

**ARE COSMIC SPHERULES FOUND IN GLACIOGENIC SEDIMENTS? A NEW VIEW OF AN ONGOING INVESTIGATION.** B. Toft, J. Chambers, R. Hassing, A. Godwin, R. Schauer, A. Ross, J. DeBaer, R. Melchior, and J. Annexstad. Bemidji State University, Bemidji, Minnesota 56601-2699.

Cosmic spherules have been found in such environments as deep-sea sediments, Antarctic and Greenland ice and oceanic beach systems. In 1997, we examined a variety of glaciogenic sediments from the Leech Lake area of northern Minnesota for the occurrence of cosmic spherules. These sediments were derived from the Wadena lobe of the Laurentide ice sheet and are between 20,000 and 18,000 years old. Included in the sample series were ground moraine, terminal moraine, glaciofluvial and outwash facies. Examination of these samples produced a suite of particles, particularly from outwash facies, which were selected for the following characteristics: (1) more or less spherical in shape, (2) less than approximately 0.25 mm, (3) glossy or reflective and (4) darker in color. SEM analysis was done on the spherules at Macalester College, St. Paul, Minnesota, to determine chemical composition. Preliminary results, which encouraging, were not sufficient to definitively prove the existence of cosmic spherules in northern Minnesota glacial drift.

Due to the morphological and other superficial characteristics of the Leech Lake particles similar to those described as cosmic spherules, [1, 2] it was decided to pursue the project further in an attempt to find enough additional particles to resolve what we felt, were equivocal chemical results. The results from phase 1 were not consistent with the chemical characteristics found in the literature [2, 3] so consequently, more in-depth analysis is needed.

Phase 2 samples were collected from the same Mid-Wisconsinan glacial material, as sampled in phase 1 of the project, though glacial marginal lakes and supraglacial outwash were emphasized. It was felt that these depositional facies had the watershed

dimensions necessary to accumulate particles from large portions of the ice surface where the particles had presumably fallen. All samples were taken from below the weathering profile in what was, at least visually, unweathered parent material.

The present goal of the project is to examine glacial environments for the occurrence of cosmic spherules. We have not yet answered that question to our own satisfaction. We now have secondary questions: Are our particles altered cosmic spherules? Can the cosmic spherules survive post-glacial weathering and groundwater environments?

**References:** [1] E. Robin, M. Christophe Michel-Levy, M. Bourot-Denise, and C. Jehanno. 1990. Earth and Planetary Science Letters. 97. 162-176. [2] D.E. Brownlee, B. Bates, and L. Schramm. 1997. Meteoritics and Planetary Science. 32. 157-175. [3] M. Christophe Michel-Levy and M. Bourot-Denise. 1992. Meteoritics. 27. 73-80.