

RANDOM WALK

A PILGRIMAGE TO PRÍNCIPE

Albert Einstein became a worldwide celebrity in 1919 when his outlandish claim that gravity could bend light was proven to be true. Doing so took the efforts of a team of Englishmen led by Arthur Eddington, the Plumian Professor of Astronomy at Cambridge University, and a happy confluence of the stars—literally, in that the sun went into a total eclipse in the midst of the Hyades, a cluster of bright stars in the constellation Taurus; and figuratively, in that World War I had ended just months earlier, making it politically possible for a British astronomer to prove a German physicist's theory.

Eddington and E. T. Cottingham sailed to the remote equatorial island of Príncipe off the west coast of Africa, at the time a Portuguese colony. As part of the same expedi-

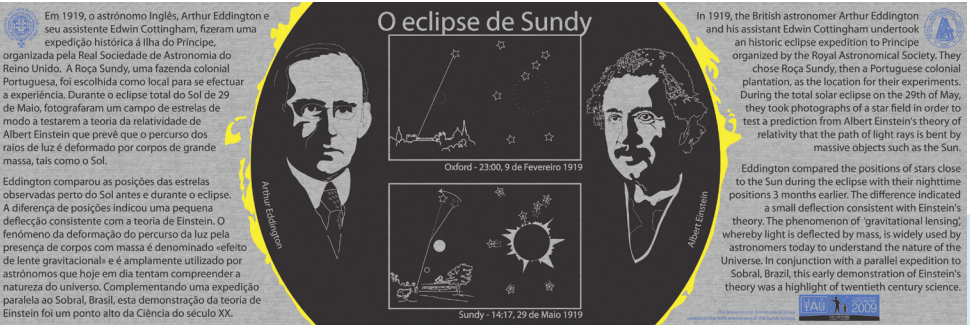
tion, Charles Davidson and A. C. D. Crommelin went to Sobral, Brazil. Both groups took photographs of the Hyades before and during the eclipse, looking for slight changes in the apparent positions of stars near the sun's limb that would indicate that their light had been influenced by the sun's mass. The British astronomers successfully measured the small deflection, 1.75 seconds of arc, predicted by Einstein's theory of general relativity.

Today this phenomenon, called gravitational lensing, is an important astronomical technique. Caltech researchers have exploited it with the W. M. Keck, Hubble, and Spitzer observatories to study some of the most distant galaxies known, make the first 3-D map of the distribution of dark

matter in the universe, and trace the mysterious dark energy that pervades the cosmos.

Richard Ellis, the Steele Family Professor of Astronomy, has participated in several of these studies, and was also once the Plumian Professor at Cambridge before moving to Caltech. In September 2008, Ellis undertook what he describes as a “personal pilgrimage” to Príncipe, now part of the democratic republic of São Tomé and Príncipe. (São Tomé is the bigger and by far the more populous island.) Ellis's mission was to find the spot where Eddington took his photographs, and to line up government support to install a commemorative plaque this May—the eclipse's 90th anniversary—as part of the International Year of Astronomy's program of global events marking the 400th year of Galileo's first use of the telescope. The plaque, in Portuguese and English, was designed by Richard Massey of the University of Edinburgh, a collaborator of Ellis's and former Caltech postdoc.

Ellis recounted some of his adventures at a recent lecture in the Hameetman Auditorium in the brand-new Cahill Center for Astronomy and Astrophysics. Eddington arrived with his equipment following a monthlong sea voyage via Lisbon and Madeira; Ellis took a small plane from São Tomé, landing on the tiny Príncipe air-



The plaque.

strip in poor weather—to be greeted by the rusting hulk of an abandoned aircraft in the tall grass just off the runway. Equipped with transcripts of Eddington's letters to his mother, Ellis was able to retrace Eddington's visits to possible observing sites that ultimately led him to Roça Sundry, the now-derelict plantation where the famous photographs were taken.

The arrival of a professional astronomer on this tiny island did not go unnoticed. Ellis was interviewed on national television at the eclipse site—an appearance enlivened by a very aggressive cockerel snapping at his heels—and was subsequently invited to meet the president of the republic, Fradique de Menezes, who graciously offered his support. For meetings at the presidential palace, a dark suit, tie, and black shoes are mandatory. This was a serious problem for an academic who had only packed “Sports Chalet attire,” until an obliging former foreign minister loaned him the necessary clothes. The shoes proved to be two sizes too small, but fortunately for Ellis's feet, the meeting was relocated to the president's mountain residence—a more relaxed setting.

Now sponsored by the San Tomean government as well as the International Astronomical Union, the Royal Astronomical Society, and a sympathetic Dutch hotelier and eco-

tourist developer Rombout Swanborn (who Ellis also met), the plaque's installation will be accompanied by lectures in Portuguese and a poster display. Gisa Weszkalnys, a social anthropologist who studies the islands' economic future, and Pedro Ferreira, a Portuguese cosmologist at Oxford University, are assisting with the project. For further details, see <http://www.1919eclipse.org>.



AIDS VACCINES: Y SO HARD?

It's 25 years and counting after the AIDS epidemic began, yet we still don't have a good vaccine against HIV, the virus responsible. A Caltech team thinks that part of the reason may be that our body's natural HIV antibodies simply don't have a long enough reach.

Antibodies, which are Y-shaped, work best when both arms of the Y bind to their target proteins on the virus at more or less the same time. This can increase the antibody's grip strength a hundred- or even a thousandfold. But double-armed binding can be easier said than done. Pamela Bjorkman, the Delbrück Professor of Biology and a Howard Hughes Medical Institute investigator, and grad student Joshua Klein looked at two antibodies that bind to proteins that stick out like spikes from HIV's viral membrane.

“The story really starts to get interesting when we think about what the HIV virus actually looks



Opposite: The Roça Sundry plantation's central square seen from a point close to where Eddington made his observations.

Top right: Ellis and o Presidente. Right: Remote Parking Lot A at the Príncipe airport.

