9 SEPTEMBER 1983 · VOL. 221 · NO. 4615 $2.50

SCIENCE

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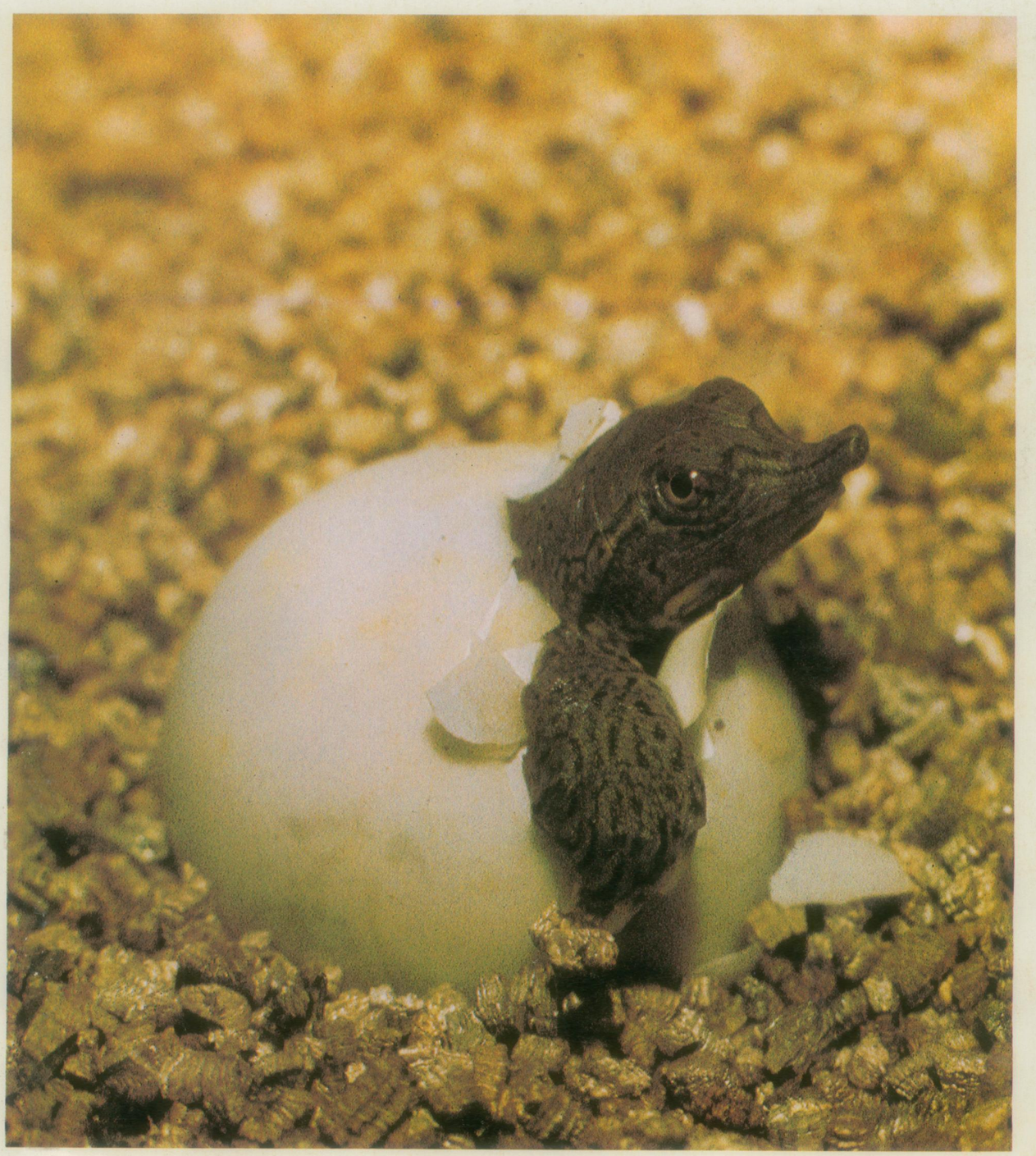

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9 September 1983

Volume 221, No. 4615

SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

REPORTS

COVER

Softshell turtle (*Trionyx spiniferus*) in the process of hatching from its rigid-shelled egg. Eggs like this exchange little, if any, liquid water with the surrounding environment during the course of incubation. Although biologists have come to expect embryos developing in eggs of this kind to convert wastes from protein catabolism into insoluble urates, embryonic softshell turtles convert nitrogenous wastes into soluble urea and ammonia. See page 1049. [Mary J. Packard, Colorado State University, Fort Collins 80523]

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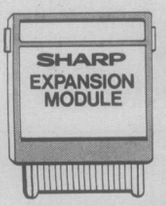

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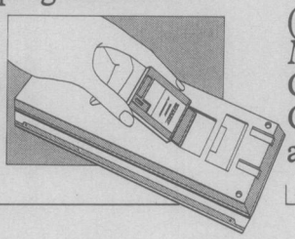
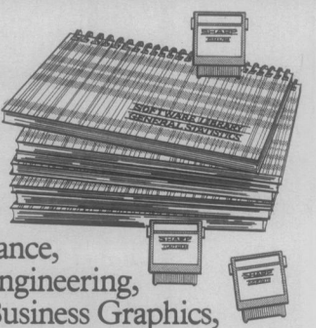
(8K + 16K)

Now you can take 24K with you wherever you go—thanks to the new Sharp PC-1500A. It's the 8K hand-held computer that expands to a powerful portable 24K computer system when the optional 16K memory module is added. And because it's programmable in Basic, the most popular computer language, it gives you the power and capabilities to handle most scientific, engineering and management uses.





The PC-1500A also has a complete library of plug-in software programs including: Sharpcalc (Spreadsheet), Finance, Math, Electrical Engineering, Circuit Analysis, Business Graphics, General Statistics, Statistical Distribution and Graphics Development.

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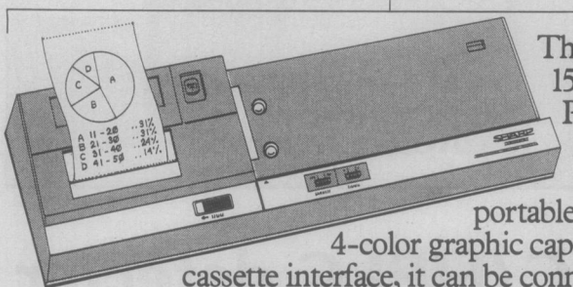

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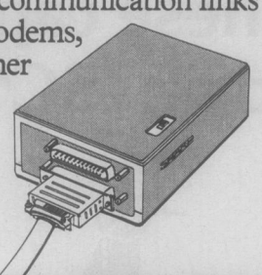

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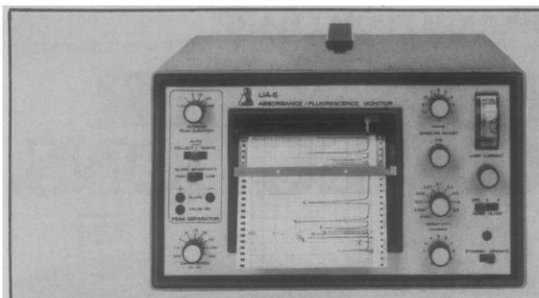

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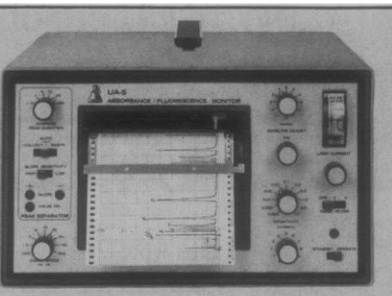
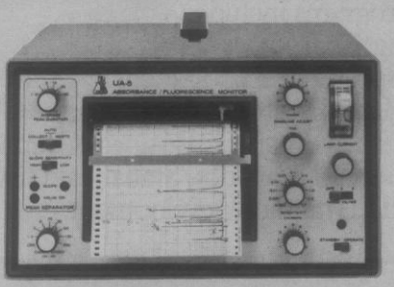
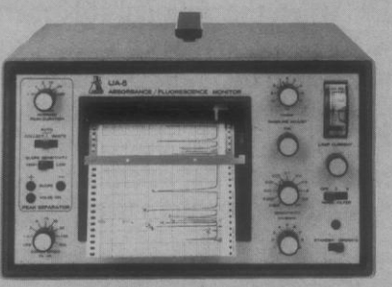


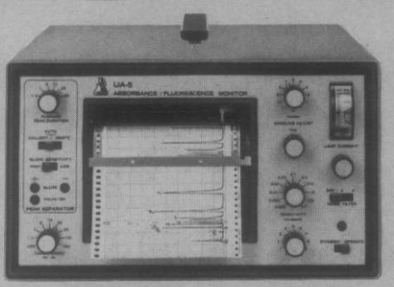
visible absorbance detector



fluorescence detector



peak collector



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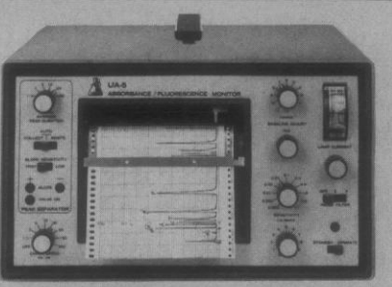
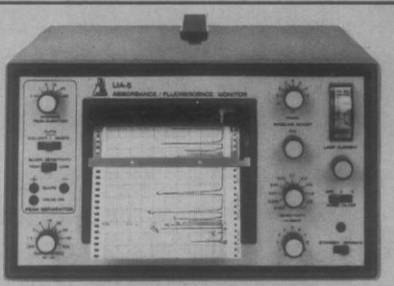
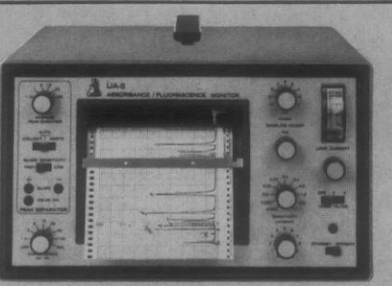


gel scanner



density gradient scanner



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How Exxon has pioneered systems to optimize

Roy Lieber works at the leading edge of process control.

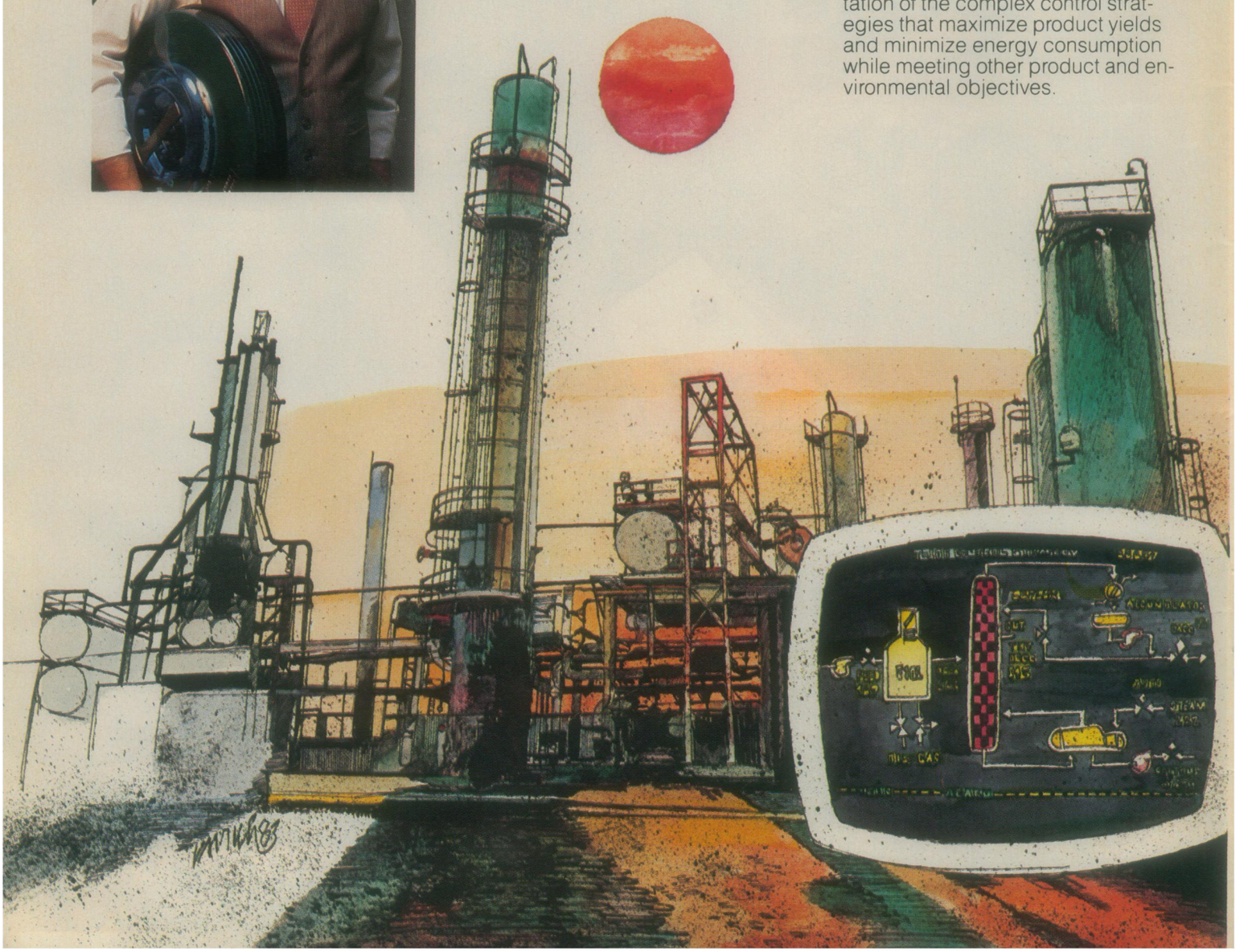
As an operator at an Exxon refinery monitors the schematic of a process on the CRT, the representation of the furnace suddenly changes color and begins to pulse, indicating a condition requiring attention. He touches the screen and corrective action is taken. Elsewhere another operator advises the system by CRT to switch a tower's emphasis from propane to butane as a result of analysis of market data.

Such advanced process control is the result of a long history of pioneering in the application of computers to refinery operation. It goes back to the early 1960's when Roy Lieber and his colleagues at Exxon Research and Engineering Company (ER&E) introduced the use of computers for closed loop control. These first systems, which used the primitive minicomputers of that era, provided superior regulatory control despite their limited functionality.

Precision refining

As computer technology advanced, the systems designed by ER&E became progressively more sophisticated. Combining control theory with process know-how further expanded applications, including the automation of related refinery functions such as blending, product storage and shipping.

Current systems permit implementation of the complex control strategies that maximize product yields and minimize energy consumption while meeting other product and environmental objectives.



advanced computer refinery operation.

User friendliness is also being stressed. Through an interconnected, hierarchical network of micro, mini and maxi computers, today's operators monitor the entire refinery from work stations housing three to five CRTs.

Future trends

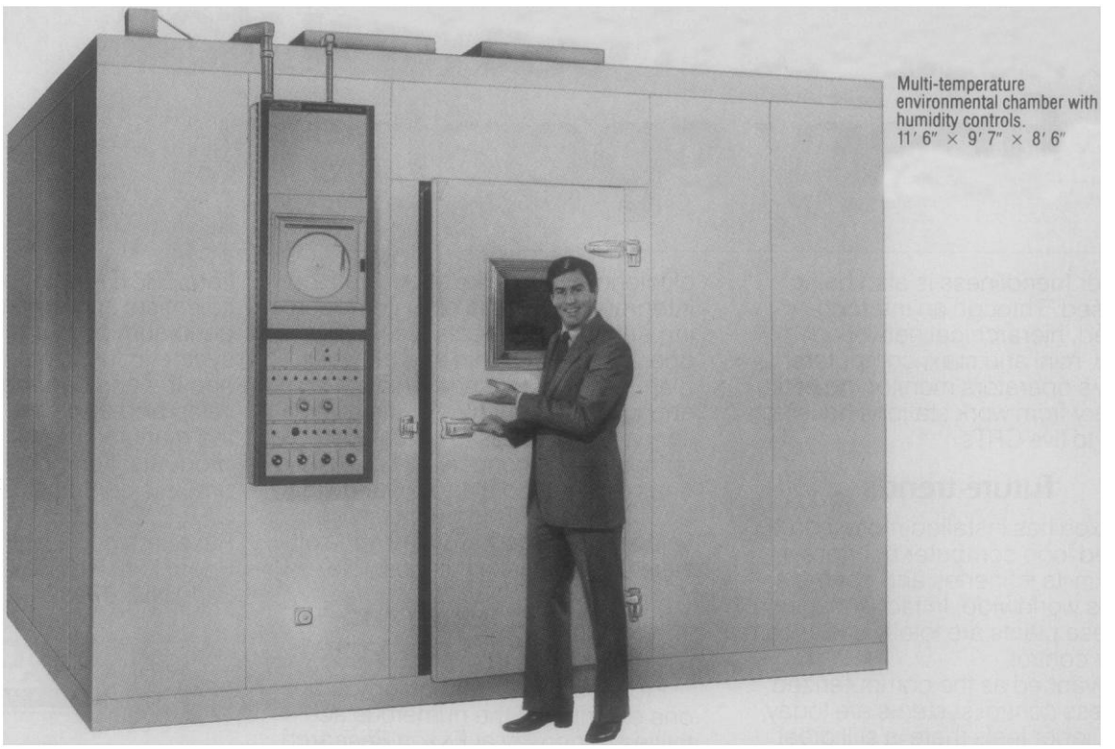
Exxon has installed more than 100 closed loop computer control systems in its refineries and chemical plants worldwide. In fact, the majority of these plants are totally under computer control.

Advanced as the computerized process control systems are today, Roy Lieber feels there is still great potential for future economies and efficiencies. He talks about work on integrated networks of systems sharing data on all aspects of refinery operation both within and between plants. Using advances in electronics and concepts such as artificial intelligence, the goal is to optimize single refineries and conceivably even refineries on a regional and a worldwide basis. He is helping guide the development of the hardware and software that will make this possible.

Exxon Research and Engineering Company

Process control technology is but one example of the numerous activities underway at Exxon Research and Engineering Company. A wholly owned subsidiary of Exxon Corporation, ER&E employs more than 2,000 scientists and engineers working on petroleum products and processing, synthetic fuels, pioneering science and the engineering required to develop and apply new technologies in the manufacture of fuels and other products. For more information on process control or ER&E, write Dr. E.E. David, Jr., President, Exxon Research and Engineering Company, Room 704, P.O. Box 101, Florham Park, N.J. 07932.

EXXON



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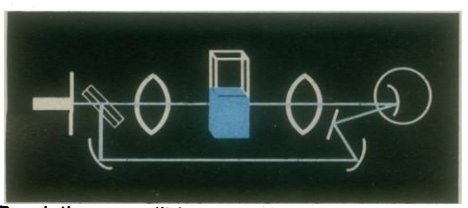

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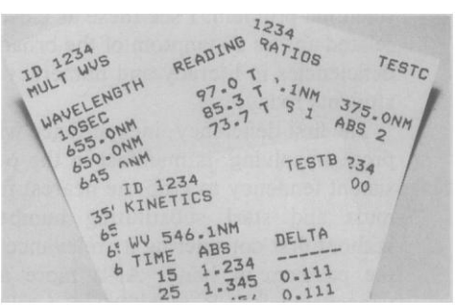

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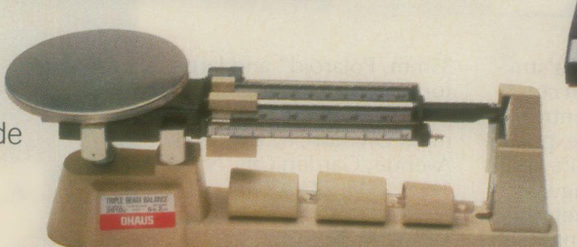

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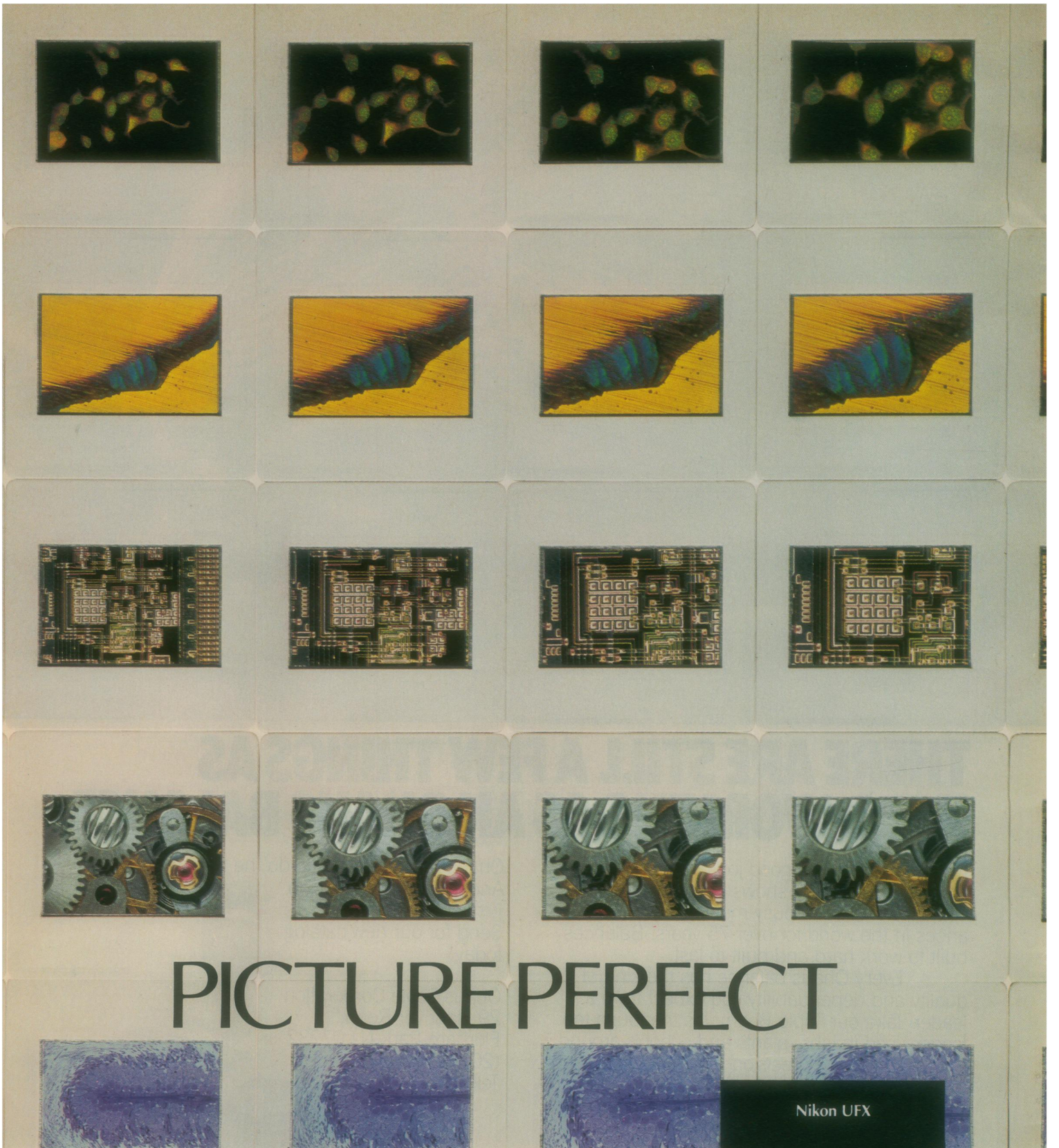

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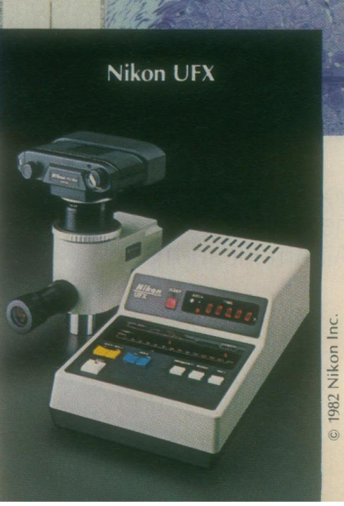

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9 September 1983, Volume 221, Number 4615 **SCIENCE**

Communication Between Scientists

Unhealthy long-term trends are evident in both written and verbal scientific communication. The problems of the proliferating scientific literature have been frequently discussed. Less attention has been given to the equally important verbal communication.

Those who are familiar with trends are especially concerned about the evolution of annual meetings of scientific societies. Historical records of meetings describe them as gatherings in which enthusiasm ran high, spirits were lifted, and much exciting information was exchanged. Crowds were smaller then, and meetings were held under agreeable circumstances, either on college campuses or at some other suitable spot.

As the number of scientists increased, it was inevitable that the character of the annual meeting would change. But the evolution was so slow that little thought was given to the danger that the values of personal interchange might be lost.

Occasionally at a big meeting attendees meet peers with whom they can enjoy mutual intellectual stimulus. However, it is decades since an annual meeting as a whole was described in glowing terms. What do attendees experience at a large annual meeting? The cold, impersonal, commercial atmosphere of hotels sets the tone. Sessions with forty or more simultaneous papers present a bewildering requirement for choice. Actually, the decision made is not crucial. The typical session is loaded with 10- or 15-minute papers delivered with the crutch of slides. Almost invariably there are far too many slides; the content on each is so excessive that it cannot be read, let alone comprehended. In the decades since slides came into traditional use, no substantive improvement in their design has occurred.

Despite the limited value of the meetings, the tradition of obligatory attendance persisted. But major societies are now experiencing a change. At meeting after meeting, attendance has been declining from earlier peaks. Current overall costs for a participant average $1000 or more. In a time of tight budgets, realism about the value of the annual meeting is overcoming tradition.

For established scientists, the decay of the typical meeting is no loss. They have in place a rich variety of communication links. The most deeply satisfying of these in one-on-one conversations with peers. There they can enjoy the mutual exchange of ideas and enthusiasm, as did scientists a century ago. But the potential for excitement is even greater now since air travel makes their peers readily accessible. Once a level of mutual trust and understanding is achieved, the telephone and electronic mail constitute effective supplements to personal encounters. Some scientists are extroverts who hunger for the presence of a group of peers. This involves the nuisance of mutual scheduling, but can be arranged. A favorite form of meeting is the small closed symposium. Around the world there is increasing use of the formula initiated by the Gordon Research Conferences. These meetings last a week and have about 100 invited attendees. They are held in secluded spots where participants are free from distractions and the presence of nonscientists. Part of the time is spent in loosely scheduled sessions. However, there is adequate time for the personal interactions that are so crucial and enjoyable.

Despite diminishing attendance, the scientific societies will continue to hold annual meetings. They will continue to follow firmly established traditions. The simultaneous sessions will continue, often with audiences of fewer than ten. The formula of 10-minute talks with scores of illegible slides will persist. The scientific community, including its elite, should give serious thought to this. In a few large scientific centers, young people receive adequate stimulus from professors and peers. But in smaller institutions, critical components of enthusiasm are missing. Professors may do their part in trying to indoctrinate an appreciation of the beauty of science, its great structure of knowledge, and the intellects of those who built it. But they need help which the big annual meetings do not supply.

—PHILIP H. ABELSON

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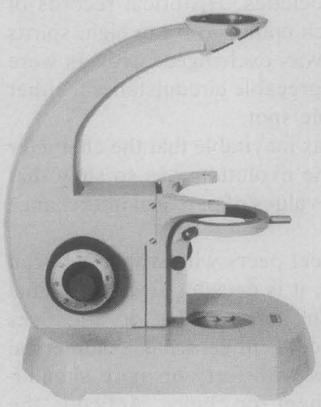
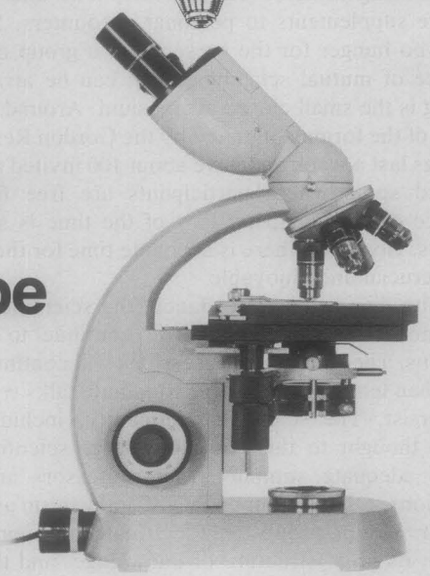


The Zeiss Standard Microscope System.



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