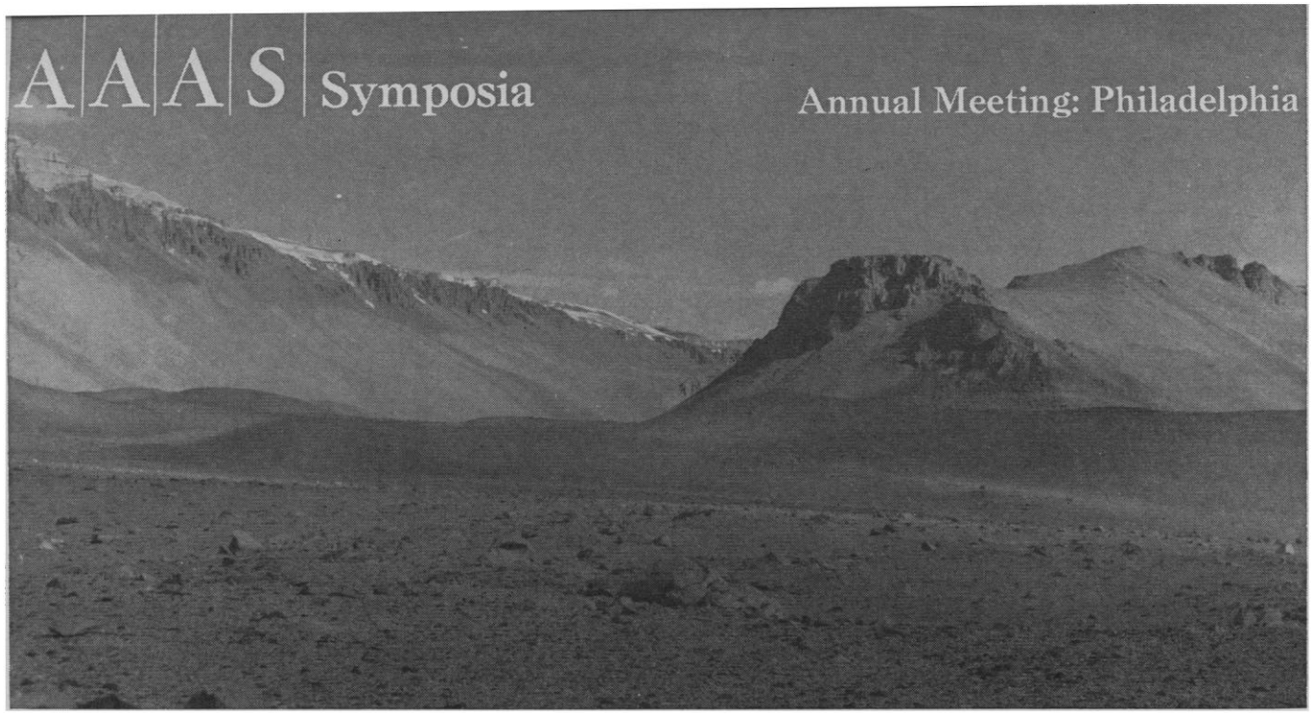

View up ice-free Wright Valley showing vegetation-free, boulder-strewn, palor desert–glaciated terrain. The valley is 5000 feet in depth. McMurdo Sound, Antarctica. [T. L. Péwé, Arizona State University, Tempe]

29–30 December

Polar Deserts

Man's search for minerals and other resources in the crust of the earth is taking him from the highest mountains to the deepest oceans, and from the hot tropics to the frigid poles. Exploration and search in polar areas and in the deep oceans has had to await technological advances before they could be made in a safe and economical manner. Global population growth and the rise in the standard of living for our masses is causing a need to exploit resources no matter where they are to be found. Technology is not yet advanced enough to exploit the deep oceans, but it is now feasible to exploit the polar areas. Man is in increasing numbers beginning to move into these last "frontier" areas as minerals and other natural resources are discovered. Perhaps the most habitable parts of the polar regions are the "desert" areas, and man will, without doubt, disturb the delicate balance between the climatological, geological, and biological processes in operation in these areas. Thus man's move in polar desert areas must be made with considerable caution, otherwise he will repeat the same mistakes he has made in exploiting the temperate and tropic zone deserts.

Deserts are generally thought of as being those arid or semiarid areas in the tropic or temperate zones where there is an extreme shortage of water and, because of a lack of cloud cover, an oversupply of sunshine. Because the development of early civilization was in part closely associated with these deserts, they played a large role in the history of mankind. Polar deserts will undoubtedly play an increasing role in our future. For this symposium the following somewhat arbitrary definition is proposed for a polar desert: a polar desert is a glacier-free terrestrial area wherein the mean annual precipitation is less than 25 centimeters, and the mean temperature for the warmest month of the year is less than 10°C. Tundra areas which essentially meet these conditions are included in this definition; thus the Arctic Slope of Alaska, for example, is considered a polar desert.

The Sahara Desert generally receives approximately 17 to 18 centimeters (7 inches) of precipitation whereas Antarctica receives approximately 15 centimeters (6 inches). The 15-centimeter water equivalent received in Antarctica is, however, in a solid state and, because of the prevailing low temperature over that continent, there is very little melt. This allows the snow and ice to accumulate and practically cover the continent with a thick blanket of ice. The Sahara area has prevailing high temperatures with "drying" winds, so that the moisture which it receives in the liquid state is quickly lost back to the atmosphere; thus the Sahara has an acute shortage of water. Perry Land in northern Greenland has an annual precipitation of approximately 10 to 12 centimeters, and its relative humidity frequently drops below 20 percent during the summer months. Oases are found in Perry Land only where there are melting snow drifts and rivers to provide ample water. Other climatic factors which play a highly important role in the polar environmental milieu with which man will have to contend are: permafrost; abrasion of surfaces by wind-driven snow, ice, and sand grains; widespread atmospheric inversion layers; and a lack of diurnal temperature changes.

Man's ability to survive under a wide variety of conditions, often quite adverse, is entirely dependent upon his creating a microenvironment area suitable to his needs, because in actuality the tolerance range within which man can properly function is limited. Man's occupation of hot deserts was made possible by the domestication of the camel and the invention of the portable water bottle. His occupation of the polar deserts is an entirely different matter. Tropic and temperate deserts are bounded by areas well populated by man; thus food and other products can be easily transported in and out. Polar deserts are located far from centers of civilization, which causes many problems in transportation, communications, and other aspects of modern living.

The environment of polar deserts places a stress on society, and society will create a strong stress on the environment. Recreation and social problems will need to be "tailor-made" for

each society because of its isolation. If man is not to do irrepairable harm to the environment, he must develop a strong rapport with the physical and biological processes that will either influence or be influenced by any intensified development.

The coming years will see a great development in the polar areas, and the most habitable parts of those areas are primarily of the "desert type." The AAAS Committee on Arid Lands has, therefore, arranged a symposium on polar deserts to be held on 29 and 30 December 1971. Participants from Canada and the United States will examine various aspects of the natural environment of polar desert areas—the indigenous people who have inhabited these areas, the economic base for the development of resources, and several of the problems which will confront people moving to those areas.

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Topics and Speakers

Arranged by Terah L. Smiley, Department of Geosciences, and James H. Zumberge, College of Earth Sciences, University of Arizona, Tucson.

29 December

Introduction, James H. Zumberge (Dean, College of Earth Sciences, University of Arizona, Tucson)

Energy and Precipitation Regimes of Ice-Free Areas in Polar Deserts, Mario B. Giovinetto (Associate Professor, Department of Geography, University of California, Berkeley)

Geologic and Geomorphic Processes of Polar Deserts, Troy L. Péwé (Chairman, Department of Geology, Arizona State University, Tempe)

Hydrology of Polar Deserts, Robert S. Sigafoos (Research Botanist, U.S. Geological Survey, Washington, D.C.)

Soils of the High Arctic Landscapes, J. C. F. Tedrow (Professor, Department of Soils and Crops, Rutgers University, New Brunswick, N.J.)

Application of Low Latitude Microbial Ecology to High Latitude Deserts, Roy E. Cameron (Technical Staff, Biosciences Section, Jet Propulsion Laboratory, California Institute of Technology, Pasadena)

Macrobiology and Ecology in Polar Deserts, William S. Benninghoff (Professor, Department of Botany, University of Michigan, Ann Arbor)

Indigenous Peoples of Polar Deserts, Graham W. Rowley (Scientific Adviser, Department of Indian Affairs and Northern Development, Ottawa)

30 December

Processes and Costs Imposed by Environmental Stress, Arlon Tussing (Professor, Institute of Social, Economic, and Governmental Research, University of Alaska, College)

Review of Development of Arctic Resources, John C. Reed (Institute Senior Scientist, Arctic Institute of North America, Washington, D.C.)

Current Aspects of Resource Development, George Jacobsen (Arctic Consultant, Montreal)

Prospects for Future Development, Fred G. Armstrong (Executive Director, New York Academy of Sciences, New York)

Communication and Transportation in the Arctic (the speaker to be announced)

Health and Sanitation Problems in the Arctic, J. W. Grainge, Regional Engineer, and John W. Shaw, Regional Engineer (Public Health Engineering Division, Department of National Health and Welfare, Edmonton)

Behavioral Design of Habitats for Man in Polar Deserts, William M. Smith (Regional Analysis, College of Community Sciences, University of Wisconsin, Green Bay)

27 December

Experimental Manipulations of Natural Systems

Considerable interest is developing in the analysis of natural ecosystems. Research of this scale is not undertaken lightly. Substantial expenditures of time, effort, and monies are required for this form of ecological research. The theoretical base required for the development of relevant and testable hypotheses and the technologies required to evaluate such constructs are receiving more and more attention in several laboratories. The role of experimental manipulations as a mechanism for hypothesis testing in natural ecosystems is increasing in importance.

This symposium is designed to enable a comparison of an array of research programs which have successfully utilized experimental manipulations of natural ecosystem components. Emphasis will be given to the development of the theoretical basis for the specific hypothesis to be tested, the formulation and implementation of the experimental design, the data analysis, and resulting inferences concerning the original hypothesis. The trade off between the specificity of the original hypothesis and the degree of constraint imposed on the behavior of the system is of great importance. The comparative feasibility of manipulations in various ecosystems will be indicated by the distribution of programs represented.

Ivan Valiela and John Teal will discuss their nutrient- and sewage-enrichment experiments in a salt marsh ecosystem at Woods Hole. Paul Dayton will present his experiments of marine benthos manipulations in the Antarctic. Ken Cummins and Robert Boling will present an integrated systems and experimental manipulation approach to the analysis of a temperate woodland stream ecosystem. Robin Vannote will present the experimental stream ecosystem program at the Philadelphia Academy of Science. Dave Schindler will present the experimental eutrophication of lakes with phosphate and nitrate. Herb Bormann will discuss the theoretical developments that have emerged from the Hubbard Brook program. Dan Simberloff will discuss experiments with islands and their insect communities. Dave Reichle and Robert Van Hook will present the design and analysis of a manipulated forest ecosystem at the Oak Ridge National Laboratories.

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