SLAC pursues fractionally charged particles

The search for isolated fractionally charged particles, pioneered in 1909 by Robert Millikan, continues in 2002 by reaching back 5 thousand million years.

Martin Perl's microdrop experiment at DOE's Stanford Linear Accelerator Center uses ancient meteorite matter suspended in tiny droplets of oil 25 microns in diameter. Perl's group monitors the zig-zag travel of these droplets as they fall through an alternating electric field. Using the same basic physics as Millikan did – albeit updated by modern imaging, computing and microdrop generation equipment - the group calculates the charges on the tiny spheres, looking for hints of fractional charge.

The meteorite sample used by Perl's team is roughly 5 thousand million years old and has never undergone any form of refining. This makes it a good candidate to have retained fractionally charged particles that may have been created in the Big Bang. No evidence of fractional charge has been seen yet, but the odds have been improved by the introduction of the carbonaceous chondrite meteorite matter.

Theorists who speculate about the existence of fractional charge expect that if such particles exist, they might show charges such as multiples of 1/6 the electron charge. The particles would also need to be extremely massive to have escaped detection to date by detectors at the world's most powerful accelerator facilities.

The discovery of stable, fractionally charged particles would open a new field in elementary particle physics, improving theoretical models, which have often skirted issues of fractional charge, answering questions about the early universe, and perhaps leading to technological exploitation of the particles.

The prize may or not be out there—according even to Perl, fractionally charged particles may not exist at all, let alone prove detectable.

Submitted by DOE's Stanford Linear Accelerator Center

AIMING FOR THE STARS: HAKEEM OLUSEYI

Hakeem Oluseyi

Physicist Hakeem Oluseyi recently joined Berkeley Lab as a member of the Supernova Cosmology Project, the Nearby Supernova Factory, and SNAP, the proposed SuperNova Acceleration Probe, coordinating application of the Berkeley Lab CCD to the supernova search.

Oluseyi learned spaceborne instrumentation and astrophysics from renowned African-American physicist Arthur Walker II at Stanford. Among other discoveries, he predicted and found a new component of the solar atmosphere by studying the sun with multilayer optics and special filters.

Stanford Ph.D. in hand, Oluseyi switched fields to semiconductor manufacture in 1999. At Applied Materials he developed innovative methods for testing wafers, and for gate-etching in layered materials; several patents, granted and pending, resulted. Meanwhile he taught astronomy at nearby Foothill College, pursuing a commitment to education that has never slackened since his childhood.

"We moved every year—I grew up in ghettos all over the South," Oluseyi says. "I spent a lot of time reading: Alex Haley's *Roots* at nine, an entire encyclopedia by age 10. At 11 I discovered Einstein, who became one of my heroes." He credits dedicated mentors and the fellowship of the National Conference of Black Physics Students, to which he was introduced while attending Tougaloo College in Mississippi on scholarship, for guiding him from hard times to scientific success.

At Berkeley Lab he remains committed to educational outreach. "There's a misperception that African-American students aren't interested in science," he says, "but when they feel welcome in the subject, they can earn top marks."

Having built spaceborne instruments and used them to make basic discoveries—and having secured patents in the manufacture of semiconductors—Oluseyi's a perfect fit for the nitty-gritty applications of the new CCD. But that's not all. He's intent on "figuring out the secrets of the universe," he says. "I want to shoot for the stars."

Submitted by DOE's Lawrence Berkeley National Laboratory