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Warren S. Wooster, formerly associate research oceanographer at the University of California's Scripps Institution of Oceanography, has left for Paris, where he will head UNESCO's recently established Office of Oceanography. The Office of Oceanography was authorized by the UNESCO Council in November. At the same time, the council set up an Intergovernmental Oceanographic Commission. The aim of both bodies is to foster international cooperative research in the marine sciences. As director of the Office of Oceanography, Wooster will serve as secretary of the commission.

Physicist Richard F. Humphreys has been named president of the Cooper Union for the Advancement of Science and Art in New York City, effective 1 June. He is now vice president of the Armour Research Foundation, Illinois Institute of Technology, Chicago. Humphreys succeeds Edwin S. Burdell, who retired in February 1960 to become president of the Middle East Technical University in Ankara, Turkey, after 22 years as director and president of Cooper Union.

Wendell M. Stanley, director of the University of California's Virus Laboratory, Berkeley, arrived in Europe this month to begin an 8-month study tour on a Guggenheim fellowship. Through visits to laboratories in ten European cities, he hopes to strengthen and extend international scientific cooperation in the field of virus research.

The following men will lecture at a number of colleges and universities during March as Sigma Xi national lecturers.

Theodosius Dobzhansky, Dacosta professor of zoology, Columbia University, will discuss "Man and Natural Selection."

Norman F. Ramsey, professor of physics at Harvard University, will discuss "Nuclear Interactions in Molecules."

Sanborn C. Brown, associate professor of physics at Massachusetts Institute of Technology, will discuss "Plasma Physics."

C. Jolliffe, deputy director of the Grants Division of Great Britain's Department of Scientific and Industrial Research, London, will be in the United States and Canada from 28 March to 8 May. He is primarily interested in the handling of problems arising from government support of universities and technical institutions. He will visit Washington (30 March–5 April, and 4–7 May); Baltimore; Raleigh, N.C.; the Boston area; and Ottawa and Montreal, Canada.

Among the six women with outstanding careers in government selected as winners of the first annual Federal Women's Award were two scientists—Charlotte Moore Sitterly, physicist with the National Bureau of Standards, Washington, D.C., and Rosslyn S. Yallow, principal scientist, Radioisotope Service, Veterans' Administration Hospital, Bronx, N.Y.

At Stanford University School of Medicine, Thomas A. Stamey, associate professor of urology at Johns Hopkins University Medical School, has been appointed associate professor of surgery and will head the new division of urology in the department of surgery. Tag Eldin Mansour, associate professor in the department of pharmacology at Louisiana State University, has been appointed professor of pharmacology.

Maurice J. Murray, chemical consultant to the Universal Oil Products Co., Des Plains, Ill., has been appointed chief scientist of the U.S. Army Chemical Corps. He will report for duty on 1 March. Prior to joining Universal Oil, Murray was professor of chemistry and acting chairman of the department of chemistry at Illinois Institute of Technology.

William N. Parkinson, vice president in charge of the Temple University Medical Center, is retiring after more than 35 years of service. Parkinson, who has held various posts at Temple, was for 30 years dean of the Medical School, from which he was graduated in 1911.

Louis Gordon, professor of chemistry and a well-known analytical chemist, has been appointed dean of graduate studies at Case Institute of Technology. The appointment will be effective 1 July, when Eric Arnold, at present associate dean, reaches the mandatory retirement age for administrative personnel. Arnold will continue as professor of chemistry.

James A. Krumhansl, professor of physics at Cornell University, has been appointed director of Cornell's Laboratory of Atomic and Solid State Physics, succeeding Robert L. Sproull, who was recently named director of the Cornell Materials Science Center.

Lauriston Sharp, distinguished anthropologist, has been appointed visiting professor of anthropology for the 1961–62 academic year at the University of California, Berkeley. Sharp is an authority on the cultures of Southeast Asia.

Recent Deaths

Lyman Allen, Burlington, Vt.; a past president and a founder of the American College of Surgeons and emeritus professor of surgery at Vermont College of Medicine; 2 Feb.

Larry R. Commissaris, Tucson, Ariz.; zoologist; was doing graduate work in the department of zoology at the University of Arizona; 17 Jan.

Rev. Dr. Etienne Drioton, Paris, France; 71; archeologist and well-known Egyptologist who was named head curator of Egyptian antiquities of the Louvre Museum in 1952; worked in Egypt for 28 years, but at the time of the Egyptian coup d'etat of 1952 was dismissed from his posts as director general of the Department of Egyptian Antiquities in the Ministry of Education and director of the Egyptian Museum in Cairo; 19 Jan.

Robert H. Kent, Havre de Grace, Md.; 75; physicist and a leader in modern ballistics, who worked at the Army's Proving Ground Ballistics Laboratory for 34 years before retiring in 1956; for many years was chairman of the explosives and armament panel of the Air Force Scientific Advisory Board; 3 Feb.

Meyer Mendelsohn, New York, N.Y.; 65; chemical engineer; vice president of Yardney Chemical, Inc.; and head of chemical research for the Yardney International; early developer of ion-exchange separators, used in silver-zinc batteries for missile, satellite, and other applications; 14 Feb.

Jerome T. Syverton, Minneapolis, Minn.; 53; professor and head of the department of bacteriology, University of Minnesota; distinguished teacher and investigator in virology and cell biology; 28 Jan.
scribed and discussed in the present edition, but the accounts of many times that number of other birds have also been revised in keeping with new data accumulated since the book was first published. The nomenclature throughout has been revised where necessary to conform with the latest edition of the *Check-list of North American Birds* (American Ornithologists’ Union, 1957). It seems obvious that this fine volume will continue to be useful.

*Birds of Hawaii* is a new printing of a book first published in 1944; it has been out of print for a long time and, consequently, was difficult and costly to obtain. When Hawaii became a state, it was felt that the occasion justified publishing a revision of the only modern compendium and manual for studying the bird life of the new state. The chief alterations in this printing are the addition of a handy list of all the changes made since 1944 in the classification and nomenclature of the birds and the replacement of some of the less satisfactory illustrations found in the original printing. If and when a new edition is published, I hope it will have better color plates. The ones in the present volume are not good enough for a state bird book; the text is far better than the plates.

**HERBERT FRIEDMANN**

*U.S. National Museum, Smithsonian Institution*

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**New Books**

**Mathematics, Physical Sciences, and Engineering**


*Fundamentals of Aerodynamic Heating.* Robert Wesley Truitt. Ronald, New York, 1960. 269 pp. Illus. $10. From the preface: “This book is an introduction to the subject... developing... the theoretical background necessary to a fundamental understanding of laminar and turbulent boundary layer and their relation to skin friction and heat transfer.” Truitt is professor and head of the department of aeronautical engineering at Virginia Polytechnic Institute.


*Organic Electronic Spectral Data.* vol. 1, 1946–1952. Mortimer J. Kamlet, Ed. vol. 2, 1953–1955. Herbert E. Ungnade, Ed. Interscience, New York, 1960. vol. 1, 1222 pp., $25 (subscription price); $28.50. vol. 2, 929 pp., $17.50 (subscription price); $15. From the preface material: “The spectral data have to satisfy the following minimum requirements: The investigated compound must be sufficiently pure to give satisfactory analyses and definable by a molecular formula. The solvent or phase should be stated and the spectral data complete concerning that the same solvent and absorption and molar absorptivities could be computed even if they were not stated in the original publication. Later, it was decided to include data for which no solvent was given, provided spectral data with solvents did not exist for such compound. Volumes 3 and 4 are scheduled for publication.”


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design of pattern-recognition devices. One theoretical device is able to distinguish patterns, regardless of their rotation or translation in the visual field, by differences in the frequency with which the lines of the pattern were intersected by a line segment, of fixed length, repeatedly placed in random orientation and position on the visual image (a "randomly tossed" curve).

**Visual Systems**

J. R. Singer of the University of California described a visual system which, by means of radial scanning, can recognize a two-dimensional object regardless of the visual angle it subtends or of its rotation in the visual field. However, this system requires that the object be centered in the visual field, so it is unlikely that the visual systems of living organisms, at least of vertebrates, use the same principle.

A different type of artificial visual system, designed by L. D. Harmon of Bell Telephone Laboratories, can recognize the continuity of a moving target. It consists of seven similar photocells, six tightly packed around the central one. The output of the central photocell produces inhibition at an artificial neuron; the output of the others, excitation. The neuron responds only to the passage of targets with radii within a particular size-range, according to the threshold setting. This system may correspond to the convexity detectors in the frog’s eye, previously reported by Lettvin, Maturana, McCulloch, and Pitts.

F. E. Loebner demonstrated an artificial visual system consisting of a matrix of photoconductors, each connected in series with an electric energy source and an electrolumino. When light hits a photoconductor, this permits current to flow through the lumino and causes the luminor to emit light. By appropriate connections and interconnections of these elements it is possible to reproduce many of the functions of the vertebrate retina, including all four detection functions found in the frog retina by Lettvin et al. It is possible that some of the circuits used in the model may be recognized in the living retina.

A machine capable of distinguishing among the spoken names of the digits ("one," "two," and so on) was described by W. C. Dersch of International Business Machines Corporation. At least one of the principles on which it operates is known not to be used in the human auditory system. L. A. de Rosa of International Telephone and Telegraph Corporation presented a theory of the operation of the auditory system, explaining that its frequency discrimination is produced by an autocorrelation process rather than by mechanical filters.

W. A. von Bergeijk of Bell Telephone Laboratories has built an artificial neuron network which he considers analogous to the spiral innervation of the cochlea and has measured signal loss as a function of simultaneous firing of several branches of the neuron. No similar measurements have been made on the actual nerve for comparison. He has also built an analog of a branching sensory nerve of the skin and has found that the analog and such nerves have comparable recruitment functions.

**Artificial Neurons**

The highlight of the symposium was a group of talks by W. S. McCulloch and other mathematicians from his laboratory at the Massachusetts Institute of Technology and by K. K. Maitra of RCA Research Laboratories, on the general problem: "How simple can a nervous system be?...perform all the known functions of the brain?"

They started with the very simple McCulloch-Pitt neuron, which consists of a device that has many inputs which can carry either excitation or inhibition. It possesses a polar threshold such that the output is in one or the other of two states, depending on whether the algebraic sum of the inputs does or does not exceed the threshold value.

M. Blum considered the general question of what logical functions could be performed by simple networks of such neurons. He showed that if the number of inputs (such as signals from different sense organs) to a neural net is large, the number of logical functions which the net can perform approaches one-quarter of the number of logical functions. This should certainly be enough to perform the limited number of logical functions which are known to be carried out by the brain.

A. N. Verbeek showed how to produce reliable computation with a "noisy," unstable neuron having four sources of trouble: variations in the signal strength of the inputs, faulty connections, variations in internal threshold, and inability to propagate its output signal. He used triplet networks made up of three of the simple neurons, all the inputs to the triplet going in parallel to two of the neurons and their outputs going to the third neuron, whose output was the output of the triplet. Signals from each input were connected in parallel to each of the three neurons. Each of these performs the logical operation, and the output of all the triplets goes to a neuron which acts as a majority decision, taking the outputs, comparing them, and deciding which is correct according to the output signals of the.
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pointed which will make the performance. Ability. Von Neumann has shown that to achieve a reliability of one error in a million by this older method with neurons which produce an error 5 percent of the time would require a net of about 20,000 neurons.

Cowan presented the mathematical logic he has developed for dealing with the behavior of nets of neurons carrying on logical computations in the presence of noise. He was able to represent a general noisy computation scheme and to calculate the amount of signal that came through.

K. K. Maitra presented an extension of the work of Verbeek in the design of nets which reliably perform logical operations even though the neurons and connections of the net may be unreliable. He developed a simplified mathematical symbolism for describing the manipulations of each triplet network. He was able to show that where a certain logical function is desired from the triplet, this function can be achieved with the greatest reliability by making the triplet from a combination of neurons each having a particular logical function, determined by a process he could specify. In a similar way he was able to show that if triplets are combined into triplet networks and these in turn into larger triplets, and so on, a minimum probability of error is found in networks made by three or four orders of such tripling. When instead of tripling the triplets he duplexed them, this gave increasing reliability with increasing order of duplexing up to any arbitrary level of reliability. Thus, it is possible in theory to design networks with unreliable neurons which will give any desired reliability of performance.

In a delightful summarizing talk, H. von Foerster of the University of Illinois pointed out the importance of this work on reliability. It permits the achievement of increased reliability in a system not by increasing the reliability of the components and connections but, more economically, by multiplexing unreliable components.

At the end of the symposium a final question was presented to McCulloch. He was asked, in effect, whether the people working on information processing would not some day, like the nuclear physicists today, have cause to regret the social consequences of their
work. McCulloch replied that he was convinced that it was in man's nature to develop both the socially good and the socially bad consequences of any invention. He fully expects that the world will be booby-trapped by the use of these and other sciences, but it is his firm hope that by making available information-handling devices of great capacity man will prevent the detonation of that booby trap through mis-information.

Leo E. Lipetz
Institute for Research in Vision,
Ohio State University, Columbus

Forthcoming Events

March


20–22. American Physical Soc., Monterey, Calif. (W. A. Nierenberg, Univ. of California, Berkeley 4)


20–24. American Surgical Assoc., Boca Raton, Fla. (W. A. Altemeier, Cincinnati General Hospital, Cincinnati 29, Ohio)


20–24. Western Metal Cong. and Exposition, 12th, Los Angeles, Calif. (A. R. Putnam, American Soc. for Metals, Metals Park, Ohio)

21–23. American Meteorological Soc., general meeting, Chicago, Ill. (E. P. McClain, Dept. of Meteorology, Univ. of Chicago, Chicago 37)


21–24. American Assoc. of Anatomists, 74th annual, Chicago, Ill. (O. P. Jones, Dept. of Anatomy, Univ. of Buffalo, Buffalo 14, N.Y.)


23–25. Quantum Electronics, 2nd intern. conf., Berkeley, Calif. (J. R. Singer, Dept. of Electrical Engineering, Univ. of California, Berkeley 4)


26–29. American Assoc. of Dental

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Letters

Drug Industry and Government

With reference to your recent “Science in the news” article [Science 132, 1536 (1960)] commenting about government intervention in the drug industry, could it be that the author displayed just a little cynicism (which is perhaps too common these days) in saying: “There is the danger not of cordiality between the regulators and the regulated, which is useful, but of the regulators’ coming to forget that, despite the room for a great deal of useful cooperation, the regulators and regulated do, or should, after all, represent opposing interests and opposing points of view”?

It does not seem to me that a really objective observer could conclude that the interests of the Food and Drug Administration and of the pharmaceutical industry are opposed. Rather, our interests are really identical: to provide the best medicine for those in need of it, or, putting it another way, to protect patients from bad medicine.

If the views of the industry and the government differ from time to time, I think such differences are largely confined to the question of how we attain our common objective. This may be a fine point, but it is one that is useful in the interests of clarity.

AUSTIN SMITH
Pharmaceutical Manufacturers Association, Washington, D.C.

DNA’s and RNA’s

In the realm of biochemistry, names (of substances) are used to designate products in which substantially all the molecules in a sample are the same, or at least potentially the same, through tautomerism. To speak of a mixture of structurally different molecules, as though they were all the same, causes misleading muddlement. The same principle holds for alphabetical abbreviations such as ATP, ADP, AMP, TTP, FAD, and TPN. For example, AMP stands for adenosine-5’-phosphate. If it were used indiscriminately to designate the 5’-compound, the 3’-compound, the 2’-compound, or the 2’, 3’-phosphate, this could only cause confusion.

A widespread violation of this principle, which can only result in confused thinking, particularly on the part of unsuspecting biology students, is the use of the designations DNA and RNA as though they, too, represent single species of molecules. This is particularly objectionable because there must be a multitude of DNA’s and RNA’s and...
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their biological functioning depends specifically upon the existence of a great diversity of molecules. To speak of a DNA or the DNA's is proper, but to refer simply to “DNA” as though it designated a chemical substance is unfortunate and leads to mixed-up thinking on the part of those who may not be fully initiated.

ROGER J. WILLIAMS
Clayton Foundation Biochemical Institute, University of Texas, Austin

Stimulus Generalization Gradients

In a recent report [Science 132, 1769 (1960)] Eliot Hearst compares the stimulus generalization gradients obtained in the case of each of a concurrent pair of responses, one response being maintained by an appetitive reward, the other by aversive reinforcement. From his results he concludes that aversive reinforcement produces greater generalization (flatter gradient) than an appetitive reward. This conclusion is not warranted from the data presented because there is not even an attempt to equate the drive level corresponding to the two responses.

Since the earliest Pavlovian work it has been known that increased hunger (deprivation) flattens the generalization gradient of an alimentary conditioned reflex. Hearst could have readily manipulated the flatness of his appetitive gradient in this fashion. In the case of the aversively maintained response, the relevant drive variables are the intensity of the electric shock, the number of shocks received, and the time since the delivery of the last shock. Of these, the first is particularly significant. By decreasing the shock intensity in conditioning the avoidance response, a sharper gradient would have been obtained.

The equating of drive between positively and aversively reinforced habits is certainly unattainable in practice, and probably even in principle. Thus, Hearst’s conclusions would in any case be questionable. The report would have had some factual value, however, if the deprivation schedule of the food-reinforced response and the electric shock parameters had been clearly described in the text. The absence of this information means that the data are not even reproducible by the uninhibited reader.

MICHAEL F. HALASZ
Department of Psychology,
University of Chicago,
Chicago, Illinois

I am glad to have the opportunity to make some additional comments on our stimulus generalization data and to answer several points raised by Michael Halasz.

1) Since appetitive and aversive
drives have quite different properties, any attempt to equate them would be very dubious. In my opinion this “obstacle” does not render futile or questionable all comparisons of appetitive and aversive behavior. A more positive approach to the problem might initially involve the design of a model situation in which both generalization gradients can be obtained, and then an analysis of the effects of various factors on the relative slopes of the two gradients. In our laboratories my co-workers and I are currently investigating such variables as type of avoidance and reward schedule, kind of response measured, visual versus auditory cues, method of testing, and amount of food deprivation to determine whether the reported results can be generalized to a wider variety of experimental conditions.

2) Extremely flat gradients of the sort reported for avoidance have rarely, if ever, been noted in prior investigations of appetitive drives, even with extremely high hunger motivation [for example, with subjects at 60 percent of normal body weight (1)]. In support of our avoidance findings, Sidman (2) has recently presented data which also indicate a very flat gradient for the type of avoidance behavior we studied; Sidman’s results were obtained for an auditory dimension, and the two subjects were trained under different levels of shock.

3) It is not likely that shock parameters are extremely influential variables here. The monkey subjects rarely received more than one or two shocks per 2-hour session, and such factors as shock level, number of shocks, and time since preceding shock probably are important only in a situation where a meaningful number of shocks are received. In any case, it was noted in the report that no rewards or shocks were possible during generalization testing. Thus these factors could not have had a direct effect during the generalization tests sessions.

4) Halasz’s assertion that decreases in shock intensity would have resulted in sharper avoidance gradients is rather premature, since there are very few experimental data bearing on this problem. As a matter of fact, Sidman (2) has recently shown that threefold changes in shock duration, though affecting response rate, have no effect on generalization. Additional experimental work is needed on this interesting problem, however.

5) The specific parametric values of the reported experiment are typical of those used in many current comparative studies of appetitive and aversive behavior—for example, in several productive investigations of differential drug effects on reward-motivated and fear-motivated behavior. Limitations of space made it impossible for me to include several details of the experimental method in the published report. The monkeys were maintained during the experiment on a daily diet of 60 to 70 Foringer D & G whole diet pellets, and each monkey was given one orange immediately after the session; the subjects had thus been food-deprived for approximately 22 hours at the beginning of each experimental session. Water was continuously available in their home cages. The shock level was set at an intensity of approximately 5 ma (0.6-sec duration), and shocks were delivered through a Foringer shock power supply and grid scrambler, which randomly reversed the polarity of the voltage on the grids. According to the animal’s particular posture and movements at the time of punishment, the shock might vary by as much as 0.5 to 1.0 ma from the predetermined value.

Edward Hearst
Clinical Neuropharmacology Research Center, Saint Elisabeths Hospital, Washington, D.C.

References