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FARRAND®
Master
DIFFRACTION GRATINGS

HIGH ENERGY
RESOLUTION
DISPERSION
SPECTRAL PURITY

Farrand Master Diffraction Gratings **are the most precise ever available.** They are produced on a Ruling Engine recently constructed according to the designs of Dr. John Strong.

DATA

Type: Master, Plane Reflection.

Size: Blank 6" diameter.
Ruling 5" wide x 2.8" long.

Lines per inch: 14,400.

Efficiency: 65-85% of Incident Energy in Blazed Region.

Ghost Intensity: Less than 0.1% in First Order of 5500 Å.

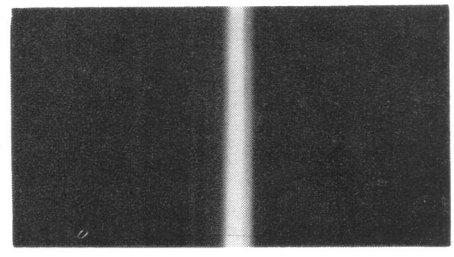
Resolution: 100% of Theoretical in Third Order or Better.

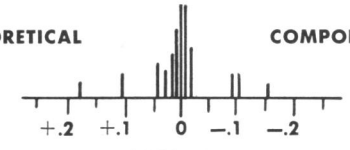
IMMEDIATE DELIVERY

The Farrand Optical Co., Inc. is also in a position to supply the FARRAND-STRONG Ruling Engine on special order

HYPERFINE STRUCTURE OF MERCURY SPECTRUM

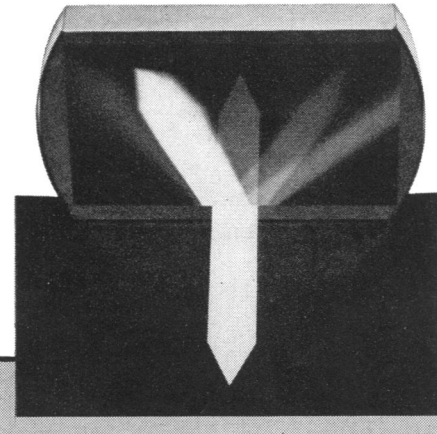
Unretouched photograph taken with a Farrand Diffraction Grating





λ=4538 A 6th ORDER (DOUBLE PASS)
RESOLVING POWER = 750,000

Below, an unretouched photograph of a grating, blazed for First Order at 5500 Å, illustrates the control achieved over the groove form.



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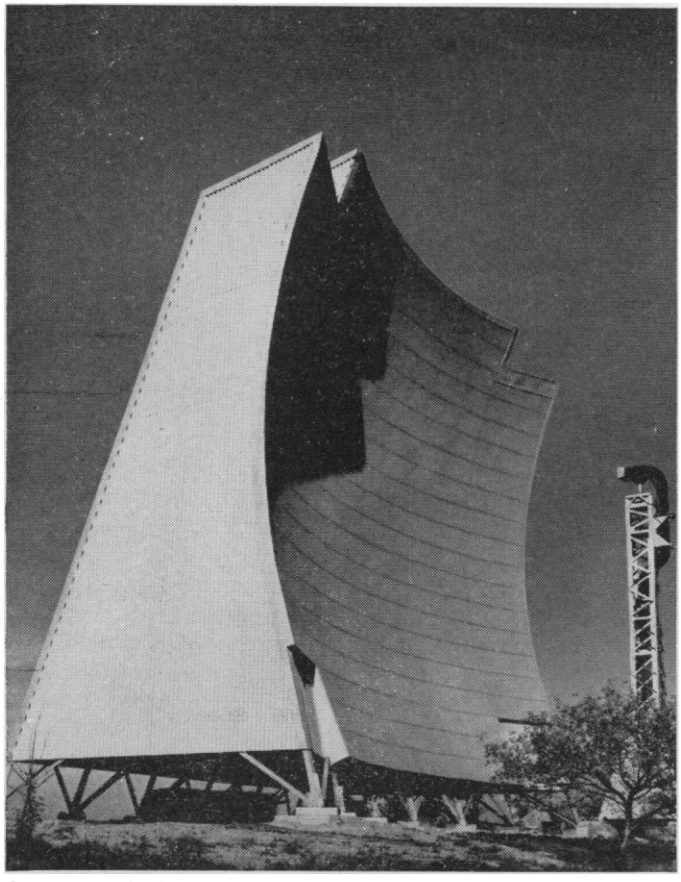


Giant over-the-horizon antenna designed by Bell Telephone Laboratories for "White Alice," Air Force Alaskan defense communications network.

How UHF radio got seven-league boots

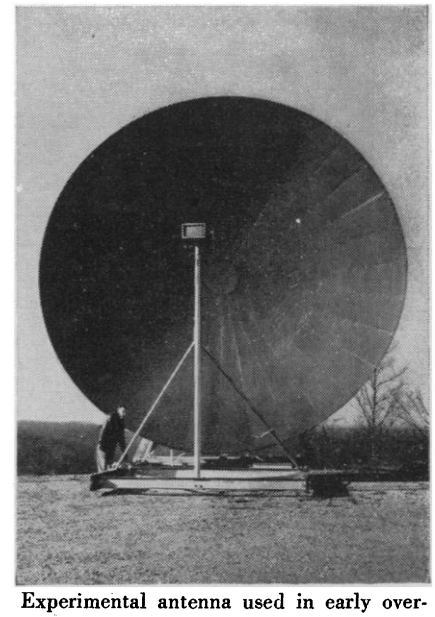
THE huge antenna systems which project ultra-high frequency radio communications beyond the horizon began when a Bell Telephone Laboratories engineer became intrigued with a strange phenomenon. Although these radio waves were supposed to be useful only over line-of-sight distances, the waves displayed a mysterious tendency to take off in a giant stride to antennas beyond the horizon.

This phenomenon had been studied both here and abroad, but no practical use was seen until the engineer became interested and thoroughly sifted the experimental data. He came up with the stimulating conclusion that over-the-horizon transmission is far stronger and much more dependable than was generally supposed. Further he predicted that it could be utilized to supply dependable broadband communications. He and his associates at Bell Laboratories confirmed the prediction experimentally, then drew up requirements for the first over-the-horizon UHF transmission system.

This pioneer work at Bell Telephone Laboratories has greatly increased the usefulness of UHF communications. For example, over-the-horizon transmission now provides critically important communications between remote military outposts in the Arctic and in the far north.

For the Bell System it can provide important new links for telephone conversations and television.

Kenneth Bullington, B.S.E.E., University of New Mexico; M.S., Massachusetts Institute of Technology; recipient of the 1956 Morris Liebmann Memorial Prize and the 1956 Stuart Ballantine Medal for his contributions in the field of over-the-horizon ultra-high frequency radio transmission.



Experimental antenna used in early over-the-horizon UHF radio transmission research. Research extended transmission from 30 miles line-of-sight to 200 miles.

BELL TELEPHONE LABORATORIES

WORLD CENTER OF COMMUNICATIONS RESEARCH AND DEVELOPMENT

implications of, serotonin (S. Udenfriend, H. Weissbach, and D. F. Bogdanski); (viii) central neurohumoral agents (B. B. Brodie and P. A. Shore); (ix) adrenolutin as a psychotomimetric agent (A. Hoffer); (x) metabolism of thyroid hormones by brain tissue (J. R. Tata); (xi) thyroid treatment and appetite for alcohol (C. P. Richter); and (xii) thyroid hormones and mental health (R. W. Rawson, H. Koch, and F. F. Flach).

The section on serotonin is especially good. Woolley concludes: ". . . sufficient evidence has been found to suggest that serotonin plays a role in the brain, and that the pharmacological interference with this function there may influence mental and neurological processes. There is no proof that these relatives (analogs) of serotonin do not affect other processes aside from those concerned with serotonin, and these other processes may be of great importance. However, the use of analogs of serotonin has brought to light so many phenomena related to mental function as to suggest a participation of this hormone in normal mental process." Furthermore, the biochemical studies on serotonin by Udenfriend, Weissbach, and Bogdanski provide additional evidence indicating that serotonin has a role in the function of the brain: (i) serotonin is found in the brain, (ii) enzymes which both make and destroy serotonin are found there, and (iii) increasing amounts of serotonin in the brain, as with 5-hydroxytryptophan, or decreasing it by pyridoxine deficiency produce marked central difficulties. Finally, the pharmacological effects produced by indole drugs give added proof of an important central function for serotonin.

Allan C. Goldstein's chapter, which includes a large amount of work accomplished in association with Frank A. Beach, is a rather thorough account of numerous observations on the experimental control of sex behavior in animals. From these observations it is rather evident that the lower spinal cord, the hypothalamus, the amygdaloid complex, and the cerebral cortex are important structures for the sexual act. As for the status of our knowledge pertaining to a relationship between hormone action and neural functioning, Goldstein admits that little is known beyond what was said by Beach and Philip Bard in 1940. The development of newer techniques, however, provides promise of obtaining pertinent information in this area.

The title of this book is somewhat out of proportion to the subject matter it contains. Notably absent are the groundbreaking contributions of G. W. Harris, J. D. Green, C. H. Sayer, A. Rathballer, Jacob de Groot, G. Sayers, David Hume, and Monte Greer. These names are synonymous with neuroendocrinology. The value of this little book could have been greatly enhanced by the incorporation of the newer observations from Harris and his school and from the Los Angeles group.

JOSEPH T. VELARDO
Yale University School of Medicine

Models of Man. Social and rational. Mathematical essays on rational human behavior in a social setting. Herbert A. Simon. Wiley, New York; Chapman & Hall, London, 1957. 287 pp. $5.

Herbert Simon's 16 "mathematical essays on rational human behavior in a social setting," gathered together under the title *Models of Man,* have appeared in recent years as separate technical articles. He has organized them into four groups and prefaced each section by a short introduction that establishes the common theme. Although the mathematical demands are not unduly severe or the mathematics unconventional, the book will be accessible mainly to those who have some knowledge of the general problem area and some technical facility with classical mathematics. Social scientists who possess the requisite skills should find much of the volume congenial. It is not polemic. ("In the long run, mathematics will be used in the social sciences to the extent that it provides a sufficiently powerful language of analysis and exposition to justify the time and effort required to use it.") And, in several of the papers, Simon has taken a well-known social theory as his starting point (see, for example, his formalizations of Festinger's and Homans' theories of group interaction).

There are three central, but independent, themes in the book: causation, social adaptation, and limited rationality. In the first series of essays, causation is treated essentially as unilateral interaction within a dynamic system, which is what Simon feels that practicing scientists—in contrast to philosophers—mean by the concept. The analysis is limited to those dynamic systems that can be described by certain fairly narrow classes of equations. These ideas for handling asymmetric relations are then applied to two substantive problems: political power and the influence of a social prediction (for example, prediction of the outcome of an election) on the actual outcome.

The first three papers on social adaptation, which formalize three current theories of group process, use familiar differential equation techniques to study social equilibriums and stability in human groups that are characterized in terms of certain aggregated group variables. As in the theories, no real analysis of the nature of the basic variables is presented, and, although this question is discussed in the introduction to the section, it is not disposed of to my satisfaction. "Friendliness," "activity," and "pressure to communicate" are extremely subtle, complex notions that are not clearly numerical in nature, and any model that assumes that they are may well have a fragile foundation. The final essay in this section—the best of the 16, to my mind—offers a general statistical mechanism to account for the diverse social distributions that exhibit the relationship known as Zipf's "law" or the rank-size rule.

Simon's final thesis is that "it is time to take account—and not merely as a residual category—of the empirical limits on human rationality, of its finiteness in comparison with the complexities of the world with which it must cope." He advocates a principle of bounded rationality under which, among other things, the goal of maximizing is to be replaced by what he calls "satisficing"—that is, achieving a criterion. What he means is amply illustrated in a variety of special cases, but nowhere is it formulated in sufficient generality to be really competitive with the traditional optimizing ideas.

The book suffers from what I am afraid must be the fate of any collection of journal articles. They have been written for experts and, hence, take for granted a familiarity with the literature, on the part of the reader, that cannot be supplied by the short connective sections. At the same time, in articles that were originally directed to different audiences, there is bound to be some redundancy and unevenness of level. Since Simon has a flair for exposition, we can only regret that he did not elect to rework this material into a fully integrated book.

R. DUNCAN LUCE
New York, New York

New Books

General and Applied Entomology. V. A. Little. Harper, New York, 1957. 551 pp. $7.

The Terpenes, vol. IV, *The Triterpenes and Their Derivatives: Hydrocarbons, Alcohols, Hydroxy-aldehydes, Ketones and Hydroxy-ketones.* The late Sir John Simonsen and W. C. J. Ross. Cambridge University Press, New York, 1957. 533 pp. $13.50.

Psychology, Evolution and Sex. Cecil P. Martin. Thomas, Springfield, Ill., 1957. 179 pp.

The Journal of a Scientician. Piero Modigliani. Philosophical Library, New York, 1957. 136 pp. $3.75.

Radioactivity and Nuclear Physics. James M. Cork. Van Nostrand, Princeton, N.J., ed. 3, 1957. 427 pp. $7.75.