He'll Keep You in the Dark

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A stargazer's dream - nonstop night.

Wayne Rosing was an avid astronomer long before he became a Silicon Valley legend. Now he's pursuing a stargazer's dream - nonstop night.

From Apple to Sun to Google, 60-year-old Wayne Rosing has played key engineering roles for some of the biggest corporate names in technology. But none of his past work quite matches the scope of what he's planning now, through a little-known (at least for now) entity called Las Cumbres Observatory Global Telescope Network Inc., LCOGT for short.

Based in Goleta, LCOGT is more than just another observatory. Its goal is to build the first earth-based 24-hour platform for viewing stars and other nighttime objects. This would be a web of computer-linked telescopes circling the globe in both northern and southern hemispheres, so that observers could watch any spot in the night sky without being interrupted by daytime. Rosing, a senior fellow in astrophysics and engineering at UC Santa Barbara, and a senior fellow in mathematics and physics at UC Davis, is LCOGT's founder, director, chief engineer and financial supporter. Its scientific director is Tim Brown, an astrophysicist who came to LCOGT last year from the National Center for Atmospheric research in Boulder, Colo. Brown is an adjunct UCSB professor of physics.
We like to say we’re a global telescope, Rosing says, emphasizing the singular. When it is up and running, the LCOGT will function as one, big unblinking eye. It will be used to detect changes in celestial objects, such as pulsating stars, as well as to catch sudden, short-lived events such as gamma-ray bursts that may signal the collapse of stars into black holes. "If something goes off, the probability is that we’ll have a telescope that can look at it," he says.

Well before it is finished, the network will be serving globally as an educational tool. Thanks to remote telescope controls and the Internet, students in Europe are already using two of LCOGT telescopes, in Australia and Hawaii, for real-time observing during their school hours. As the web of telescopes is filled in, Rosing wants to set up a similar link for Santa Barbara schoolchildren to a future telescope in the eastern hemisphere, possibly in South Africa.

At its completion, the LCOGT as Rosing envisions it will have overlapping global webs of reflecting telescopes in three sizes. The smallest will have mirrors with a diameter of 0.4 meters, or just under 16 inches. There will be about 25 of these around the world. They will mainly be used in schools, but Rosing says they can be used for certain types of scientific work as well. At the next level there will be a global network of 1-meter telescopes. These, he says, "will enable us to do pretty serious science" on supernovae and other transient events. The largest scopes will have 2-meter mirrors and will be used for more detailed observing based on data from the 1-meter group.

Searching the World for Sites

A land-based telescope network can do the same round-the-clock observing now possible only through much costlier orbiting telescopes. But this advantage comes with a challenge — where to find enough suitable sites to cover the night sky 24 hours a day, in both northern and southern hemispheres. The range of sites is narrowed by climate, accessibility and the fact that three-quarters of the planet is covered with water. Most of the world’s big telescopes are in a few choice locations that combine high altitude,
clear skies and that astronomers call good ?seeing? ? a low level of turbulence in the atmosphere. The peaks of Hawaii, northern Chile and the Atlantic island of Tenerife in the Canaries fit this bill, and they?re studded with big scopes as a result. Australia and South Africa offer some good sites as well. So far, Rosing has bought two 2-meter telescopes, one atop Haleakala on Maui and another at the Siding Spring Observatory in New South Wales, Australia.

That leaves some gaps. Eventually Rosing would like to have a few 2-meter scopes, along with around twenty 1-meter instruments, spaced evenly north and south of the equator. Sites in Chile, Australia and South Africa could do the trick for the southern half of the globe. The northern half is more challenging. Between the prime sites on islands in the Atlantic and Pacific, there?s a huge swath of the planet taken up by the Eurasian land mass. Much of it is too cloudy during the summer monsoon to be suitable. Other areas are too remote to be practical or safe. Rosing says the region around Urumchi, in the far west of China, might work. But he says it?s risky to put a telescope in the middle of nowhere rather than at an established observatory where it has plenty of neighbors. Vandalism is one threat. ?If we put a telescope on some random mountain, some hunter will decide it?s a target,? he says.

Rosing has done quite a bit of astronomy-focused travel, including about 20 trips to Chile. And he?s likely to be on the road again, possibly in some of the world?s hard-to-reach places, as he tries to find the best spots for LCOGT telescopes. Some of the 0.4 meter reflectors being built for LCOGT will probably be used as survey telescopes in this quest, set up to monitor sky conditions at prospective observatory sites. But the first of these will be set up closer to home ? right in Rosing?s back yard in Santa Barbara.

Watching and Waiting

None of the individual telescopes in the completed LGOCT will come close in size, or light-gathering power, to the largest telescopes in use today. But the network will have a unique ability to monitor a spot in the night sky for transient events that take place over a just a few hours. Even the largest earth-based telescope will miss these if they take place when the telescope is in daylight. LCOGT? Brown says this ?time-domain? astronomy is well-suited to detecting planets or studying subtle changes in the size and shape of stars. Finding planets doesn?t require a particularly large telescope. The first planet detected outside our solar system was found with a 2-meter instrument in France, Brown says, and one planet crossing in front of a star was picked up with a 10-centimeter scope ?more akin to telephoto lenses you see on sidelines at a football game.?

The telescope network would not actually see the planet. Instead, it would record a drop in the light coming from the star, if the planet is large enough to block a significant part of it. Or it might detect a smaller planet through the phenomenon known as ?microlensing.? Occasionally, a nearby star will pass between the earth and a more distant star, and the nearby star?s gravity will slightly bend the light of the background star. Brown says the light normally bends in a ?nice smooth curve,? but now and then astronomers have noticed ?short-lived anomalies ? bumps and wiggles and things like that ? most likely caused by a planet going around the foreground star. The disruptions
are short-lived, so they can easily be missed if an observer is just checking every night. It's not enough to see the star once or twice a day, Brown says. You have to see it once or twice an hour. These phenomena will be the subject of the LCOGT's first major experiment, due to start this year in time for the southern hemisphere winter. Brown says the 2-meter telescope in Australia will watch a particular region in the sky where these microlensing events are known to occur.

**Not Just a Hobby**

Even with just a fraction of its telescope network online, the LGOCT already is putting a number of engineers and scientists to work. Brown says two post-doctoral researchers are involved in the project now, and three more are on the way. They are supported by a larger staff of engineers. As an organization we are about four-fifths to three-quarters engineers, and the rest scientists, says Brown. That's about the level that's going to be needed in the long term to keep a technically complex organization going.

The cost of all this will run into the tens of millions, Rosing says. And it's all coming out of a foundation established by Rosing and his wife, Dorothy Largay. This reliance on family funds keeps Rosing from pursuing expensive NASA-style dreams, but it also gives him and the LCOGT scientists a level of freedom they would not have if they had to pursue grants from government or other private foundations. We have a very unique mission, he says. We don't have to follow the fashion of the moment; we don't have to worry about what a funding institution feels is the right way to program a telescope. We can focus on long term programs.

Rosing's has had a celebrated career in computer and Internet technology. He was a director of engineering at Apple in the early 1980s and later led teams that developed the SPARCStation and Java for Sun Microsystems. From 2000 to 2005, he was vice president of engineering for Google. Throughout all this time and well before astronomy was what he calls a serious hobby that grew into something quasi-professional as time went on. I've been interested in astronomy for longer than I can recall, he says. It's an avocation that goes back before first grade. He made his first telescope, an eight-inch reflector, when he was a freshman in high school.

His telescope plans became far more ambitious in the 90s when he was working on Java at Sun and helping grow the Internet: It occurred to me that a network of telescopes around the world was something I could achieve if I set my mind to it. And set his mind to it he did, so much so that he now calls his Google years a distraction from his main mission? though he's grateful for having the opportunity to be distracted? He explains: The challenge to cap my career with helping build Google Engineering was irresistible. I commuted to the Bay Area from early Monday to late Friday night for nearly five years. My basic commitment was to grow Google engineering from about 60 to a thousand engineers and to keep and try to enhance the creative culture. Every minute of that time was a challenge and fun.

In 2005, he and Dorothy moved from near Las Gatos to the Santa Barbara area. Why here? Rosing says they were looking for good weather, ocean, a great university, culture, and a community small enough to get our head around. His ties to UC
Santa Barbara go back a bit further. The engineering staff at Google had a large contingent of UCSB alumni or former faculty?at least 20 or 30, he estimates. He also knew Matt Tirrell, Dean of UCSB?s College of Engineering, through Google connections. When it came time to retire from the Silicon Valley scene and get serious about building LCOGT, Rosing found that UCSB, along with the Kavli Institute for Theoretical Physics, had both facilities and talent to offer. The project?s headquarters are in leased UCSB space at a Goleta engineering research center, and it has a large UCSB contingent of scientists and engineers. Two UCSB graduates are on its engineering staff, three UCSB students are interns, and three post-doctoral researchers are working with Brown on the science side. ?The connection with the university and Kavli is really fundamental,? Rosing says. ?If we were attempting to do this somewhere else, it would be very difficult.?