

## Computers that teach: Hello Mr. Chips

Welcome to the world of software ice cream, where the pistachio is programmed and the chips aren't chocolate but micro. Such computerized ice cream stands constitute just one of a number of "microworlds" being developed to help students learn about complex subjects using simulated real-world environments. Though these computer-teaching programs are not yet widespread in the classroom and have had little input from behavioral research, they are nonetheless being heralded as a boon to educators. The pros and cons of the new field were discussed this week in Toronto at the annual meeting of the American Psychological Association.

"Computers can bring great leverage to education," says Allan Collins, principal scientist at Bolt, Beranek & Newman, a software firm in Cambridge, Mass. In the program he and his colleagues designed, called "Ice Cream Price Wars," small groups of students learn about economics by running their own electronic ice cream stands. Group members communicate by computer and decide how many cones to make, set prices to compete with other groups and develop advertising slogans. They must also deal with a random element in the program that can dampen sales—rainy weather.

A program such as this teaches students to solve problems and lets them see the effects of their actions, says Collins. Innovative educational software is in its infancy, he notes.

"Flexibility is the most distinctive feature of computers for teaching," says Ernst Rothkopf, a psychologist at Bell Laboratories in Murray Hill, N.J. "They can be used to match teaching to students' learning styles, making education a more pleasant experience." But learning research, including that focusing on advanced technology, has almost exclusively studied efficiency and speed of mastery, he adds. Social scientists have had little say about what makes a teaching method acceptable and satisfying to learners.

An acceptable computer-teaching program may need to leave the classroom altogether and invade the video arcades, says psychologist Ricardo Barrera of the University of Vermont in Burlington. He developed an English grammar software program that was recently tested on 25 junior high school students recruited at a video arcade. After completing part of the "curriculum," some students were given two free video game tokens, others were given credit for two tokens to be used after the month-long course was over, and still others received no tokens. Those who were reinforced immediately scored far better on video grammar tests, says Barrera.

Similarly designed systems covering topics such as civics or health may effec-

tively supplement classroom learning, he suggests.

But classroom computer use may suffer, says Richard Shavelson of the University of California at Los Angeles, because teachers who use the new technology well are leaving school for jobs with better pay and working conditions.

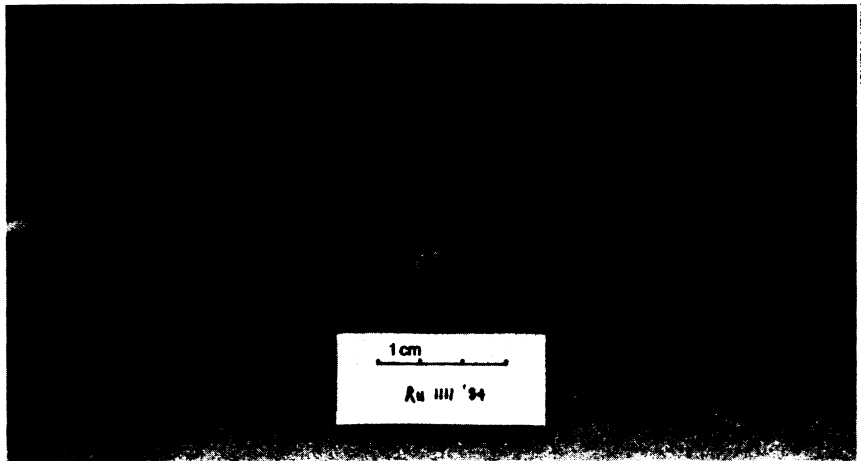
He and several colleagues contacted teachers and administrators at 50 schools in California. The researchers were surprised at the number of times they were told about "master teachers" who left education for greener pastures. They found only 60 mathematics and science teachers who were using computers in an "exem-

plary" fashion.

"Computers can encourage students to learn by discovery and error," says psychologist Susan Markle of the University of Illinois in Chicago. "They can learn to 'debug' their own thinking." But most educational software is inadequate and over-promoted, she holds.

Katherine Vorwerk, project director at an educational software firm in Amherst, Mass., finds that teachers and children like the systems her company sells, but she expresses a reservation. "Right now the medium is so novel and seductive that almost any computer-instruction system would please the users," she says. "Five years from now I don't know if the same systems will prove to be educationally effective."  
—B. Bower

## Old bones from family-tree trunk



Foot and lower leg from an ape-like creature that lived 18 million years ago.

With but eight days left on a six-week expedition, scientists from Johns Hopkins University in Baltimore and the National Museums in Kenya stumbled across 18-million-year-old bones of five extinct ape-like animals.

The creatures, members of a species called *Proconsul africanus*, are generally thought to be at the base of the human-ape evolutionary tree. While the bones date back too far to solve the question of the later human-ape branching (SN: 7/2/83, p. 8), they are expected to yield details of what this early hominoid (of the family that includes apes and humans) looked like and how it lived.

The fossil site, discovered in June and announced last week, was just two miles from the researchers' camp on Kenya's Rusinga Island in Lake Victoria. Anthropologist Mary Leakey had found a nearly complete *Proconsul* skull on the island in 1948, and a few years later 60 percent of another skeleton was found nearby. Because rain had filled a trench dug near the campsite the day before, excavators were sent to look for other

potential bone deposits. They encountered the pile of *P. africanus* remains lying on the ground just a half-mile off a main road, next to a widely used path.

"It was incredible," says Mark Teaford, one of the Hopkins anthropologists. "The ground was just white with primate bones."

By studying the structure and wear-and-tear effects on the bones — from two adults, one young adult, a juvenile and an infant — the researchers hope to reconstruct details of *Proconsul's* life. The wrist bones, for example, should help establish whether *Proconsul* walked on all fours, like monkeys, or knuckle-walked, like apes. Preliminary investigation of the bones answers the question of tails — *Proconsul* was evidently more ape-like than monkey-like in this regard, having none.

Last year, some members of the same research group made another surprising find — at a site in northern Kenya, they found 17-million-year-old bones of *Sivapithecus*, a hominoid species thought to have existed 9 or 10 million years ago.  
—J. Silberman

Alan Walker