


An LTER Workshop Proposal for Long-Term Reconstructions of Past Climate Ecosystem Interactions: Solicitation of Interest by Bruce Hayden.

Workshop I:
Late Wisconsin and Holocene
Climate Reconstructions at LTER sites.



Workshop II:
FORET, CENTURY and GEM
Ecosystem Reconstructions at LTER sites.

Climate reconstructions will produce site estimates of climate parameters at 200 yr Intervals from present to 20,000 BP and 400 yr intervals 20,000 to 40,000 BP.

SIXTH ARCHAEOCLIMATOLOGY WORKSHOP

March 26-28, 1996

Department of Environmental Sciences

University of Virginia

The Sixth Archaeoclimatology Workshop will provide participants first-hand experience with macrophysical paleoclimatic models and teach them (1) how these models are created, and (2) why initial boundary conditions must be specified and what they are. The site-specific, high-resolution archaeoclimatic model that the participants will be using works on relatively simple algorithms that take into account Milankovitch cycles and the changes in atmospheric transparency caused by volcanic aerosols to calculate the glacial ice volume. The three factors are then used to calculate the annual latitudinal temperature gradient. This result is then used together with modern atmospheric calibration data and geographic data to calculate the positions of "centers of action," such as the jet stream, the subtropical high pressure system, and the inter-tropical convergence zone. The comparison of these results with modern synoptic meteorological data provides estimated monthly mean values of temperature and precipitation for any particular site with a temporal resolution of 200 year intervals back to 14,000 ¹⁴C years BP and then 500 year intervals back to 40,000 BP. The temporal and spatial resolution which this sort of paleoclimatic modeling provides is very new and, indeed, is unique to this method.

Although modified as needed to meet the interests and needs of participants, essentially the same format has been followed in the five previous Archaeoclimatology Workshops. These have included programs sponsored by the Center for Climatic Research at the University of Wisconsin-Madison, the Department of Geology and Geophysics at the University of Minnesota, the INQUA Paleomonsoons Project at Free University of Berlin, Germany, the Institute of Arctic and Alpine Research at the University of Colorado, and the Department of Archaeology at Uppsala University, Sweden. The Sixth Archaeoclimatology Workshop, to be held at the University of Virginia on March 26-28, will be 3 days in length and will consist of morning lectures of about 2½ hours, including questions and answers, followed by about 4 hours of hands-on modeling in front of the computer each day. The lectures cover the theoretical background of macrophysical climate modeling, discussions of the synoptic climatology of geographical areas of interest to the participants, the application of proxy data in verification of modeling results, and details of the actual use of the modeling spreadsheets. In essence, each participant should be able to model the past climate of the world area of their choice during the session (monthly and annual precipitation and/or temperature data). Naturally, some areas are more readily modeled than others and the modelers' skills display significant variance!

That portion of the overall model which will be utilized in the course is set up to be run on a spreadsheet. Although Lotus 1-2-3 (v. 5) is normally used, most recent spreadsheets could be substituted (e.g., Excel or Quattro Pro, preferably one of the newer versions). After the first practice exercise, in which all participants model the past climate of the same location, the program is

designed to help each participant complete at least one model (many have done several) for their chosen area, including graphs of the output.

The instructors have developed *An Archaeoclimatology Workbook: High-Resolution, Site-Specific Climate Modeling for Field Scientists* in collaboration with Emi Eto and Paul Morin of the University of Minnesota's Dept. of Geology and Geophysics to serve as a coursebook for the workshop. Copies of this manual and of supporting papers, etc., will be provided in advance so that they can be reproduced for each participant. Participants will also receive a certificate signifying their completion of the workshop. The format, content, and schedule will be tailored to suit your individual needs and interests. Professor Bryson will also present the Moore Lecture, designed for a wider audience, as a kick-off for Enviro-Days, the Department of Environmental Sciences' student research symposium.

Instructors for the Workshop will be Professor Reid A. Bryson (Center for Climatic Research, University of Wisconsin-Madison) and Dr. Robert U. Bryson (Archaeoclimatology Consultants, Davis, CA).

REID A. BRYSON, Ph.D., D.Sc.

Prof. Reid A. Bryson joined the faculty of the University of Wisconsin in 1946 at the end of his military service as a Major in the Air Weather Service. His first appointment was in the Department of Geology and in the Department of Geography. In 1948 he started the Department of Meteorology, which is now one of the largest and most prestigious in the United States. In 1963, he founded the Center for Climatic Research, in which he is currently Senior Scientist. Throughout his career, Bryson has been interested in interdisciplinary studies and was one of the founders and chairman of the University's Interdisciplinary Committee on the Future of Man. This group with some others led to the founding of the Univ. of Wisconsin Institute for Environmental Studies, of which he was the founding Director and so served for 15 years. The Institute is renowned worldwide.

Bryson received his B.A. in Geology at Denison University in 1941, a Ph.D. in Meteorology from the University of Chicago in 1948, and an honorary D.Sc. from Denison University in 1971 for contributions to Environmental Science. He has written over 200 papers ranging over the fields of limnology, meteorology, climatology, archaeology, and geography, and five books.

Much of Bryson's work has dealt with climate in relation to human ecology, and this has lead him into extensive travel, especially 26 trips to Asia where he worked primarily on anthropogenic changes of climate and landscape in general. The most obvious result of this work is seen in the introduction of pen-feeding of goats in Rajasthan, which he suggested in the mid-1960s and is now widespread and effective. Other work was on agricultural long-range forecasting of climate, especially the Indian monsoon. His best known laboratory works are in development of new approaches to climatology, such as airstream analysis and quantitative, objective methods of reconstructing past climates. He has also developed computer models of climate: the past history of the monsoon in Rajasthan, model simulation of Pleistocene ice-volume, and Pleistocene climatic history. He recently published a model simulation of the West African Intertropical Convergence position and rainfall for the past 20-40 millennia, and has now extended that work on high-resolution

climate modeling to specific archaeological sites and in montane regions and has successfully modeled the flow of the Nile and contrasted that climate history with the paleoclimate of Jerusalem and other locations in the Near East. He is currently working on three books.

ROBERT U. BRYSON, Ph.D.

An archaeologist, Dr. Bryson has been employed as a cultural resources management (CRM) consultant over the last five years while also vigorously pursuing archaeoclimatic research. In 1990 he joined the Infotec Research, Inc. staff for the PGT-PG&E Pipeline Expansion Project, a 1050 mile transect running from the Idaho panhandle to central California and involving more than 300 prehistoric and historic archaeological sites. He served as Data Manager and Laboratory Director for that project and was Branch Manager of IRI's Eugene, OR office, laboratory, and curation facilities until 1994. Dr. Bryson is currently associated with the Far Western Anthropological Research Group (Davis, CA) as a Field Director, report author, technical editor, and paleoenvironmental consultant. He also provides paleoclimatic consulting services to several other CRM firms under the business name Archaeoclimatology Consultants, which he heads. Bryson is Past-President of the Association of Oregon Archaeologists and has served on two State of Oregon advisory committees dealing with archaeological resources. He is the former Mayor of Coburg, OR and was Board Chairman of the Lane Council of Governments.

Bryson received a B.S. in Zoology from the University of Wisconsin in 1972 and a Ph.D. in Anthropology from the University of Oregon in 1989. His graduate research dealt with the chiefdom centered at the Nan Madol site complex on the island of Pohnpei in the Federated States of Micronesia. He concentrated on Pohnpeian ceramics, including INAA characterization, and also on testing oral traditional accounts of the development and use of Nan Madol against the archaeological record. He has also done archaeological field research on Tutuila in American Samoa.

Most of Dr. Bryson's paleoclimatic research has been focused on the application of modeling output to archaeological contexts, particularly for hunter-gatherer sites (e.g., north-central Oregon, northeast California and adjacent Nevada, the southwestern portion of the Mojave Desert, paleoindian sites in the High Plains, Saharan Africa). He is currently working on a Near East archaeoclimatic overview based on models of Holocene climate at all of the major Neolithic sites in that area in collaboration with his father, is working with a Chilean colleague on a series of models aimed at determining whether environmental change was involved in the prehistoric movements of Altiplano peoples toward the northern Chilean coast, and will be involved in an international research effort studying early African agriculturalists. Dr. Bryson participated in the five previous Archaeoclimatology Workshops as workshop director and computer instructor.

Papers associated with Bryson's macrophysical climate reconstructions model.

Bryson, R.A. and Goodman, B.M.(1986) Milankovitch and Global Ice Volume Simulation. *Theor. Appl. Climatology*, vol. 37, 22-28. q-31.

Bryson, R.A.(1989). Late Quaternary Volcanic Modulation of Milankovitch Climate Forcing. *Theoretical and Applied Climatology*, vol. 39, 115-125.

Bryson, R.A. (1980). An experimental deterministic climate model with predictive properties. *Rivista de Meteorologica Aeronautica*, XL(203), p. 155-172.

Bryson, R.A. (1989) Late Quaternary Volcanic Modulation of Milankovitch climate Forcing. *Theor. Appl. Climatol.* 39:115-125 17-13

Bryson, R.A. and Goodman, B.M. (1980). Volcanic activity and climate changes. *Science*, 207:1941-43.

Bryson, 1992. "A Macrophysical Model of the Holocene Intertropical Convergence and Jetstream Positions and Rainfall for the Saharan Region". *Meteor. and Atmos. Phys.* 47:247-258