

PREFACE

This Technical Report* (which is also an integral part of the new series of Technology Press Research Monographs) was written for several purposes. Primarily, it attempts to bring together in one place the views that this group has developed over the past half dozen years on processing the electrical data that we record from the nervous system. The methods that one employs in processing data are, of course, intimately related to the substantive problems that one is interested in, to the models that one has formulated, and to the capabilities of the instrumentation that is at one's command. Prevailing publication policies of most specialized journals make the discussion of these topics difficult, if not impossible. Since there is little overlap between those who read neurophysiological journals and those who are interested in communications systems, we felt that it might be useful to provide material of common interest to the various branches of the Communication Sciences.

Another motivating influence was the need to clarify our own views by making an over-all assessment of the techniques that we use in everyday research. The presentation that is given here will permit us in future research papers to refer to this monograph instead of having to include lengthy and perhaps not always appropriate discussions of data-processing techniques.

This is hardly the place to present a case history of how an experimentally oriented group evolves, how it works, and the factors that determine its choice of problems and its methods. We have greatly benefited from belonging to the intellectual community that the Research Laboratory of Electronics constitutes within "the Institute." The interest that Professor Norbert Wiener has shown in certain of our experiments has proven stimulating, and our association with Dr. Mary A. B. Brazier's group at the Massachusetts General Hospital has been beneficial. The assistance that the Digital Computers Group of the Lincoln Laboratory, under W. N. Papiian, and in particular, Wesley Clark, Jr., have given us has been invaluable.

The present report bears the traces (and indeed the scars) of multiple authorship. A group such as ours cannot claim to be a "team" nor is it something akin to a committee. The data contained in this monograph were collected by present or former members or associates of the group. The chapters were primarily written by those whose names follow the chapter titles. Among those who are not specifically acknowledged as co-authors have

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been some of our most faithful critics. They read and reread the successive versions of the different chapters and appendixes with almost as much ego-involvement as the authors. Among them should be singled out George L. Gerstein, who has performed above and beyond the call of his duty as a postdoctoral fellowship holder. Murray Eden, Belmont Farley, George Forsen, and Jan Kuiper helped us by their insistence on clarity. Professor William M. Siebert made an extraordinarily generous contribution to this monograph by writing what is to us an ideal introduction to the difficult topic of random processes. Appendix A reflects his sensitivity to the problems that concern us.

The technical services of the Research Laboratory of Electronics made their usual important contribution to the appearance and readability of this report. The Publications Office, headed by Mrs. Miriam C. Smythe, has had long experience in dealing with our prose in connection with the Quarterly Progress Reports of the Laboratory. It was in these reports that much of the material that is presented here was first discussed, usually in rather succinct form. Mr. Phokion Karas (from RLE's Photographic Service) and the personnel of the Drafting Room, under Mr. Charles P. Navedonsky, were of great assistance in the preparation of figures and graphs. Mrs. Aurice Albert and Mrs. Norma Getty assisted in many ways in the preparation of this monograph; Mrs. Albert, in particular, assembled Appendix D. It is a pleasure to acknowledge here the skill and the responsible manner in which Frank Nardo has collaborated in much of the processing of the data that are reported here. Miss Constance D. Boyd and Mrs. Ann Martin of the Technology Press exhibited unusual patience in the various phases of the manufacture of this monograph.

Finally, this series of acknowledgments would be extraordinarily incomplete were we not to express here our gratitude to one of our authors, who, with his other responsibilities, carried that of being the co-ordinating editor for the monograph: C. Daniel Geisler. Without his persistent, gentle prodding, without his industry and his common sense, we would have never come within striking distance of our deadlines; we might never have finished the job.

Walter A. Rosenblith

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PREFACE TO SECOND PRINTING

In the second printing we have kept changes to a minimum consistent with accuracy. The only sizable addition is to Appendix D, where we have brought the publications list up to date; we have not, however, incorporated into the text references more recent than the first printing of this monograph.

Dr. Eda B. Vidale's help in supervising the preparation of this second printing is gratefully acknowledged.

Walter A. Rosenblith

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