

mism. Shortsighted maneuvers by Congress pose a threat to our ability to maintain leadership in nuclear engineering, which is a development that can evolve in a satisfactory manner only by being able to attract competent technical personnel. "If low salaries, lack of tenure, and occasional intemperate attacks were the only things to be borne they would not in themselves raise such a serious question," says Mr. Lilienthal. "The difficulties, however, are more fundamental. They consist in the growing evidence that a tendency toward detailed Congressional supervision of this and other essentially technical undertakings makes the doing of a creditable job quite impossible."

Those who have in the past disagreed with Mr. Lilienthal and TVA are perhaps not likely to be won over suddenly by what he has to say here; but for those who do agree and who have followed his career with appreciation and respect, the book will be of interest as a careful statement in review of those principles which he believes to be most important to the healthful continuance of a functioning democracy. RRD

Combustion Research

THIRD SYMPOSIUM ON COMBUSTION FLAME AND EXPLOSION PHENOMENA. 748 pp. Williams and Wilkins Company, Baltimore, 1949. \$13.50.

Anyone who has ever worked with internal combustion engines—whether of the reciprocating or turbine type—knows that the greatest problem facing the designer and the theoretical investigator is one of fuel combustion. Not only do the actual combustion and flame propagation present enormous difficulties but they lead to other complications in the method of injection and ignition of the fuel. Therefore there has been, and is, no real isolation of the problem.

The present volume, containing the collected papers of the third symposium on combustion flame and explosion phenomena (held at Madison, Wisconsin in September of 1948), represents a rather sweeping survey of the field, both theoretically and experimentally. A total of one hundred papers is included under eleven major headings, with the largest number appearing in the group, Kinetics and Mechanism of Combustion Reactions.

Exactly what happens inside a cylinder in which an explosion occurs has long been fascinating. Pictures have been taken and studied in minute detail but pre-ignition and unequal distribution of temperature and pressure still dog the footsteps of the investigator in this field. Despite the experimental evidence—which is all too sketchy—and the shrewd guesses of many theorists, the inside of any combustion chamber still remains a great mystery.

It is safe to say that carburetion and ignition gave more trouble to engine designers during the last war than other single items of design. When the reciprocating engine was deserted for the turbo-jet, ram-jet, and other types, the problems of combustion trotted right along. Keeping the fire going at an even rate is of fundamental importance, and is still to be completely settled. Whereas there were volumes written on compressors and turbines there was almost nothing written on combustion

chamber design and less on research in this field. Therefore the present volume takes on added importance because it puts another sorely needed book on a shelf which is too bare.

But lest the impression be given that combustion is important uniquely in the field of engine design we need only recall that combustion is of essential economic and physical (in the sense of health) importance to everyone who must use a source of heat other than the sun to warm his house. When on top of this it is remembered that liquid fuel supplies in the United States are dangerously low, then we see the added significance and need for knowledge concerning efficient combustion and flame propagation. Not only is this field of research of essential importance to many other fields but it also happens to be the field which, above any other known to the writer, has been most consistently neglected over the years. In an entirely different connection the necessity for greater knowledge concerning explosion and combustion phenomena is illustrated: namely in human safety. It is more than coincidence that many of the outstanding men in the combustion field are members of the scientific staff of the Bureau of Mines.

Obviously it is impossible to review a collection of one hundred learned papers in any space that a journal can reasonably allot. However, it might be of some interest and value to list the headings of the eleven divisions. They are: Flame Stabilization and Quenching; Flame Propagation in Explosive Gas Mixtures; Flames of Fuel Jets; Ignition of Gas Mixtures; Kinetics and Mechanism of Combustion Reactions; Flame Spectroscopy and Radiation; Burning Detonation of Explosives; Thermodynamics of Flame Gases and Thermochemistry; Experimental Techniques; Combustion in Engines and Rockets; and Gas Burners and Furnaces.

The volume is especially noteworthy as an example of excellent editing and publishing. All too frequently published collections of papers originally read at the meetings of learned societies give an impression of extreme haste and carelessness, as though the editor had placed the papers in the volume just as he had received them across his desk and without regard to their proper order within appropriate subject categories. No such charge may be made in this instance. Workers in this field, whether physicists, chemists, or engineers, will find this a useful book to have around. It may not answer all or even a majority of the questions likely to arise, but as a survey of the present state of knowledge it will be a valuable supplement to other kinds of research apparatus.

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Guessing Game

STOCHASTIC PROCESSES AND THEIR APPLICATION TO THE THEORY OF COSMIC RADIATION. By Niels Arley. 240 pp. John Wiley and Sons, New York, 1948. \$5.00.

An English translation of a Danish thesis first published in 1943, this book deals with the important problem of providing a mathematical theory of some aspects of cosmic ray showers. When a primary electron enters a layer of matter it has a chance of emitting a photon