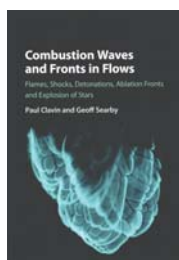


Combustion Waves and Fronts in Flows

Flames, Shocks, Detonations, Ablation Fronts and Explosion of Stars

Paul Clavin and Geoff Searby

Cambridge U. Press, 2016. \$190.00 (720 pp.). ISBN 978-1-107-09868-8



Paul Clavin and Geoff Searby's new book, *Combustion Waves and Fronts in Flows: Flames, Shocks, Detonations, Ablation Fronts and Explosion of Stars*, is a remarkable resource for both beginners and experienced researchers working in the field of combustion. Clavin and Searby were the leaders of a prominent laboratory in Marseille, France, the Institute for Research on Nonequilibrium Phenomena (IRPHE), which has been at the forefront of combustion research for more than 20 years. Their book is the most complete monograph on this topic to date. The only comparable work, Forman Williams's *Combustion Theory: The Fundamental Theory of Chemically Reacting Flow Systems* (Addison-Wesley, 1965), was the standard reference book in combustion theory until now. By skillfully adding results obtained in the past 50 years, Clavin and Searby have produced a splendid and up-to-date overview.

This book arrives at the right time to highlight the power and the importance of combustion theory. Over the past 10 years, numerical simulation, also called computational fluid dynamics, has become a standard tool in the field of reacting flows. Interest in theory has decreased as young researchers gravitated toward simulations and experimental work. This is unfortunate because theoretical results have shaped present research by providing the fundamental understanding of the mechanisms that control flames and fronts. Hopefully, Clavin and Searby will help bring young talents back to combustion theory. By gathering a century's worth of important theoretical results into a single textbook, they provide an excellent starting point for researchers who want to enter the field.

The authors use an innovative approach to organize their material. The first part of the book is a summary of the field's most important results, whereas the second part describes in detail the analytical tools used to obtain those results. Any researcher who wants to understand modern combustion research

should read the first part with attention. There, important concepts derived from theory, including flame speeds, flammability limits, ignition domains, stretch, curvature, and instabilities, are presented and explained.

The second part is more technical and will certainly become an essential reference for all readers willing to understand in detail how the material described in the first part is obtained. Many experimental results and recent simulations are used throughout the book to confirm theoretical predictions, which shows both the power and the limitations of theoretical models. Interestingly, the processes driving flames observed on Earth share many common features with mechanisms at work in stars and nuclear matter, and the authors include interesting studies of exploding stars and ablation fronts in inertial confinement fusion.

With its comprehensive, up-to-date, and creative coverage, *Combustion Waves and Fronts in Flows* fills an important gap in the existing literature and will be indispensable to researchers and students interested in the basic phenomena governing flames. I expect it will quickly become a classic in the field.

Thierry Poinso

CNRS, Institute of Fluid Mechanics
Toulouse, France

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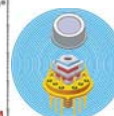
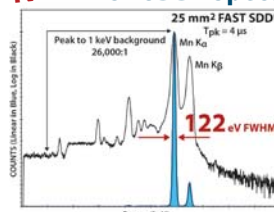
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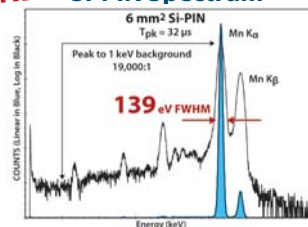
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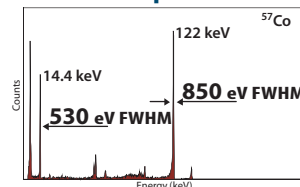
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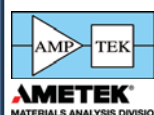
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