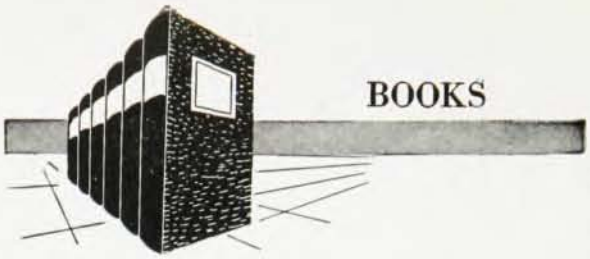

BOOKS

Democratic Strength

MODERN ARMS AND FREE MEN. By Vannevar Bush. 273 pp. Simon and Schuster, New York, 1949. $3.50.

If the uneasy progress of the cold war has given rise to any single well formed popular desire, it is that some convincing assurance be given that the present world armaments race shall not end in world disaster. It is the point of Vannevar Bush's book that disaster is unnecessary, that the democratic people, by acting wisely and with courage, have within their grasp the means (technical and otherwise) to make the future bright even in the midst of an armaments race. It is a comforting conclusion, and because Dr. Bush has had an opportunity to see perhaps with better perspective than any other person the overall picture of scientific warfare, and therefore to understand its dangers, it is a conclusion that carries weight.

Dr. Bush bases his argument upon two major premises. The first of these is that "the technological future is far less dreadful and frightening than many of us have been led to believe, and that the hopeful aspects of modern applied science outweigh by a heavy margin its threat to our civilization." In elaborating, he predicts that the defensive arts in warfare, rather than falling still farther behind the offensive, will become increasingly more effective and will soon regain the ascendency held by the defense in the first world war. He bolsters this by a critique of the various offensive techniques used in the last war. In a thorough, step-by-step discussion of each he depreciates the potential effectiveness of airborne assault operations, the high altitude bomber as a means of delivering atomic or other weapons, the great ships of the Navy, and the several forms of subversive attack, including biological warfare. His one major concession to the offensive is his unqualified respect for the snorkel-equipped submarine, and he makes the blunt point that the Navy's primary responsibility should be to meet this threat.

The second premise is "that the democratic process is itself an asset with which, if we can find the enthusiasm and the skill to use it and the faith to make it strong, we can build a world in which all men can live in prosperity and peace." The continuation, which gives eloquent testimony to Dr. Bush's personal convictions, is perhaps most interesting as it becomes a critical evaluation of the respective abilities of democratic and totalitarian systems of government to compete on a technological level. Dr. Bush has no doubts on this score, expressing a firm belief that the technology of a dictatorship, trapped within the narrow vacuum of state politics, cannot compete in the long run with the scientific freedom of a democracy. "This does not mean," he cautions, "that we can flatly disregard the Communist state and cease our advances in the techniques of war. The Communists can copy and improve, and a whole mass of scarcely developed techniques remains from the last war as material for this process. It does mean that we must continue to break new ground, and that we can do so with our heads high, for we have a system essentially adapted for the purpose, if we do not distort it or sacrifice it to false gods of fancied efficiency."

In spite of this reference to breaking new ground, Dr. Bush's forthright extrapolations over immense and uncharted distances seem to depend very largely upon an orderly development everywhere of military applications along already established and familiar lines. At face value, any prediction of an extended offensive-defensive stalemate in a world crowded with secret laboratories dedicated to the science of war would seem unrealistic and risky. Dr. Bush lists numerous attack methods which he agrees are capable of inflicting, under favorable conditions, great damage and many casualties, but somehow he finds comfort in the fact that none by itself is now an absolute and decisive weapon. Nor is it altogether reassuring to be led through an involved argument suggesting that the immense threat of biological warfare may be to some considerable extent minimized because "somewhere deep in the race there is an ancient motivation that makes men draw back when a means of warfare of this sort is proposed."

Yet the panorama that Dr. Bush presents is so sweeping and so comprehensive that it is misleading to examine it piecemeal; its object is to explore all elements of the national strength, and this he does in a compellingly individual manner. His remarks concerning the ideal political objectives of the ideal democracy may not meet with uniform agreement, but they will command attention because they are reasoned and articulate and forceful; neither can his commentary on education be taken lightly, for he is challengingly direct in calling for the immediate reexamination and remedy of outworn notions and practices.

Above all this is a book rooted deep in the conviction that progress is good, that the democratic environment is uniquely favorable to progress, that the future is unmistakably in our hands to do with as we will. R.R.D.

Essentially Applied

ACOUSTIC MEASUREMENTS. By Leo L. Beranek. 914 pp. John Wiley and Sons, Inc., New York, 1949. $7.00.

Dr. Beranek, who is technical director of the MIT Acoustics Laboratory, has written a useful book. He intends it for one thing as a reference volume for graduate students and research workers in the field of acoustics, but more than that the book was conceived as an aid to acoustic physicists interested in fundamental measurements, to communication engineers concerned with the performance of audio communication systems, to psychologists working in the field of hearing, to otologists studying hearing defects, and finally, to industrialists applying acoustic measuring techniques in manufacturing processes.

This is an extremely ambitious program, the last attempt of this magnitude having occurred fifteen years ago, when E. Waetzmann with the aid of about twenty collaborators published the two volumes entitled Technische Akustik in the series called Handbuch der Experimentalphysik. The Waetzmann group and Beranek posed for themselves similar tasks: namely to spell out the basic facts underlying acoustic measurements, to describe the most important acoustic appartus, to discuss the most useful methods of electro-acoustic measurement, and finally, to give as much theoretical material as necessary for the intelligent performance and evaluation of acoustic measurements. The mere enumeration of these tasks suffices to indicate the scope of the undertaking.

Beranek introduces his subject with a brief history of acoustic measurements, a 20 page section on terminology, and a generalized discussion of the propagation of sound through a medium that can be either free of obstacles or encumbered with spheres, cylinders, disks, and the like.

Following this, he goes into the matter of techniques for measuring sound pressure and particle velocity, being concerned largely with the reciprocity technique of calibration. Microphones and ears are treated at length; problems of measuring frequency, acoustic impedance, and man's ability to hear are discussed; various sound sources are considered for test purposes; and three chapters are devoted to the measurement of the characteristics of complex waves. Included in this section are discussions of some statistical properties of random noise, and also of various kinds of indicating instruments and analyzers.

The next major section of the book deals with tests: tests for microphones, earphones, loudspeakers, hearing aids, and other components of communication systems. And since we must test entire systems by means of listeners, there follows a chapter on articulation tests, including instructions for the statistical treatment of data. After two chapters dealing with room acoustics and acoustic materials the last chapter is dedicated to the sound level meter.

Beranek's book is certainly up to date as far as the American literature goes, although it bears perhaps too heavily the imprint of the last decade, which in Beranek's own opinion was essentially a period of applied acoustics. This was the period during which the author was in the thick of acoustic research, and therefore, perhaps, it has been somewhat difficult for him to apply in his writing the selective filtering that distance in either time or space naturally imposes. But in a sense it is a point of merit that Beranek has been a faithful recorder of the contemporary scene in American acoustics.

The style of his book is pleasant and only occasionally is it handicapped by its role of being almost a summary technical report. The level of exposition is appropriate for the public it wants to serve. One can safely predict that Beranek's book will find a place on the shelf of students and workers in acoustics. Those who do research in more fundamental aspects of the field will find it a convenient aid to be used in conjunction with basic works by such authors as Rayleigh, Morse, Bergmann, and others.

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More Usable Machines

APPLIED EXPERIMENTAL PSYCHOLOGY. By A. Chapanis, W. R. Garner, and C. T. Morgan. 434 pp. John Wiley and Sons, Inc., New York, 1949. $4.50.

Written as a beginning text in the field of engineering psychology, the style of writing in this book is exceptionally easy to follow and the authors have spared no means of making a rather difficult subject clearly understandable to anyone who might be interested.

The book is primarily concerned with what the communications engineer might call the coupling of a man to a machine. Important sections in it deal with means of displaying information, with the design of dials, with the design of tone signalling systems, with the design of controls such as those used in aircraft, and with the arrangement of work on production lines. Two excellent chapters are included which give summaries on the problems of fatigue, length of work periods, sleep, and on the effects of atmospheric conditions, noise, light, and color on human efficiency.

Applied Experimental Psychology differs markedly from previous books in the field in that it attempts to deal with the psychology of the human in relation to the job which he has to perform. Most of the results are in conformance with common sense. However, as an observer during the war, it was my experience that the average mechanical and electronic engineer pays little attention to what, after reading this book, seems obvious.

I was not able to discover any errors of consequence. At one point I was pleased to note four typographical errors in two sentences, only to find in the following sentence that the authors said I should have found five.

This work left me with one minor negative impression. The authors seem to have tried so hard to clarify the subject matter that they became a little talkative. The result was that insufficient space remained for them to introduce more detailed aspects of the experiments which they report. Also, in some cases, I feel that their attempts to simplify concepts leads one to believe that the data are of superficial significance.

It would please me to see this book on the shelves of electronic and mechanical design engineers throughout the country. I am certain that widespread reading of it will result in great improvement in the usability of machines of the future.

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Rockets

ROCKET PROPULSION ELEMENTS. By George P. Sutton. 294 pp. John Wiley and Sons, Inc., New York, 1949. $4.50.

In the growing engineering field of jet propulsion, perhaps the least well documented part is the one which relates to rocket power plants. Although rockets are devices of great antiquity, it is only in the last decade that serious effort has been made to develop them. It seems to this re-