Einladung zum

WIENER PHYSIKALISCHEN KOLLOQUIUM

www.univie.ac.at/wpk

Interconnectedness of science: ultrahigh-energy neutrinos, climate, volcanism, and life in ice

Buford PRICE

Physics Department, University of California, Berkeley, USA

Physics research can have unexpected spinoffs that transcend disciplinary boundaries. The cubic kilometer-size IceCube Project, now underway in 2500-meter-deep ice at the South Pole, will track extragalactic neutrinos by imaging the Cherenkov radiation from charged particles produced in neutrino interactions in ice. To do this we had first to measure the absorptivity and scattering of visible and ultraviolet light as a function of depth in ice. We discovered that the transparency of glacial ice varies with depth, due to atmospheric dust whose flux into the ice depends on Earth's climate. This led us to invent an optical logging tool that fits down boreholes in glacial ice and that records not only dust but also cm-thick ash layers from volcanic eruptions. Dust concentration proves to be a proxy for Earth's temperature. We discovered that volcanic ash in both Greenland ice and ice across Antarctica shows a strong causal relationship with abrupt climate changes of > 20ºC over at least the last 80,000 years. A reverse spinoff of this work is that logging dust and ash at many locations in the IceCube array provides isochrons of optical properties that will sharpen our resolution of neutrino sources.

With a fluorescent version of the optical logger, we record the concentration of microbes of various types as a function of depth in ice. They live in liquid veins and on mineral grains in the ice, metabolizing at a rate proportional to $\exp(-U/kT)$. Methanogens, a type of archaea that cannot survive in oxygen, are detected by their strong fluorescence when excited at 420 nm. They produce methane that reveals their presence in terrestrial ice and might even account for the methane in the Mars atmosphere.

Montag, 2. Mai 2005, 17:30 Uhr

(ab 17:00 Uhr Kaffee)

Großer Hörsaal des Instituts für Experimentalphysik der Universität Wien

Strudlhofgasse 4/1. Stock, A-1090 Wien

Universität Wien   ÖPG   TU Wien

Unterstützt vom Kulturamt der Stadt Wien