

The scientist as poet

Alexander Dorozynski

Not many people could find poetry in that most prosaic of instruments, the computer. But Daniel Hillel does. "A poet gazing through his window may perceive the grass field stretching outside as a realm of supreme serenity and quietude", writes Dr Hillel, a soil scientist with the University of Virginia in Charlottesville. "But to the environmental scientist, it is a system of incessant flux, where matter and energy are transformed and transported to and fro in a series of numerous concurrent processes involving physical, chemical, and biological changes."

One way to bridge the vast gap between poet and scientist says Hillel is through the modern computer, which is capable of processing simultaneously the many constantly interacting variables and thus can help us to understand the complex interrelationships between soil, water and plant.

For many years, soil science relied more on experimentation than theory. "We did not know how to reconcile the results. Our approach was empirical, and very often we did not consider the interacting, dynamic factors that came into play. Now, the technique of computer simulation can help us pre-search the best answer before undertaking costly experiments."

Many soil scientists, he points out, have not been trained in computer science, and if they haven't caught up with it, they may well become "obsolete". Dr Hillel himself (after studying at the University of Georgia, Rutgers, the Hebrew University in Jerusalem, and completing postgraduate work at the University of California at Berkeley) came to the field in the 1950s, when computer science was still a fledgling. Hence, he says, he has had to make an effort to retrain himself in the new art — or suffer the likely consequence of prematurely becoming an administrator!

Working in the United States, Japan, Israel, and Belgium, he acquired the techniques necessary for the elaboration and utilization of models simulating soil-plant-water interactions.

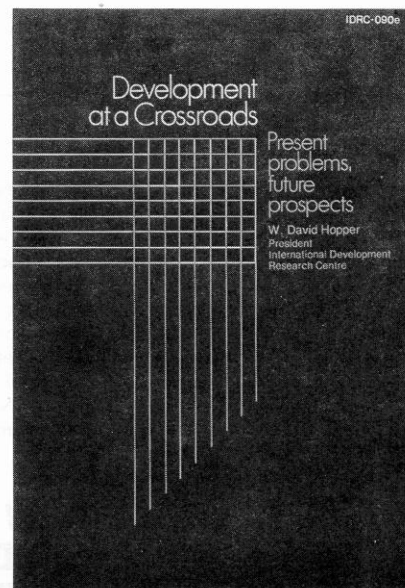
In the past two years, Dr Hillel, with

the help of an IDRC fellowship, has committed to paper some of the computer models he has developed or been involved with. His book (*Computer Simulation of Soil-Water Dynamics — A Compendium of Recent Work*, IDRC-082e) is addressed to problem-oriented research workers. Its purpose is to supplement the usual empirical approach to research, by adding a theoretical dimension that may be essential to reaching "the most crucial decision in any research project" — that is, the decision of what to research. Such models can help identify leads before a project is actually undertaken, and they can also be used to evaluate the results of the research once it is underway or completed.

The book assumes a basic working knowledge of calculus and at least some familiarity with computer programming and, from then on, leads the reader along a path to better understanding of more complex and complete models. A model, however, is by definition a simplification. It cannot account for all the processes at work, and certainly not for processes we may still be unaware of. Dr Hillel points out that he does not wish to convince the reader of the lasting validity of the models he presents, but rather to challenge him to do better on his own. "In science, and particularly in modeling, no "last word" (even if it is, for a fleeting moment, the "latest word") can ever become the "final word". But simulation is a good point of departure for theorists and experimentalists to begin journeying together."

Dr Hillel, who received his own basic training "in the primitive prehistoric dark ages before computers appeared on the scene and became ubiquitous and inescapable", demonstrates the value of learning the "new art".

"And what a pleasure", he adds, "to be able to bend this powerful machine to your will and make it do your bidding, as, stage-by-stage, it calculates how energy and mass interact in making plants grow to fruition in a simulated field, combining the exactitude of science with the beauty of poetry." □



Development at a Crossroads: Present problems, future prospects, by W. David Hopper. Published July 1977, 18 pages, IDRC-090e.

This monograph is based on a lecture delivered by the IDRC President in Tokyo earlier this year at the invitation of the Japanese Ministry of Foreign Affairs. It presents an historical overview of development assistance efforts, examines some of the factors contributing to present problems, and concludes on an optimistic note, with Dr Hopper stating his belief that "the joint actions of rich and poor can and will be focused on harmonizing economic possibilities with need."

Trees for People, by Clyde Sanger, Gilles Lessard and Gunnar Poulsen. Published September 1977, 52 pages, IDRC-094e.

This monograph is the first in a planned series describing in detail the research supported by the Agriculture, Food and Nutrition Sciences Division of the IDRC, and deals with the forestry research program. It describes many projects in fields such as plantation research, agroforestry and tropical timber utilization, as well as a section on the proposed International Council for Research in Agroforestry.

Social Change and Internal Migration: A review of research findings from Africa, Asia and Latin America, by Alan Simmons, Sergio Diaz-Briquets, and Apodicio A. Laquian. Published July 1977, 128 pages, IDRC-TS6e.

This report by the Centre's Migration Review Task Force focusses on development policy issues and related research implications with respect to migration and population distribution. While each region is reviewed separately, the report is structured to enable easy cross-reference to specific topics. The report also contains an extensive bibliography.