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Global Change Instruction Module Wins Prize for Innovation

Arthur Few, Rice University, has won the 1993 EDUCOM Higher Education Software and Curriculum Award for Best Natural Sciences Curriculum Innovation in the Atmospheric Sciences. The award was given for the teaching module *System Behavior and System Modeling*, part of NCAR's Global Change Instruction Program. Designed to teach the basics of modeling to undergraduates with little grounding in math and the technical aspects of science, the module uses STELLA, a graphics-based modeling application for the Apple Macintosh that allows users to create computer models without knowing how to program. Few's module discusses the components and uses of modeling and then shows students how to build three simplified working models: of a bathtub, the earth's energy system, and human population. A companion Instructor's Manual contains detailed solutions to the exercises in the module and an additional set of modeling exercises.

Few has used STELLA to teach modeling at many levels, from survey courses for nonscience majors to graduate-level courses. STELLA can also be used by the researcher for day-to-day work, although it cannot handle the larger partial differential equations. Using STELLA, a music major, with the help of a teaching assistant, can create his or her own simple climate model for the earth, with atmospheric greenhouse feedback, and explore the global warming produced by increasing atmospheric CO_2.

Five modules currently are available through the Global Change Instruction Program. They are designed to be integrated into a number of existing courses—in earth sciences, biology, physics, astronomy, chemistry, meteorology, and the social sciences. Each represents two to three weeks of classroom time, and all are written to be accessible to college freshmen. They are

System Behavior and System Modeling by Arthur Few (Rice University). A primer on system modeling in general and computer modeling in particular, with special emphasis on climate modeling. Program disks are provided; must be run on a Macintosh computer. $5.00

Instructor's Manual for System Behavior and System Modeling. Contains discussions and solutions to the 15 exercises in the modeling module in text and Macintosh disk form. $4.00

The Sun-Earth System by John Streete (Rhodes College). Discusses how solar energy is produced on the sun, electromagnetic radiation, and how the earth's atmosphere interacts with solar radiation. $2.50

Clouds and Climate Change by Glenn Shaw (University of Alaska). Discusses the underlying physics of cloud formation and cloud-climate feedbacks, with supplementary discussions of cloud patterns on other planets and of the energy in clouds. $2.50

El Niño and the Peruvian Anchovy Fishery by Edward Laws (University of Hawaii). Discusses El Niño, the ecology of the Peruvian *anchoveta*, the economics of fisheries management, and the impact of climate change on these natural and human systems. Includes a computer simulation that allows students to test the impacts of economic and climatic variables on the fish population. Program disk is provided. $6.00

Population Growth, by Judith Jacobsen (University of Denver). Discusses the relation of population to global change, the basics of demographics, patterns of population growth, and the role of public policy on population control. Includes a 1993 World Population Data Sheet. $5.00

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