

Twentieth Symposium on NAVAL HYDRODYNAMICS

**Ships in a Seaway
Propeller Cavitation Performance
Ship Motions Under Way; Wave Resistance
Oscillating Propulsors
Ship Motions—Nonlinear
Cavitation
Propeller Noise
Ships in Shallow Water
Cavitation Inception; Supercavitating Flows
Diffraction; Nonlinear Drift
Wave Breaking
Near-surface Turbulence
Ship-generated Vortices
Hydrodynamic Impact
Bubble Flows
Waves
Turbulent Ship Flows
Ship Viscous Flows
Forced Wave Motion
Computation of Viscous Propulsor Flows**



Attendees at the Twentieth Symposium on Naval Hydrodynamics, Santa Barbara, California, August 21-26, 1994.

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FOREWORD

The Twentieth Symposium on Naval Hydrodynamics was held in Santa Barbara, California, from August 21-26, 1994. This international symposium was organized jointly by the Office of Naval Research (Mechanics and Energy Conversion S&T Division), the National Research Council (Naval Studies Board), and the University of California, Santa Barbara. In addition to promoting the exchange of naval technical research developments of common interest to all the countries of the world, this biennial symposium encourages both formal and informal discussion of the presented papers, and the occasion provides an opportunity for direct communication among international peers.

More than 130 participants from 13 countries attended the symposium. The attendees represented a mix of experiences and expertise: some were newly graduated students and others were of established international repute. Sixty-six papers were presented in twenty topical areas, including ships in a seaway; propeller cavitation performance; ship motions under way and wave resistance; oscillating propulsors; ship motions—nonlinear; cavitation; propeller noise; ships in shallow water; cavitation inception and supercavitating flows; diffraction and nonlinear drift; wave breaking; near-surface turbulence; ship-generated vortices; hydrodynamic impact; bubble flows; waves; turbulent ship flows; ship viscous flows; forced wave motion; and computation of viscous propulsor flows. These topical areas were chosen because of the recent significant advances made in them. Examples of such advances presented in the papers include nonlinear motions for ships in seaways, the effect of irregular waves on extreme ship motions, the effect of three-dimensional propeller geometry on cavitation, acoustic radiation produced by unsteady propeller cavitation, shallow

water ship hydrodynamics, numerical experiments for breaking waves, direct simulations of free-surface turbulent flows, computations of bubble interactions with turbulent flows, computations of unsteady viscous three-dimensional propeller flows, and near-field numerical prediction of turbulent nonlinear free-surface flows around ships.

This brief list illustrates the quality and timeliness of the symposium for naval hydrodynamics. This occasion for the symposium marked its twentieth anniversary.

During the opening ceremony, the prestigious Distinguished Public Service Award was presented to Marshall Tulin by RADM Marc Pelaez, USN, Chief of Naval Research, on behalf of John Dalton, Secretary of the Navy, for a distinguished career and achievements that include the founding of this symposium series.

The success of this symposium was the result of hard work on the part of many people. The Organizing and Paper Selection Committee consisted of myself, Dr. Patrick Purtell, and Mr. James Fein (Office of Naval Research), Mr. Lee Hunt (National Research Council), Prof. Marshall Tulin (University of California, Santa Barbara), and Dr. William Morgan and Dr. Justin McCarthy (David Taylor Model Basin). The contribution of this committee was certainly the cornerstone for the success of the symposium. However, the administrative preparation and execution would not have been possible without the support of Mrs. Susan Campbell, Mrs. Mary G. Gordon, and the staff of the Naval Studies Board of the National Research Council.

Edwin P. Rood
Office of Naval Research

Department of the Navy



Certificate of Award

*In appreciation of
Distinguished Public Service
to the Department of the Navy*

The Secretary of the Navy

takes pleasure in presenting the

DISTINGUISHED PUBLIC SERVICE AWARD

to **Marshall P. Tulin**

for services set forth in the following

CITATION

For his contributions to improving the quality of the National Academy of Engineering which has been instrumental in providing direction to the naval hydrodynamics community as a whole. Specifically, Professor Tulin's prediction techniques for spray generation and deck wetness, and for dead water effects in stratified waters, have profoundly influenced the conceptual designs for future surface ships operating on the high seas and in shallow littoral waters. His design, construction, and implementation of a novel wave-and-wind tow tank has educated numerous students with significant impact on national and international expertise in naval hydrodynamics. Professor Tulin's dynamic involvement in the procedures and decisions affecting naval hydrodynamics research is legendary. He founded the Office of Naval Research Symposium on Naval Hydrodynamics and is organizing the 20th symposium. These unique international meetings provide for the exchange of interdisciplinary research results and ideas important for the advancement of naval hydrodynamics. Professor Tulin's dedicated service to naval hydrodynamics research has reflected great credit upon himself and his University, and has been invaluable to the naval hydrodynamics community and the Department of the Navy.



John H. Dalton
Secretary of the Navy

18 May 1994
Date

The prestigious Distinguished Public Service Award presented to Professor Marshall P. Tulin, Director, Ocean Engineering Laboratory, University of California-Santa Barbara, by RADM Marc Pelaez, USN, Chief of Naval Research, on behalf of John Dalton, Secretary of the Navy, for a distinguished career and achievements that include the founding of this symposium series.



**Professor Marshall P. Tulin, Director, Ocean Engineering Laboratory
University of California-Santa Barbara.**

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