Hydrodynamic Instability

PROCEEDINGS OF
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VOLUME XIII

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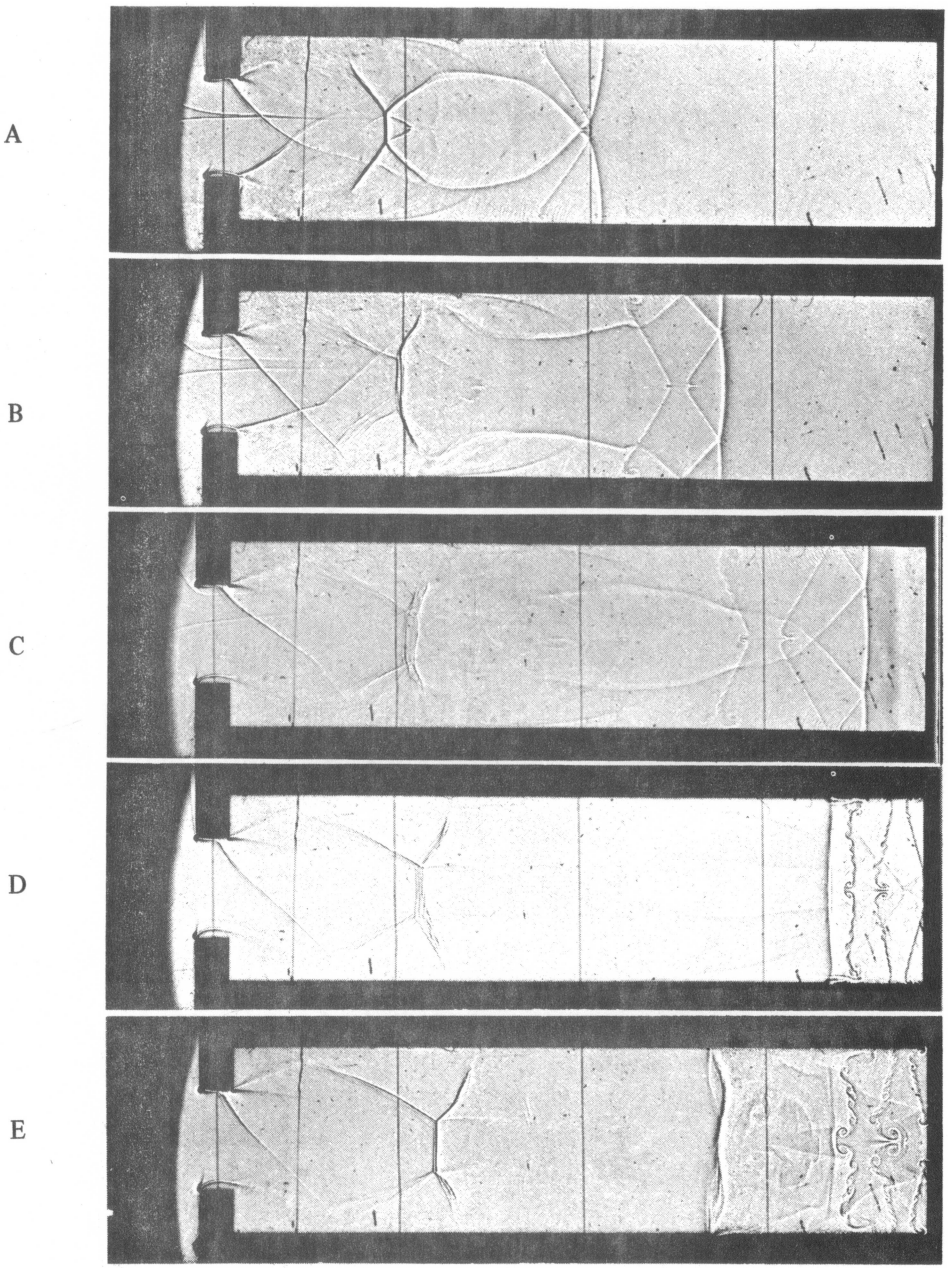

Diffraction of a Mach 2.1 shock wave, showing Helmholtz instability of slip lines (see p. 77)

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HYDRODYNAMIC INSTABILITY

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FOREWORD

This volume deals with the following loosely related subjects: hydrodynamic instability, the statistical theory of turbulence, water waves, waves in a medium with random properties, and the theory of guidance and control. These subjects all use similar mathematical methods and ideas, and it seemed impossible to give an adequate picture of contemporary views about hydrodynamic instability without touching on them all. The fact that such a diversified group of problems are exhibited in hydrodynamics alone can only make one admire the inexhaustibility of fascinating problems that occur in nature. Yet we have hardly tapped on the range of problems that arise in astrophysics.

Even a casual perusal of the papers below will bring out a steady trend in theories of hydrodynamic instability, from the linear deterministic processes analyzed so successfully by Kelvin and Rayleigh, to *nonlinear random processes* whose theory must be regarded as the primary goal of future research efforts. We hope this book will help to stimulate and guide such efforts.

The editors wish to thank the authors for providing an excellent collection of papers dealing with such a diversified group of topics and for their cooperation in the publication of this volume.

G. Birkhoff
R. Bellman
C. C. Lin

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AUTHOR INDEX

Italic numbers refer to pages on which a complete reference to a work by the author is given.

Roman numbers refer to pages on which a reference is made to a work of the author. For example, under Minkowski would be the page on which a statement like the following occurs: "This theorem was proved earlier by Minkowski [7, § 2] in the following manner. . . ."

Boldface numbers indicate the first page of articles in this volume.

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