

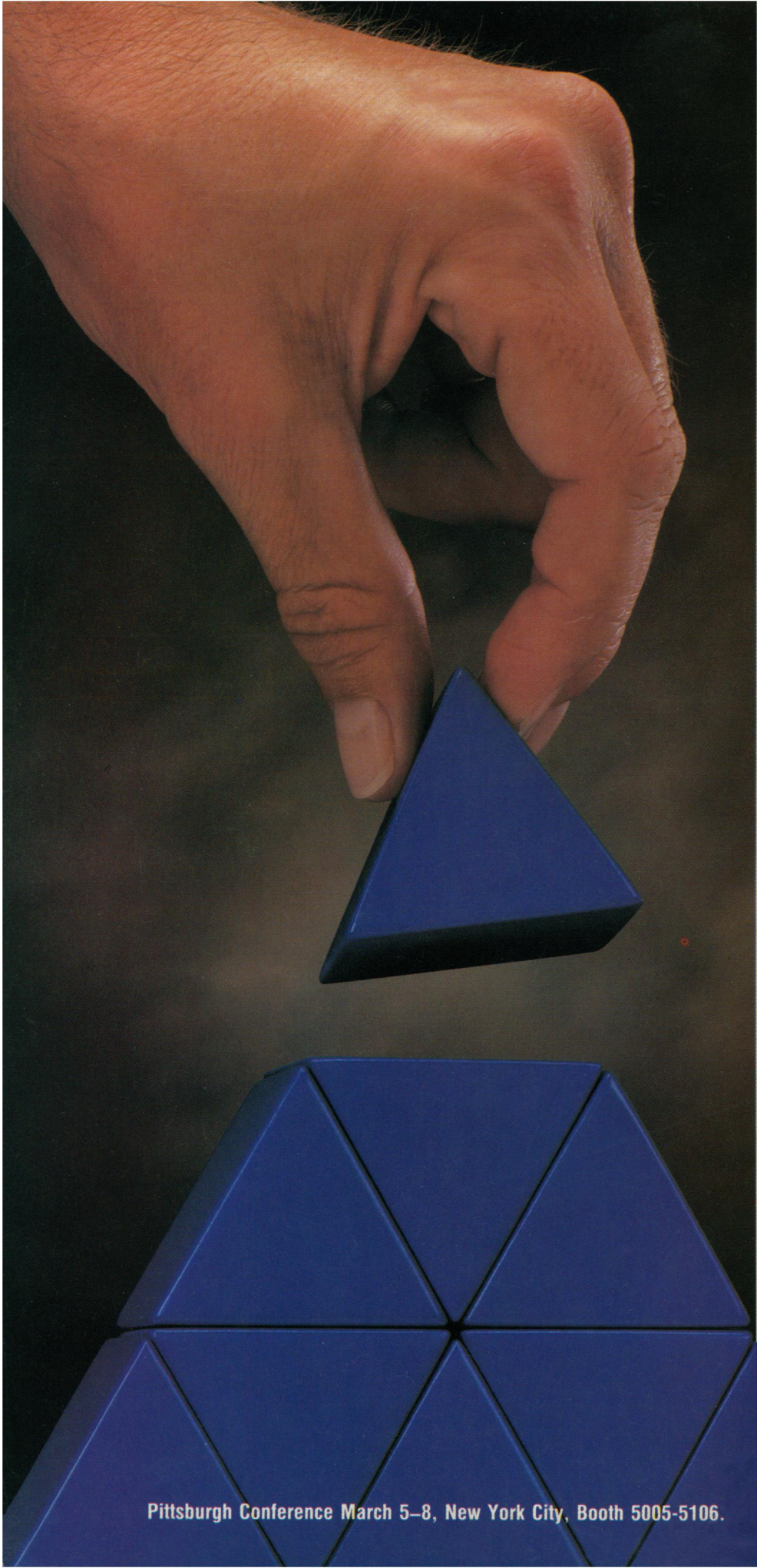
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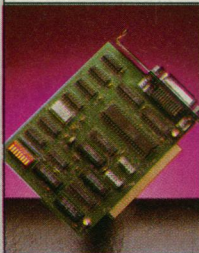
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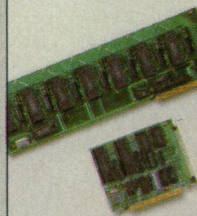
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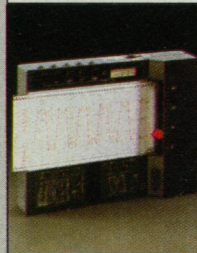
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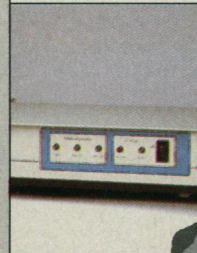
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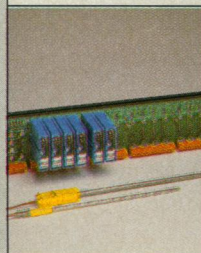
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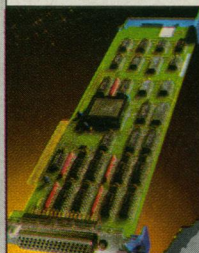
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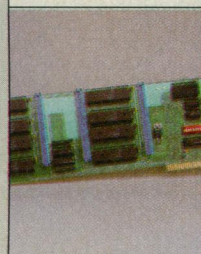
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COVER A photograph of dark sunspots and bright faculae near the sun's limb, obtained in broad-band light with the vacuum tower telescope at Sacramento Peak Observatory. These two kinds of photospheric magnetic structures both influence the total solar irradiance. The smallest facular elements visible are approximately 500 miles in diameter. See page 556. [By permission of the National Solar Observatory/Sacramento Peak, a division of the National Optical Astronomy Observatories, Inc., under cooperative agreement with the National Science Foundation]

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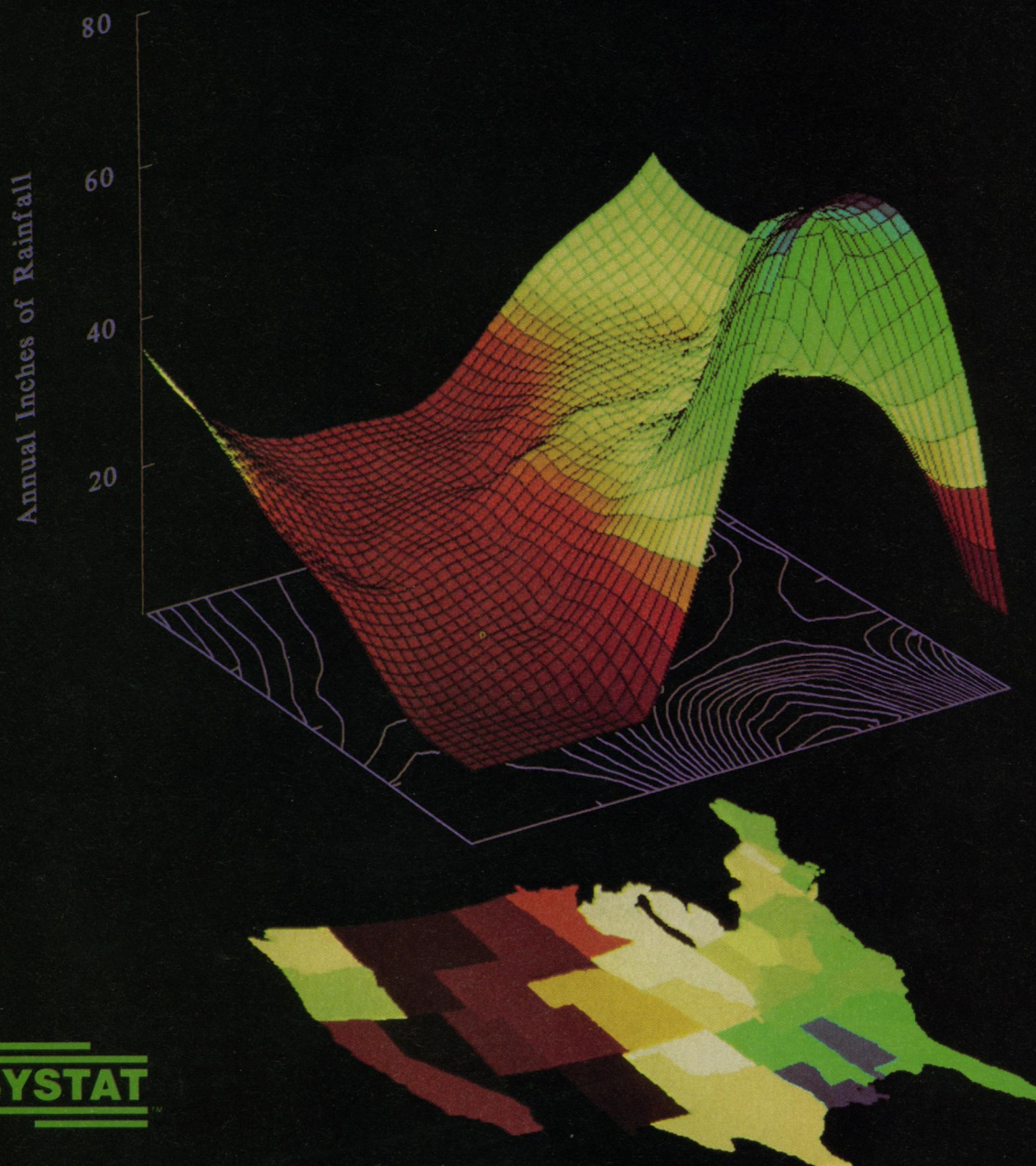
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This Week in SCIENCE

Health care costs

IN 1989, the United States spent a colossal \$600 billion dollars on health services, a sum that was more than 11% of the gross national product (GNP) (page 534). A steadily increasing chunk of the GNP has gone to the health sector during the past 40 years; this trend has been fueled by diverse social, political, technological, and biological factors. Features of health sector economics, such as the financing of health care by third parties, distinguish health-related financial decisions from decisions associated with other types of purchases. Fuchs addresses these and related issues, noting that there is mounting political pressure to contain health sector expenditures and that the most effective approach is likely to be one that emphasizes reining in both the quantity and the price of health care services. Rationing is no longer a question; who will do the rationing and what and who will be rationed are thorny decisions for the future.

Penning traps and geonium structure

ONE of the winners of the 1989 Nobel Prize in Physics was Hans Dehmelt who developed the Penning trap. In this trap, under conditions of ultrahigh vacuum and ultralow temperature, elementary particles can be captured and held in an electromagnetic field and scrutinized. How the trap works and the atomic properties of a captured "man-made" geonium pseudoatom—a trapped single electron—are the subjects of Dehmelt's review (page 539). Measurements of geonium's g factor (the dimensionless gyromagnetic ratio) improve by more than three orders of magnitude the accuracy with which magnetic moment measurements of elementary particles can be made. The results confirm the validity of predictions of the quantum theory of electrodynamics regarding the structures of elementary particles and bear on the Big Bang theory of the creation of matter.

Promising sickle cell animal model

ALTHOUGH the molecular basis of sickle cell anemia has been understood for more than 30 years, suitable animal models for the disease or for the sickle cell trait (the condition in which an individual has one normal gene and one disease gene) have not been available and good therapies have not materialized. A promising model for the trait and possibly (with further manipulations of such things as in vivo oxygen tensions and pressures) for the disease is now described by Ryan *et al.* (page 566). Sickle cells are red blood cells that contain structurally aberrant hemoglobin. As a result of this protein abnormality, the cells sickle when oxygen tension is lowered, occlude small blood vessels, and cause tissue damage. Human globin genes (hemoglobin consists of an iron-porphyrin heme group and the protein globin) that produce sickle hemoglobin were inserted into fertilized mouse eggs; the eggs were then implanted in foster mothers and allowed to develop. A transgenic mouse line was produced that synthesized human sickle hemoglobin; so as to maximize the physiologic effect of the human hemoglobin, this line was bred with a second line of mice that had low levels of mouse globin. The progeny showed a number of sickle cell traits—red blood cells that sickled in vitro, several hematologic indicators of anemia, and enlarged spleens.

Ischemia and stroke antidote

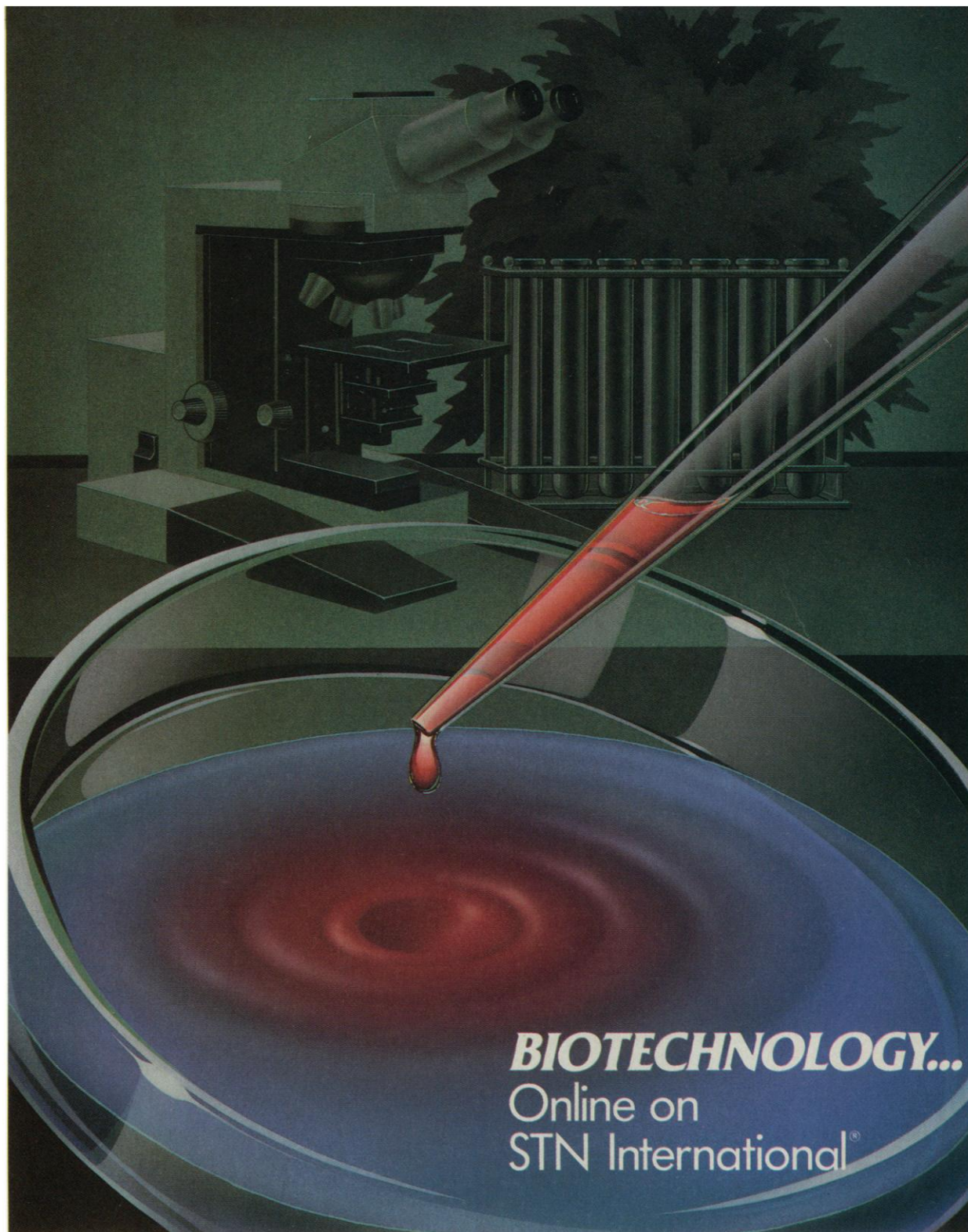
NBQX, a pharmacologic compound in the quinoxalinedione family, is a candidate drug for treating strokes and other sequelae to ischemia, the "tissue anemia" that results when the local blood supply is cut off. In the brain, ischemia kills nerve cells, and, therefore, even temporary reductions in blood circulation to the brain can lead to permanent neurologic damage. The exact sequence of molecular events that lead from a condition of

ischemia to the death of cells is not known; however, it appears that the activity of brain receptors of the quisqualate subtype is somehow involved. NBQX is a potent antagonist of the quisqualate receptors. In vitro, as shown by Sheardown *et al.*, NBQX binds to the receptors with high affinity and produces specific electrophysiologic effects (page 571). When NBQX was injected into gerbils in which ischemia was induced, death of neuronal cells was prevented; the drug was effective even when it was injected hours after the ischemic episode had occurred. NBQX appears to be a more potent receptor antagonist than similar quinoxalinediones that have previously been evaluated.

Neural graft for Parkinson's disease

A 49-year-old man with advanced Parkinson's disease has shown significant and sustained clinical improvement after receiving a graft of fetal brain tissue (page 574). The transplanted tissue, fetal mesencephalon, is rich in dopamine-synthesizing neurons; patients with Parkinson's disease show a loss of this type of neuron, a loss that causes tremors and lack of motor control. After transplanting tissue into the patient's brain, Lindvall *et al.* used brain imaging techniques to test the neurochemical activity (enhanced dopamine functioning) of the graft and also evaluated the patient's motor performance. In general, the patient's parkinsonian symptoms have diminished and he has shown less rigidity and less sluggishness. Survival of the grafted cells and restored neuronal activity at the site of implantation suggest that the marked improvement in the patient's clinical condition is not simply a consequence of brain jostling by the surgical procedures. Marx presents an overview of this and other recent transplantation studies that have been directed at improving the neurologic functioning of patients with various neurodegenerative diseases (page 529).

■ RUTH LEVY GUYER



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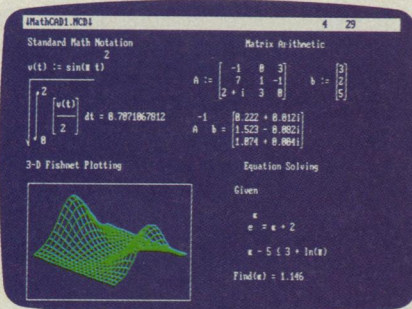
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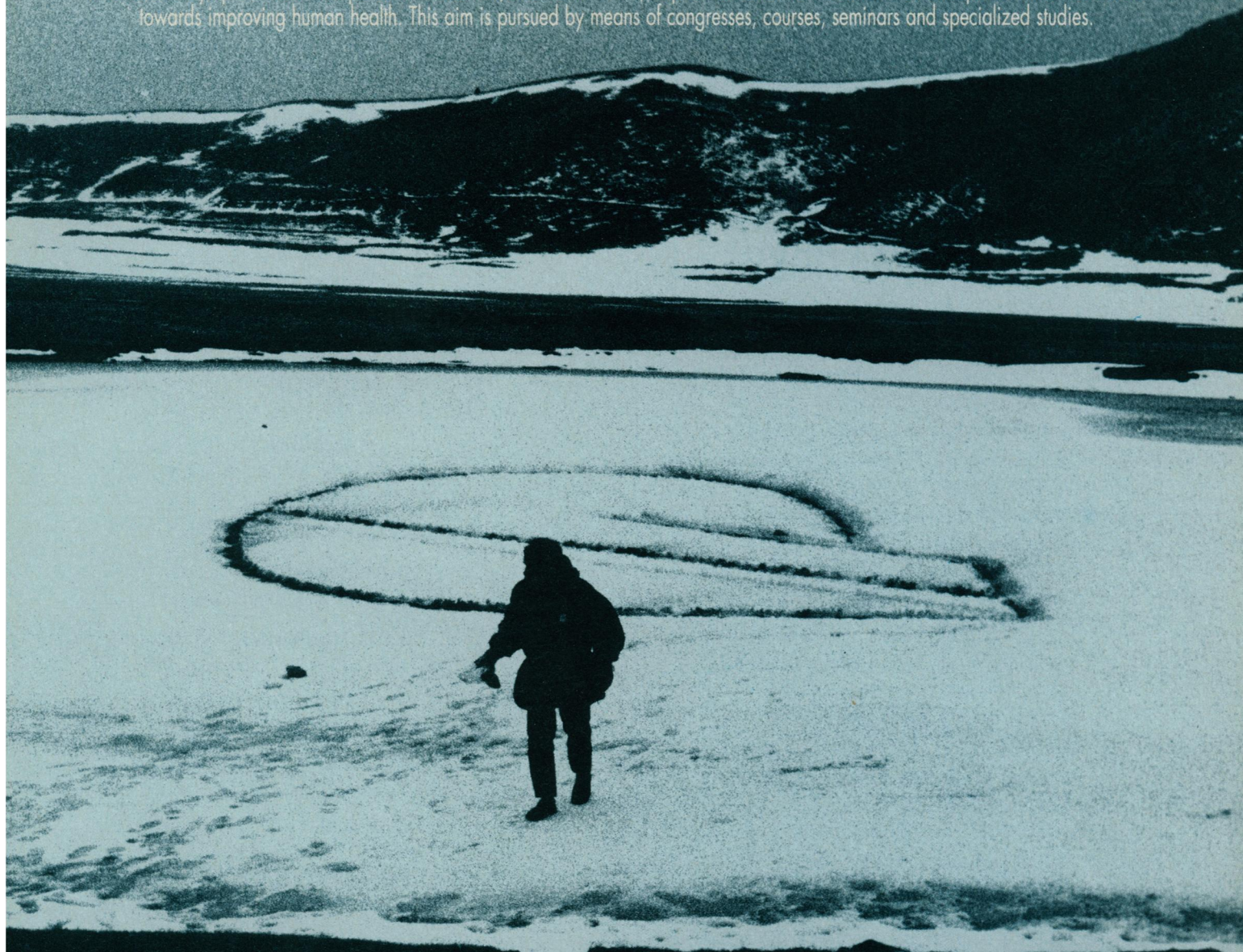
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