

SCIENCE

5 July 1974

Vol. 185, No. 4145

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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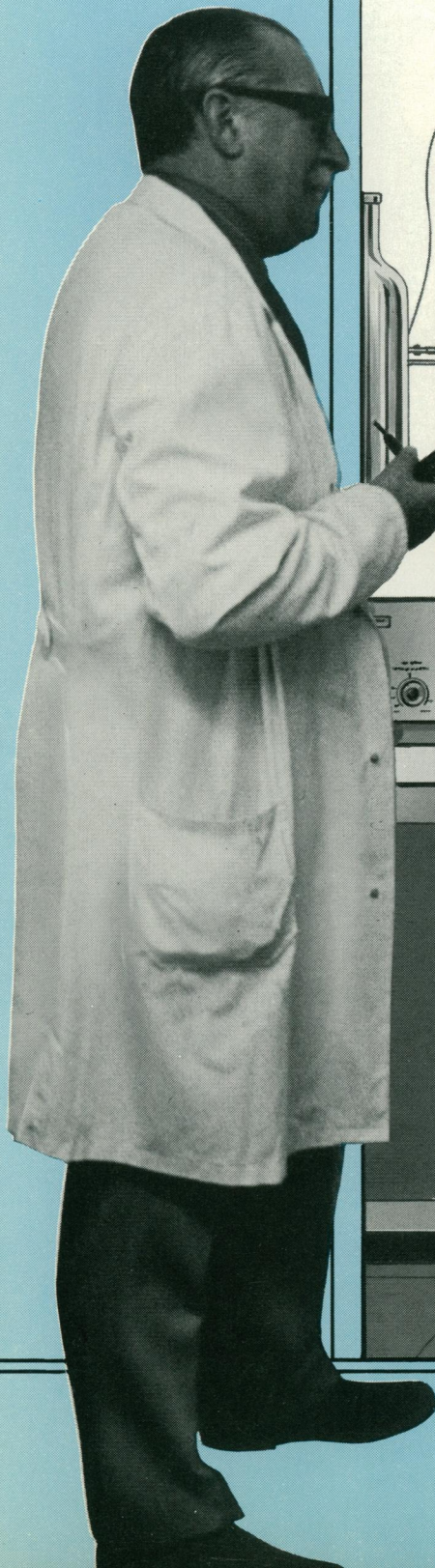
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Western Electric Reports:

The electron diet leads to a slimmer, trimmer wire.

In most telephone switching offices, every time a telephone number is changed, distributing frame wire is changed. That old wire is usually pulled out and a new wire soldered in. When that happens, the wire is subjected to considerable abuse. It must withstand abrasion during connects and disconnects and it must resist heating when the closely spaced wires are soldered.

So conventional wire has had a thick, heavy insulation of a plastic jacket, cotton wrap and lacquer coating.

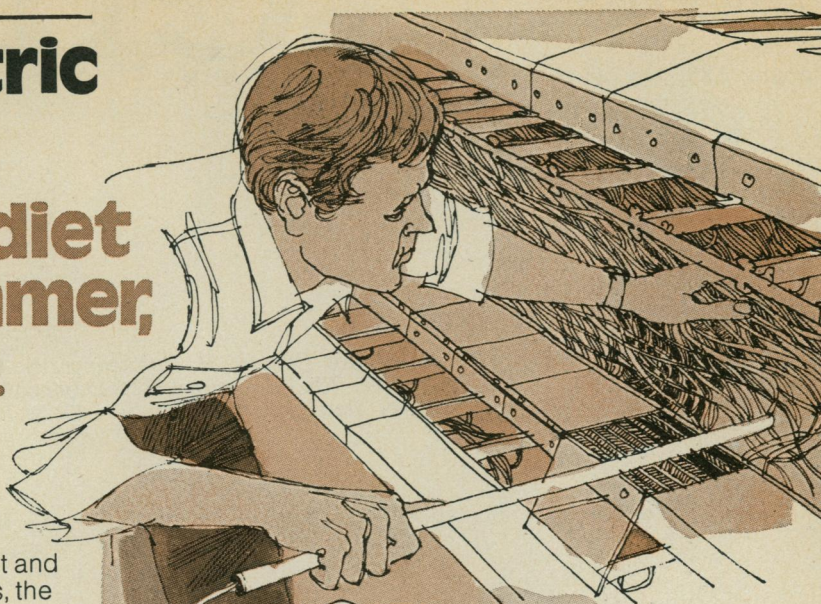
While this heavy textile insulation solved one problem, it created others. For example, in some metropolitan areas, central office frames can become so congested with the thick wires that it's almost impossible to remove unused lengths. And while the number of these wires can grow, the space on a frame for them can't.

Engineers at Western Electric and Bell Labs set out to develop a thin single-layered insulating material that would satisfy two conflicting requirements: it had to soften at moderate temperatures for extrusion onto a conductor, yet it had to have high heat resistance at installation.

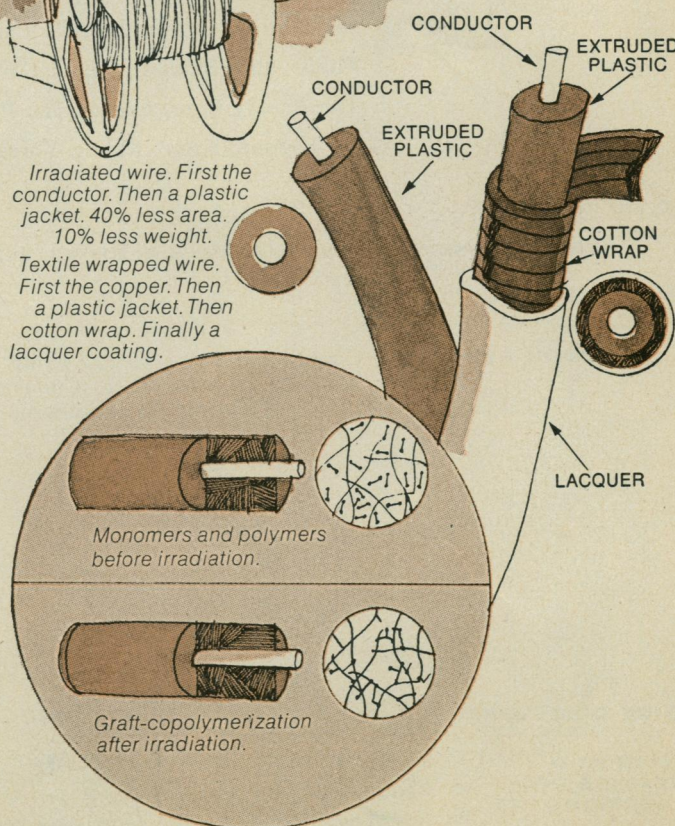
The answer was a carefully engineered mixture of polyvinylchloride and a crosslinking monomer. This compound softens at moderate temperatures for extrusion. But later when bombarded with electrons generated by an electron beam accelerator, the monomer molecules crosslink with each other and the plastic forming a network that prevents flow at high temperatures.

Engineers at Western Electric's Buffalo Works designed facilities to insure uniform crosslinking of this wire at production rates. And by the end of this year, it will be produced in substantial quantities.

Benefit: The new wire has 40% less cross-sectional area and 10% less weight than conventional textile insulated wire. Its surface friction is much lower than the old wire's so disconnected wire can be more easily pulled out.



Central office distributing frame. Reach in, pull out an old wire, and solder in a new one.



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5 July 1974

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SCIENCE

LETTERS	Breeder Reactor Debate: <i>B. Commoner; R. Gillette</i> ; Unfettered Mother: <i>K. Arms</i> ; Medical School Recommendations: <i>C. F. Herreid II</i> ; Cancer Detection: <i>J. F. Seybolt; G. S. Duboff</i>	9
EDITORIAL	Should We Ban Nuclear Testing Now?: <i>G. W. Rathjens and J. P. Ruina</i>	11
ARTICLES	Mineral Resources, Economic Growth, and World Population: <i>D. B. Brooks and P. W. Andrews</i>	13
	Ethology and Stress Diseases: <i>N. Tinbergen</i>	20
	Resource Partitioning in Ecological Communities: <i>T. W. Schoener</i>	27
NEWS AND COMMENT	Killian Committee: Report Urges Advisory Council in White House	39
	Malcolm R. Currie: World's Largest R&D Manager	41
	Middle East Studies: Funding Wilts as Arab-U.S. Friendship Flowers	42
	The Energy Bureaucracy: The Pieces Fall into Place	44
	Methadone: Court Ruling Threatens FDA Regulations	46
RESEARCH NEWS	Leukemia: Much Is Known, but the Picture Is Still Confused	48
BOOK REVIEWS	Copper and Tin, reviewed by <i>M. J. Mellink</i> ; Myoglobin, <i>R. E. Forster</i> ; The Lichens, <i>W. L. Culberson</i> ; Biological Oceanographic Processes, <i>J. H. Steele</i> ; Cytotaxonomy and Vertebrate Evolution, <i>H. G. Callan</i>	52

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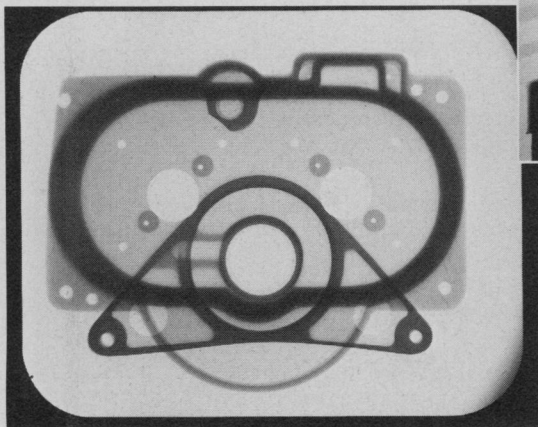
REPORTS	Auditory Membrane Vibrations: Measurements at Sub-Angstrom Levels by Optical Heterodyne Spectroscopy: <i>P. R. Dragsten et al.</i>	55
	<i>Woodruffia metabolica</i> : An Exception to the Rule of Desmodexy: <i>T. K. Golder</i>	57
	Photochemical Activity of Single Chloroplasts Recorded by the Use of Nuclear Track Emulsion: <i>W. Arnold, S. Perdue, J. Azzi</i>	59
	Expression of the Familial Hypercholesterolemia Gene in Heterozygotes: Mechanism for a Dominant Disorder in Man: <i>M. S. Brown and J. L. Goldstein</i> . .	61
	Brain Cells in Culture: Morphological Transformation by a Protein: <i>R. Lim and K. Mitsunobu</i>	63
	Convergent Morphological Evolution Detected by Studying Proteins of Tree Frogs in the <i>Hyla eximia</i> Species Group: <i>L. R. Maxson and A. C. Wilson</i>	66
	Malignant Melanoma: Specific Immunity Induced by Bacillus Calmette-Guérin in BALB/c Mice: <i>R. P. Faraci and L. Schour</i>	68
	Failure of Beta-Adrenergic Receptor Blockade to Prevent Arrhythmias Induced by Sympathetic Nerve Stimulation: <i>R. A. Gillis, D. L. Pearle, T. Hoekman</i>	70
	Testosterone Induces "Splitting" of Circadian Locomotor Activity Rhythms in Birds: <i>E. Gwinner</i>	72
	Localization of Sister Chromatid Exchanges in Human Chromosomes: <i>S. A. Latt</i>	74
	Chloride Spike: A Third Type of Action Potential in Tissue-Cultured Skeletal Muscle Cells from the Chick: <i>J. Fukuda</i>	76
	Choice in Free-Ranging Wild Pigeons: <i>W. M. Baum</i>	78

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COVER

Human spines. See page 13. [From
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The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

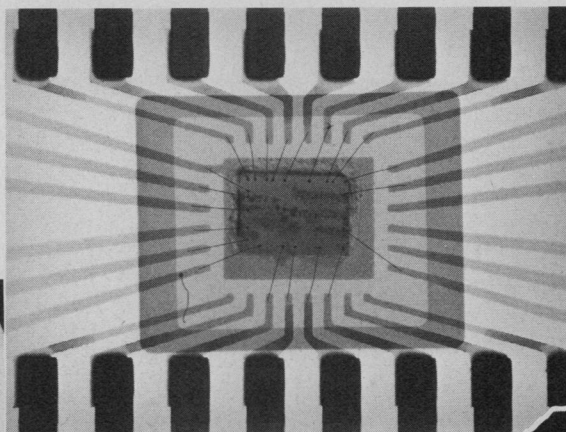


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With prices starting at \$3350,* the 43805 brings the benefits of instant X-ray inspection into laboratories that could not previously afford it, and enhances its feasibility for classroom use. The optional fluoroscope starts at \$300,* and the manipulator at \$150.*

Think what you can do with 4.8 million bytes of memory in a desk-top computing calculator.

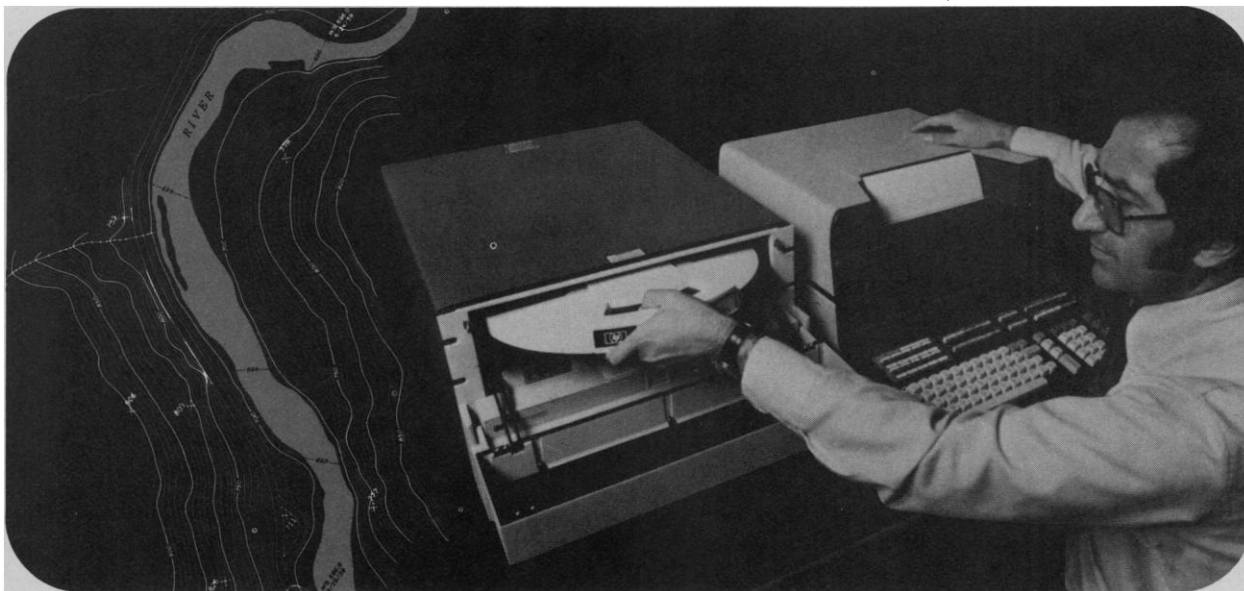
The new HP 9880B Mass Memory has been developed specifically for the HP 9830A Programmable Calculator, dramatically extending the calculator's storage and instruction capabilities.

For instance, its 4.8 million bytes of storage can accommodate large-data-base programs in statistical analysis, structural design, and inventory

dicted, dam sites selected, and optimum dam sizes determined.

With a disc drive of one fixed and one removable platter, the Mass Memory can store 2.4 million 8-bit bytes on each platter—as much as can be stored on 38 magnetic tape cassettes. If you want even greater capacity, a second disc drive with two more platters can be added to the system. Because access is random, it is extremely fast. You can retrieve any 1,000-word program and load it into the 9830 in just one second. A comprehensive BASIC language command set provided with the Mass Memory lets you access files by name using simple commands such as “read” or “print.”

A full line of peripherals is available for the Programmable Calculator system: card readers, line printers, plotters, digitizers, and tape punches. The lease price per month for the 9830A Calculator and 9880B Mass Memory starts at \$890.*



Map courtesy of U.S.G.S.

control—programs that previously required a sizeable computer system.

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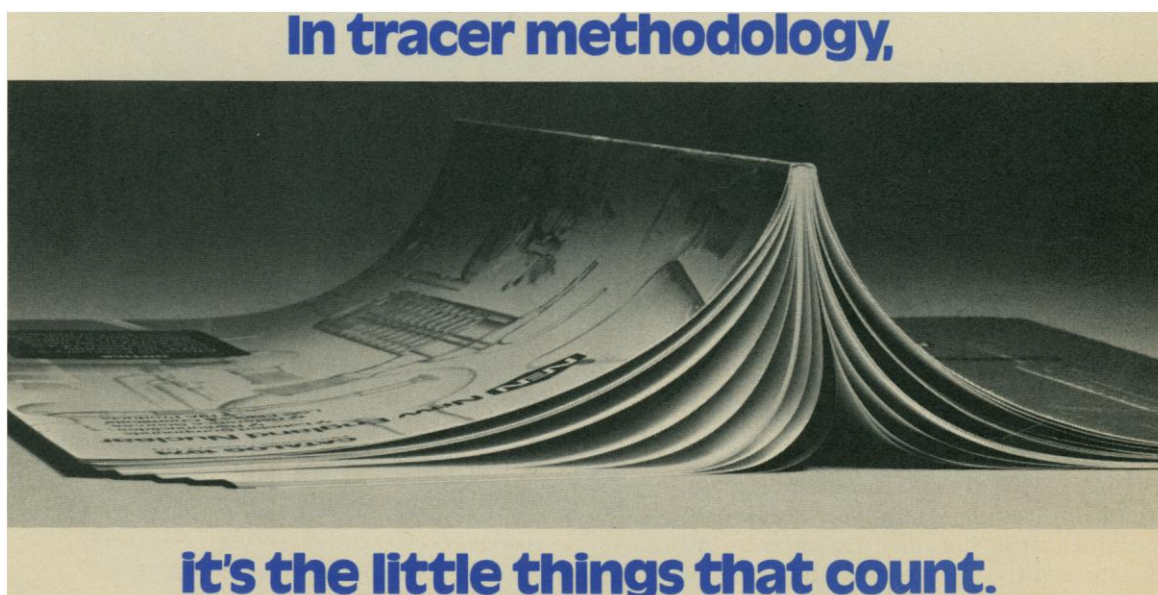
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Should We Ban Nuclear Testing Now?

In 1963 the United States and the Soviet Union signed a limited test ban treaty which banned all but underground nuclear tests and which proclaimed as aims "an end to the armaments race" and "the discontinuance of all test explosions of nuclear weapons for all time."

Since 1963 both countries have continued nuclear testing with full vigor; there has been no perceptible slowdown in the arms race and no progress so far in negotiations for a comprehensive test ban.

From a purely technical perspective the case for a comprehensive agreement is now much better than it was a decade ago.

In 1963 it was estimated that the seismic signals from as many as 150 Soviet earthquakes per year could be confused with those from underground nuclear explosions. To resolve ambiguities and as a deterrent to clandestine testing, the United States insisted that a comprehensive agreement include the right to conduct a limited number of on-site inspections of suspicious events. Efforts to conclude a comprehensive agreement foundered on the on-site inspection issue. Since then, seismic and other means for identification have been improved so that they are more effective than feasible on-site inspections.

Of equal importance, after the failure of the last 10 years of intensive underground nuclear testing by both countries to produce any significant breakthroughs in weapons technology, there seems little possibility that any Soviet clandestine testing program could produce a destabilizing outcome.

All in all, the net military risk of a comprehensive test ban is thus very low—lower now without on-site inspections than with them a decade ago.

Also, from the results of continued nuclear testing and detailed analyses, peaceful uses of nuclear explosions appear to be even less promising than they were in 1963.

Notwithstanding these developments, only a "threshold" treaty is now proposed. This would proscribe underground testing above some given level, defined in terms of the magnitude of the seismic signal.

It is unlikely that a threshold lower than 4.75 on the Richter scale will be agreed upon. This means that virtually all current nuclear testing could be continued. Even though explosions greater than about 100 kilotons would be ruled out, this would represent only a small obstacle to the development of new strategic systems, since both countries have large numbers of tested warhead designs already in their inventory. Particularly, it must be expected that there would be no effect on the new Soviet missile programs, since it is inconceivable that the Soviet Union would conclude such an agreement without already having tested suitable warheads for these missiles.

Would such an agreement be helpful in preventing the further proliferation of nuclear weapons? Hardly. Even if nonnuclear powers were to accede to the agreement, they could develop and test weapons without violating it. In fact, such an agreement might even have negative effects in holding the line on nuclear proliferation. It would raise questions as to why a comprehensive ban could not be negotiated, given the dramatic improvements in seismic identification capabilities. It would signal the reluctance of the superpowers to give up nuclear weapons testing, and it would be widely viewed as a measure of how pathetically little they are prepared to accept in the way of nuclear arms control at this time.

Thus, while a threshold treaty would impose some limitations on weapons development, its political effect is likely to be minimal at best, and very possibly negative, particularly now that a comprehensive treaty would be so welcome and seems within reach.—G. W. RATHJENS and J. P. RUINA, *Massachusetts Institute of Technology, Cambridge 02139*

Skepticism

Skepticism is a stock trade of science. Thus, the promise of the green revolution is weighed against its actual costs . . . the potential of geothermal energy is squared against problems, environmental and political . . . confident 20th-century conceptions of prehistory are critically examined . . . our understanding of natural phenomena — volcanoes, earthquakes, hurricanes — is questioned. This third volume of *Speaking of Science* offers a wide ranging sampling of skepticisms — from population policy to views of man's violent behavior. Knowledgeable people take a sharp-eyed look at twelve different problems involving science and technology. An insight is gained into current attitudes toward some familiar problems . . . and a few new ones.

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