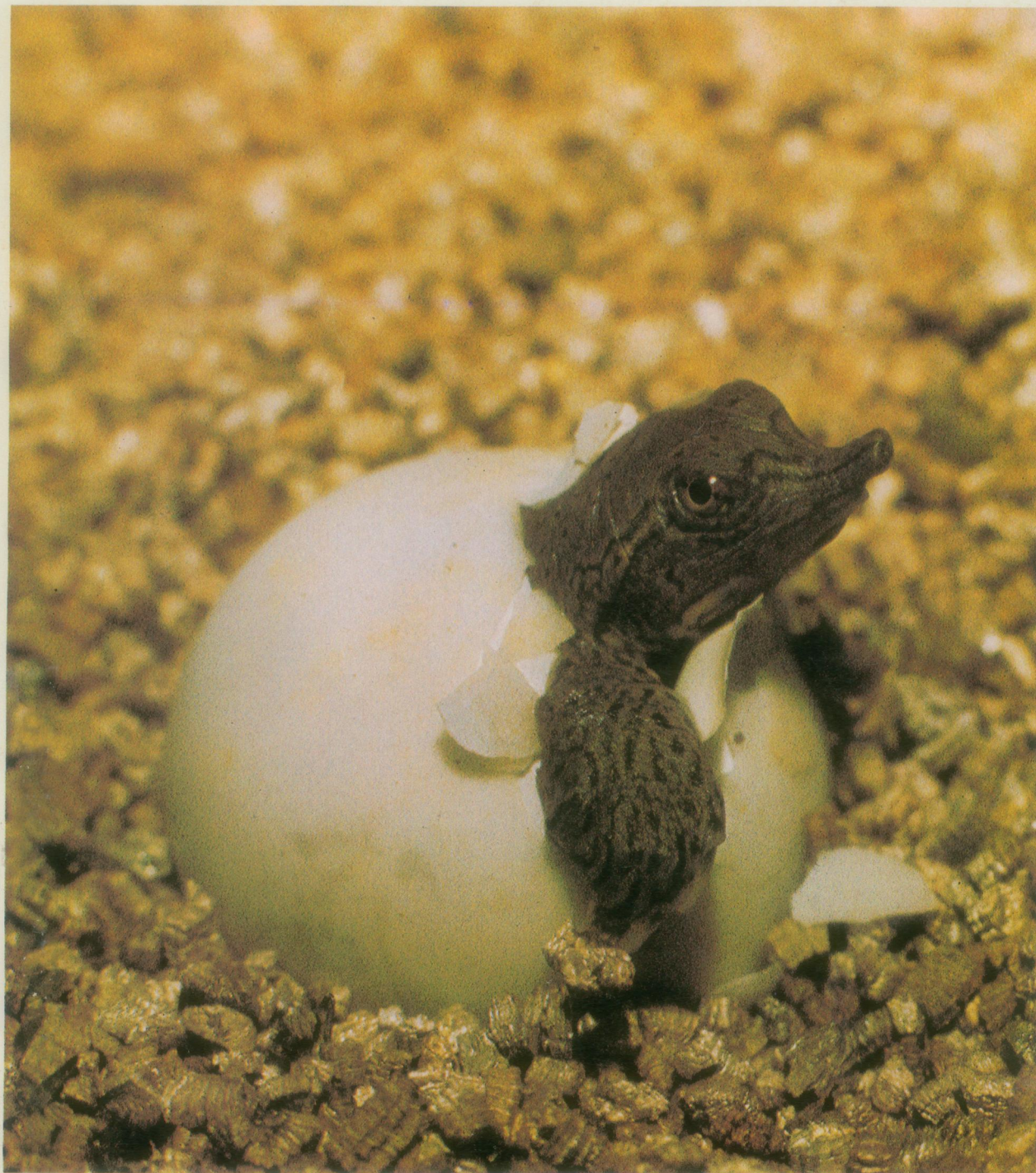


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COVER

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 soft-shell 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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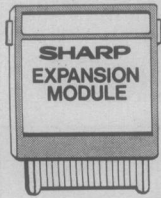


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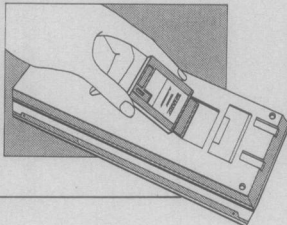
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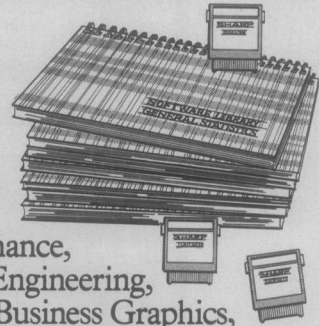


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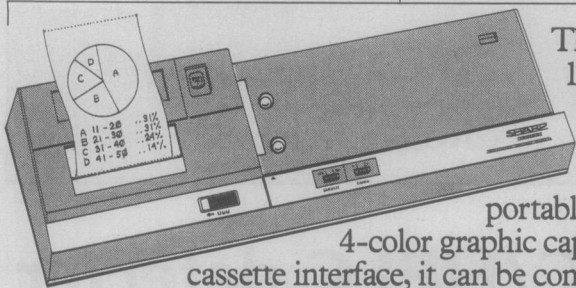
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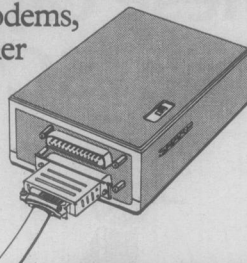
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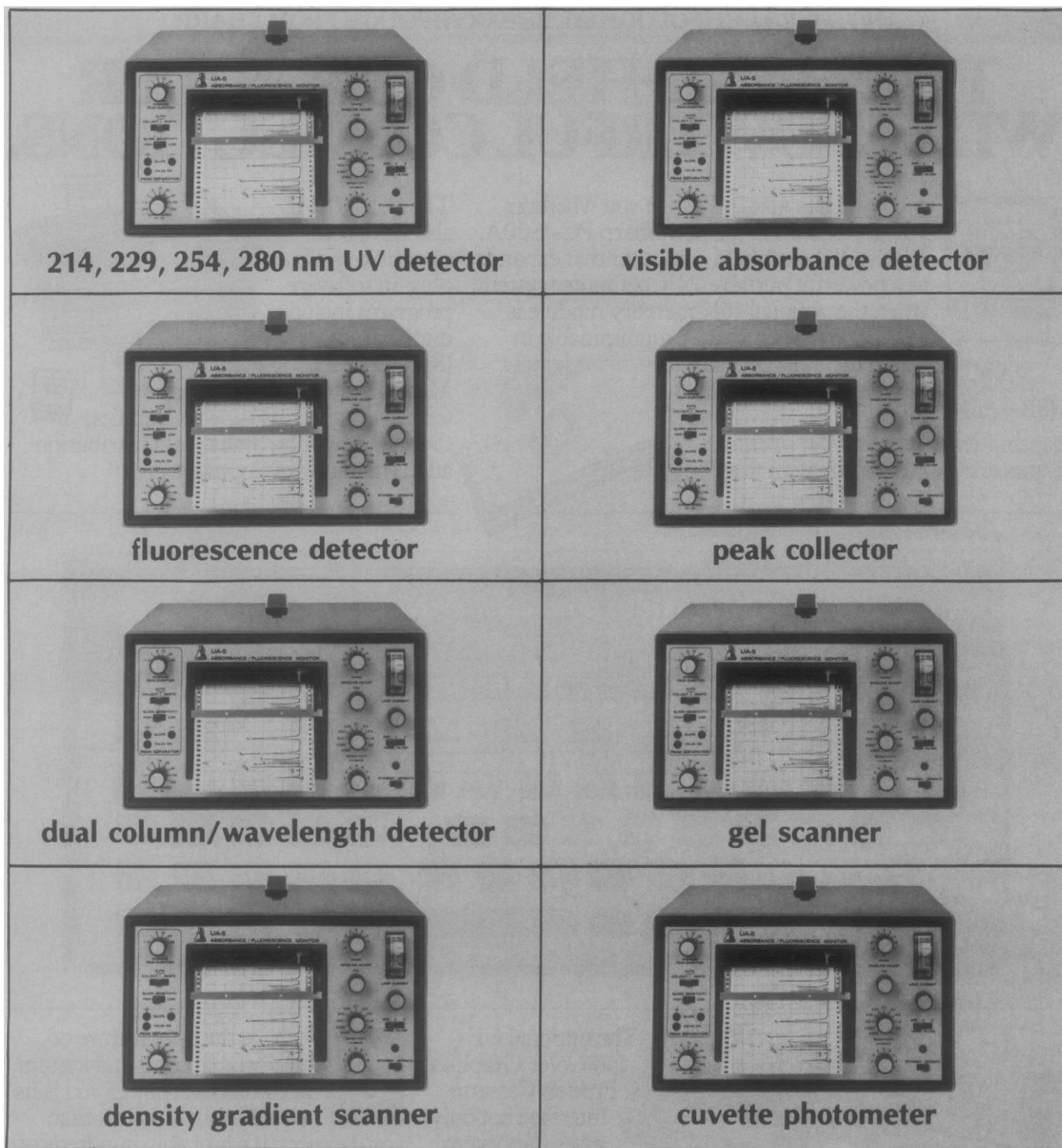


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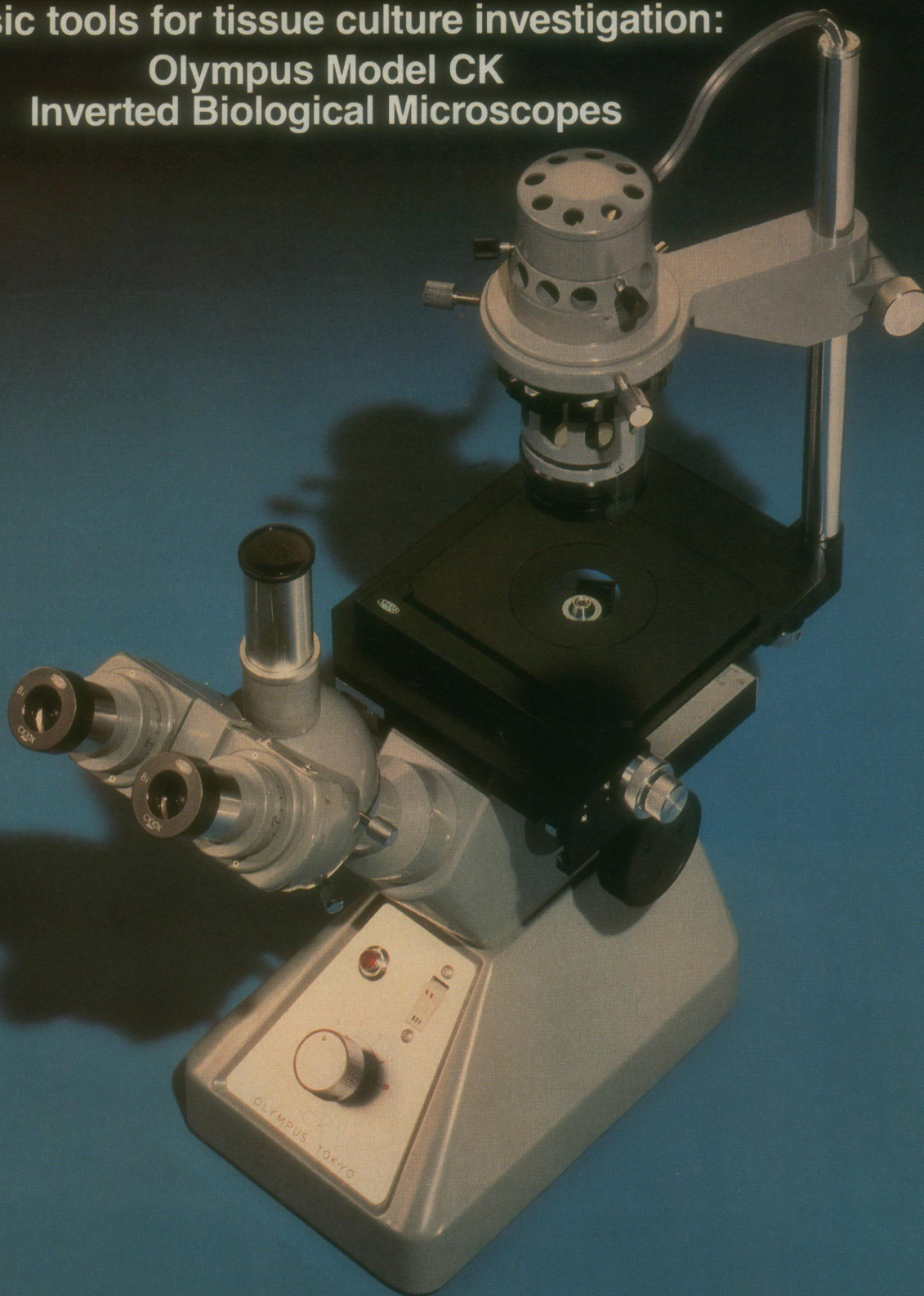


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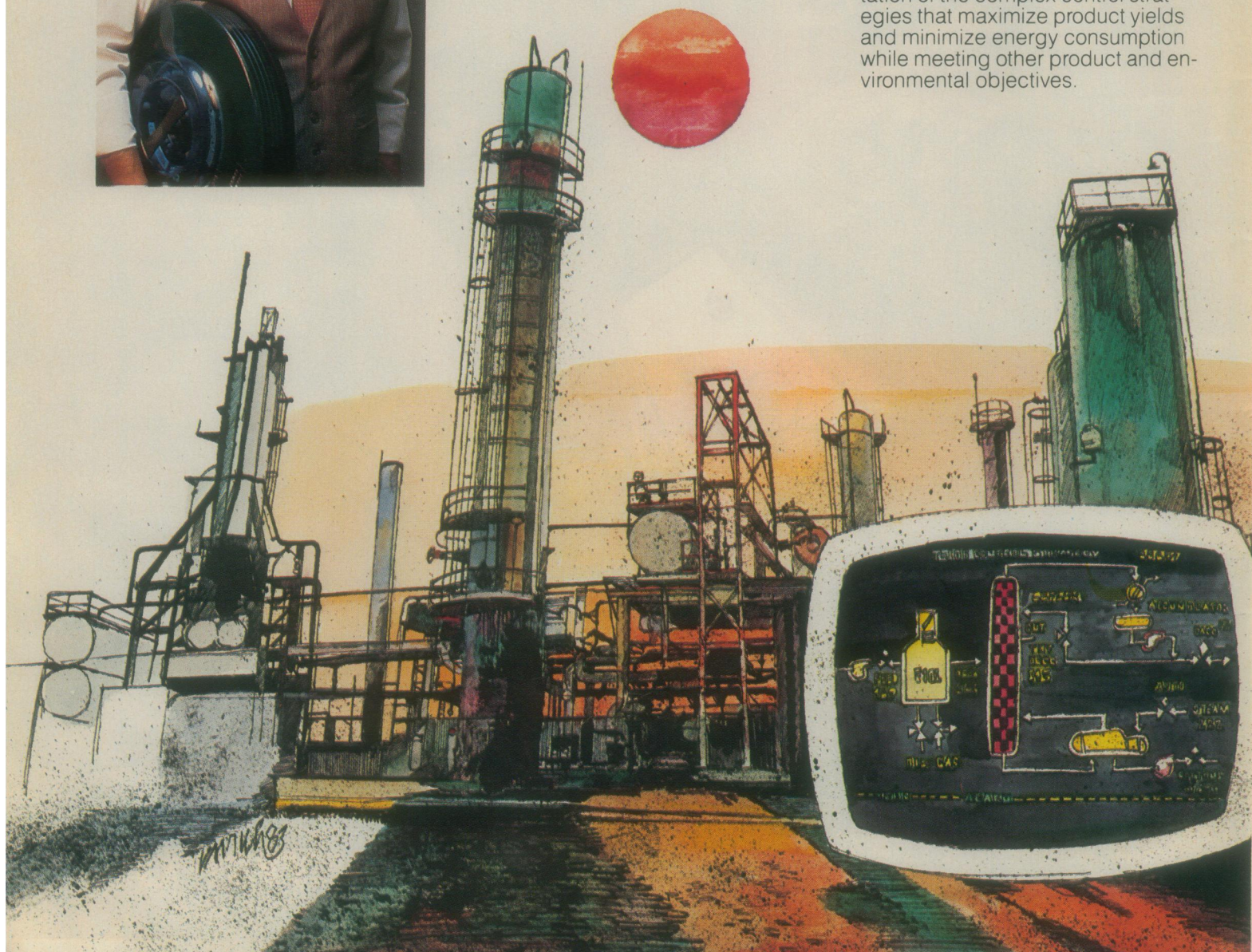
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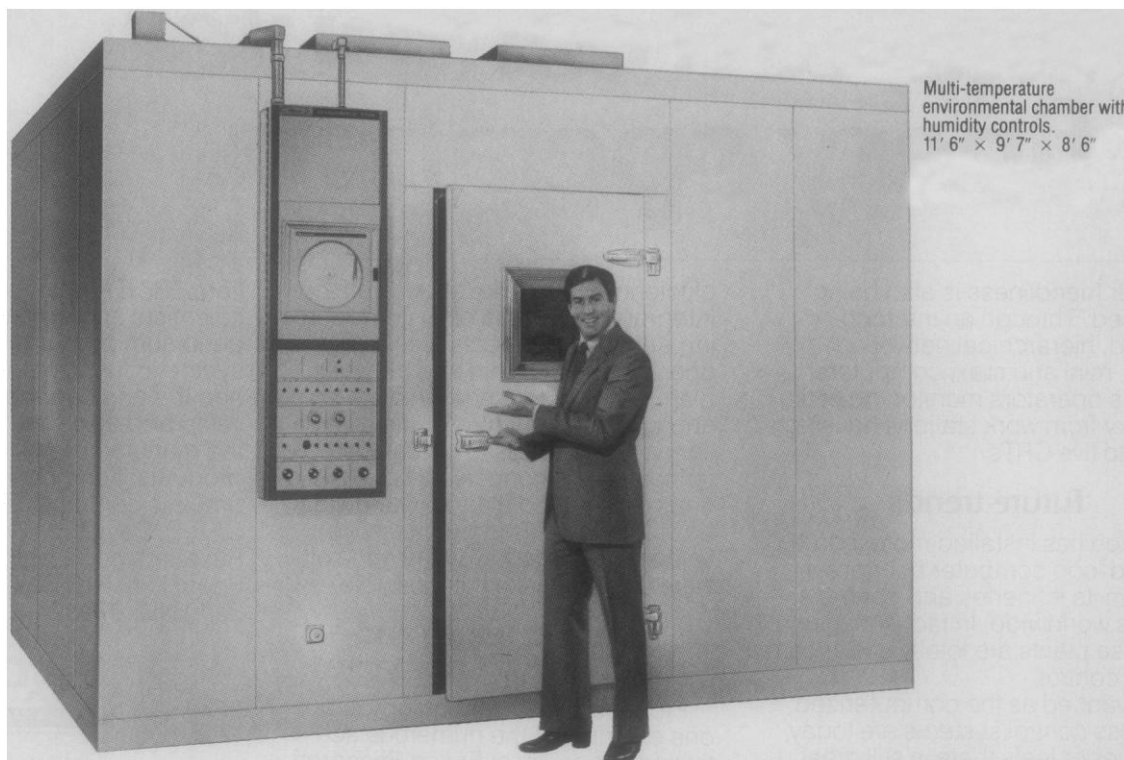
efficiencies. He talks about work on integrated networks of systems sharing data on all aspects of refinery operation both within and between plants. Using advances in electronics and concepts such as artificial intelligence, the goal is to optimize single refineries and conceivably even refineries on a regional and a worldwide basis. He is helping guide the development of the hardware and software that will make this possible.

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tion, 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.





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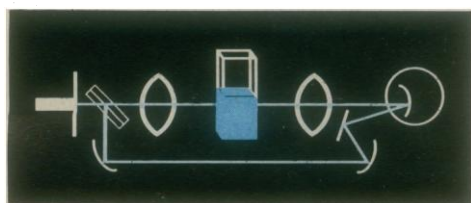
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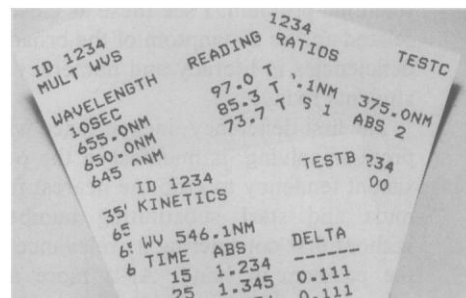
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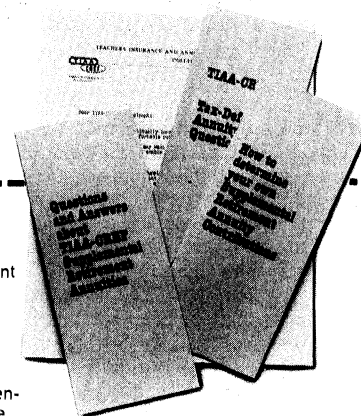
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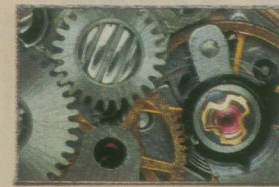
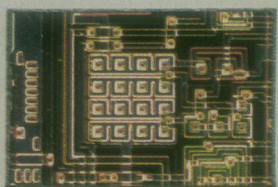
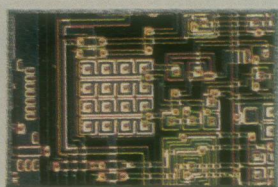
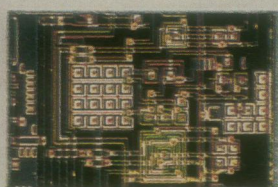
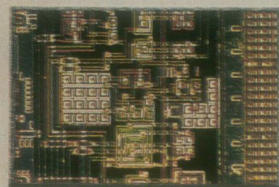
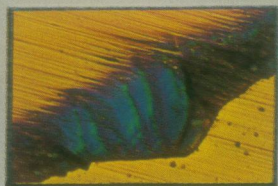
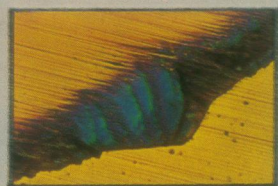
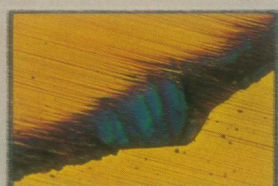
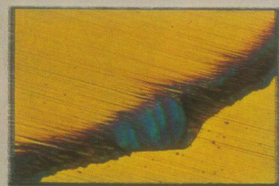
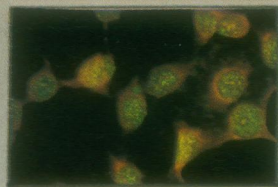
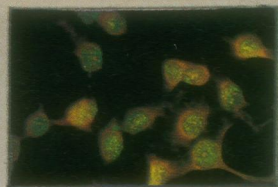
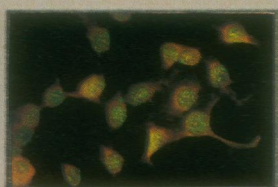
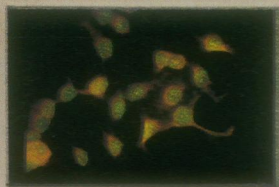
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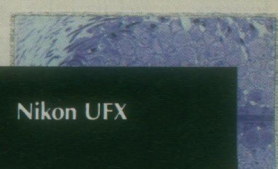
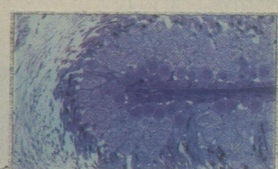
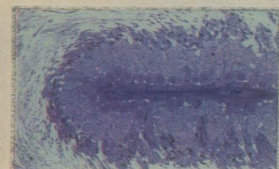


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Communication Between Scientists

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.

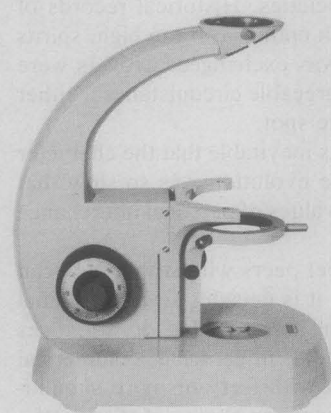
For established scientists, the decay of the typical meeting is no loss. They have in place a rich variety of communication links. The most deeply satisfying of these in one-on-one conversations with peers. There they can enjoy the mutual exchange of ideas and enthusiasm, as did scientists a century 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.

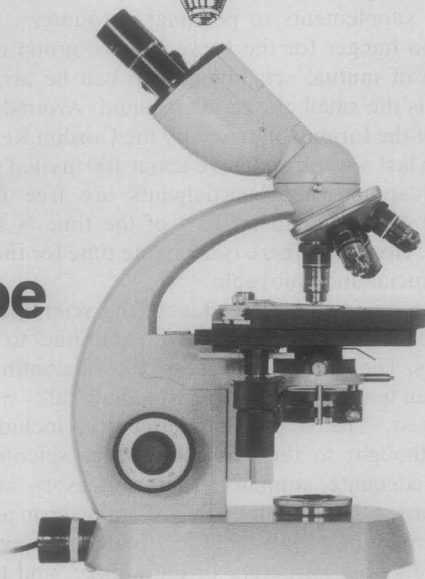
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