



A large solar farm in the Atacama Desert, Tarapacá, Chile.  
(Photo by zwansaurio.)

## SOLAR

# Powering Latin America

By Harley Shaiken

“Ovshinsky is arguably one of the greatest thinkers and inventors you’ve never heard of. He’s been called his generation’s Thomas Edison and his brilliance compared to that of Albert Einstein.”

— Rachael Lallensack, *Smithsonian magazine*, October 2018

“Stan has allowed us to see the world as it could be.”  
— Senator Carl Levin, September 2012

The scientific research and inventions of Stanford Ovshinsky (1922–2012) have changed the world from Chile to China and, of course, the United States, Japan, Germany, and beyond. Lillian Hoddeson and Peter Garrett’s excellent new biography *The Man Who Saw Tomorrow: The Life and Inventions of Stanford R. Ovshinsky* (MIT Press, April 2018) insightfully probes the sources of his scientific genius, his remarkable and often turbulent life, and his deep commitment to social justice. The book likewise offers critical insight into the urgency of climate change — which

California Governor Jerry Brown has appropriately called an existential threat — and the ways it could be addressed.

Stan (as he always preferred to be known) had a particular passion for Latin America, and his work had a special relevance for the region. The Center for Latin American Studies (CLAS) hosted Stan a number of times — he was a lifelong friend and mentor — and his work inspired UC Berkeley faculty, researchers, and students. Given Stan’s scientific achievements and his social values, it was natural to introduce him to key friends of CLAS. A dinner with President Michelle Bachelet and Jerry Brown, hosted by Isabel Allende, stands out. But Stan also enjoyed meeting informally with students, people from social movements, scientists, and labor leaders.

Three dimensions of Stan’s work had particular importance for Latin America: his incandescent scientific brilliance; his deep understanding of manufacturing (he began his career as a machinist); and his commitment to

social justice. At a celebration near Detroit, Michigan, honoring Stan on his 90<sup>th</sup> birthday, Hellmut Fritzsche, an internationally recognized physicist and former chair of the Department of Physics at the University of Chicago, described his reaction to his first encounter with Stan and his ground-breaking research in 1963 when he visited Energy Conversion Laboratories, then located in a nondescript storefront on Six Mile Road in northwest Detroit:

I realized that Stan had discovered a huge unexplored field of material science. This happens very rarely. We were in uncharted territory. In Stan’s disordered Ovonic materials, we were confronted with phenomena of bewildering diversity and complexity which required for their explanation a new language and concepts. Stan’s intuition and deep understanding of the roles of different elements in his materials were ingenious.

The ultimate outcome of these discoveries, *The Economist* reported in late 2007, “can be used for energy generation (in fuel cells and solar cells), for energy storage (in batteries), for computing (to store data on discs or in chips), and to create custom materials with novel properties,” all of which are expanded on and put in context in *The Man Who Saw Tomorrow*.

Stan’s background as a machinist in Akron, Ohio, and his early career as a designer and builder of machine tools gave him a deep understanding of manufacturing and mass production. The originality and value of his scientific vision was exceptional, but he was also able to translate this vision not simply into profound scientific discoveries, but into new machines, processes, factories, and industries. He and his brother Herb, who was a gifted engineer, instinctively saw new approaches to making things. When Stan began producing flexible solar panels based on Ovonic material, he produced it by the mile on a machine the length of a football field using a process that resembled a printing press. The best and brightest scientific minds had assured Stan it couldn’t be done, yet he once again defied conventional wisdom. What Henry Ford had achieved six decades earlier for the production of cars, Stan did for the production of solar material.

Stan passionately advocated for a “Green New Deal” in the 1970s (decades before the term had been coined) and, most importantly, created the technical basis for accomplishing many seemingly impossible goals. “You want new industry in the United States, with astonishing technological advances, new mass production techniques and jobs, jobs, jobs?” New York Times columnist Bob

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Photo courtesy of Stan Ovshinsky.

A Mayan woman carrying her child and a box of solar panels in Chiapas, Mexico. Stan ended all of his presentations with this slide.

Herbert wrote in November 2009 after spending two days in Detroit with Stan. “Try energy,” Herbert continued. “The U.S. has the intellectual resources and expertise to lead in the development of clean energy. It just needs the will to make it happen.”

With this potential in mind, Stan kept his research facilities and manufacturing operations in the Detroit area, where he saw the urgency for creating new industries and jobs. Nobel laureates such as Sir Nevill Mott (who gave credit to Stan for his award), Isidor Rabi, and other scientific luminaries made the trek to the Motor City to discuss this new area of physics — disordered, amorphous materials called Ovonic in Stan’s honor — and what it might mean. The ability of science to fuel development, new research, and good jobs in emerging economies was of particular importance to Stan.

Finally, his passion for social justice informed everything. While he and his wife Iris were starting Energy Conversion Devices in the 1960s, they stated the goal was “using creative science to solve societal problems.” Both remained very active in the civil rights and peace movements, human rights campaigns, and other progressive causes. They would send good friends and family a dozen carnations and a card saying “with the oppressed; against the oppressor” every May Day. As Hellmut Fritzsche told Stan, “[you] continued fighting against injustice and prejudice all your life. It is typical for you to be the only Fellow of the American

Physical Society who, at the same time, is a union member of the International Association of Machinists.”

In the 1960s and 1970s, Stan began developing his vision of a hydrogen economy that would sharply reduce the world’s dependence on fossil fuels. Remarkably, he saw very early issues related to environmental destruction, climate change, and wars over oil. As United States Senator Carl Levin said at Stan’s 90<sup>th</sup> birthday celebration:

[Stan’s] vision for decades has been a world freed from its dependence on fossil fuels. One in which we create good jobs and a growing economy on the strength of green ideas. One in which science lights the way to a brighter future and in which justice and fairness prevail.

Senator Levin pointed out “Stan knows that the visionary’s path is not an easy one. Those who seek to change the world embark on a lifetime of ups and downs.” This assertion understates what Stan faced: the “ups” were exceptional, but the opposition from rivals and those who felt threatened could be virulent. Nonetheless, he and Iris persevered.

Stan particularly seemed to resonate with Chile, although he engaged with Brazil and Mexico, as well. In 2009, I traveled with Ricardo Lagos (President of Chile, 2000–2006) to meet Stan in Detroit, where he lived and where the research laboratories and production facilities he had built were still located. President Lagos has a strong relationship with CLAS and taught several classes at UC Berkeley following his presidency, while he also served as the United Nation’s Special Envoy for Climate Change (2007–2010). President Lagos reflected on the visit to Detroit in a subsequent article in the *Berkeley Review of Latin American Studies*:

The kinds of solutions that Stan Ovshinsky is proposing should be available in Chile... I think that we, the developing countries here in South America, are going to have to better integrate our own energy resources while at the same time advancing in such a way that we can benefit from new technologies being developed in the United States. Cooperation in this area will be essential. It seems to me that, in the long run, cooperation on energy policy will be good for the U.S. and good for Latin America. And Chile would like to play a role in that cooperation.

Given the accelerated and dangerous ways in which climate change and environmental destruction are now proceeding, these were truly prescient sentiments. Later in 2009, President Lagos invited Stan to visit Chile for a week on a trip organized by the government of President Michelle Bachelet. At the time, Chile had very little installed solar. Stan began the trip with the keynote address at a renewable

energy conference with 500 participants from throughout Chile — from scientists to business leaders, from cabinet ministers to students. The conference was held in the north of the country in the port city of Antofagasta, surrounded by the Atacama Desert, one of the driest and sunniest places on the planet. Stan saw the possibilities for Chile to harness the intense rays of the desert sun to reduce pollution, address climate change, and create new industries. Little had been done with solar in Chile at the time, but Stan sparked real interest, inspired many, and received a standing ovation.

After the talk, Stan spent a day and a night at the Paranal Observatory, one of the world’s best astronomical observation sites. Standing near the top of a desolate 8,000-foot mountain in the sun-drenched Atacama, which receives the strongest solar irradiance on the planet, Stan told a film crew that “Chile [could be] a showcase of how you could have energy without pollution, without climate change, without war over oil.” He saw the possibilities of “building new industry in Chile” for jobs and development and collaborating with Chilean scientists on future research. “I love it here,” he said, “I’m closest to the sun.”

The trip received widespread publicity and introduced new ideas on solar energy throughout the country. Juan Gabriel Valdés, the Director of Public Diplomacy and subsequently Chile’s Ambassador to the United States, accompanied Stan for the week. He gave lectures and met with scholars, entrepreneurs, and government leaders in Santiago, including a dinner with President Bachelet at her home, where they both spoke deep into the night reflecting on the traumas of the past and looking toward a brighter future. She was very aware of the dangers of climate change and fascinated by Stan, his research, his vision, and his values.

El Mercurio, the leading Chilean newspaper, published an extensive article on Stan and an interview with him that spread out over a page. “Saudi Arabia was only desert before they found oil, which is not a renewable resource,” Stan said. “Chile has a natural resource in the sun that is much more powerful than oil. There is plenty of space in the desert to put collectors that can distribute energy to the cities or capture it from the roofs of houses. There

is a lot of energy, and it will be renewable for the next 5 billion years. Chile also has people with natural talent and enough vision to make this a reality.”

Six years later, President Bachelet and her new Minister of Energy, Máximo Pacheco, implemented a far-reaching plan to embrace renewable energy at the beginning of her second term in 2015. “I am convinced that climate change is a reality, a complete and absolute reality,” she said in an interview in late 2017. “We think it’s essential for our economic development to have cleaner energy because we want this planet to last.” Today, Chile has more installed solar than the rest of Latin America combined and is targeting clean sources to generate 90 percent of its electricity by 2050, compared to 45 percent today.

Likewise, President Lagos is more committed than ever to addressing climate change, and he returned to California in late January 2018 on a trip organized by CLAS. He visited Lawrence Berkeley National Laboratories to look at cutting-edge work on climate change and renewables and then met with Governor Brown in Sacramento to discuss the ways in which California and Chile might cooperate on new approaches in these areas. He also took time to meet with students and scientists.

As Lillian and Peter’s compelling book and their article below clearly indicate, Stan would have been proud! His vision continues to inspire, and his work has never been more relevant. I can see him smiling and saying, “Great work! But we have a lot more to do.”

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### Chile’s Installed Solar Photovoltaic Capacity (in megawatts)

Source: “ClimateScope2018: Chile,” published by Bloomberg New Energy Finance. Accessed January 10, 2019.

