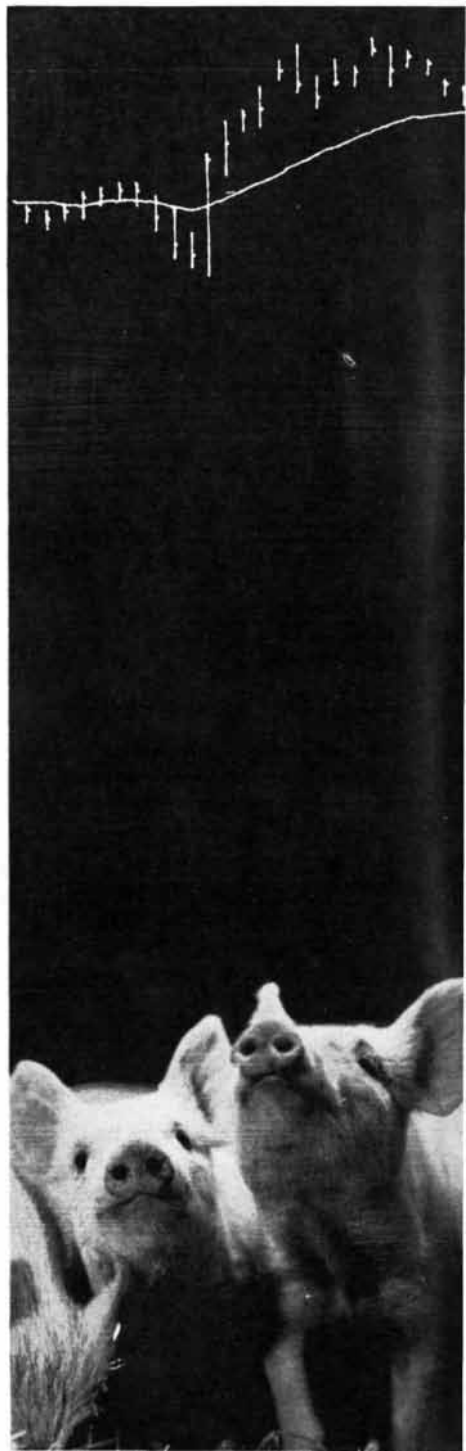
Measurement display spots trends in the commodity market. Stops bullets from ruining the 6 o'clock news. Takes the pain out of learning impedance.

Charting futures in pork.
Consider the problems of a broker in futures – precious metals, wheat or pork bellies. Imagine the seasonal shifts, or changing daily demands, which could radically alter his view on cocoa in the morning.

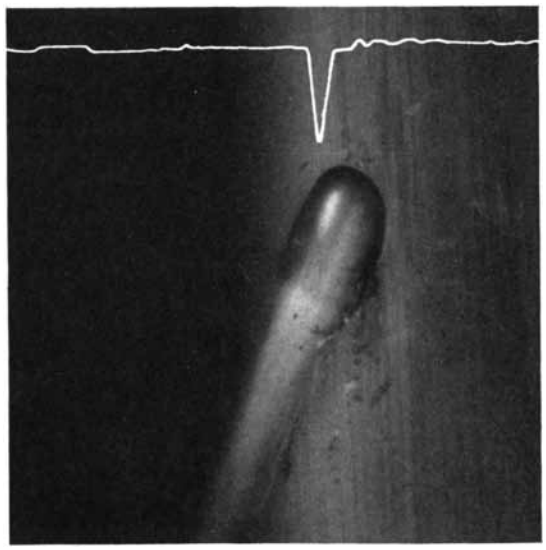
A large securities house may have the time, staff and possibly a computer to follow the action of slower trading. The commodities man needs an answer now. Fortunately, he can produce his own charts overnight with the new Hewlett-Packard 9100A Computing Calculator and its 9125A X-Y Recorder.

He inserts a wallet-sized magnetic card already programmed for high,



low, close. Percentage loss or gain. Extended logarithmatic average. Possibly a "Nervousness Indicator" developed out of his own experience.

He punches in today's reports. In seconds the plotter starts drawing curves. He can even continue a chart started yesterday. And draw his own conclusions. Privately. Smoothly.



The 9100A Calculator can also handle such problems as coordinate geometry, network analysis, statistical distribution, strain loadings or gear design; the 9125 X-Y Recorder plots the results. Cost: $4400 for the calculator, $2475 for the recorder. Write today for our illustrated brochure on the 9100A Computing Calculator and its accessories.

Bouncing echoes off bullet holes.

The nation's highest TV transmitter, 1500-feet tall, was set up to improve TV pictures over a vast area of Texas. It had scarcely been put into use when there were complaints about more bad pictures. When engineers inspected the tower, they found that marksmen were using it for target-practice. The only answer was to find each hole or dent in the cable.

They could have inspected the cable inch by inch. Instead they used HP's new time domain reflectometer that plugs into our 180A Portable Oscilloscope. This device acts much like a miniature radar to pinpoint breaks in transmission lines within a quarter inch. The reflectometer marks the transmission of a pulse with a step in the sweep on an oscilloscope. Any disturbance in the path reflects some energy which is sampled by the reflectometer and easily recognized on the scope. The distance can be read off in nanoseconds or feet of travel. The first hole is a big one, causing a major reflection 35 feet 3¾ inches up, the second a dent in the outer conductor, causing a capacitive change 70 feet 4½ inches up, and so on.

The HP 1815A Time Domain Reflectometer obviously has other applications than on the Texas range. It can locate faults in the maze of cables on aircraft, in buried cables, in cables on production lines, or in cable connectors. It operates with frequencies up to 12.4 gigahertz (12.4×10^9 Hz). Reflectometer, sampler and step generator cost $3150. If you need only inches of resolution rather than millimeters, a less expensive system sells for $2125. Of course, you'll need the HP 180A Portable Oscilloscope, at $825.

If you have an interest in fault finding —TV or otherwise — simply ask for Data Sheets 1815A and 180A.

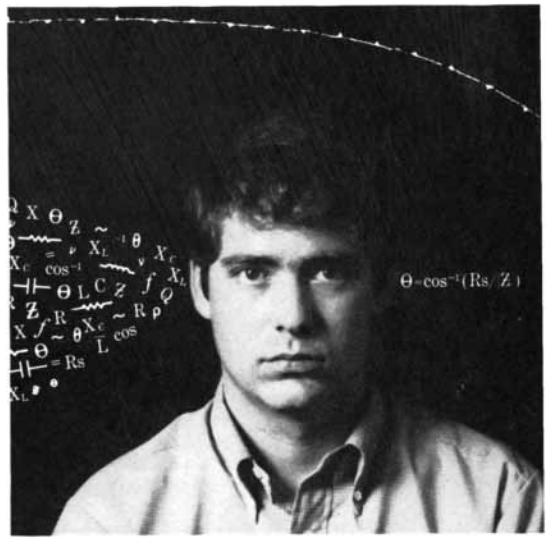
Demonstrating the dynamics of Z.

To undergraduate students of physics, some theories are absolutely Greek. For example, take the behavior of a simple electrical circuit faced with alternating currents of different frequencies. No longer is resistance simply a matter of E=IR; now the student is involved with the Zeta and Theta of impedance, inductance and capacitance.

With all the calculations required, demonstrating the effect of frequency in the laboratory is next to impossible. Spot measurements with bridge, ac generator, ac voltmeter or oscilloscope can hide rapid changes of impedance with changes in frequency. They can also obscure the construction errors of the student, even if all his calculations are correct.

A happy way out of this hang-up is the use of a Hewlett-Packard Model 4800A Vector Impedance Meter. Two meters on the face indicate directly the magnitude and phase angle of complex impedance (Zeta and Theta), regardless of how often the frequency is changed. The meter is just as responsive when the frequency is electronically swept over a range from 5 hertz to 500 kilohertz. And the student can readily plot curves which demonstrate that inductive reactance and capacitive reactance are, as a matter of fact, directly and inversely proportional to frequency. (The HP 4815A Vector Impedance Meter will do the same job for frequencies between 500 kilohertz and 108 megahertz.)

The cost of the meters may seem expensive for the undergraduate institution ($1650 for the HP 4800A and $2650 for the HP 4815A), but they compare favorably with the signi-



ficant advantage of greater student confidence in the utility of basic concepts.

A complete discussion of the teaching technique is found in AMERICAN JOURNAL OF PHYSICS, Volume 37, Number 1, January 1969. Detailed descriptions of the instruments are available from Hewlett-Packard for the asking.

If there's something we can do to help you solve a problem with a new approach to measurement display, give us a call. Hewlett-Packard, 1503 Page Mill Road, Palo Alto, California 94304; Europe: 1217 Meyrin-Geneva, Switzerland.

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Measurement, Analysis and Computation

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