University of San Diego sampled vernal pools in San Diego and throughout the Central Valley. They tallied 80 crustacean species, many existing in only a few pools. Losing these crustaceans could have ramifications up the food chain, says Simovich. Fairy shrimp, for example, are eaten by mallards and other migratory birds that winter in California.

Plugging vernal pool loss and Simovich's numbers on species range into a computer model that forecasts extinctions, Jamie King of the Environmental Protection Agency in Annapolis, Maryland, has estimated that up to a third of the crustaceans that lived in the Central Valley's pools 150 years ago have since gone extinct. "Given that most crustacean species occur only in a few pools, you don't have to lose much habitat before you lose a lot of diversity," King says.

Hoping to thwart further losses, the U.S. Fish and Wildlife Service in the past year has bought two San Diego tracts with vernal pools and says it plans to buy more. The city itself is guarding some pools, including the one on Noble Drive. And Miramar, the Marine Corps Air Station just outside San Diego, has hired contractors to restore 116 vernal pools on its 9300-hectare base—an anticipated 5-year, $1 million project that will involve, among other things, sculpting depressions and stocking them with fairy shrimp, plants, and other vernal species.

But conservation strategies on private lands—which aim to create an equal amount of vernal pool habitat for that destroyed—are bogged down in disputes. Some landowners complain about regulators spying on private property in the hopes of catching citizens filling in mere puddles. "It's a nightmare," says Bruce Blodgett, director of national affairs for the California Farm Bureau Federation in Sacramento, who worries that farmers could lose cropland to restored vernal pools. Scientists decry the strategy for another reason: "This 'no net loss' approach ignores the fact that some fairy shrimp species live in one pool but not in another," says Simovich, who wants to see pools with rare species conserved, not re-created. "The conflict," adds Bauder, "is getting worse."

–KATHRYN S. BROWN

Kathryn S. Brown is a science writer in Columbia, Missouri.

ORIGIN OF LIFE

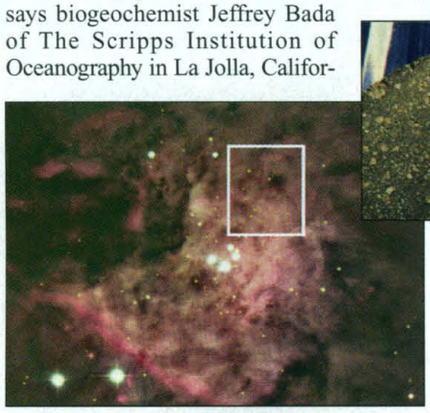
Did Twisty Starlight Set Stage for Life?

In their quest to trace the origins of life on Earth, scientists keep confronting a puzzle: How did vital molecules get their distinct twists? Nearly all the amino acids in proteins are "left-handed" (L), a designation for one of two mirror-image configurations of atoms around a carbon center. On the other hand, the sugar backbones of DNA and RNA always spiral to the right. This uniform handedness, or homochirality, could have arisen in the course of evolution, either by chance or because such shapes somehow aid DNA replication or protein synthesis. Or it may have preceded life: Some researchers argue that our infant solar system was seeded with L amino acids formed in cool interstellar clouds, which then rode to Earth aboard comets, meteorites, and dust.

That scenario receives a boost this week with a report on page 672 describing the first evidence of a possible space-borne mechanism. A team led by Jeremy Bailey of the Anglo-Australian Observatory near Sydney has spotted circularly polarized infrared light—in which the electromagnetic wave rotates steadily—streaming from a region of intense star birth in the Orion Nebula. Ultraviolet (UV) light polarized this way can selectively destroy either left- or right-handed (D) amino acids, depending on the direction of spin. If similar radiation bathed the dust around our newborn sun 5 billion years ago, says team member James Hough of the University of Hertfordshire in Hatfield, England, "it could have created the necessary precursors to life's [handedness]. This process would produce a much higher excess [of L amino acids] than anything that could occur on Earth."

The findings are "quite exciting," adds organic geochemist John Cronin of Arizona State University in Tempe, who has found a surplus of L amino acids in two meteorites

that hit Earth this century and thinks such space-borne amino acids might have set the pattern for ones made later on Earth. Origin-of-life experts have a different spin. "There are so many problems" with the scenario, says biogeochemist Jeffrey Bada of The Scripps Institution of Oceanography in La Jolla, California, who doubts that large quantities of amino acids from space would have survived the journey to Earth or hung around long enough to influence early biology. "I doubt this will settle the issue of how homochirality arose."



DAVID MALIN/ANGLO-AUSTRALIAN OBSERVATORY (INSET) DUANE WILLIAM DIETZ/VISUALS UNLIMITED

Stellar spin. Polarized light from part of the Orion Nebula (box) may form amino acids with a twist, such as those in the Murchison meteorite *(inset)*.

Those who favor an unearthly genesis for homochirality have for years pointed to circular polarization as a possible trigger. Astronomers have seen high levels of such radiation near binary stars and in other exotic settings with strong magnetic fields. Now, Bailey's team has found it in an environment much like the one that spawned our solar system. They studied the Orion Molecular Cloud, a cauldron of star formation, with an infrared camera on the 3.9-meter Anglo-Australian Telescope. They found that up to 17% of the infrared light streaming from Orion was circularly polarized, presumably by scattering off fine dust grains aligned in a magnetic field. "That was a big surprise," says Bailey, who had expected levels of 1% to 2%.

Infrared light, however, does not pack the energy needed to destroy organic molecules. That would take UV light. Although Bailey's colleagues could not see UV light from Orion because of obscuring dust, they calculate that a similar percentage of UV light should also be circularly polarized. If such light from a nearby star cascaded through our early solar system, it could have broken the bonds in enough D amino acids to yield one extra L amino acid for every 10 molecules—enough of an excess for early organisms to seize upon and amplify. Other planetary systems, depending on the direction of polarization, might see an excess of D amino acids.

Even so, Bailey and Hough acknowledge, many events must fall into place to render their scenario plausible. Those steps include making huge amounts of amino acids in space and delivering them to Earth without losing the surplus to "racemization"—the spontaneous transformation of homochiral molecules to an even-handedness that happens quickly at high temperatures and in water. "I consider each of those steps to be possible," says planetary scientist Christopher Chyba of the University of Arizona, Tucson, noting Cronin's recent discovery of L amino acid excesses ranging from 3% to 9% in the Murchison meteorite, which fell in Australia in 1969 (*Science*, 14 February 1997, p. 951), and in a 1949 meteorite from Kentucky. "The open question is, would such an excess be important to the origin of life?"

Bada and his colleague at the University of California, San Diego, chemist Stanley Miller, think not. "Once the amino acids get to Earth, they would racemize in very short order," Miller says. "I've always felt that homochirality arises by chance." **–ROBERT IRION**

Robert Irion is a science writer in Santa Cruz, California.

ORIGIN OF LIFE

A Sulfurous Start for Protein Synthesis?

Although Charles Darwin proposed that life originated in a warm, nourishing broth, new evidence supports a less cozy idea: that the cradle of life was more like a Puritan minister's version of hell—a sulfurous swirl of superheated water and oozing magma. On page 670, chemist Claudia Huber and patent attorney Günter Wächtershäuser report that they have re-created a crucial step in assembling the ingredients of living cells—the linking together of amino acids into short, proteinlike chains called peptides—under just such harsh conditions.

Although other researchers have achieved a similar feat in the lab, they generally did so with the help of additives or conditions not likely on early Earth. The amino acids had to be kept dry, for instance, or be activated by compounds not found in nature. In contrast, Wächtershäuser says, his system "uses nothing more than what is available in volcanic exhalations"—the magma and pressurized gases that suddenly hit cooler ocean water at cracks in Earth's crust. James Ferris of the Rensselaer Polytechnic Institute in Troy, New York, agrees: "These peptides are made under plausible prebiotic conditions. You don't have to throw anything in that is artificial."

Indeed, says evolutionary biologist Norman Pace of the University of California, Berkeley, the peptide formation is "very ex-

ScienceScope

INDIA TELESCOPE CUTS PHONE DEAL

An 11th-hour agreement was expected to be signed this week to prevent a global mobile phone system from interfering with India's new $17 million Giant Metrewave Radio Telescope (GMRT), an array of 40 huge antennas near Pune. Iridium India Telecom, a Motorola subsidiary, is planning on 23 September to start up a system that will send satellite transmissions to a gateway only 80 km from the telescope (*Science*, 28 November 1997, p. 1569). Now, astronomer Govind Swarup, the "father" of GMRT, says, "we have arrived at an agreement with Iridium"—details yet to come—to avoid interference from emissions in the 1610-MHz band, a frequency important for probing star-forming regions.

SELLING ONCE-SECRET, ONCE-SOVIET SCIENCE

Russia's beleaguered nuclear scientists are about to get help from a new program to get them into commercially productive research. Announced 24 July in Moscow by Vice President Al Gore and Russia Prime Minister Sergei Kiriyenko, the Nuclear Cities Initiative (NCI) aims to boost U.S. private-sector investment in the once–top-secret cities.

Times are tough in these towns. Last week, scientists in Sarov, 400 km east of Moscow, struck for a day to protest months of unpaid wages. And some researchers, it is believed, have resorted to aiding Iran's missile program. To get scientists more positively engaged, the U.S. Department of Energy (DOE) has sunk

ВНИИ

Logo of nuclear facility in Sarov

$30 million this year into applied research in science cities. But the problem is so great, says Janet Hauber, NCI manager at DOE, that "we don't think that model will respond quickly enough." Under the NCI, U.S. investment will be sought for projects at three nuclear cities—Sarov, Snezhinsk, and Zheleznogorsk. There's no new government money for the initiative, says Hauber, but hopes are that there will be enough private sector enthusiasm to expand it to seven more cities.

Contributors: Eliot Marshall, Susan Biggin, Pallava Bagla, Richard Stone.