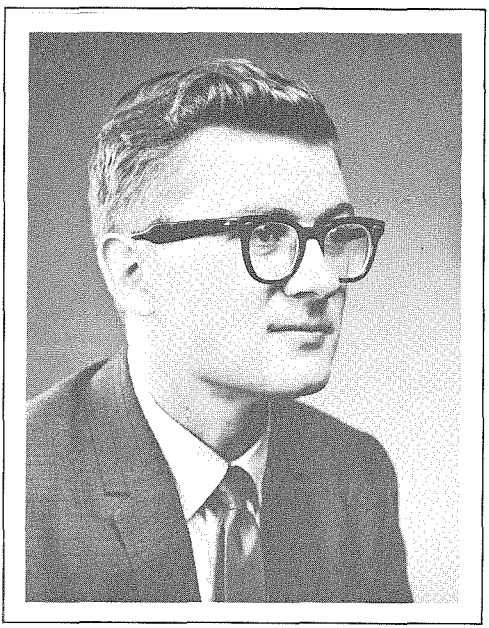
AMERICAN GEOPHYSICAL UNION

of the

NATIONAL ACADEMY OF SCIENCES–NATIONAL RESEARCH COUNCIL

Fifth Award of the

JAMES B. MACELWANE AWARD



DON L. ANDERSON

Presented at the Honors Meeting of the

AMERICAN GEOPHYSICAL UNION

APRIL 20, 1966

VIRGINIA SUITE
SHERATON-PARK HOTEL

8:00 p.m.

Biographical Sketch

Don Anderson was born in Frederick, Maryland, thirty-three years ago. He took his Bachelor's degree at Rennselaer Polytechnic Institute in 1955. Between 1955 and 1958 he worked for Chevron Oil Company, served in the Air Force, and conducted research for the Arctic Institute of North America. He received his Ph.D. from Caltech in 1962, where he currently serves as Associate Professor of Geophysics.

Don L. Anderson has utilized the range of modern observations concerning seismic body and surface waves, the free vibrations, and the loss characteristics of all these to re-evaluate and to revise interpretations of the elastic and anelastic structure of the Earth. He has analyzed recent observations of large artificial explosions to elucidate the complex events in the epicentral range 10°–40°, where he finds that a succession of triple-valued travel-time curves appears to occur. These curves are interpreted in terms of two regions of rapid increase in both velocity and density, one at the bottom of the Gutenberg low-speed zone at depth 300 km, the other at depth 600 km. These interpretations are consistent with the results from free-mode observations. The two levels of rapid changes may represent zones of phase change. In the lower mantle, the density increases very slowly relative to the rates in the earlier Earth models.

With his co-workers Archambeau, Kovach, and Ben-Menahem, he has estimated the distribution of the dimensionless quality factor Q, finding very low values in the low-speed layer relative to the high values in the lower mantle. The Q values in the upper mantle are roughly in constant ratio at corresponding depths to viscosity values deduced by McConnel from the uplift of Fennoscandia. On the assumption that this ratio remains approximately the same in the deep mantle, a less deformable lower mantle of high viscosity is indicated. This large indicated difference in viscosity between the upper and lower mantle reconciles the rapid postglacial uplifts with a slow rate of adjustment needed to account for the slightly nonhydrostatic shape of the Earth. Although still controversial, this hypothesis must be reckoned as a major one in explaining the mechanical properties of the Earth.

Anderson has used the extensive information about the properties of the Earth's mantle as a function of pressure and temperature to predict the structure of the Moon and nearby planets. Thus, by drawing from the newest techniques of seismology, many of which he pioneered himself, and by using the most recent data from solid-state physics, he has paved the way for a new attack on the large-scale and basic problems of planetary processes.

EARL G. DROESSLER, *Chairman*
FRANK PRESS
LOUIS B. SLICHTER

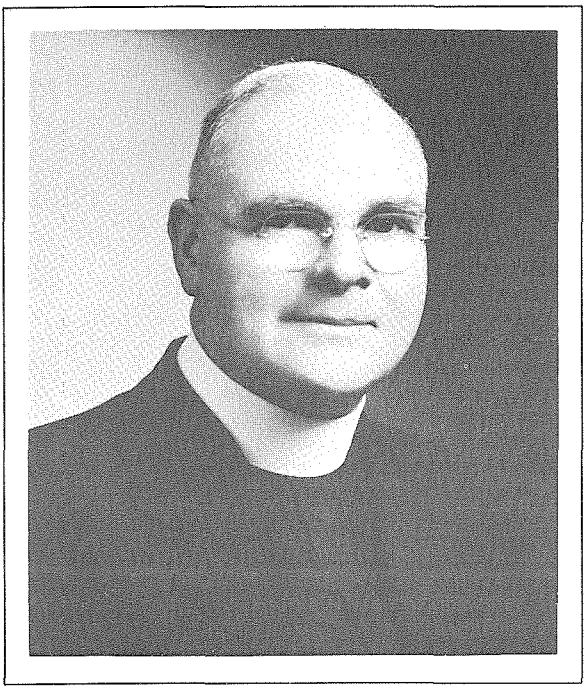
Award Statement

(1) The principal purpose of the James B. Macelwane Award is to inspire young scientists in the pursuit of excellence in the geophysical sciences by recognizing those scientists of outstanding ability at the earliest possible age.

(2) The James B. Macelwane Award is given by the American Geophysical Union in recognition of outstanding contributions to the geophysical sciences by a young scientist.

James B. Macelwane (1883-1956)

James B. Macelwane is remembered as the founder of the first institute of geophysics in our country, as the tireless promoter of innumerable activities advancing the geophysical sciences, and as an enthusiastic teacher and counselor of young scientists. From 1925 until his death he was Professor of Geophysics and Director of the Department of Geophysics in Saint Louis University. There, in 1944, he established the Institute of Technology, the University's School of Earth Sciences and Engineering. His other offices and activities included presidency of the



JAMES B. MACELWANE

Jesuit Seismological Association, membership on the National Science Board and in the National Academy of Sciences, and Chairmanship of the U. S. Technical Panel on Seismology and Gravity for the International Geophysical Year. In 1926 Father Macelwane became an active member of AGU, later serving as President of the Section of Seismology and from 1953 until his death, as President of AGU. For his constant efforts on behalf of the advancement of the geophysical sciences, he was honored as the Bowie Medalist of AGU in 1948.

Previous Recipients of the James B. Macelwane Award

James N. Brune	1962
Alexander J. Dessler	1963
Klaus F. Hasselmann	1964
Gordon J. F. MacDonald	1965