Analog Computation

In answer to the need of practicing engineers and scientists to keep abreast of advances in their fields, an Institute on Analog Computation, the only one of its kind in central eastern United States, was given at Catholic University of America, Washington, D.C., 10–21 June. An introduction to analog computation, its role in scientific and engineering analysis, methods and techniques in analog computation, its applications in various fields, and the procedures and requirements of a laboratory set-up were the topics of discussion. The entire course was presented by engineers and mathematicians of the Training and Education Division of the Electronics Associates, Inc., of Princeton, New Jersey. Twenty representatives from various institutions ranging from academic to space flight centers participated in the program that was coordinated with laboratory exercises to stimulate the problems that were discussed during the sessions.

The analog computer was introduced as a tool for solving problems in scientific analysis. The requirements of a general purpose analog computer were developed in a manner basic to its concepts, and various linear components that go into making a computer were discussed. While modern computers are very complex electronic systems, the mathematician or the chemical engineer can learn rather quickly how to use them efficiently.

A quick and informative description with particular attention to operational amplifier, attenuators, and mode control pointed out that the modern analog computer does not work with numbers as does the digital type. The quantities represented on an analog device are continuously variable and require interpretation through some process of measurement. The analog computer contains units for performing summation, integration with respect to time, multiplication by a constant or a variable, generation of trigonometric or arbitrary functions, and other specialized operations which are all performed by manipulating voltages which correspond to physical variables.

Differential equations are the basis for techniques of an analog computer. Solutions of linear and non-linear differential equations, such as the famous Van Der Pol's equation, were investigated. In the course of lectures, it was noted that the following were among the multitude of problems solved by the analog computer: non-linear pendulum, automobile suspension systems, coupled-pendula, hydraulic transients and surge-tank phenomena, and aerospace applications. Bio-engineering and bio-medical applications for simulation of physiological processes and other complex phenomena in the behavior of living things, method of steepest descents as applied to target positions, heat transfer, statistical studies, and so forth were discussed, demonstrated, and solved on TR-10 and TR-48 transistorized analog computers with the help of plotters.

An important highlight of the course was the introduction of Hybrid Computation as a means to combine analog and digital techniques. As carried out by the HYDAC Computer it provides the research and design engineer with a convenient means of applying both analog and digital techniques in the solution of his problem. Such operations are combined in one integrated system to achieve a computational efficiency that is well beyond the limits of either computer alone. As an illustrative example, it was pointed out that a function dependent on the solution of a set of differential equations containing adjustable parameters, can be minimized by systematic search procedures in parameter space, which can be implemented by a hybrid system.

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Forthcoming Events

August

20–26. **Psychology**, 17th intern. congr., Washington, D.C. (American Psychological Assoc., 1333 16th St. NW, Washington 6)

20–26. **Zoological Nomenclature**, intern. committee meeting, Washington, D.C. (W. E. China, British Museum of Natural History, Cromwell Rd., London S.W.1)

20–27. **Zoology**, 16th intern. congr., Washington, D.C. (Secretary of the Congress, Natl. Acad. of Sciences, 2101 Constitution Ave., NW, Washington 25)

21–23. **Biochemical Conf.**, Pacific Slope annual, Honolulu, Hawaii. (P. E. Wilcox, Dept. of Biochemistry, Univ. of Washington, Seattle 5)

21–29. International Conf. on **Population**, Ottawa, Ont., Canada. (B. Benjamin, Intern. Union for the Scientific Study of Population, General Register Office, Somerset House, London W.C.2, England)

22–24. National Council of Teachers of **Mathematics**, Pittsburgh, Pa. (E. G. Begle, Stanford Univ., Stanford, Calif.)

24–25. **Transactional Analysis**, first summer conf., Monterey, Calif. (E. Berne, Box 5747, Carmel, Calif.)

25–28. **Soil Conservation** Soc. of America, Logan, Utah. (H. W. Pritchard, Soil Conservation Soc., 7515 Northeast Ankeny Rd., Ankeny, Iowa)

25–29. **Medical** Correctional Assoc., Portland, Ore. (F. L. Rouke, 14 Studio Arcade, Bronxville, N.Y.)

26–28. Simulation for **Aerospace Flight**, specialists meeting, Columbus, Ohio. (Inst. of the Aerospace Sciences, 2 E. 64 St., New York 21)

26–28. **Superconductivity**, intern conf., Hamilton, N.Y. (R. W. Schmitt, General Electric Research Laboratory, P.O. Box 1088, Schenectady, N.Y.)

26–29. American **Sociological** Assoc., Los Angeles, Calif. (T. Parsons, Dept. of Social Relations, Harvard Univ., Cambridge 38, Mass.)

26–30. American **Mathematical** Soc., 68th summer, Boulder, Colo. (Mrs. R. Drew-Bear, Special Projects Dept., AMS, 190 Hope St., Providence 6, R.I.)

26–30. **Rheology**, 4th intern. congr., Providence, R.I. (R. S. Rivlin, Brown Univ., Providence 12)

26–30. **Solar Spectrum**, intern. symp., Utrecht, Netherlands. (C. de Jager, Theoretical Dept., Sterrewacht, Servaasbolwerk 13, Utrecht)

26–31. **Haematology**, European Soc., 9th congr. Lisbon, Portugal. (Secretary, Haematology Congr., Dept. of Haematology, Inst. of Tropical Medicine, Lisbon)

27–30. **Alaskan Science** Conf., Anchorage. (A. H. Mick, Alaska Agricultural Experiment Station, Palmer)

27–30. American **Physiological** Soc., Coral Gables, Fla. (M. Edwards, Physiology Dept., Univ. of Miami School of Medicine, Coral Gables 34)

27–30. **Computing Machinery** Assoc., natl. conf., Denver, Colo. (F. P. Venditti, Univ. of Denver, Denver 10)

27–31. American Inst. of **Biological Sciences**, Amherst, Mass. (R. A. Jester, Dept. of Floriculture, Univ. of Massachusetts, Amherst)

27–4. **Automatic Control**, 2nd intern. congr., Basel, Switzerland. (A. von Schulthess, Wasserwerkstr. 53, Zurich 6, Switzerland)

28–31. **Electron Microscope** Soc. of America, 21st annual, Denver, Colo. (V. L. Van Breemen, Mercy Inst. for Biomedical Research, 2920 E. 16 Ave., Denver 6)

28–4. **British Assoc. for the Advancement of Science**, Aberdeen, Scotland. (Sir G. Allen, Burlington House, Piccadilly House, London, England)

29–30. **Solvation** Phenomena, symp., Calgary, Alberta, Canada. (P. J. Krueger, Dept. of Chemistry, Univ. of Alberta, Calgary)

29–31. **Pollen Physiology** and **Fertilization**, symp., Nijmegen, Netherlands. (H. F. Linskens, Dept. of Botany, Univ. of Nijmegen, Driehuizerweg 200, Nijmegen)

29–4. American **Psychological** Assoc., Philadelphia, Pa. (E. B. Newman, Memorial Hall, Harvard Univ., Cambridge 38, Mass.)

30–1. **Pancreatic Islets**, intern. symp., Uppsala, Sweden. (S. Brolin, Univ. of Uppsala, Uppsala)

30–2. Individual **Psychology**, intern. congr., Paris, France. (H. Schaffer, 28 rue des Archives, Paris 4)