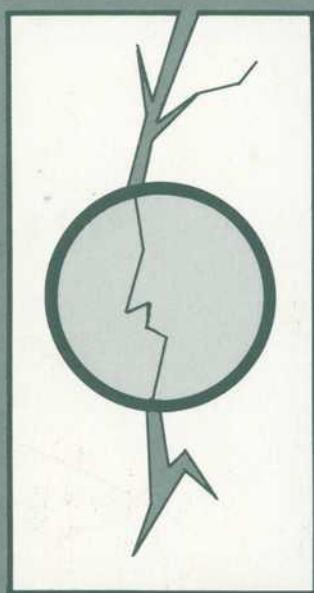


# Mechanics of **FATIGUE** **CRACK** **CLOSURE**



**Newman/Elber**  
EDITORS

**ASTM** STP 982

**STP 982**

# ***Mechanics of Fatigue Crack Closure***

*J. C. Newman, Jr. and Wolf Elber, editors*



ASTM  
1916 Race Street  
Philadelphia, PA 19103

ASTM Publication Code Number (PCN):04-982000-30  
ISBN: 0-8031-0996-2  
Library of Congress Catalog Card Number: 88-6303

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The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of these peer reviewers. The ASTM Committee on Publications acknowledges with appreciation their dedication and contribution of time and effort on behalf of ASTM.

# Foreword

The International Symposium on Fatigue Crack Closure was held in Charleston, SC, on 1–2 May 1986. ASTM Committees E-24 on Fracture Testing and E-9 on Fatigue were co-sponsors. J. C. Newman, Jr., NASA Langley Research Center, and Wolf Elber, U.S. Army Aerostructures Directorate, presided as symposium chairmen and are editors of this publication.



**Herbert F. Hardrath**

## **Dedication**

*Herbert F. Hardrath contributed greatly to the success of ASTM Committee E-9 on Fatigue. He was a member of the committee from 1958 until his death on 25 September 1985, and was the Chairman of Committee E-9 from 1966 to 1971.*

*Herb grew up in Manitowoc, WI, and joined the Navy during World War II. He received a Bachelor of Science and a Master of Science degree in Civil Engineering at Tulane University and the Case Institute in Cleveland, OH. In 1947, he joined the National Advisory Committee on Aeronautics (NACA) as a Structural Engineer to forge a fatigue research effort. In 1952, he became the Head of the embryonic Fatigue Section. Under his leadership, the Fatigue Section became a Branch at the National Aeronautics and Space Administration (NASA) Langley Research Center. In 1970, he was elevated to Assistant Division Chief of the Materials Division. Also in 1970, he received a Special Achievement Award for his amassed contributions. Herb retired from NASA in 1980.*

*Herb was very active in ASTM Committee E-9 on Fatigue. He received the ASTM Award of Merit in 1970 for his many contributions to fatigue research and for the development of fatigue standards. He was invited, in 1970, to present the AIAA Structures Design Lecture. In 1972, he presented the ASTM Gillett Memorial Lecture and, in 1974, he presented the AIAA Dryden Research Lecture. Because of his expertise in fatigue and fracture mechanics, Herb was chosen to be part of a select group to visit technical centers in the U.S.S.R. in 1976.*

*Herb was the United States delegate to the International Committee on Aeronautical Fatigue (ICAF) from 1965 to 1980. In 1971, he hosted an international meeting of ICAF in Miami, FL. He presented the Sixth Plantema Memorial Lecture to open the 1977 ICAF meeting in the Federal Republic of Germany.*

*As an eminent fatigue expert, he was chosen to participate in many investigations of fatigue problems in military and commercial aircraft, such as the B-47, F-111, C-5, and the DC-10.*

*Herb is remembered for more than his technical accomplishments; he was a model for personal integrity and dedication.*

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ISBN 0-8031-0996-2