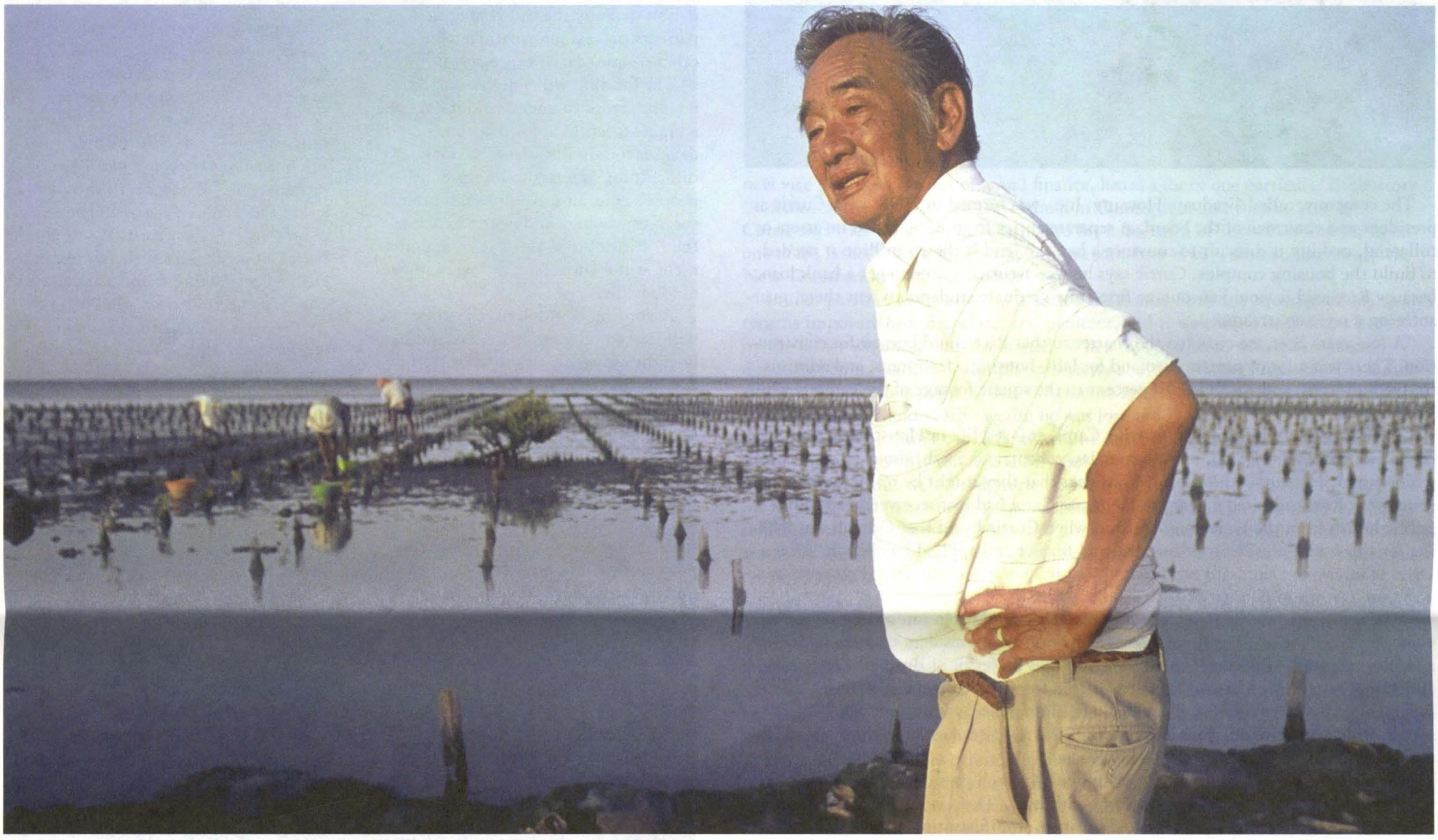
# Out of Manzanar



**Biologist Gordon Sato stands before one of the many mangrove forests that his Manzanar Project has planted in the Red Sea waters off Eritrea (see map, left). In June, Sato was honored with the Blue Planet Prize for his two decades of pioneering work to alleviate hunger in the East African nation. The $500,000 international environmental award recognized him "for achievements that . . . are demonstrating to the world the importance of a way of living which regularly uses the technology of environmental conservation and humanity."**

*"I thought, 'If they can build an atomic bomb and call it the Manhattan Project, maybe I can help stop famine and call it the Manzanar Project. Maybe it's my romantic nature," says Gordon Sato, PhD '56, who has devoted much of the last 20 years of his life to alleviating hunger in the Horn of Africa nation of Eritrea. He was on his way there for the first time when he decided to name his antihunger project after the Manzanar relocation camp in the California desert, where he and his family, along with thousands of other Japanese Americans, had been interned during World War II. Arriving in Eritrea, he found the country locked in a brutal struggle for independence from Ethiopia, whose attempts to starve the rebel nation into submission had unleashed widespread famine in the region. The intense, soft-spoken American biologist won the trust of the rebel leadership, and with the support of the Eritrean military established an ocean-based fish-farming operation in a village on the country's northern coast, which produced high-protein food for the wounded.*

*By the time Eritrea won its independence in 1991, Sato had committed himself and the Manzanar Project to creating new and permanent opportunities for sustainable development in the East African nation. When fish-farming proved to be too labor-intensive for the country's fragile infrastructure to support on the scale he had envisioned, he turned to mangrove cultivation, which, as he explains in the following interview, has the potential to spur food production all the way up the Eritrean food chain and provide a thriving, low-tech means of enhancing economic well-being. To date, the Manzanar Project has planted some 800,000 mangrove trees along the Eritrean coast. Many more are on the way.*


*Gordon Sato was 14, living in Southern California, when the forced resettlement of the state's Japanese Americans turned his life upside down and left him with an intense desire to see some good come out of his Manzanar experience. In 1950 an unlikely chain of events led him to Caltech, where he did his graduate work with Max Delbrück. In 1958, he joined Brandeis University as a professor of biochemistry, and in 1969 moved to UC San Diego, where he was a professor of biology until 1983. From 1983 to 1992, he was a director of the W. Alton Jones Cell Science Center in Lake Placid, New York. Elected to the National Academy of Sciences in 1984, Sato, now 78, spent much of his research career investigating how tissue culture cells could be transformed into cells representative of those in living organisms. This work has led to a new understanding of the complexity of hormonal requirements in the body's cells and holds tremendous promise for the development of new cancer therapies.*

*In the mid-1970s he began a series of experiments in the California desert near the Salton Sea to develop a form of algae that could grow successfully in salt water.*

*"Many of the faculty members at UCSD thought I had gone bonkers," recalls Sato, who nevertheless kept at his efforts, inspired by his memories of Manzanar where the "food was so awful we began looking for ways to grow our own in that harsh desert environment." Blue-green bacteria are extremely high in protein, and Sato felt that they had exceptional promise as a food source in agriculturally barren regions of*

*"We're working very hard to perfect a low-tech sustainable-development program that can be readily exported to many regions of the world where hunger has been an enduring problem."*


**In 1942, at age 14, Gordon Sato and his family were sent to the "Manzanar War Relocation Center" in California's Owens Valley. This Library of Congress photo is one of many taken by famed photographer and human rights activist Ansel Adams to document the grave injustices meted out to the nation's Japanese Americans after the December 1941 attack on Pearl Harbor.**

*the world. In 1986, he brought his expertise and convictions with him to Eritrea. "From one who experienced the camp," says the website for the Manzanar Project, "comes an effort to create a proud though bittersweet remembrance, to further memorialize the Japanese Americans and their hardships in a way that is appropriate to their character."*

*Over the last 20 years Sato estimates that he has poured at least half a million dollars of his own money into the Manzanar Project, but his financial prospects have recently taken an upward turn. In 2002, he received a $100,000 Rolex Award, presented every two years by the Swiss watchmaker in recognition of innovative and pioneering projects intended to foster "a spirit of enterprise around the world." And the recent FDA approval of the drug Erbitux for treatment of colon cancer could bring Sato additional revenues of up to several hundred thousand dollars a year, according to some estimates. The drug owes its genesis to work carried on in Sato's UC San Diego lab in the 1970s; he and his son, J. Denry Sato, are two of the four inventors credited on the patent.*

*This past May, Sato returned to his alma mater to receive the Institute's highest honor, the Distinguished Alumni Award (see related story, page 17). In late June came word that he had been awarded the $500,000 Blue Planet Prize for 2005 by the Tokyo-based Asahi Glass Foundation. Established in 1992, the international environmental award, which has been called the Nobel Prize of ecology, is presented every two years "to individuals and organizations that make outstanding achievements in scientific research and its application, and in so doing help to solve global environmental problems." Sato was recognized "for developing a new mangrove planting technology in Eritrea. . . . His achievements, which have proved a practical measure to enable economic self-sustainability in the poorest area of the world . . . are demonstrating to the world the importance of a way of living which regularly uses the technology of environmental conservation and humanity."*

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*In this interview, Sato discusses the Manzanar Project, his memories of the Manzanar internment camp, and his experiences at Caltech. He was interviewed on separate occasions for* Caltech News *by Heidi Aspaturian, editor of* Caltech News, *and Daryn Kobata, editor of the campus community biweekly* Caltech 336.

**Sato is joined by members of the local population who are working with him on the Manzanar project.**

***What inspired you to begin the Manzanar Project? Had you known much about the area or the Eritrean struggle for independence before that?***

I had met a scientist at a National Research Council meeting who had told me a lot about Eritrea, and I had talked to Eritreans in Washington, D.C., but essentially I just went. I didn't really know much about the area or its language or culture. I just wanted to do something to help.

***Now when you first started it, the hunger project was more of an aquaculture initiative?***

Yes, with a focus on fish farming. We had to produce food quickly to ease the suffering from famine, and so we put the emphasis on that. We kept that project going for about two years, while the war was still being fought. After the Eritreans achieved independence, the situation became more complicated. Fish farming is sustainable in the long term, but it takes a lot of labor and money to get it organized and to keep it going. During the war, I had all the help of the army for this type of intensive labor effort, but after the war, they had other priorities.

***So how did you then decide to transition to mangrove cultivation?***

I was in an area with mangrove trees, and I noticed the camels eating them. I got the idea that the trees could also supply food for sheep and goats. There was lots of available space for growing mangroves, so it seemed like an obvious solution. Initially, I had to figure out how best to grow them and how to make the mangroves good food. We found that mangroves would be adequate food for livestock, as long as they were supplemented by a small amount of fish meal prepared from fish waste. It's been a lot of work.

***Had the Eritreans been using mangroves before that?***

Not really. They had let the camels eat them, and that was about the extent of it. It had never occurred to them these trees might provide food for sheep and goats—that the seeds could be dried and fed to their livestock. They also didn't realize that the seaweed that washes up on shore in great amounts could be dried and processed and used as animal food. This is something that had been done for centuries in Ireland, but it was a new concept in Eritrea, where sheep and goats have traditionally grazed freely on grass and other vegetation. They would eat the trees—the acacia thorn bush, for instance—but each year the supply dries up within a few months, which means that the farmers and herders have to repeatedly move farther into the mountains with their animals in hopes of finding more food. It's a very unreliable form of subsistence.

***So it sounds like growing mangroves is actually addressing several sustainable resource issues. It's providing food and preventing deforestation at the same time.***

Yes, And the mangrove forests that we've planted are quite beautiful. The thing about mangroves is that they can grow in seawater, and we're planting thousands of them in the intertidal zones along the Eritrean coast. We wanted to optimize growing conditions, so we experimented to identify the mangroves' pH tolerance range, and we also developed an ammonium phosphate and iron solution that provides the trees with essential minerals that they cannot get in sufficient amounts from the seawater. We grow the trees from small plants, and these new plants have thrived.

***There has been some criticism to the effect that the amount of fertilizer used in mangrove cultivation might destroy local coral reefs. Can you comment on that?***

I'm familiar with that viewpoint. My own view is that there are people who are pursuing their own selfish agendas and have no interest in getting a firsthand look at what we're actually accomplishing. We have measured the fertilizer from our planting, and there is none polluting the sea. We have developed ways of releasing fertilizer so that it goes slowly to the trees in just the needed amounts. These people who claim that we cause damage are awful—and you can quote me on that. There's one critic in particular who claims to be an expert on biodiversity, who could have come out and measured the amounts of fertilizer we're generating. He hasn't done that in two years. He could have come to see for himself if coral reefs are in fact, as he claims, dying, and he hasn't done that either. If

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