John W. B. Stewart

Global Change and Terrestrial Interactions

John W. B. Stewart holds undergraduate and postgraduate degrees from Queen's University, Belfast, Northern Ireland. Most of his scientific career has been spent as a faculty member at the University of Saskatchewan, where he has been employed since 1964. He is currently Dean, College of Agriculture and previously was Director of the Saskatchewan Institute of Pedology. His research contributions include: Nutrient Cycling in Soils and the Inter-Relationship of Carbon with Nitrogen, Phosphorus and Sulfur in natural ecosystems. He has related the changing of soil properties and crop production capability along environmental gradients to different management treatments and has been involved in the use of conceptual and mathematical modelling of soil processes. For several years he has been interested in problems of the environment and is currently Secretary General of the *Scientific Committee on Problems of the Environment* (SCOPE). Address: University of Saskatchewan, Saskatoon, Canada, S7N OWO.

During the past three decades significant changes have been recorded in the composition of the earth's atmosphere. These changes, mainly anthropogenic in nature, appear to threaten the earth's life-sustaining environment. Worldwide economic and technologic activities are contributing to rapid and potentially stressful changes in our global environment in ways that we are only now beginning to understand. The effects of these changes may profoundly impact generations to come (IGBP 1989). How well we anticipate and respond to a rapidly changing environment depends on our commitment to document and understand the earth system processes involved in these changes.

Concern among the scientific community resulted in the *International Council of Scientific Unions* (an international non-governmental scientific organization composed of 20 scientific unions, 75 national members and 26 scientific associates) creating a new interdisciplinary programme,

the *International Geosphere-Biosphere Programme:* a Study of Global Change (IGBP). By addressing the interactive physical, chemical and biological components of climate change, the IGBP complements the *World Climate Research Programme,* which is concerned with the physical aspects of climate change.

I used a large percentage of my time at the Wissenschaftskolleg to help develop and synthesize ideas on how the world's scientific community could coordinate its efforts in an IGBP programme The objective of IGBP is to describe and understand the interactive processes that regulate the total earth system, the unique environment which provides its life, the changes that are occurring in the system and the manner in which they are influenced by human activities.

My interest is on the use of land and the ability of land to sustain the production of food and fibre. Soil quality, a term that is difficult to define, is important in land sustainability. My research in the past has been directed towards understanding changes in soil properties as affected by management, environmental gradients, and vegetation. I have used my time at the Wissenschaftskolleg to expand this research to include aspects of the processes that produce trace gases that are important in atmospheric chemistry and the controls on those processes.

It has also been useful during the past seven months to think about the problems of the environment in a wider range. Scientists per se are making progress in understanding the interactive physical, chemical and biological components of the interactive earth systems. When we find a means of achieving better land or environmental management, we must then translate this into practical solutions. Somehow one has to bridge the gap between decision-makers who in their effort to devise sustainable policies lack, in many respects, necessarily reliable and timely scientific information and scientists working on these issues of intrinsic scientific interests, not necessarily directly relevant to the needs of the decision-makers.

It has been extremely useful to discuss aspects of the human dimension of global change with other Fellows at the Institute and to develop ideas that can be put into action. I have been able to bring some of these issues into a planning phase through my position as Secretary-General of SCOPE (a *Scientific Committee on Problems with the Environment).* SCOPE has recently launched two new projects, one dealing with the use of scientific information for sustainable development and the second dealing with biodiversity. Biodiversity is likely to become one of the most crucial issues of environmental sciences, partly because it can be perceived from too many different angles: scientific, ethical and religious, aesthetical, emotional, economic, legal and mandatory, but these are not

necessarily comparable in their approaches and conclusions. In addition, nearly all non-governmental and private institutions dealing with the environment have quite understandably to deal with processes and issues related to biodiversity irrespective of the efforts of the organizations concerned. This leads most unavoidably to some misunderstandings and overlaps.

As usual, of course, one always brings with one projects which were started prior to arriving at the Kolleg and papers that are joint publications with former graduate students or postdoctoral Fellows. One important new activity that the IGBP at the Kolleg started during their stay here has been the preparation of a textbook on global change. We hope to finalize this book within the next year but have made a geod start during the time here.

Finally, I should like to thank the Kolleg for giving me the opportunity of spending a most interesting 6-7 months here. It has been an excellent place to work and the support staff have been extremely helpful.