Cash and Carry Science

"Scientists Who Fund Themselves" by Jon Cohen, in *Science* (Jan. 9, 1998), 1200 New York Ave. N.W., Washington, D.C. 20005.

With research grants harder to get these days, some scientists have discovered a different way to pay for their laboratory work: they dig into their own pockets.

Such self-funding researchers are still a small minority, reports *Science* writer Cohen, but their number is growing—and not all of them are wealthy. Take biologist Robert Summers, of the State University of New York at Buffalo, who studies the developmental biology of sea urchins. He is not a rich man, but about 10 years ago he saw the handwriting on the wall. "I just realized that if I wanted to continue," he told Cohen, "I'd have to beg, borrow, steal, and scrape—and spend my own money." Last year alone, he estimates, he kicked in some $10,000.

Scientists underwriting their own work is nothing new. When modern science began in the 17th century, it was largely a pursuit of rich amateurs. Self-funding remained common in the United States until World War II, when levels of government support for scientific research soared. In recent years, however, with the Cold War over, Washington's enthusiasm for funding research projects has diminished. To keep their research going in the absence of sufficient support from the National Science Foundation or other grant givers, self-funding scientists draw on their own salaries or pensions or other sources of income; some channel their outside consulting income into their labs. And a fortunate few are able to rely on family wealth.

Self-funding has definite advantages for scientists. It saves them months of work on grant applications, and frees them to depart from the more fashionable lines of research favored by conservative peer reviewers. But these advantages, Cohen notes, can also be drawbacks. Writing a grant application can help a researcher to clarify his thinking about his project, and peer review can provide useful feedback. For universities, there is a further disadvantage, since they claim a portion of all faculty grants as "overhead." In fact, some self-funders have seen their labs shut down because they failed to satisfy their parent institution's hunger for that kind of cash.

Power from Outer Space

"Beam It Down" by Martin I. Hoffert and Seth D. Potter, in *Technology Review* (Oct. 1997), Massachusetts Institute of Technology, Bldg. W59, Cambridge, Mass. 02139.

In the 1970s, Czech-American engineer Peter Glaser proposed a novel solution to the oil crises: "geosynchronous" satellites (rotating with the Earth, some 22,000 miles above the equator) could use photovoltaic cells to convert sunlight into electrical current, then transmit it via a microwave beam down to Earth. Glaser's proposal was imaginative, but it had a few problems, not least that, with the satellites at that altitude, the receiving antennas on the ground would have to be about six miles in diameter. Not surprisingly, the National Aeronautics and Space Administration and the Department of Energy soon lost interest.

Today's revolution in telecommunications, write Hoffert and Potter, physicists at New York University, could give Glaser's idea an unexpected lift. By early in the next century, swarms of low-altitude communications satellites will be orbiting the globe. Teledesic Corporation, a joint venture of Microsoft chairman Bill Gates and cell phone tycoon Craig McCaw, alone plans to spend $9 billion to launch 288 communications satellites. They will use microwave beams to relay voices, video images, and data to locations around the world.

Why not equip the satellites with solar collectors and use the same microwave beams to carry electrical power? say the authors. "By piggybacking onto these fleets of communications satellites—and taking advantage of their microwave transmitters and receivers, ground stations, and control systems—solar power technology can become economically viable." The new satellites have other advantages. They will orbit only a few hundred miles above the Earth's surface, so the receiving antennas can be much smaller (and less expensive) than in Glaser's scheme. The solar collectors also can be much smaller—only a few hundred meters