A NEW SOURCE OF MICROMETEORITES: THE SOUTH POLE WATER WELL.
S. Taylor, J. Lever and R. Harvey. Cold Regions Research and Engineering Laboratory, Hanover, NH 03755-1290. Department of Geological Sciences, Case Western Reserve University, Cleveland, OH 44106-7216.

In 1995 we built, tested and deployed a collector to suction particulates from the bottom of the South Pole drinking water well (SPWW) in the hope of finding large numbers of micrometeorites. The SPWW, because it melts huge amounts of firn and ice, provides an efficient way of concentrating micrometeorites, which occur ubiquitously but in low concentrations in terrestrial environments. We made 5 separate collections, traversing an area of about 30 m² and collecting approximately 200 g of material. Microscopic examination of the 250-425 µm size fraction from 2 of the 5 collections suggests that 1 of every 1000 particles in this size fraction is a melted micrometeorite. There are also translucent and transparent spherules, similar to those described by Maurette et al. [1], which are thought to be extraterrestrial and particles which appear to be unmelted micrometeorites. Dating of the ice [2] brackets the depositional age of any micrometeorites collected between 1000-1500 AD.

As described previously [3] the well is a melt pocket formed within the polar ice cap. Over its ten-year life, the well melts progressively older firn and ice (1500 to 400 AD) at about 10 m/year. By sampling all, or a known percentage, of the well bottom and repeating the collection on an annual basis, the flux rate, and any variation in either rate or composition of micrometeorites, can be determined on a 100-year time scale. The complex bottom topography in the SPWW precluded our suctioning the entire bottom [4]. However, we suctioned a gently curved, central plateau (about 20 m²) and 3 surrounding pockets (about 10 m² total) and should be able to return to these areas annually to determine flux rates.

Using the flux rate estimated for Greenland ice [1] there should be about 1 gram of meteoritic material in the size range 50-300 µm on the bottom of the SPWW. We covered about 7 percent of the well bottom so we should have 0.07 grams of meteoritic material of this size range in our samples.

Having just returned from the field we have not yet looked at all the samples nor have we chemically analysed any of the material. We used a binocular microscope in the field to hand pick spheres from a pocket collection and from the plateau collection. We looked primarily for cosmic spherules because they often have distinctive surface textures [5,6] and are identifiable microscopically. All 6.01 g of the 250-425 µm size fraction and 0.56 g of 23.8 g of the 106-250 µm fraction of a pocket collection were examined as was all 3.5 g of the 250-425 µm size fraction from a collection made of the plateau area. From the spheres which were hand picked only those which were magnetic were counted as being of possible extraterrestrial origin. We did this to avoid counting solder spheres (tin) which are not magnetic. Many of the magnetic particles had the 'brick-work-like' surface textures described in the deep sea spheres [6]. This surface texture was not as pronounced in the SPWW particles possibly because weathering has not removed much of the interstitial glass in the short time these particles have been exposed to water, 0-4 years.
A NEW SOURCE OF MICROMETEORITES: Taylor et al.

From the pocket collection, 93 spheres (250-425 μm), thought to be micrometeorites, were found in the 6.01 g sample and 176 spheres (106-250 μm) were found in the 0.56 g examined. From the collection made of the plateau (approximately 6 times the area) 115 spheres were found in 3.5 g of 250-425 μm sized material. Flux rates calculated from these numbers are preliminary (the extraterrestrial nature of the particles needs to be confirmed and better collector area coverage will be obtained from the videos) but they indicate a higher flux rate than that estimated from the Greenland ice. Scanning electron microscopy and energy dispersive x-ray analysis will be used to determine the composition of the particles.

This work is supported by NSF grant #OPP-9316715.