space plasmas. As a result, the reader will often see how a plasma physics principal is applied to the space environment. While this is desirable, it also means that some topics are not covered in as much depth as one may wish. For example, the discussion on solar wind is somewhat brief and does not include topics such as the calculation of the garden hose angle or magnetic field strength as a function of distance from the Sun. Similarly, topics such as sector boundaries or high-speed streams are not covered. The equations are often derived in a short and sweet manner, giving the book a nice flow, but those desiring a more lengthy treatment of the derivations may need to consult other books. Also, the equations are not always derived from first principals. For example, the equation describing the atmospheric density profile as a function of height is given without reference to the principal of hydrostatic equilibrium. So depending on the circumstances, instructors may need to provide supplemental information to the students.

According to the authors, the chapters are expansions of lecture notes from a two-semester course given to third year undergraduate and graduate students in geophysics. It is difficult, however, to pinpoint a group of students for whom the entire book is suitable. Some chapters or sections contain clear and physical descriptions of a concept without detailed mathematics, making them more suitable for undergraduates or nonspecialists. Others require a level of sophistication which is geared more toward graduate students. Some instructors may choose to skip around a bit to fit the needs of their students. Similarly, some may wish to present parts of the book in a different order to avoid situations such as having to discuss shock waves prior to the introduction of plasma waves, for example.

Overall, this book is a valuable addition to the literature. My biggest disappointment is that it does not contain much of the recent theoretical and observational developments in the field. A companion book by the same authors titled *Advanced Space Plasma Physics* may present more of this material.—*Nick Omidi, SciberNet Inc.; and University of California at San Diego*

AGU

Kanamori Receives the Bucher Medal

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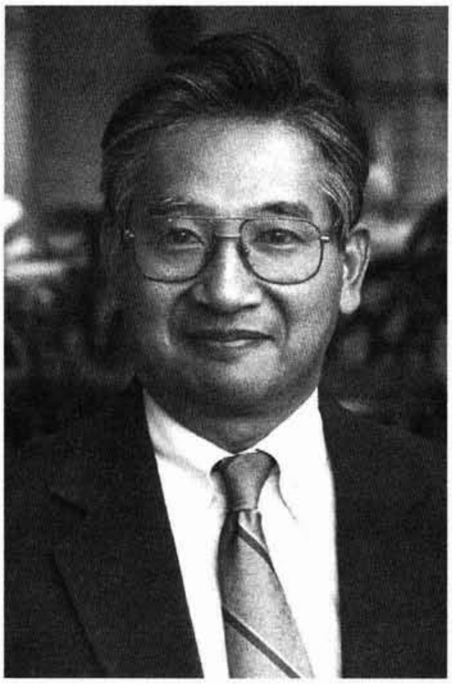
Hiroo Kanamori was awarded the Walter H. Bucher Medal at the AGU Fall Meeting Honors Ceremony on December 17, 1996, in San Francisco, California. The Bucher Medal recognizes original contributions to the basic knowledge of the Earth's crust. The award citation and Kanamori's response are given here.



Citation

"It is a pleasure to introduce the recipient of the Bucher medal, Hiroo Kanamori. We honor him for outstanding contributions in the use of seismological methods to study the physics of earthquakes and the tectonic processes that cause them.

"The ideal seismologist would have three talents: (1) a sophisticated understanding of the physics of seismic wave generation and propagation; (2) an uncanny ability to extract information from seismograms (both intuitively and via digital data processing), and (3) the geophysical intuition to use seismograms to both ask and answer questions about how the Earth works. Many fine seismologists have one of these talents, a select few have two, and Hiroo excels at all three.

"Hiroo's research career began in the early sixties at Tokyo University, where he helped develop a seagoing gravimeter and worked on high-pressure mineral physics experiments. He began work in seismology in the late sixties, by which time the formulation of plate tectonics showed how valuable seismological data could be in tectonic studies. At that time, however, techniques existed to exploit only a small fraction of the information in seismograms. In particular, only the times of first-arriving seismic waves and their polarities were used to infer the location and fault geometry of earthquakes. As a result, seismologists could study only the initial rupture of large and complex earthquakes and were seriously hampered by the comparative sparseness of seismic stations, including their restriction to on-land sites.

"In the past 20 years, however, this situation has changed dramatically as a result of pioneering studies by Kanamori and others. One of the key elements came from advances in the theory of the Earth's normal modes, which can compute the entire displacement field generated by an earthquake. One of the most successful approaches, introduced by Kanamori in 1970, used mode theory to study earthquake sources utilizing seismograms recorded at different azimuths from the earthquakes. In short order, first in Japan and then after he came to Caltech, Hiroo studied the major subduction zone earthquakes. These included the gigantic 1960 Chilean earthquake, which he estimated had an average slip of 21 m on a 800 by 200 km fault. He not only used the seismic data from the world-wide Standard Seismograph Network, which were then state of the art, but also developed methods to analyze older data from important earthquakes, including the great 1923 Tokyo earthquake.

"His series of papers based on these studies led to much of our current picture of how the largest earthquakes reflect the release of strain built up at the locked interface between the subducting and overriding plates. Kanamori also showed that some large earthquakes indicate internal failure of the subducting slab under its own weight.

"He went on to propose that there were systematic differences between subduction zones in the fraction of the total plate motion that occurred as seismic slip and that these differences reflected fundamental differences in the nature of the plate interface that were also manifested in the pattern of volcanism and subduction zone morphology.

"Hiroo has also been one of the leaders in elucidating the physics of earthquakes. His work clarified the relationship between the measured seismic moment and the minimum energy released by earthquakes and established the 'moment magnitude' scale, which provides a consistent way of characterizing the size of earthquakes from small to large, while maintaining continuity with the work of Richter and Gutenberg.

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"Another important thrust of his work has been developing methods to use seismograms to study the details of earthquake rupture. Hiroo has been one of the leaders in showing how during earthquakes the amount of slip varies significantly in space and time along faults. These results, some of which can now be confirmed by high-resolution geodesy, provide the 'ground truth' for attempts to use the results of laboratory studies and theories of fracture to understand how earthquakes actually start and work.

"These are a few highlights of his accomplishments: time prohibits me from saying much more. I do not have time to discuss many others, including development of a sophisticated new seismic network in southern California, contributions to understanding California earthquakes and tectonics, and efforts to understand and reduce earthquake hazards. Similarly, I can only briefly note his overall impact on seismology and geophysics, via his publications, his professional service, and his interactions with others. I vividly recall many late night sessions with him when I was in graduate school, discussing both specific research questions and more general geophysical issues. It seemed as though Hiroo knew just about everything about earthquakes and seismology and a lot about almost any topic in geophysics. The opportunity to exchange ideas and learn was invaluable. My experience is surprisingly common: both in Japan and in the United States, an enormous number of us have been influenced by Hiroo as students, coworkers, colleagues, and students of his students.

"His skill, and insight, and his willingness to share them have done much to shape geophysics. We are very fortunate to have him."—*Seth Stein, Northwestern University, Evanston, Ill.*

Response

"Thank you, Seth, for your very kind words.

"When I heard that I would receive the Walter H. Bucher medal, I was certain that the AGU had mixed up the names. I know that there are many people who would deserve this medal much more than I do. However, after it was confirmed that the letter was correctly addressed, I decided that it is not necessarily given to me as an individual, but is given to the type of science I do; I am grateful to the American Geophysical Union for this.

"I realize that I am not very effective in organizing, promoting, and managing big science programs. I like to solve some of the mysteries that nature presents to us using whatever tools I can manage to use. I have many fond memories of pondering over some curious problems, coming up with some rough ideas, and finally solving them to my satisfaction. I was fascinated by spectacular long-period waves from giant earthquakes, slow earthquakes, world-circling seismic waves caused by the Mt. St. Helens eruption, atmospheric oscillations excited by the Pinatubo eruption, strange seismic signals during the passage of a space shuttle over Los Angeles, etc. Unfortunately, my ability is limited, so I needed lots of help from my colleagues, associates, and students through hours and hours of discussions.

"I would like to thank the late Hewitt Dix, who gave me an opportunity to work at the California Institute of Technology as a "freelance" postdoctoral fellow in 1965. The old Seismological Lab in a mansion on San Rafael Hill in Pasadena had a special atmosphere. During my postdoc years, I was lucky to have a small desk set up for me at a corner of a large conference room where I could talk to many graduate students, like Lane Johnson, Leon Teng, and Francis Wu, and to all the distinguished visitors and seminar speakers passing by my desk every day. I benefited from numerous coffee break discussions in the basement among a complex array of heating pipes and telephone switches. Don Anderson, Clarence Allen, Stewart Smith, Jim Brune, and Charles Richter were among the frequent participants. Numerous conversations with them, including some monologues from Charles Richter, helped me prepare myself for becoming a professional seismologist.

"When I came to Caltech in 1972, with the encouragement from Bob Sharp, Gene Shoemaker, and Don Anderson, the Seismological Lab converted a bathroom attached to the former Hugo Benioff's office into my new office. For several months thereafter, I took advantage of the wisdom of the many visitors who inadvertently rushed into my office. Many of these inevitably hasty interactions turned out to be key to solving many mysterious problems later. I feel that the type of interactions I had during those days in the cluttered Lab had a profound influence on shaping my career. This good tradition was kept up in the present Seismological Lab, and I have opportunities to learn from even more people, including colleagues, students, and visitors; many of them are sitting in this room.

"I was very excited when I thought that I finally understood what nature is telling me. Then some of my colleagues told me that someone else had already discovered it. In some cases someone, very often one of my students, later disproved my conclusion. Despite these unfortunate events, I have been very lucky to work with good colleagues, students, and staff, both in Japan and the United States. I regret that the names are too numerous to mention here, but I sincerely thank all the people who shared with me the excitement of finding the secret of nature.

"Unfortunately, it is getting more and more difficult to get support for this type of science. I believe many of my colleagues feel the same way and are struggling to get support for their research. In this regard, I especially thank the American Geophysical Union for recognizing the importance of intellectual endeavor in promoting science for the future.

"Finally, the experience of the last few years working with Egill Hauksson, Tom Heaton, Rob Clayton, Jim Mori, Lucy Jones, and many other people at Caltech and the U.S. Geological Survey to promote real-time seismology has been very exciting. It is truly gratifying to me to see how the result of our science is being used effectively for the safety and welfare of the public."—*Hiroo Kanamori, California Institute of Technology, Pasadena, Calif.*

In Brief

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Gripped by science A new handbook, *Science Teaching Reconsidered*, helps science educators understand students, accommodate individual differences, and clearly communicate the principles, the method, and the excitement of science. Drawing on the experiences of successful educators and the results of education research, the handbook from the National Research Council provides examples of practical and effective teaching techniques. Skillful, experienced professors indicate that class exercises completed by small groups of students (a far less passive experience than listening to lectures) generates lively discussion. Furthermore, explaining a concept or working out a problem aloud forces students to examine the logic of their thinking processes and gives them confidence in figuring out a problem or contradic-tion.

The handbook also discusses how learning can be hindered by misconceptions, fears, and societal attitudes toward science, and how developing a full understanding of scientific principles is necessary to overcome misconceptions. The selection and use of instructional resources including textbooks, the Internet, and other information technologies are examined. Chapters are devoted to helping professors evaluate their teaching and students' learning, including an in-depth look at approaches to testing and grading.

Copies of *Science Teaching Reconsidered: A Handbook* can be ordered from the National Academy Press (tel 202 334-3313 or 1-800-624-6242) for $10.00 plus shipping charges.

Old boy network? Ideally, peer review is an objective process. In reality, scientists who are male or have a connection to the reviewer receive higher peer review scores than their counterparts with equal qualifications. These findings were published in the May 22 issue of *Nature*, by Swedish researchers Christine Wennerås and Agnes Wold, who obtained access to peer-reviewers' scores for postdoctoral fellowship appli-

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