

## Arctic Climate Variations Studied

Reconstructing Arctic climate variations over the past 150,000, 20,000, and 2000 years and understanding the interactions of these variations with the global climate system are the major goals of Paleoclimates of Arctic Lakes and Estuaries (PALE), a National Science Foundation-sponsored initiative within Arctic System Sciences (ARCSS). Research is based on a circum-Arctic gridwork of sites analyzed for multiple paleoclimatic indicators that are calibrated with modern data and placed in a fine-resolution temporal framework. Large-scale controls over Arctic climate variations and feedbacks to the global system will be evaluated through sensitivity tests and simulation experiments with general circulation models.

Over the past year, several new components of the research program have been implemented and funding levels have increased.

At a recent meeting in Vladivostok, Russia, hosted by the Far East Branch of the Russian Academy of Sciences, a set of research protocols were adopted as standard methodology for PALE-funded projects. This

document outlines three levels of analysis for the program:

- **Level 1: Modern Calibration.** Modern lake/estuary sediments and reference materials will be analyzed to calibrate sediment parameters with vegetation, lake characteristics, and climate and to assess the potential quality of radiocarbon control for paleo-records.

- **Level 2: Paleorecords of one proxy climate indicator.** High-quality records of at least one proxy indicator with the secure dating (circa 1 accelerator mass spectrometry (AMS) date per 1000 years) are required for several locations within each region to document the spatial variability of Arctic climate changes.

- **Level 3: Analyses of multiple proxy indicators or fine temporal control at key sites.** Several proxy indicators will be analyzed at sites with particularly good records (for example, especially sensitive to paleoenvironmental fluctuations and exceptionally fine temporal resolution).

Proxy paleoclimatic data from prior studies of Arctic lakes, peats, ice cores, tree rings, etc., as well as data from new projects, will be assembled for paleoclimatic analysis and stored as part of the National Oceanic and Atmospheric Administration's global environmental data base. These circum-Arctic data sets will be used in conjunction with general circulation models to evaluate the causes and consequences of Arctic climate variability. A post-doctoral position has been created at the National Center for Atmospheric Research to facilitate this effort.

PALE has established strong linkages to several international programs with similar goals and time tables through collaborative projects between individual investigators and at meetings such as the one in Vladivostok. The international community plays a key role in planning and has helped define research methods. PALE has formed close ties with Paleocological Analysis of Circumpolar Treeline (PACT, Canadian-Russian), Paleo-Environmental and Climatic History of the Russian Arctic (PECHORA, Norwegian-Rus-

sian), and Last Inter-Glacial in the Arctic (LIGA, multinational). PALE is a core project of the IGBP/PAGES (International Geosphere-Biosphere Program/Past Global Changes) project.

An annual newsletter, *PALEO Times*, has been established to summarize research findings of PALE-funded and related projects. Program updates and communication among PALE researchers and interested scientists is carried out through an electronic-mail bulletin board. The first annual PALE investigators meeting will be held February 4-5, 1994, in Boulder, Colo., to discuss research findings and identify new programmatic needs.

PALE funding began in 1991 and is expected to continue until at least 2000. The budget for fiscal year 1993 is approximately \$1,500,000, and maximum annual funding may increase to approximately \$2,000,000. Annual proposal deadlines are September 15. Interested scientists are encouraged to submit proposals. For specific information, contact H. Zimmerman, NSF-ATM or the Steering Committee co-chairs (addresses below).

For copies of PALE's science and implementation plan, research protocols, or newsletter, contact PALE Steering Committee co-chairs John T. Andrews, Institute of Arctic and Alpine Research, University of Colorado, Boulder, CO 80309-0450; tel. 303-492-5183; fax 303-492-2606; e-mail Andrews.jt@CUBLDR.COLORADO.EDU; or Linda B. Brubaker, College of Forest Resources, University of Washington, Seattle, WA 98195; tel. 206-543-5778; fax 206-543-3254; e-mail lbru@u.washington.edu.—Linda Brubaker, College of Forest Resources, University of Washington, Seattle