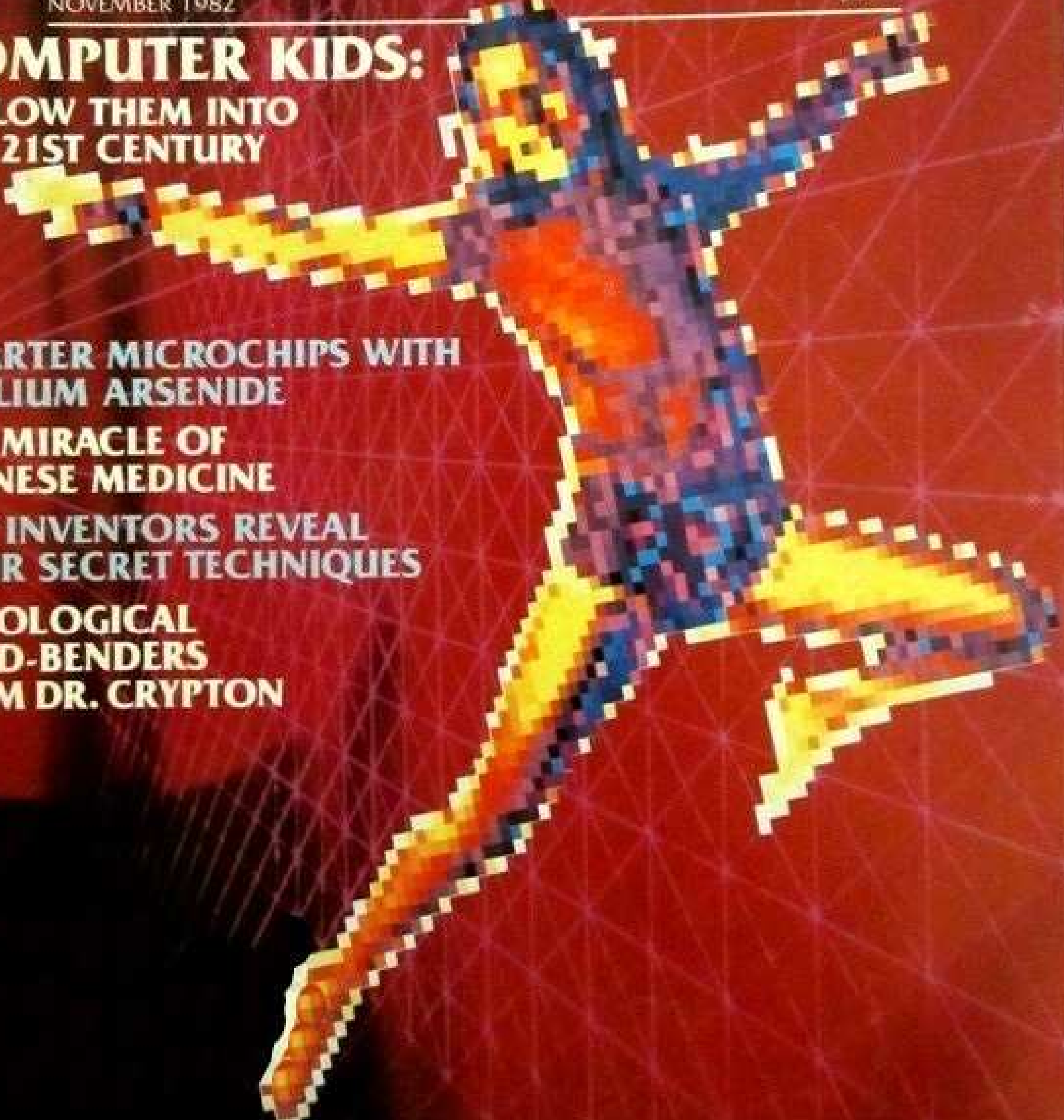
NEWEST ANTI-HERPES DRUG: TEST RESULTS

SCIENCE DIGEST

NOVEMBER 1982 $2.00

COMPUTER KIDS:
FOLLOW THEM INTO THE 21ST CENTURY



SMARTER MICROCHIPS WITH GALLIUM ARSENIDE

THE MIRACLE OF CHINESE MEDICINE

TOP INVENTORS REVEAL THEIR SECRET TECHNIQUES

TOPOLOGICAL MIND-BENDERS FROM DR. CRYPTON

TEST BLAZES FIGHT FIRES

For years scientists have used computer models to predict the behavior of fires. Until recently, their efforts involved hypothetical fires, not actual blazes that can injure or kill real people. But now that's changing.

Leonard Cooper, a research engineer at the National Bureau of Standards Center for Fire Research, in Gaithersburg, Maryland, uses data from controlled fires to calculate how long people can remain safe inside various kinds of rooms. His studies help determine architectural fire-safety guidelines.

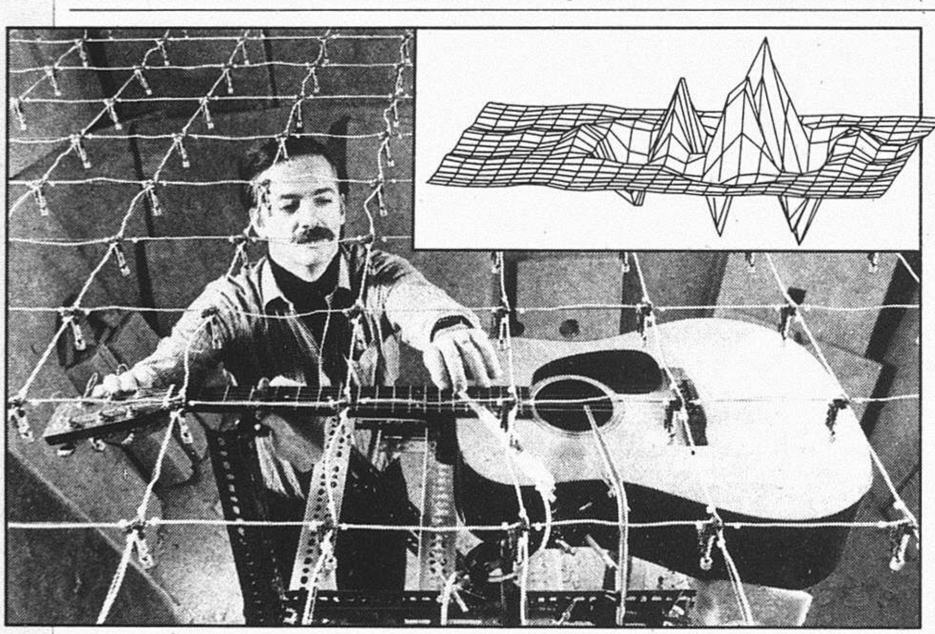
Safe egress from a room depends on a number of factors, such as its size, how fast it fills with smoke and noxious gases, the number of occupants and exits, and how soon a warning is sounded. To run laboratory tests on individual rooms is costly and time-consuming. "My job is to use computer models to solve actual problems," Cooper explains. "We want to be able to predict and ultimately control hazards that result in fires."

A top concern in fire safety is getting people out quickly. But what about those who can't escape? In a prison fire, for example, it may take too long to evacuate inmates (and once out, getting them back in is another problem).

To study such cases, Cooper built four prototype cells based on those at two maximum-security prisons. The cells differed only in their doors, which ranged from bars to a solid slab with a window on top and an undercut at the bottom. Tests showed that the greater the ventilation through the door, the faster a fire inside a cell burns and fills the cell block with smoke. In cells with solid doors, fires burn longer but more slowly.

Cooper used his findings in a computer model, simulating the effect of fans that would extract dangerous smoke and gas from the cell block. He found that if properly designed and placed, fans could enable prisoners to stay safe in their cells indefinitely—or at least until they come up for parole. □

A BASEBALL PLAYER trying to hit a 90-mile-per-hour pitch must begin his swing a quarter of a second after the ball is released.



A grid of microphones picks up sounds, which are transformed by a computer into a three-dimensional image (inset). Peaks represent variations in acoustic intensity.

COMPUTER SKETCHES 3-D SOUND MAPS

A team of researchers has invented a new way to see sound. Called nearfield acoustical holography, the technique could help industrial engineers to design quieter machinery, mechanics to spot car trouble and craftsmen to build finer musical instruments.

The method, developed at Pennsylvania State University, is unique in that it locates the precise origin of a sound—such as that ominous noise under the car hood—and plots the transmission of that sound through space.

A network of 256 microphones is used to record the "field of sound" and its source. The microphones, strung together in an even grid resembling an oversize fishing net, are hung from the ceiling. The sound-emitting object is centered beneath the grid. Sound waves are snared by the microphones and transmitted to a computer, which produces a three-dimensional acoustic map on a TV monitor. The resulting image looks like a piece of graph paper with a chain of mountains emerging from its flat plane of squares. The tallest peak represents the loudest area of the sound: its source.

"This ability to isolate the center of a sound may prove important in studying the deafening drone of industrial machinery," says acoustician Earl Williams, a member of the research team. By pinpointing the source of sound in a single piece of complex equipment, nearfield acoustic holography would allow designers to correct a model before starting full-scale production. Several auto manufacturers have expressed interest in using the method to help them design quieter cars.

Williams is now employed by the Naval Research Laboratory in Washington, D.C., in what may be the most ambitious project yet involving nearfield acoustic holography. A Navy spokesman says the technique will be used in laboratory tests "to study how sound scatters or radiates from different basic nautical shapes and bodies under water." When applied at sea, Williams explains, data from the Navy's studies are expected to improve interpretation of signals from sonar and other detection systems and to help cut noise from ships and underwater weapons.

However, before nearfield acoustic holography lowers the world's noise level or bolsters our national defense, musical-instrument makers will probably bring the technique into the concert hall. In fact, the first Penn State sound-pictures were made from notes strummed on an acoustic guitar. □

EARTH IS AN unimaginably watery place. In, on and above the planet are close to 370 quintillion gallons of the substance in solid, liquid or vapor form. This quantity is over 100,000 times the capacity of Lake Superior, the largest of the Great Lakes, and could provide everyone on Earth with something approaching 100 billion gallons.

Photograph courtesy of Department of Public Information and Relations, Pennsylvania State University; inset illustration courtesy of Julian D. Maynard, Department of Physics, Pennsylvania State University