SCIENCE

7 February 1975

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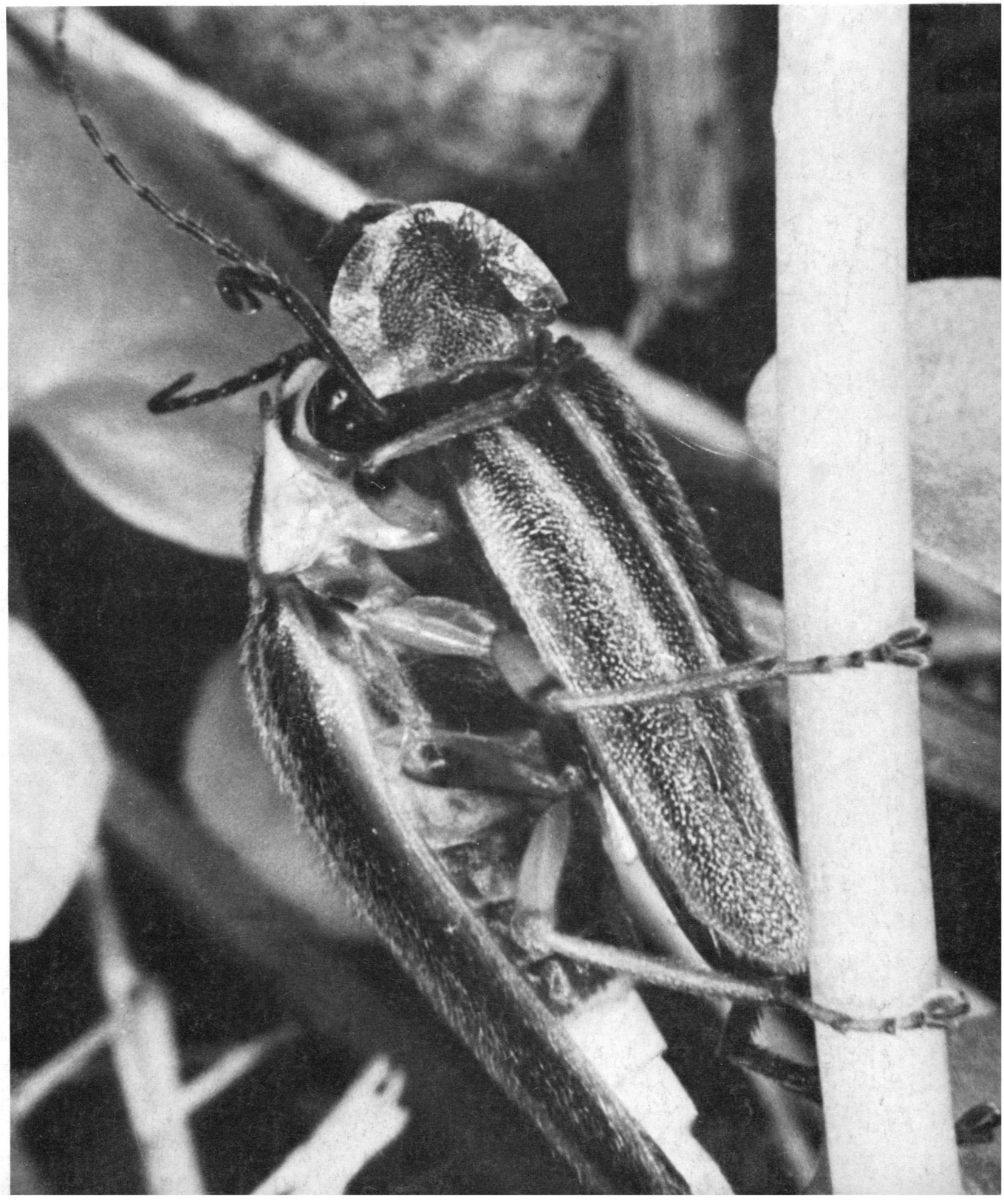
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



We want to be useful ...and even interesting

Advice on TLC: snip, save, char

The mighty force of fashion powers more than the fashion industries. It governs the furnishing of the laboratory no less than the furnishing of the home. Don't knock it.

If talk of thin-layer chromatography (TLC) is slightly less fashionable today than when Eastman Chromagram sheet was introduced, it's because there are that many more instruments and methods to talk about now than then. TLC still works fine at separating molecular species, but its contribution toward building an impressive capital budget is a bit weak.

Our precoated sheet failed to obsolete the glass TLC plate. It did find its niche, though. A Chromagram sheet costs about the same as a precoated plate, but if only a piece will do, one needn't waste a whole plate. There are still those to whom such considerations matter. They use our product even though our poly(vinyl alcohol) binder has precluded charring in the visualization procedure.

Luckily our source of poly(vinyl alcohol) dried up. A composition based on poly(acrylic acid) has replaced it. With this substitution, nay improvement, for users of currently manufactured silica gel- or alumina-coated forms of Chromagram sheet (with or without incorporated fluorescent indicator), charring is no longer precluded!

How do you like that for candor?

You can order Eastman Chromagram sheet from Curtin Matheson Scientific, Fisher Scientific, North-Strong, Preiser Scientific, Sargent-Welch, SciChemCo, Scientific Products, or VWR Scientific (East).

Project for a slow week

Let us say he is good with tools and ought to be kept busy in a meaningful way. Let us say the professional staff makes use of the photographic process at a level that averages somewhat more than a single 135 cartridge of film processed per week but less than 100 gallons of processing solutions and wash water per day. Let us say there is no capacious municipal sewer system in which entities like acetic acid and thiosulfate ion that have served their photographic purpose can join all the other oxygen-demanding effluvia that characterize centers of civilization. Let us merely state for the record that Kodak pamphlet J-43, "A Simple Waste-Treatment System for Small Volumes of Photographic-Processing Wastes," is available for the asking from Kodak, Dept. 412-L, Rochester, N.Y. 14650. If there is also concern for recycling of a valuable resource, we can be asked to throw in J-9, "Silver Recovery with the KODAK Chemical Recovery Cartridge."

A perceptive type of customer

Weren't we once promoting a TLC method of mass-screening neonates for metabolic anomalies?

Yes.

Is it now in wide use?

No.

Why not?

Because of a scarcity of people not only wise in blood chemistry but willing to spend their careers looking at thousands of different TLC patterns before finding one that justifies the cry "Aha!" From our long experience in medical x-ray film, we should have known how long it takes to develop such keen perceptions.

It is up to our industry to maintain a flow of what it believes to be improvements and up to the professional customers to decide whether they really are. At the moment the spotlight shines on a blend of terbium-activated gadolinium oxysulfide and lanthanum oxysulfide. When instead of a spotlight, x-ray photons in the diagnostically useful 50 to 150 kV range fall on this blend, formulated as fluorescing screens in contact with the emulsion on either side of a sheet of x-ray film, light is emitted at around 540 nm in the green, with a few small spikes in the blue and violet. All but 2 or 3 percent of the film exposing is done by light from these screens. The trick is very old but has generally been done with phosphors that largely emit a broad band of blue light, such as calcium tungstate. A couple of years ago we put on the market screens that emit principally in the ultraviolet, more of which is absorbed in the emulsion instead of spreading out to degrade the image on the opposite side of the film base.

Now, the lanthanide phosphors. In practical medical use, a pair of the new Kodak Lanex regular screens absorb about 60 percent of the x-radiation reaching them, as compared with 40 percent for the same thickness in $CaWO_4$. Absorption is the name of the game. Information-bearing x-ray photons that have passed through the patient are precious. With emulsions sensitized to green light, the absorption is convertible into several desirable currencies: reduction in patient dosage (popular, but not always the best choice for the patient's benefit); ability to freeze motion by shortened exposure time; better geometrical sharpness by reduction of focal-spot size when less tube current is required; use of the small focal spot to produce magnified images for improved diagnostic capability in some examinations; use of slower films for less "quantum mottle" from statistical fluctuation than when the delineation job is done with fewer of those mighty x-ray quanta.

Maybe flexibility is the name of the game.

Kodak

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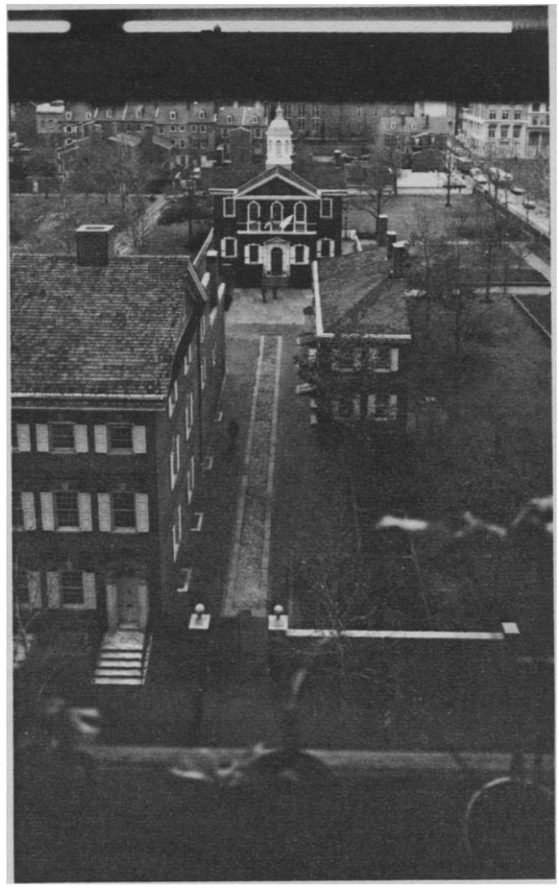

Carpenters' Hall—where the First Continental Congress met in 1774—from ISI

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While you're in the historic area, we hope you'll use the opportunity to tour ISI—we're located just a block from Independence Hall and the Liberty Bell. We'd like to show you how *Current Contents*®, the *Science Citation Index*®, and a variety of other information services are produced.

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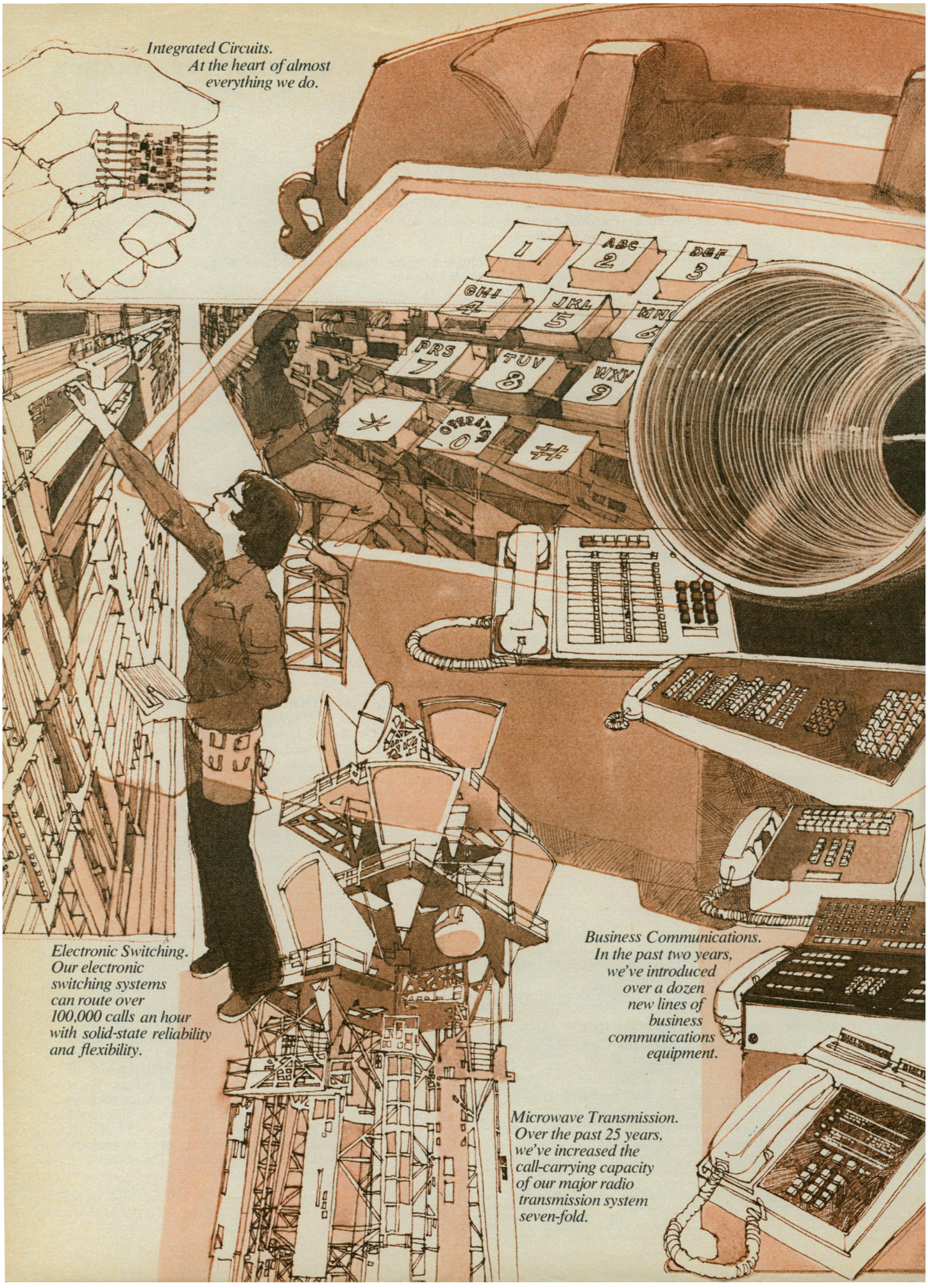
COVER

Fatal embrace. *Photuris* female (left) has seized a male of another species and is chewing on his thorax. When she is finished, little will remain except his eyes, feet, and wings. These females attract foreign males to them by mimicking the mating signals of their females. See page 452. [J. E. Lloyd, Department of Entomology, University of Florida, Gainesville]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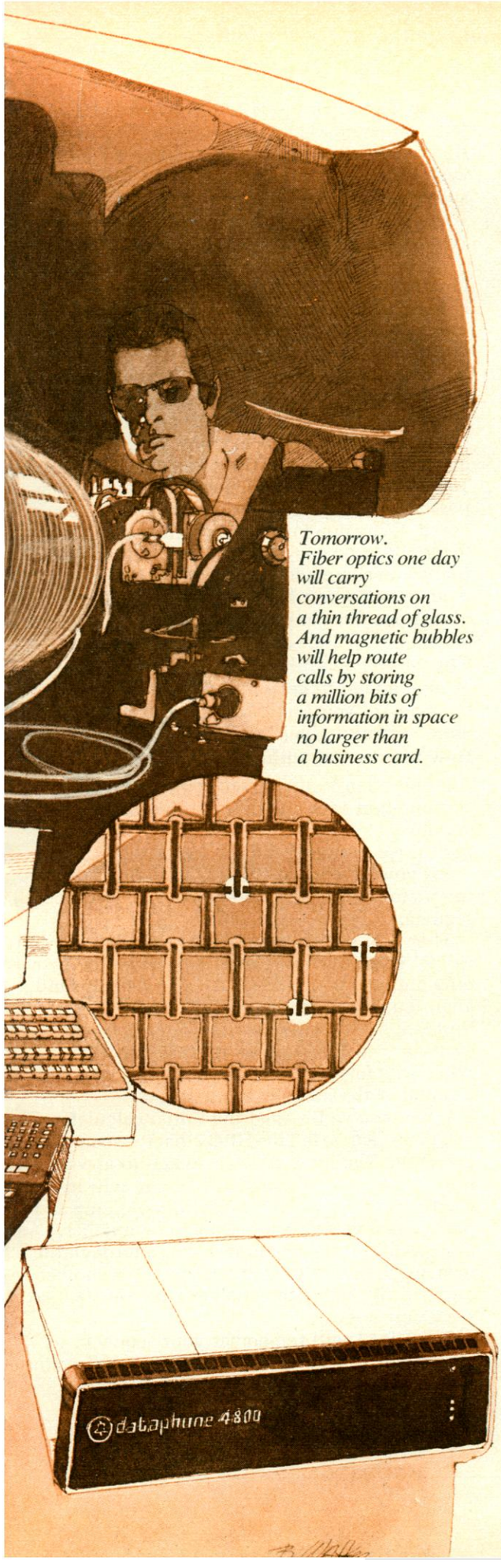

Tomorrow.
Fiber optics one day will carry conversations on a thin thread of glass. And magnetic bubbles will help route calls by storing a million bits of information in space no larger than a business card.

The Incredible Machine.

It takes more than a telephone to make a phone call. It takes an incredible machine of some 10,000,000,000,000 individual parts.

And because all these parts—telephone wires, relays, electronic systems—work together in a delicately balanced network of more than 300 million miles of circuits, you can reach the one phone you want out of more than 130 million others.

Bell Labs and Western Electric have long played a key part in building the Bell System telephone network to provide economical and dependable service. And now, fifty years after the founding of Bell Labs, putting science to work for telephone users requires even closer cooperation than ever before.

For example, the design of today's solid state circuits requires precise knowledge of a material's atomic ingredients. As well as an ability to change the recipe. And manufacture has gone beyond the punch press to building circuits atom by atom.

This unique combination of design and man–ufacture leads to unprecedented innovation. The people at Bell Labs receive more than two patents for every working day. And nearly half of what the people at Western Electric will make next year didn't even exist four years ago.

Together, they're keeping the incredible machine incredible.

Bell Labs
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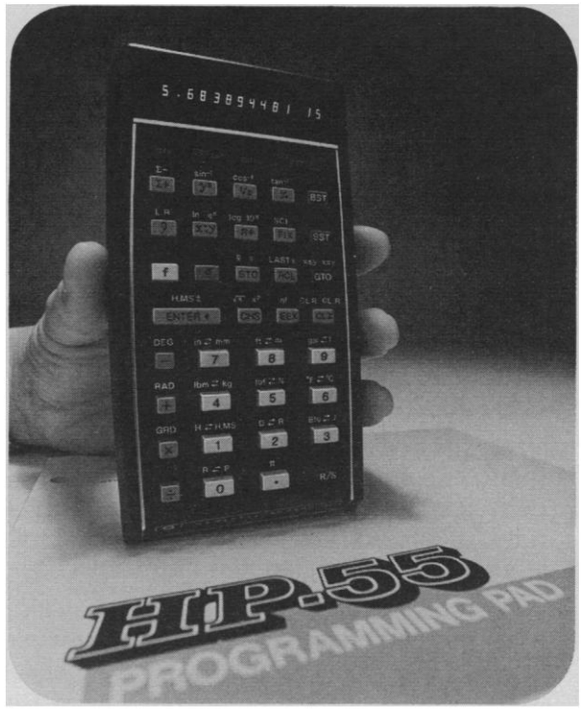

This is a new Hewlett-Packard calculator. The HP-55.

It has 86 preprogrammed functions and operations, and 20 memory registers. You can program it to do repetitive calculations. You can time events with it. It costs $395*

Our new HP-55 not only gives you 38 more mathematical functions and operations on the keyboard than our HP-45. It will also remember an intricate calculation so that you can keep entering variables and see new answers until you're satisfied and turn it off.

You can program an equation with up to 49 steps in it—in addition to which your program has access to all 86 preprogrammed calculations and data manipulations, plus the 20-register memory. You can do direct and conditional-access branching (the calculator will automatically compare values and choose among alternatives). When you've entered your program you can step through it to verify and edit.

You can perform arithmetic into and out of 10 of the registers, store in all 20.

You can do circular trigonometry in degrees, radians, or grads, converting directly from degrees to radians, decimal degrees to D/M/S (and vice versa).

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You get instant true metric conversions without having to multiply by a constant.

You also have the HP four-register stack that lets you enter even the most complicated equation in an easy, natural way without having to keep track of parentheses and brackets. The result of each intermediate calculation is displayed as you perform it, giving you the continuous feedback you need to avoid ending up with a wrong answer.

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If you often find yourself repeating a tedious computation over and over, putting in different variables to see a range of answers, you're the person we designed the HP-55 for.

All you have to do is flip a switch to tell the calculator it's going to memorize a computation sequence.

Then you simply key in your calculation (we call it "keystroke programming") as if you were only going to do it once. Except that before and after you enter each variable you press [R/S] (for Run/Stop). That tells the calculator that whenever you run the program it must stop at that point, wait for a new number, and start computing again after the number is entered.

When you've finished the initial calculation, you press [R/S] to tell the HP-55 that the sequence is complete. Then you flip the switch to RUN and press [BST], whereupon the machine will instantly calculate up to the first variable, stop and wait. When you've entered the new number, press [R/S] and the machine will zip through the next sequence, stop again and wait for another number. After the last variable is in, press [R/S] to see a new answer.

The HP-55 will remember your sequence as long as you don't switch it off. So you can iterate and reiterate until you run out of variables.

A better way to measure blood oxygen—non-invasively.

Consider the human ear: external, thin in cross-section, and highly vascularized. Since it metabolizes only a small part of the blood it carries, oxygen saturation of hemoglobin in the ear is high—comparable to that in the aorta.

The ear oximeter makes use of these characteristics of the ear to measure the oxygen saturation of hemoglobin in a patient, without drawing blood. With the ear oximeter, the physician can make the measurement simply by attaching an optoelectronic device to the patient's ear and reading percent oxygen saturation on the display: no blood sample, no delay for lab analysis, no patient discomfort and the opportunity to make continuous measurements and study the dynamics of oxygen saturation.

The oximeter works by analyzing the absorption of light transmitted through the upper part of the ear. Other things being equal, the absorbance spectrum varies directly with the oxygen saturation level in the blood. But other things are seldom equal. There are changes in absorbance from patient to patient that depend on tissue and pigment variations, for example.

The new HP 47201A Oximeter uses digital processor technology to compensate for these patient variations automatically. By specially processing arterial blood tapped from volunteers of both sexes and all ages, races, and oxygen saturation levels, researchers determined the coefficients of absorbance that provide the best fit of oximeter readings to true oxygen saturations. This information is stored in the 47201's digital memory, in effect permanently calibrating it for the full range of patient variables in its intended use. Additionally, the absorbance measurement itself is made at *eight* different wavelengths because different light-interfering substances in the blood and ear have different absorbance effects at different wavelengths. Finally, the 47201's digital processor solves simultaneous equations that take all these calibration and measurement variables into consideration and calculates the percent oxygen saturation. Its accuracy is ± 1.7 percent for saturation levels between 90 and 100 percent, to ± 2.6 percent in the 60 to 70 percent range (1σ).

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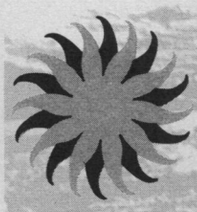

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SCIENCE

President Ford's Energy Initiatives

In his State of the Union message President Ford devoted considerable attention to energy. Critics will continue to find controversial aspects of the proposals. However, in the speech and especially in a White House–issued Fact Sheet accompanying the speech, the Administration indicates good comprehension of the complex details and interactions of the many aspects of the problem. This is in contrast to the material that emanated from the White House during the last year and a half of the Nixon Administration. Moreover, President Ford has seized the initiative in energy matters. He looks good in comparison to members of Congress, who have taken piecemeal initiatives but have presented no comprehensive program. They have now merely responded negatively.

There is a substantial probability that Congress will make a big thing out of expanding the inflationary tax-cutting program while emasculating the Administration's energy proposals. There is also likely to be a big divisive fight about whether to tax or to ration shortages. Despite all the rhetoric, energy will be scarce and costly and delays will only exacerbate the problems. Moreover, this country continues a drift toward greatly enhanced vulnerability to a new embargo and possible nuclear confrontation. Domestic production is down. Imports of oil and its products have been at an all-time high. Total inventories exceed those of a year ago during the embargo by less than 4 days' consumption.

Instead of dragging its feet in a way that will win it no lasting respect, Congress should take the stance that the Administration does not advocate going far enough fast enough. The White House has proposed accumulating an insurance inventory of oil. However, the indicated pace of implementation is slow. The Administration has estimated that by 1985 this country should be producing 1 million barrels a day of synthetic oil (less than 6 percent of present consumption). In no facet of the President's program is there an inspiring, challenging goal to capture the public's attention and admiration. This nation has shown that when its intellectual and material resources are effectively employed it can perform wonders.

This country can do better than hunkering down, vulnerable to embargos, morosely awaiting the passage of 10 years for a promised but unlikely energy independence. This country can do better than creating leaf-raking jobs for the unemployed or giving them small handouts while there is much important work that should be done.

In the end, in order to achieve energy independence this country will find it necessary to engage in vast construction programs. These will include additions to existing plants to permit use of coal as a substitute for oil or natural gas. Other major items needed will be installations that produce liquid hydrocarbons from coal and shale, methane from coal, and electricity from nuclear and fossil fuel sources. To get these tasks done the federal government will have to provide some funds and some guarantees of price floors on products.

The risks and the amounts of capital needed to move toward energy independence are tremendous. Because of high interest rates, long construction times, and substantial costs, the projected price of clean liquid fuels is in the neighborhood of $10 or more a barrel. This could easily be undercut by foreign suppliers. However, once the original investments were amortized the cost of producing liquid fuels would drop to half the initial price or less.

To move expeditiously toward energy independence, it will be necessary to remove bottlenecks in supplies through a system of priorities. It will also be necessary to find better ways of balancing legitimate environmental concerns against energy requirements.—PHILIP H. ABELSON

energy:

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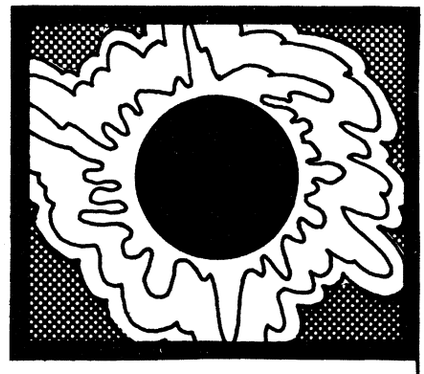

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vania State University), one of the first researchers to appreciate the use of isozymes as diagnostic tools and whose presentation was on the medical use of isozymes. He illustrated the utility of monitoring the isozyme patterns of serums from diseased individuals to facilitate diagnosis, since changes in the isozyme patterns of serums tend to reflect the contributions of tissues suffering cellular damage. The tissue-specific patterns of various isozymes, their possible significance, and the ways in which different patterns can be produced through a combination of synthesis and degradation was presented. An iconoclastic approach was taken in pointing out persuasively that the kinetic properties and physiological roles of a number of isozymes has been inferred from kinetic analyses performed under very nonphysiological conditions and that many of these proposed roles should be reevaluated. The physiological roles of isozymes remain a central area of investigation.

The three plenary session speakers did much to set the tone for the symposium and encouraged a critical approach in evaluating the old concepts, as well as providing encouragement to those with critical new insights. The listing of the following session headings indicates the breadth of the symposium: (i) molecular structure of isozymes, (ii) characterization of isozymes, (iii) isozymes and biochemical regulation, (iv) the physiological role of isozymes, (v) isozymes in developmental biology, (vi) isozymes in evolution, (vii) isozymes in population biology, (viii) genetic analysis of isozymes, (ix) isozymes in somatic cell genetics, (x) isozymes in disease, (xi) isozymes in cancer, (xii) isozymes and gene evolution, and (xiii) isozymes and multiple forms of polymerases. The scope of the sessions often exceeded the specific headings listed above.

The tremendous diversity of isozymology was illustrated by this meeting in which many different kinds of enzymes were discussed. Furthermore, the isozyme analyses were directed at every level of biological organization, and the taxa studied ranged from bacteria to higher plants and animals. In some sessions the researchers focused on the intrinsic properties of the isozymes themselves, such as genetic and epigenetic origin. Other sessions were devoted to discussions of isozymes as probes to study the regulation of cellular metabolism, the expression of gene function during embryogenesis, and adaptation to different environments.