Foreword

Modern ocean acoustics began with the discovery of the ocean sound channel on April 3, 1944. Ewing and Worzell sailed out of Woods Hole Harbor aboard the Saluda and lowered a hydrophone to 1,300 m to listen to 2-kg charges at up to 1,000-km ranges. They reported a signature so sharp that it would be "impossible for the most unskilled observer to miss it" (not true). They also predicted that some day it would be possible to transmit over 10,000-km ranges (true). Later that year, the Russian acoustician Brekhovskyikh accidentally recorded a signal that he attributed correctly to transmission through a waveguide. In both countries the work was part of a classified effort in Anti-Submarine Warfare (ASW); Ewing and Brekhovskyikh did not learn of each other's work for years to come.

The following three decades saw intensive international efforts in ASW and associated acoustic problems. Progress was limited, not so much by a lack of understanding of acoustics but instead by a lack of understanding of underlying ocean physics.

The very essence of ocean acoustics is its inherent variability. Phases and amplitudes vary in a complex manner. Fadeouts are the rule rather than the exception. Early on, this inherent variability was attributed to isotropic homogeneous ocean turbulence; ocean turbulence is neither isotropic nor homogeneous. *Sound Transmission through a Fluctuating Ocean*, published by Flatté and co-workers in 1979, suffered from a lack of understanding of the ocean environment and limited observations.

At this very time, oceanography was going through the mesoscale revolution. For more than a century we had ignored the decisive role played by ocean weather. In fact, the ocean has a weather; storms are called mesoscale eddies. They have typical scales of 100 km and 100 days (compared to 1000 km and 3 days in the atmosphere). Single ships sailing at 12 knots and never repeating a station are incapable of resolving ocean weather. Carl Wunsch and I had spent a sabbatical year at Cambridge University trying to come up with an observational strategy that could. We ended up with "Ocean Acoustic Tomography," the use of sound

transmission as a tool for learning about the oceans rather than observing the oceans as a tool for learning about sound transmission.

Since the publication of *Sound Transmission through a Fluctuating Ocean*, there has been tremendous progress in observational techniques and analyses of the propagation of sound through the ocean. The author has significantly contributed to both; this book pays proper attention to both.

The time to review a subject is when it is being rapidly developed rather than when it is being put to bed. This is the right time for publication!

Walter H. Munk