
Preface

This book is a tribute to a prodigious man, Henry Stommel, on the occasion of his sixtieth birthday, September 27, 1980. In the course of his scientific career, his influence on the development of physical oceanography during nearly four decades has been immense. At the center of that influence has been the originality and penetration of his own research, which, in major part, has generated the modern concepts of ocean circulation. The fruits of his thinking are much more widespread than is apparent from his own work, however, for by his enthusiasm and intellectual vigor, he has stimulated many investigators to follow lines of inquiry that he foresaw as fruitful and revealing but that were too numerous to be pursued by himself. He is a theorist of extraordinary creativity, an astute observer willing to spend weeks at sea, and an ingenious laboratory experimentalist of the sealing-wax-and-string school, and he has been an inspiring, if sometimes bewildering, teacher to a generation of graduate students. Many have been drawn into his orbit simply by the fascination of his personality, for in company with these scientific activities, the variety of Stommel's avocations is also overwhelming. He pursues these interests with exuberance, whether it be as gentleman farmer, amateur painter, home printer, Oriental chef, marine antiquarian, musicboxicologist, or alarmingly casual experimenter with explosives. His pranks are a delight to most who witness them, his kindnesses have been felt by many, and his charm has won him widespread affection.

In considering a fit celebration of Henry Stommel's sixtieth birthday, we thought at first to solicit reports on research projects from his colleagues, students, and other friends, in the manner of the traditional *Festschrift*. We recognized almost immediately, however, that these contributors would be so numerous as to make the book impossibly large and forbidding. It seemed to us, moreover, that Stommel's preeminent position in oceanography warranted something more far-reaching and enduring than could likely be achieved by a collection of current research reports. We therefore suggested to certain of his colleagues that they prepare broad, comprehensive surveys of those aspects of oceanography with which Stommel has been concerned. Our aim was twofold: (1) to trace the development of these subjects since the time when Stommel entered the field; and (2) to lay out in specific terms the state of these subjects now—where we are and how we arrived, what is known and what seems probable, and what seem to be the key questions. The beginning of Stommel's career seemed a useful date from which to review the development of physical oceanography because it coincided roughly with the publication of *The Oceans* (1942), which had brought together much of what had gone before, and with World War II, which

marked an important transitional period in the history of the subject. Furthermore, the scope of Stommel's research interests is so wide that surveys oriented around them would embrace nearly all of physical oceanography. For these reasons, we thought that a book so organized could serve at once as a very personal tribute to Henry Stommel and as a widely useful general account of physical oceanography in 1980.

The project turned out to be less easy to define and more difficult to carry out than we anticipated. Prescribing that the historical reviews cover the years since the early 1940s, for example, sometimes proved somewhat artificial and impractical, for a few topics warrant a longer perspective, while for a few others only work in the last one or two decades is really pertinent. We are deeply grateful to the contributors, who by intense efforts met this volume's demanding publication schedule, and to those individuals who provided useful criticism. We hope that these surveys will remain of both technical and historical interest for many years to come.

While scientific chapters constitute the bulk of this volume, they are preceded by a short section that attempts in various ways to capture something of Henry Stommel himself. Two friends and collaborators, Arnold Arons and George Veronis, have provided personal perspectives and assessments of Stommel's scientific contributions. Three other old friends, Raymond B. Montgomery, G. E. R. Deacon, and F. C. Fuglister, have written brief reflections that further illuminate facets of his personality and of the historical period in which he did his early work. The ways of doing oceanography have changed so much that the scientific world of that time might seem very strange to graduate students today. In addition we have included two informal photographs that hint at his approach to life, and reproductions of two emblems designed by him that exemplify one of the less heralded aspects of his creativity.

Owing to the plan of this volume, the number of authors is necessarily relatively small, and specific individuals were asked to contribute to the project as much for their expertise as for their personal associations with Stommel. We hope that his many friends who, for these reasons, were not invited to participate will appreciate the difficulty of preparing an anniversary volume that is suitable for so remarkable a man.

Our choice of title for this volume reflects our view that physical oceanography has not merely changed during the progress of Stommel's career, but has evolved in a certain general direction. Henry Stommel himself appealed for such an evolution, first in his pamphlet, "Why Do Our Ideas about the Ocean Circulation Have Such a Peculiarly Dream-Like Quality?" (1954), and again, with slight rewording, in his book *The Gulf Stream* (1958, 1965):

I should like to make it clear, finally, that I am not belittling the survey type of oceanography, nor even purely theoretical speculation. I am pleading that more attention be given to a difficult middle ground: the testing of hypotheses. I have not explored this middle ground very thoroughly, and the few examples given in this book may not even be the important ones; but perhaps they are illustrative of the point of view in which attention is directed not toward a purely descriptive art, nor toward analytical refinements of idealized oceans, but toward an understanding of the physical processes which control the hydrodynamics of oceanic circulation. Too much of the theory of oceanography has depended upon purely hypothetical physical processes. Many of the hypotheses suggested have a peculiar dream-like quality, and it behooves us to submit them to especial scrutiny and to test them by observation.

While the "testing of hypotheses" may not, strictly speaking, have become commonplace yet, nevertheless the convergence of theory and observation that is implied in the phrase is certainly growing closer and more evident. Indeed, it is an underlying theme of many of the chapters in this book, and to our eyes it seems to offer an overall definition of the evolution of physical oceanography during the latter half of the twentieth century.

The Office of Naval Research and the National Science Foundation have joined in this celebration by generously assuming partial costs for the publication of this volume. Their support will help to make the book accessible to a much larger group of scientists and students than otherwise would have been possible.

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Woods Hole, Massachusetts
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