SCIENCE

5 July 1974

Vol. 185, No. 4145

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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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.

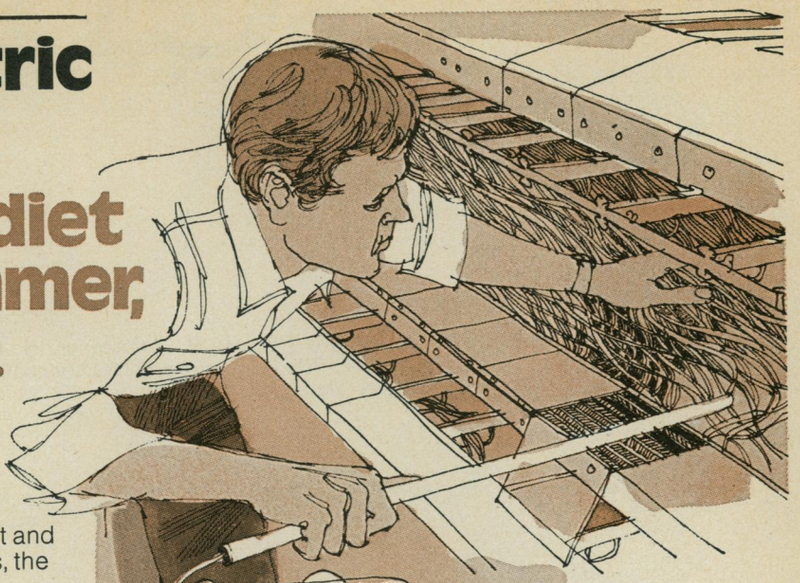
While this heavy textile insulation solved one problem, it created others. For example, in some metropolitan areas, central office frames can become so congested with the thick wires that it's almost impossible to remove unused lengths. And while the number of these wires can grow, the space on a frame 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.

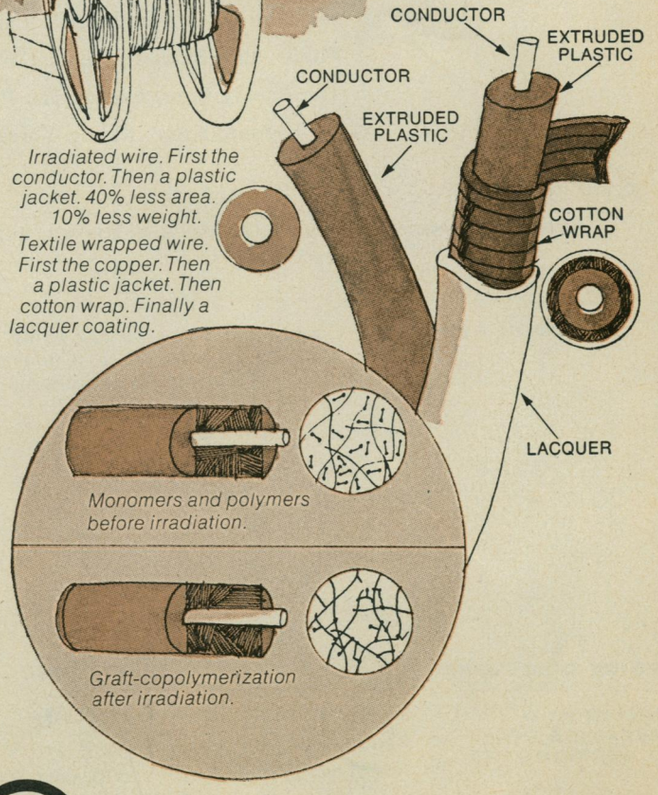
The answer was a carefully engineered mixture of polyvinylchloride and a crosslinking monomer. This compound softens at moderate temperatures for extrusion. But later when bombarded with electrons generated by an electron beam accelerator, the monomer molecules crosslink with each other and the plastic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



Irradiated wire. First the conductor. Then a plastic jacket. 40% less area. 10% less weight.

Textile wrapped wire. First the copper. Then a plastic jacket. Then cotton wrap. Finally a lacquer coating.

Western Electric

We make things that bring people closer.

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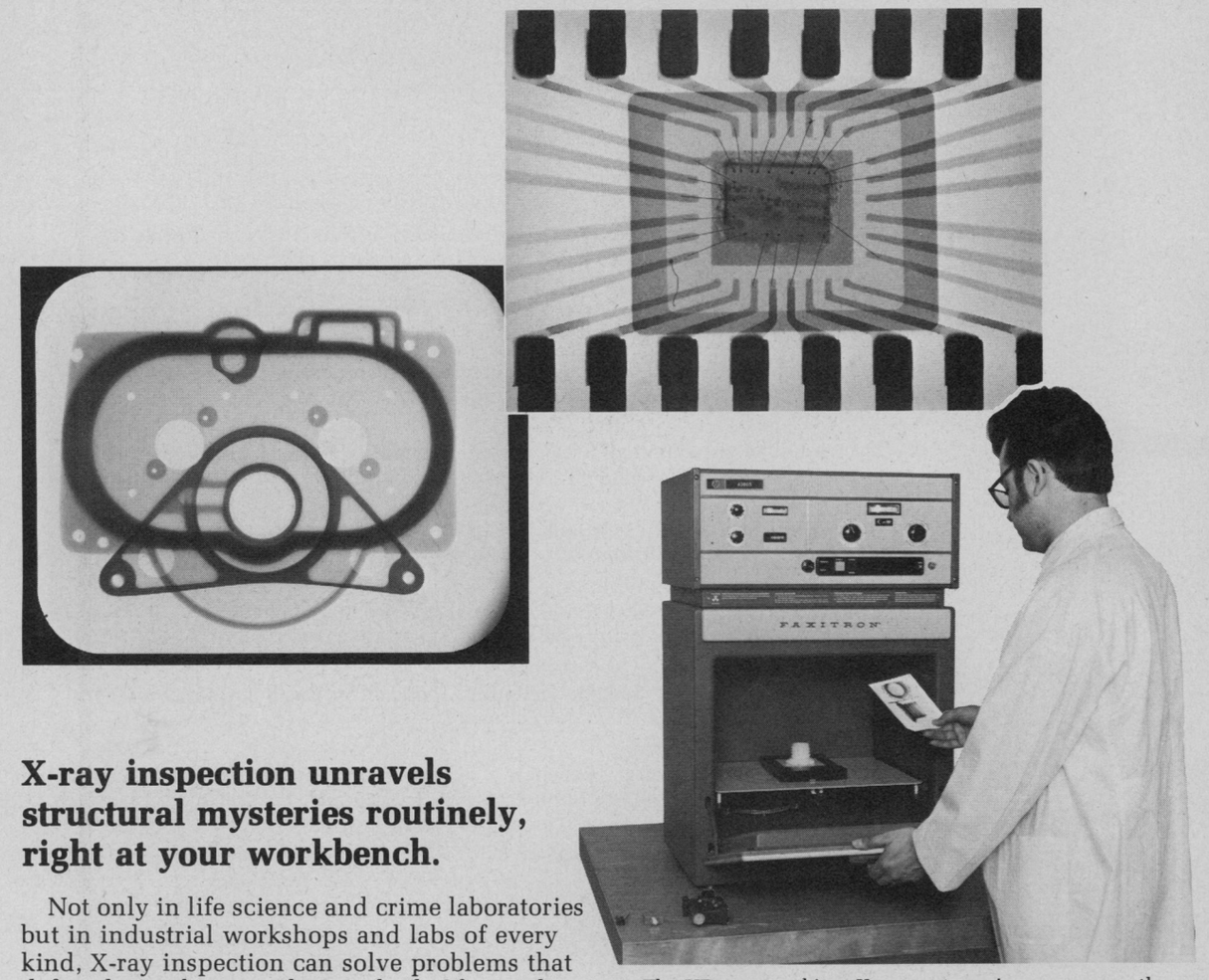
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

REPORTS

COVER

Human spines. See page 13. [From W. Barlow, *The Alexander Principle* (Gollancz, London, 1973); courtesy of Gollancz]



The HP 43805 cabinet X-ray system gives you correctly exposed films automatically—like these radiographs of a defective printed circuit board and an aluminum casting.

X-ray inspection unravels structural mysteries routinely, right at your workbench.

Not only in life science and crime laboratories but in industrial workshops and labs of every kind, X-ray inspection can solve problems that defy solution by any other method. Often radiography is the only way to examine what's inside a sample without destroying it. To check the registration of a printed circuit board, for example. Or defects in a metal casting, the condition of an encapsulated component, the presence of microfossils in sedimentary rock, the morphology of an organ.

Many investigators dismiss radiography as a practical tool because it has traditionally required bulky, expensive cabinets and a specially shielded room. Although this was once an accurate assessment, radiography now is practical and convenient for any lab or workbench with the HP 43805 cabinet X-ray system.

The 43805 is as easy to operate as an office copier. Place your sample and film in the 43805 cabinet and close the door: the machine tells you what voltage to set for best picture contrast, automatically selects the correct exposure time, makes the exposure, and shuts itself off. You get a good radiograph on the first try, without wasting film and without extensive training.

The 43805 makes sharp prints of a variety of samples because it has a wide enough voltage range (10 to 130 kV) to assure excellent contrast with materials as thin as a postage stamp or as dense as a pistol. Use Polaroid® films for 15-second, self-developed prints; Kodak Industrex 600® paper film; standard film in sizes up to 14 by 17 inches; or ultra-high-resolution wet film for enlargement of micro-detail. For quick inspections, you can dispense with film entirely and use the optional fluoroscope and manipulator.

Most important, you can use the 43805 right in your lab or work area. Just plug it into a wall outlet. Shielded to exterior radiation levels below those specified by NBS Handbook 93 for use in populated areas, the 43805 also has double safety interlocks that prevent operation with the door open.

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.

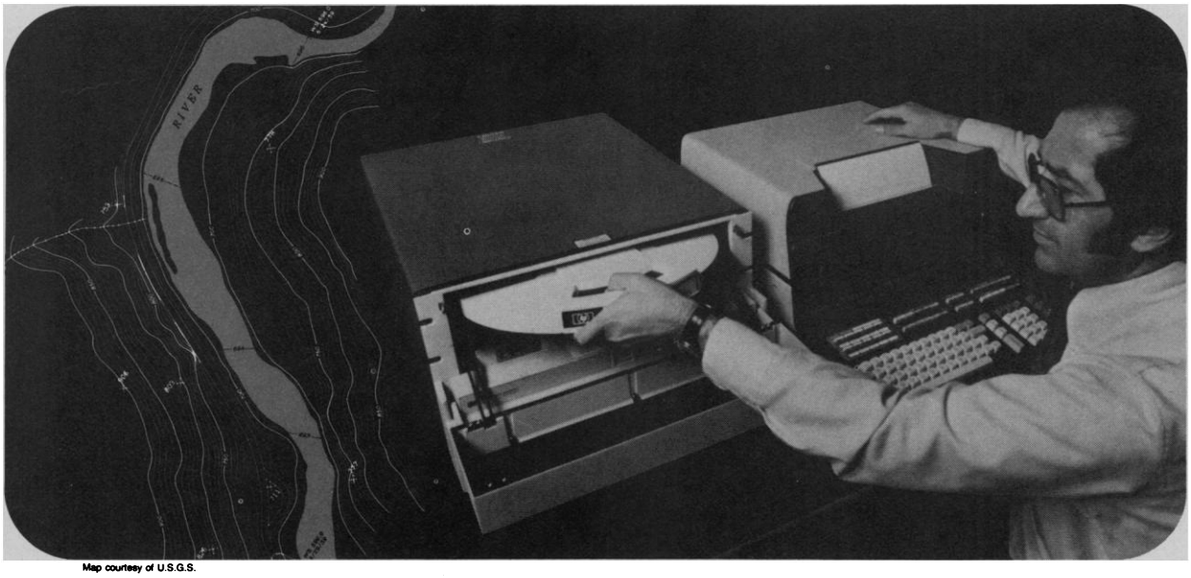
The new HP 9880B Mass Memory has been developed specifically for the HP 9830A Programmable Calculator, dramatically extending the calculator's storage and instruction capabilities.

For instance, its 4.8 million bytes of storage can accommodate large-data-base programs in statistical analysis, structural design, and inventory control —programs that previously required a sizeable computer system.

With the 9830 calculator and Mass Memory, you have enough storage capacity, for example, to store twenty or more years of rainfall and stream flow data for an entire river drainage system. And, through random access, the ability to retrieve any part of this data rapidly. Thus expected runoff and flood levels under varying conditions can be predicted, 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.

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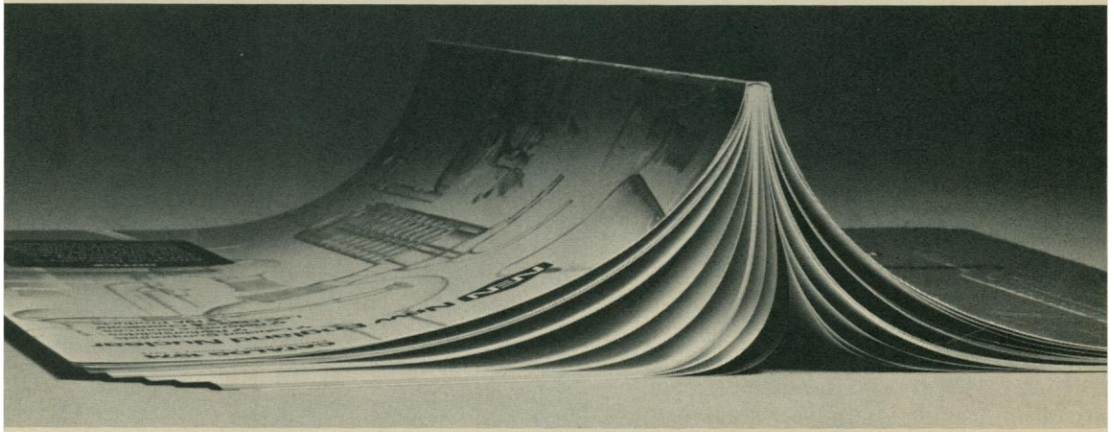

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Should We Ban Nuclear Testing Now?

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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