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MEETING REPORTS

Polar Aspects of Global Change

An International Symposium, held at the Rica Hotel in Tromsø, Norway, during 24–28 August 1998

This meeting was the first joint science symposium of the International Arctic Science Committee (IASC) and the Scientific Committee on Antarctic Research (SCAR). Hosted by the Norwegian Polar Institute and Polar Environmental Centre in Tromsø, it attracted 214 delegates from 21 nations with broad Arctic and Antarctic environmental interests. The main purpose of the symposium was to provide a current assessment of the role of the polar regions in global change. A distinguishing feature, in contrast to other recent polar research venues, was the inclusion of social scientists with physical and biological researchers.

The symposium was composed of introductory and keynote presentations, 50 oral papers, and an additional 91 posters. Following a morning session of official opening statements and keynote addresses, nine sessions (several concurrent) were held over four days on a range of important topics: Arctic/Antarctic climate trends; teleconnections linking the polar regions to low and mid-latitudes; terrestrial systems and feedbacks on climate change; variability of polar snow, ice and permafrost features; ice sheet and glacier mass balance and sea level; polar biogeochemical cycles; the polar paleoenvironmental record; atmospheric chemistry, ozone and UV-B effects; and, regional and socio-economic impacts of global change. The final morning included a summary of the research highlights of each session (by the session chairs) and an open discussion on research priorities and opportunities.

In the introductory and keynote addresses, H. Grassel (World Climate Research Programme, Geneva) discussed how the cryosphere can be an early indicator of global change, emphasizing that small changes in the water balance of the polar regions may have larger impacts on the global system. C. Rapley (British Antarctic Survey, Cambridge, UK) suggested that the most significant connections of the polar regions to higher latitudes are: albedo modulation of the planetary heat sink; atmospheric teleconnections; ocean bottom water (influencing global thermohaline circulation); sea level; as a carbon store; stratospheric chemistry; life on the edge; and, as an archive of past states (paleoclimates). O. Young (Dartmouth College, USA and IASC Vice-President) presented four cutting-edge issues or challenges to bi-polar research: (1) detecting climate change and understanding the impacts of change on the natural environment; (2) understanding the dynamics of coupled and highly interactive systems; (3) bringing in the human dimension as an equal partner with the natural sciences; and (4) bringing stakeholders into discussions with the planning of science. G. Weller (University of Alaska, USA) reviewed the aim of the symposium and noted overlaps between international science programmes in the Arctic and Antarctic. He also outlined four key questions related to global climate change in the Arctic: (1) Are we already seeing a climate change due to the greenhouse effect? (2) Are the changes in climate we see in the Arctic due to natural or man-made causes, or both? If both, what are their relative contributions to change? (3) What parameters, processes and interactions (past, present and future) do we need to understand better in order to predict future climate change? (4) What are the likely impacts of global change on the Arctic environment and people and of Arctic processes and feedbacks on the global climate and society? These questions helped frame the context in which many of the symposium questions were discussed.

Several modelling papers illustrated that the polar regions and Southern Hemisphere are now better represented in global models. However, despite model improvement, a lack of field data (for most disciplines) exists to adequately challenge the range of model outputs. Significant cryospheric changes were reported in two polar regions – ice shelves retreating around the Antarctic Peninsula and sea-ice reduction along the Russian Arctic coast. Both regions appear to be responding to recent regional warming (the Antarctic Peninsula has for two decades experienced its warmest temperatures since 1900). J. Walsh (University of Illinois, USA) indicated that while Arctic sea-ice coverage has decreased during the past two decades, a significant large-scale retreat of Antarctic sea-ice has not been revealed by satellite data. He indicated that several global climate models of the greenhouse effect suggest this Arctic-Antarctic asymmetry. Several models described the complex nature of the North Atlantic Deep Water outflow and Antarctic Bottom Water and their collective influence on overall global thermohaline circulation. Another direct polar connection is an inferred linkage of the Antarctic Circumpolar Wave with the tropical ENSO (El Niño–Southern Oscillation) presented by W. White and R. Peterson (Scripps Institution of Oceanography, USA).

Long-term northern tree-line studies by H. Nichols (University of Colorado, Boulder, USA) indicate large-scale reproductive shifts from infertility (1960s–70s) to pollen and cone production (1990s) – a possible consequence of polar warming. Studies were presented on the potential feedbacks on changing climate through altered CO_2 and CH_4 sources/sinks in Arctic tundra regions. Oceanic models showed the Barents and Kara seas and Southern Ocean to be large sinks for atmospheric CO_2 under changing climate. The symposium also highlighted the increasing use and critical importance of satellite observations, in particular radar altimetric measurements of snow and ice sheet surface topography. Emphasized in Tromsø were the large uncertainties in changes of the Antarctic ice sheet and the resulting contributions to global sea level rise. The focus of the paleoenvironmental session was on the wealth of new high-resolution archives from polar marine sediments, terrestrial sediments, and ice cores.

Anthropogenic chemicals are playing a leading role in ozone depletion and this loss is most evident in both polar regions; there has been a 40% loss of ozone over the Arctic. Papers showed that the natural ozone variability in the Arctic is significantly greater than in the Antarctic. Although increases in UV-B can have effects on mammalian immune systems, there are few data to evaluate the human health effects of UV-B increases in the Arctic. One of the major challenges faced by social scientists evaluating the impacts of climate change is that humans respond to overcome various climatic factors. For example, when studying the loss of regional

fisheries, the impacts of climate change must be taken together with other factors such as over-fishing, regulatory controls, and so on. There is also a key requirement, presented by M. Lange (University of Münster, Germany), for distinctive global (emphasizing mitigation) and regional (focusing on adaptation) regimes responding to global climatic changes.

The symposium was a visible, initial step to closer ties between IASC and SCAR. A second joint meeting is planned in several years time. Such bi-polar collaboration is necessary since, as the papers and discussions highlighted, the polar regions are integral to an understanding of the global climate and environmental change. Papers from the symposium will be published in a 1999 double issue of the refereed journal *Polar Research* (published by the Norwegian Polar Institute in Tromsø).

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The Commons Revisited: An Americas Perspective

A symposium at the10th General Assembly of the Scientific Committee on Problems of the Environment (SCOPE), held at the Environmental and Occupational Health Sciences Institute, in Piscataway, New Jersey, USA, during 14–20 June 1998

The Environmental and Occupational Health Sciences Institute (B.D. Goldstein, Director) is a joint institute of Rutgers (the State University of New Jersey) and the University of Medicine and Dentistry of New Jersey (Robert Wood Johnson Medical School).

The triennial meetings of SCOPE have two distinct parts: scientific symposia and the General Assembly itself. The General Assembly consists of business meetings, a re-evaluation of SCOPE's scientific programme, and the development of new scientific initiatives for the intervening three years. The scientific symposia are intended to examine current issues that are important to the membership attending the General Assembly. The symposia serve both to educate the public and to stimulate discussions within the SCOPE community. There were two symposia: 'The Commons Revisited: An Americas Perspective' and 'New Jersey as a Microcosm.'

SCOPE, established in 1969, is a non-governmental organization of scientists representing 39 nations. It was established by the International Council of Scientific Unions to provide independent, scientific input on environmental problems that are interdisciplinary and international. The meeting was attended by 89 delegates from 36 countries, and the symposia were attended by an additional 145 people, largely from the United States. Delegates to the General Assembly came from Europe (29%), Asia (21%), the Middle East (2%), Australia (3%), South America (5%), and North America (38%).

Opening ceremonies for the General Assembly included remarks by the President of SCOPE (P. Bourdeau, Université Libre de Bruxelles, Brussels, Belgium), the President of Rutgers University (F.L. Lawrence) and the President of UMDNJ-Robert Wood Johnson Medical School (S.S. Bergen Jr), the Director of the Environmental and Occupational Health Sciences Institute (B.D. Goldstein), the Chair of the US National Committee for SCOPE (C. Field, Department of Plant Biology, Carnegie Institution of Washington, Stanford, CA), a representative of the US National Research Council (D. Policansky), and a representative from the Governor's office of the State of New Jersey (J. Jengo). The keynote address on the Earth's resources and sustainability was given by Lester Brown (World Watch Institute, Washington, DC). The General Assembly itself addressed a wide range of issues in three main areas: Health and the Environment, Practices and Policies, and Ecosystem Processes and Biodiversity. In the Health and the Environment cluster, upcoming projects involve radiation, mercury cycling, cadmium in the environment, and various projects under the direction of the Scientific Group on Methodologies for Safety Evaluation of Chemicals (SGOMSEC, neurobehavioural methods, susceptibility, alternative testing methods, pesticides, metals, and endocrine modulators). The Practices and Policies cluster will continue or develop projects on ecological economics, urban waste management, material flow analysis, ecological engineering, emerging environmental issues, invasive species, assessment of the state of marine sciences, earth services, and other sustainable biosphere projects. The Ecosystem Processes and Biodiversity cluster projects include nitrogen transport, behaviour of large-scale ecosystems, soils and sediments, earth surface processes, tree/grass dynamics, groundwater contamination, role of environmental sciences in agricultural practices, land-ocean nutrient fluxes (silica cycle), isotopes in global change science, implications of aquaculture and mariculture on biodiversity, uses of molecular biology in the study of environmental issues, and interactions of the major biogeochemical cycles. Information on the various projects can be obtained from the Executive Director of the SCOPE in Paris, France (V. Plocq-Fichelet). Since the last General Assembly in 1995, Mexico, the Republic of Korea, and Brazil have joined the SCOPE. Officers for the next three years include President (J.M. Melillo, Ecosystems Center, Woods Hole, MA), Past-President (P. Bourdeau, Université Libre de Bruxelles, Brussels, Belgium), Vice-President (Y. Oshima, President of the Japan Wildlife Research Center, Yushima, Tokyo, Japan), Treasurer (D.O. Hall, Division of Life Sciences, King's College, London, UK), and the Secretary-General (B. Moldan, Director, Environmental Center, Charles University, Czech Republic). 'The Commons Revisited: an Americas Perspective' involved a full day of plenary talks aimed at examining a wide range of Commons issues from local to global. Organized by the US National SCOPE Committee, under the chairmanship of C. Field (Department of Plant Biology, Carnegie Institution of Washington, Stanford, CA), the symposium included speakers from North and South America. The 'Commons' is an important metaphor for understanding imbalances between populations and resources. Over-consumption may result whenever social, legal or cultural factors allow resource consumption by a few who accrue benefits to themselves, but costs to the rest of the community. Speakers in the 'Commons' symposium addressed the meaning of the commons (J. Carabias-Lillo, Department of Natural Resources and Fisheries, Mexico), a conceptual framework for commons issues (E. Ostrom, Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington, IN), fisheries (B. McCay, Human Ecology, Rutgers University, Piscataway, NJ), coastal issues (J. Burger, Division of Life Sciences and Environmental and Occupational Health Sciences Institute, Rutgers University,

Piscataway, NJ), land tenure (J. Sarukhán, Universidad Nacional Autónoma, Mexico), forests (A. Umana, Former Minister of the Environment, Costa Rica/World Bank, Washington, DC), arctic contaminants (J. Middaugh, Epidemiologist for the State of Alaska, Anchorage, AK), when the commons are not common (M. Gelobter, Public Administration, Rutgers University, Newark, NJ), global chemical cycles (P. Matson, Geological and Environmental Sciences, Stanford University, Stanford, CA), water resources (J. Richey, School of Oceanography, University of Washington, Seattle, WA), and future issues (W. Clark, Kennedy School of Government, Harvard University, Cambridge, MA, and J. Melillo, Ecosystems Center, Woods Hole, MA). 'New Jersey as a Microcosm' included keynote talks on solid waste (R. Magee, Hazardous Substance Management Research Center, New Jersey Institute of Technology), environmental pollution prevention (J. Fox, US Environmental Protection Agency, New York City), land-use and agriculture (R. Sullivan, Pinelands Commission), and why New Jersey is a microcosm for examining environmental problems (M. Greenberg, Urban Studies and Community Health, Rutgers University, New Brunswick, NJ). Each talk was followed by a panel of experts from academia, conservation organizations and the private sector to discuss New Jersey's solutions to these major environmental problems. While New Jersey is small, it has the highest population density in the United States, is a major industrial and farming state, and has made major strides toward solving environmental problems that can serve as models for elsewhere. In addition to the Assembly and symposia, delegates attended field trips that included: the Great Swamp, Port Liberté Science Center and Ellis Island, Sandy Hook National Seashore and the Sandy Hook Marine Laboratory, and the Pine Barrens and Burlington County EcoComplex.

The banquet was held on a cruise around Manhattan Island on the Spirit of New Jersey, which featured evening views of the New York skyline and a spectacular lightning thunderstorm.

There will be two major products from the SCOPE 10th General Assembly. First, the US National SCOPE Committee, which hosted the SCOPE General Assembly, is writing an overview paper of the 'Commons' symposium. Second, the papers from the symposia are being collected for an edited volume entitled 'The Commons Revisited: An Americas Perspective.' Editors are J. Burger, R. Norgaard (Energy and Resources Program, University of California, Berkeley, CA), E. Ostrom, D. Policansky (National Research Council, National Academy of Sciences, Washington, DC), and B.D. Goldstein. The next SCOPE General Assembly will be held in three years.

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