clocked at just 35 centimeters per second.

But what about stars very different from our sun? For giant, slowly oscillating stars, astronomers need to keep their spectrographs extremely stable and well calibrated over long periods and might need more than one instrument to keep watching during several oscillations. This month, a large collaboration of European astronomers announced using the Euler Telescope and a similar instrument at La Palma in the Canary Islands to observe the old giant star Xi Hydrae twice per hour for a month. It oscillated, they found, once every 3 hours. "Eventually, we hope to deduce the internal structure of stars in each possible evolutionary stage," says team member Conny Aerts of the Catholic University of Leuven, Belgium.

Gough says it's not yet possible to deduce detailed stellar properties from asteroseismology data. "But right now, we have so few measurements of this kind that any new observation is of interest, especially for an evolved star" such as Xi Hydrae. "The observed frequencies fit the theoretical expectations, and that's comforting," he says. Already, other groups are focusing on stars with special properties, such as compact dwarfs and stars with low abundances of heavy elements, and later this year the Euler Telescope will be equipped with a much more sensitive spectrograph.

The big breakthroughs, however, will have to await the launch of dedicated asteroseismology satellites. From space, sensors will be able to measure tiny brightness fluctuations rather than Doppler shifts, enabling them to scan many more stars for vibrations and study fainter stars. In December, Canada will launch a small asteroseismology satellite called MOST, and 2 or 3 years later, Denmark and France hope to launch their own missions, dubbed Rømer/MONS and COROT.

But these space pioneers will likely be eclipsed by an orbiting observatory called Eddington that the European Space Agency plans to loft in 2007 (see p. 1585). "Its final design could benefit from the preliminary results of the other missions," says Gough. "Without any doubt, space observations are going to transform this field, just like they did with helioseismology." **–GOVERT SCHILLING**

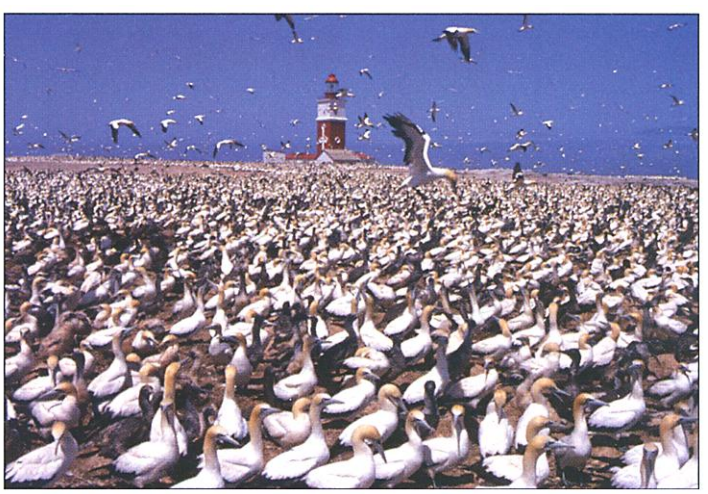
Govert Schilling is an astronomy writer in Utrecht, the Netherlands.

SUSTAINABLE DEVELOPMENT

Cash-Strapped Fund Struggles To Make Science a Priority

Earlier this month, donor nations failed to agree on a budget for the Global Environment Facility. The crisis could undermine nascent efforts to strengthen its science base

CAMBRIDGE, U.K.—When a pair of ecologists unveiled an ambitious proposal 5 years ago to triple the size of South Africa's Addo Elephant National Park, they had no trouble convincing peers that the idea was sound. As a recipe for sustainable development, their plan offered all the right ingredients: thousands of new ecotourism jobs for the depressed Eastern Cape region; a refuge for more than 400 bird species, including the world's largest gannet colony; ample breeding grounds for elephants; and hundreds of kilometers of new fencing to protect six of the country's seven biomes, from the spectacular coastal dunes in Alexandria to the fragile Sundays River estuary. All that ecologists Graham Kerley and André Boshoff of the University of Port Elizabeth needed to drum up were political support and the $40 million it would take to make the Greater Addo National Park a reality.



Taking off. GEF funding was crucial to starting work on Greater Addo National Park and its famous gannetry.

CREDIT: C. URQUHART/ECSL

Their quest for a Greater Addo came to a satisfying conclusion earlier this month, when the governing body of the Global Environment Facility (GEF) approved a $5.5 million grant. Even before the decision was made, the megafund's promise of support had provided the leverage that Kerley and Boshoff needed to convince South African National Parks and the government to embrace their proposal and to raise the rest of the money from private donors. To enthusiasts, this is exactly what GEF is all about: getting environmentally sound initiatives off the ground.

But many other projects in GEF's pipeline were not so lucky. At a parallel meeting earlier this month, the fund's donor nations failed to agree on GEF's next budget. The United States has resisted calls to increase GEF's 4-year funding from $2.2 billion to $3.2 billion to cope with a mandate recently broadened to cover desertification and persistent organic pollutants. A Treasury Department official attributes the reluctance to pony up funds to what the United States views as GEF's inadequate monitoring of whether grant money is spent wisely, as well as an intention to catch up on arrears: The United States currently owes the fund $220 million. The uncertainty leaves dozens of projects in limbo, including 16 that have already been delayed by funding shortfalls. In addition, GEF's Scientific and Technical Advisory Panel (STAP) had to cancel some of its initiatives, including a workshop on how to clean up organic pollutants.

The belt-tightening has brought to a boil what many STAP members view as the fund's most pressing issue: weak scientific underpinnings of many projects. "Given that resources are scarce, it is absolutely critical that scientific input is sought as a basis for GEF policymaking," says new STAP member Leonard Nurse, a coastal ecologist at the University of the West Indies. Adds Al Hammond, senior scientist of the World Resources Institute, who recently took part in a major outside review of GEF's operations: "If we are serious about getting scientific advice, then we have to change the system."

Since being set up a decade ago to fund the United Nations Conventions on Biological Diversity and Climate Change, GEF has spent $4.2 billion on more than 1200 projects and catalyzed an additional $12.7 billion in matching funds from governments and private investors. It funds proposals from the U.N. Development Programme, the U.N. Environment Programme, and the World Bank, which will oversee the Greater Addo project.

In the run-up to its meeting held earlier this month in Washington, D.C., GEF's governing council commissioned a major review

Like night and day. Fencing protects Addo land from overgrazing.

of the fund's first decade of operation. The panel, led by sustainable development specialist Leif Christoffersen of the World Conservation Union, concluded in January that the fund has achieved "significant results" in addressing global problems. The review drew attention to GEF-funded projects that have slashed emissions of ozone-depleting compounds and supported energy-efficient technologies. For example, a project on converting wood chips and sugar-cane waste into fuel in Brazil squeezed five times more energy out of the equivalent amount of biomass used previously; the technology is now being replicated in the United Kingdom.

GEF has moved more slowly on species conservation, but Peter Raven, director of the Missouri Botanical Garden in St. Louis, says the fund has done "invaluable work" in this area, such as funding the training of young taxonomists in SABONET, a network of botanical gardens in southern Africa. It is also contributing one-third of the $20 million budget of the Millennium Ecosystem Assessment. Under the 4-year effort, some 1500 scientists are gathering data on the world's ecosystems, assessing nature's ability to provide essential "services" such as food and clean water and projecting trends such as deforestation and species loss (*Science*, 8 September 2000, p. 1676). The analysis of this data is intended to help governments better steward their natural resources.

But GEF received poor marks for its efforts to reach out to the scientific community. Presenting the review's findings last month in The Hague, James Seyani, a Malawian botanist at the Commonwealth Institute in London, argued that "projects should be submitted to critical scientific review, which has not been the case in the past." Christoffersen's panel characterized the current process, in which one or more scientists drawn from a 400-strong roster reviews each proposal, as an "obligatory but sometimes meaningless checkoff." One reviewer told *Science* that implementing agencies are sometimes looking for a "rubber stamp" before a project goes to the council for approval. And experts in developing nations are rarely consulted, because the U.N. agencies prefer faster replies from Western experts with better communication links.

At the council meeting in Washington, outgoing STAP chair Madhav Gadgil, an ecologist at the Indian Institute of Science in Bangalore, recommended that the fund greatly expand its scientific links in the developing world and require agencies to tap local scientific networks during a project's design. His call has set in motion a long-term reassessment of scientific input into GEF projects. But given the fund's cash crunch, the council only endorsed steps that would cost a negligible amount to implement—such as consulting local experts more often.

Frantic negotiations are now under way to arrive at GEF's new budget, with some Western European nations and Japan pressing for a big boost. If the funds come through, new STAP member Peter Schei of Norway's Directorate for Nature Management says he hopes to see broader scientific involvement in GEF projects, along the lines of the Intergovernmental Panel on Climate Change.

"GEF was started as an experiment, but the experiment has grown up," says Hammond. Now, he says, is the time to take GEF to another level—by strengthening its independence and making input from scientific communities around the globe a priority.

–ADAM BOSTANCI

PROFILE GARY STROBEL

Biologist Gets Under the Skin of Plants—And Peers

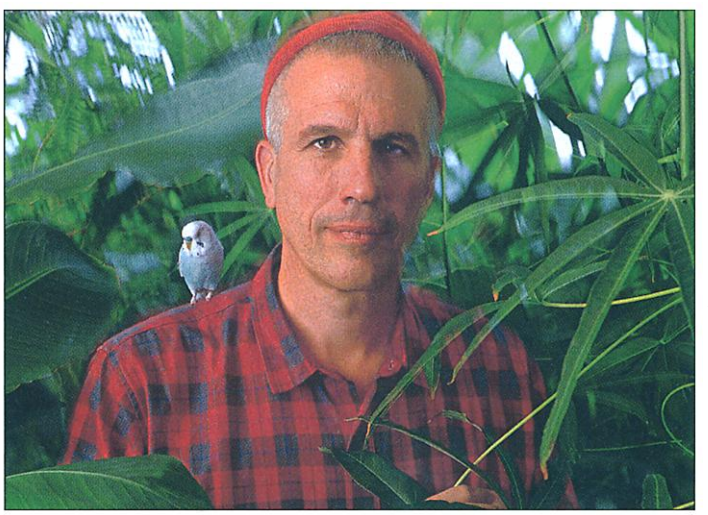
By doing things his own way, Gary Strobel has made himself a bioprospector par excellence, finding useful chemicals in the most unusual places

Gary Strobel was returning from a bush walk in Australia's Northern Territory one afternoon when he encountered a wizened man on the outskirts of a village. They struck up a conversation, during which Strobel explained that he is an American scientist who had come to collect snakevine, a plant that indigenous Australians mash up and apply to wounds. Strobel, an expert on endophytes—organisms that make their homes inside other organisms—described how he would hunt for endophytic microbes in the snakevine that might help explain its medicinal properties. Reggie Munumbi Miller, an Aborigine, listened patiently, then asked, "Can you tell me where I came from?"

That sort of metaphysical rejoinder might put off most conservative middle-aged white guys with crewcuts. But it didn't faze Strobel, who got to know the tribal elder well over the next several days. Then he returned to his lab at Montana State University (MSU), Bozeman, in September 2000, with snakevine samples and a didjeridu, a deeply resonant Aboriginal wind instrument that he enjoys playing.

And just as Strobel has often done before in remote corners of the globe, he discovered a new life-form: a kind of streptomycete, a genus of bacteria that produces more than 50 licensed antibiotics. Whereas most streptomycetes live freely in soil, the new species appears to dwell inside the snakevine, in the interstices between cells. That November, Strobel sent some photos of the bacteria to Munumbi Miller. After waiting a few months for a reply, he dispatched a second set of photos, in case the first had been lost. Then in early 2001 he and postdoc Uvi Castillo found that the new streptomycete makes a clutch of potent antibiotics. Strobel's joy would be tempered, however, by the reply he would eventually receive from Australia.

Strobel, now 63, has spent the past decade of a diverse career uncovering biochemical



Rare bird. Gary Strobel sees himself as a nonconformist.

CREDITS: (TOP TO BOTTOM) G. KERLEY; COURTESY OF G. STROBEL