

# science news

March 28, 1970 **25c**  
vol. 97, no. 13, pp. 303-334

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**Requiem for an accelerator**  
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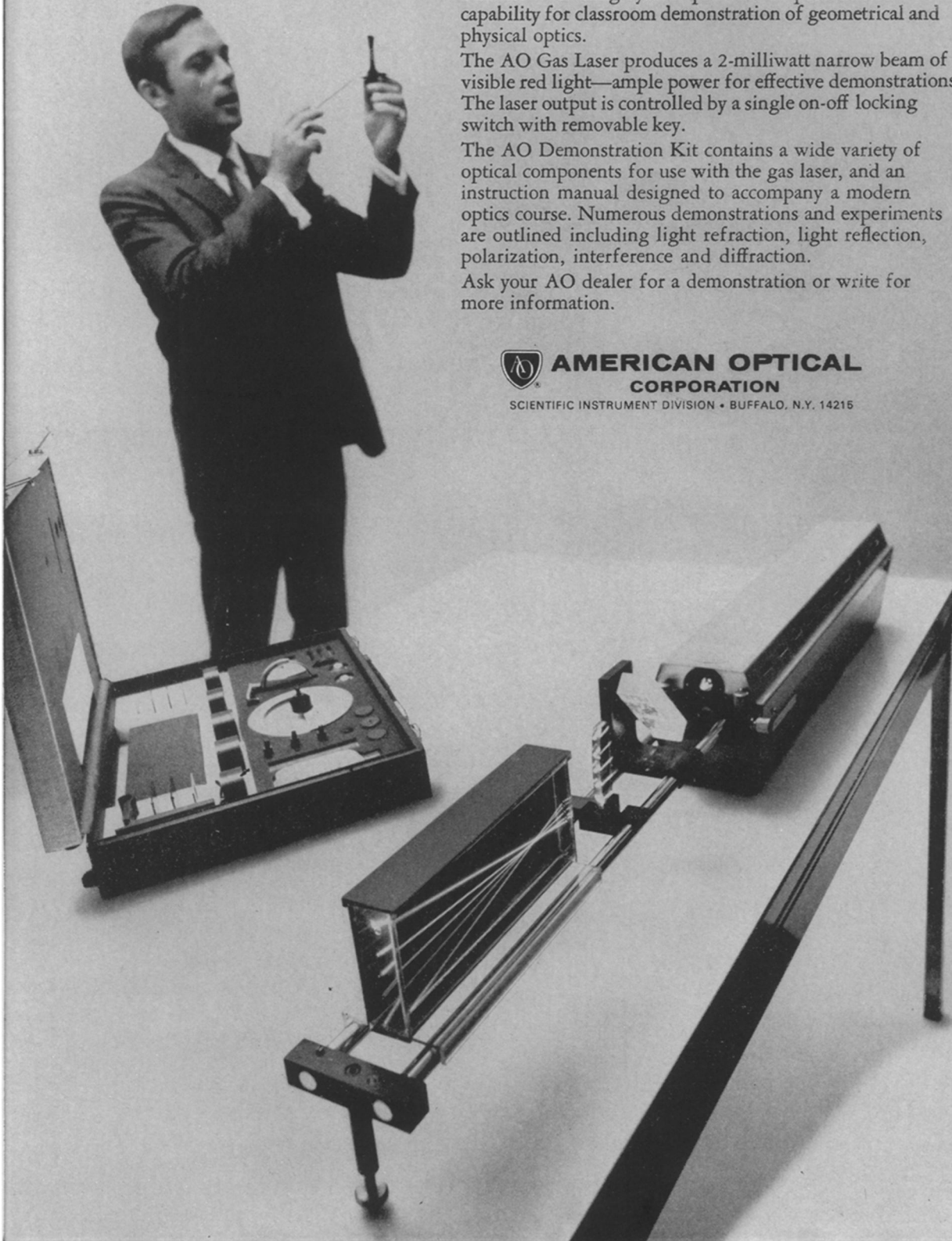
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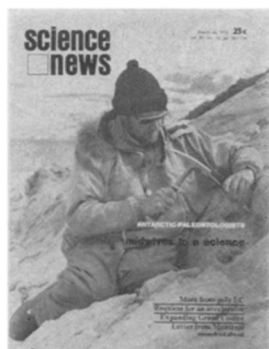
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The 450 bones of extinct reptiles and amphibians recently collected at Coalsack Bluff in Antarctica by fossil hunters such as William J. Breed open a new continent for study by vertebrate paleontologists. First of a two-part series. See page 324. (Photo: U.S. Navy)

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A Science Service Publication  
Vol. 97 March 28, 1970 No. 13  
Incorporating Science News Letter

Watson Davis, 1896-1967  
Publisher: E. G. Sherburne Jr.

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Circulation: Marcia Nelson

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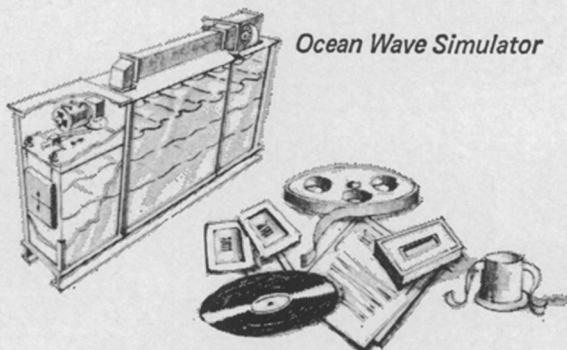
The **PROCEEDINGS OF THE APOLLO 11 LUNAR SCIENCE CONFERENCE** is the only source of information for over 150 original papers, in their most comprehensive form, written by an international team of experts who participated in the three-month lunar sample examination and announced their evaluations at the Apollo 11 Lunar Science Conference held in Houston, January 5th-8th, 1970.

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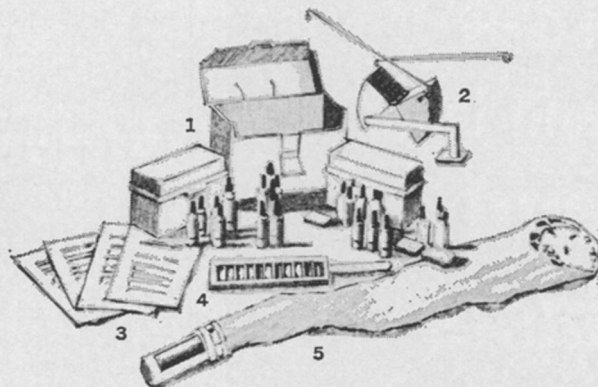
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# here's the team:

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AND A COMPUTER.**

Some of the most talented brains in electrical engineering were recruited for eleven films, produced by the NCEEF and the SEEC in association with the Education Development Center, with the support of the National Science Foundation. Here's the game plan: 1). Save set-up time with complete, ready-made demonstrations by top men. 2). Save lecture

time with slow-motion, time-lapse, close-ups and other effective film techniques. 3). Involve students with computer-generated animated graphs. Changes that occur in physical objects and the mathematics describing those changes are shown simultaneously on a split screen so students can instantly connect practice and theory.

## The line-up from the National Committee for Electrical Engineering Films and the Semiconductor Electronics Education Committee:

### NCEEF

**Complex Waves I: Propagation, Evanesence and Instability.** (26 min.) Presented by James R. Melcher, M.I.T.

**Complex Waves II: Instability, Convection, and Amplification.** (23 min.) Presented by James R. Melcher, M.I.T. These films are a part of a series concerned with electromagnetic fields and forces as they interact with moving and deformable media. Professor Melcher demonstrates a variety of real wave phenomena and discusses the effect of the parameter in the wave equation which describes the phenomena. The simultaneous display of the real phenomena with its associated (computer animated) omega-k dispersion relation demonstrates the effect on the phenomena as the parameters of the system are varied.

**Synchronous Machines: Electromechanical Dynamics.** (33 min.) Presented by Herbert Woodson, M.I.T. This film is one of a series concerned with electromagnetic fields and forces as they interact with moving and deformable media. The film starts with a demonstration that magnets free to rotate about the same axis, line up with each other. From this simple interaction Professor Woodson develops the application of this principle in rotating electric machines.

**Harmonic Phasors.** (6 min., Silent only) Presented by William Huggins, Johns Hopkins University and Donald Weiner, Syracuse University. A computer pantomime designed for use as a teaching aid to demonstrate some ideas relevant to the representation of sinusoidal signals by rotating "phasors," the addition of vector quantities, and the description of a simple periodic function by Fourier series.

**Movies from Computers: An Interim Report.** (20min.) Presented by Ellis King, U.C.L.A. The film

presents a number of extracts from existing computer generated industrial and research films. The basic purpose is to stimulate study and use of computer animation of films as a basic tool for learning. Applications in mathematics, engineering and physics are shown.

**Response of a Resonant System to a Frequency Step.** (12 min., Silent only) Presented by Donald Weiner, Syracuse University and William Huggins, Johns Hopkins University. This film is a computer pantomime motion picture designed to be used as a teaching aid in demonstrating fundamental concepts relevant to: (1) linear system theory; and (2) frequency modulation. Specifically, the role assumed by transients in proving a smooth transition between initial and final steady-state conditions is illustrated using rotating "phasors" to portray the envelope and phase of modulated signals.

**Wave Velocities, Dispersion, and the Omega-Beta Diagram.** (28 min.) Presented by Theodore Van Duzer, University of California, Berkeley. This film considers traveling waves and the way they propagate through transmission systems. It is designed to be used in connection with lectures on phase velocity, group velocity, backward waves, and dispersion and to show how these wave characteristics are displayed on the Omega-Beta diagram. Mathematical derivations are assumed to have been done prior to viewing the film, which concentrates on visualization of the concepts through animation and experiment.

### SEEC

**Gap Energy and Recombination Light in Germanium.** (37 min.) Presented by Richard Adler, M.I.T. and Jacques Pankove, R.C.A. In order to make as tangible as possible the concept of the energy gap in

semiconductors, an optical experiment is performed to measure the wavelength of the light emitted by the recombination of excess hole-electron pairs in the neighborhood of a pn-junction located near the middle of a germanium bar. The intensity of the emitted radiation is also examined along the bar, and plotted as a function of the distance away from the junction. Dr. Pankove presents the experiments and Professor Adler the theoretical argument.

**Minority Carriers in Semiconductors.** (26 min.) Presented by Richard Haynes, Bell Telephone Laboratories and William Shockley, Shockley Labs., Clevite, Inc. This film demonstrates the existence and behavior of injected excess minority carriers in semiconductors by repeating in modified form the Haynes-Shockley drift-mobility experiment (originally performed in 1949). The importance and the principal dynamical features of minority carriers—namely, drift, diffusion, and recombination—are shown and discussed.

**Diffusion along a Bar.** (5 min., Silent only) A computer generated random walk model of Diffusion Along a Bar. Part I shows the random motion of 512 particles in a diffusing group and Part II shows the random motion of some individual particles in a steady-state concentration gradient.

**Transistor Structure and Technology.** (38 min., Color only) Presented by Richard Thornton, M.I.T. and James Early, Bell Telephone Laboratories. The film begins with a description of how the alloy junction transistor (PNP) is made, followed by a discussion of the limitation of its speed and voltage characteristics. The characteristics of PNIP and NPNN types are discussed. Fabrication of NPNN transistors is shown. Finally there is a brief review of power handling capability and heat dissipation.

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