Anderson Receives 1991 Bowie Medal

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Don L. Anderson, of the Seismological Laboratory of the California Institute of Technology, was awarded the 1991 William Bowie Medal for outstanding contributions to fundamental geophysics and unselfish cooperation in research. The Bowie Medal, AGU's most distinguished honor, was presented to AGU Past-president Anderson on May 29 at the annual Spring Meeting Honors Night in Baltimore, Md.

The award citation, delivered by C. Barry Raleigh, and Anderson's response are presented below.

Citation

"The past recipients of the William Bowie Medal form a select and illustrious group. They are among the most honored scientists anywhere, and the inclusion of Don L. Anderson in their company is appropriate.

"The Bowie Medal is the most recent in a succession of honors fellow scientists have bestowed on Don, including the James B. Macelwane Award, the Emil Wiechert Medal of the German Geophysical Society, the Arthur L. Day Medal, and the Gold Medal of the Royal Astronomical Society. This William Bowie Medal signals more than Don Anderson's meritorious achievements, however. It honors the generosity of spirit and intellectual integrity that gives rise to 'unselfish cooperation in research,' the criterion that makes this medal special.

"Don's scientific career has several remarkable aspects, not the least of which is an awesome directedness. It's as though, one might imagine, little Don Anderson woke up one morning in Maryland and said to himself, 'I think I'll find out the structure and composition of the Earth' and never looked back. First, in the 1960s Don and his colleagues, investigating the fine structure of velocity dispersion data for Love and Rayleigh waves, demonstrated that these were explained well by two velocity discontinuities in the mantle, at 400 km and 670 km depths. Subsequently, in a series of papers, Anderson and his students have used both surface wave and body wave data to confirm these global discontinuities, to analyze the anelastic structure of the mantle, and core, and to map the mantle velocity structure in relation to position, whether shield, continental, ocean basin, or tectonically active belts.

"In 1981, he and Adam Dziewonski produced the definitive average Earth model, PREM, which stands today as an excellent model for the elasticity of the Earth. The PREM inversion of teleseismic travel times, surface wave dispersion and normal mode periods, required azimuthal velocity anisotropy in the upper mantle to achieve a satisfactory fit. Don has shown that the assumption of isotropy can lead to substantial errors in mapping upper mantle velocity structure. With the enlargement in global coverage of seismic stations expected from the Global Digital Seismic Network (GDSN), a very significant improvement in our ability to link the detailed elastic and anelastic properties of the upper mantle to its dynamic behavior and petrological heterogeneity will become possible. Even though there is worthy competition for expenditures on large scientific facilities, Don's own work makes the case for a large expansion of the GDSN most compelling.

"When Anderson began looking into the elastic and anelastic properties of rocks in the 1960s, the problem of characterizing the phase and chemical constitution of the upper mantle from seismic data was daunting. The uppermost mantle at that primitive time was suspected to be peridotite, and a few proposed eclogite. Don began systematically to assemble such ultrasonic data on the elastic properties of minerals as was available into synthetic velocity profiles.

"In the 'Seismic Equation of State' and his recent book *Theory of the Earth*, Anderson has pulled off a tour de force, reconstructing from high-pressure phase equilibria studies and elastic properties measurements petrologically and geochemically constrained models of the constitution of the Earth's interior that are generally consistent with seismic data. Given that we have only fragmentary direct experience of the mantle's structure and composition and that there are many phase assemblages possible in a laterally heterogeneous mantle of unknown chemical stratification over a range of pressures and temperatures only partly within experimental reach, Anderson's model of the Earth's interior is one of the great scientific achievements of our day.

"Don does other things in his spare time, including directing Caltech's famous Seismological Laboratory for 22 years, serving on NASA committees, NAS panels, leading the American Geophysical Union, and lobbying some of his more benighted colleagues endlessly to support the GDSN. He has been the mentor of some of the most prominent young geophysicists active today. He also has a habit that probably accounts for my delivering this encomium rather than one of his closer colleagues. Whether through low exposure, high tolerance, or just poor taste, I actually enjoy Don's puns. An increased dosage rate, such as one would get at home or at the Seismo Lab, might have changed the tone of this address.

"Actually, I also represent the selection committee whose unanimous and enthusiastic choice of Don Anderson to receive this award tonight probably broke the record for being the AGU's shortest committee meeting. Don, the highest honor the American Geophysical Union can bestow, the William Bowie Medal, is yours tonight and there is no one more deserving."—*C. Barry Raleigh, Columbia University*

Response

"Thank you Barry. It is traditional to acknowledge one's family, environment, colleagues, postdocs and students and I do this with enthusiasm. I'd like to particularly acknowledge my debt to the AGU—a remarkable organization—and to the people who have built it and nurtured it—Waldo, Fred, Cynthia, Meredith Ann, Brenda, Judy, Brent—and to all the Ted Flinns who make science work. I'd also like to acknowledge the planet Earth, and honor it for being such a fascinating object whose well-hidden mysteries will certainly keep all of us and AGU in business for aeons to come. The 'Old' Seismo Lab and all the people who came through were indispensable to me and my science.

"I'd like to return to Barry Raleigh's remarks. Sophisticated word play is often used to make a deep philosophical point and people who don't understand this tend to twitch and become slightly crazed when exposed to elegant language. I am reminded of the opening scene in Shakespeare's *Julius Caesar* where two Roman alderman ask a humble cobbler what he does for a living. The cobbler responds that he is a saver of men's soles. It is in this spirit that I make my remarks. Of course, the play turns out to be a tragedy and more than a few Romans die or go crazy before the merciful end. This is not uncommon in Shakespeare, or during speeches of this type.

"I'm very pleased that Barry Raleigh read the citation. I owe a great deal to the Raleigh family. You may know that there are two branches to this family. One extends back to Sir Walter Raleigh who was a favorite of Queen Elizabeth and who was eventually put to death. He is described as an adventurer and a courtier. My Baltimore education never included the word 'courtier' but it turns out to mean 'one who seeks favor especially by flattery or obsequious behavior.' 'Obsequious,' it turns out, means 'full of servile compliance, fawning,' as in 'the undertaker's obsequious grimaces.' Barry Raleigh is a direct descendent of this family line.

"The other branch goes back to Lord Rayleigh, or John William Strutt, the English physicist who is well known to all of you. His name is associated with Rayleigh waves, Rayleigh scattering, Rayleigh Number and Rayleigh fractionation. I have been involved in all of these areas of study and have even worked with Raleigh weakening, discovered by our citationist. Considering his ancestors it is somehow appropriate that Barry's name is attached to a 'weakness.' Let me indicate my debt to the Rayleigh family.

"My early career was spent on Rayleigh waves with Nafi Toksoz and Ari Ben-Menahem and later Martin Smith, Tom Jordan, Bob Hart, Ichiro Nakanishi, and Adam Dziewonski.

"Rayleigh's principal allowed us to rapidly invert seismic data; I've worked on Rayleigh's principal with Dave Harkrider, Dave Hill, and Bob Kovach. Modern inversion theory is built on Rayleigh's principal.

"Non-Rayleigh scattering is an important attenuation mechanism that I worked on with Charles Archambeau, Eric Chael, Hartmuth Spetzler, Dave Jackson, Bernard Minster, and Jeff Given.

"Rayleigh and Brillouin scattering theory and experiments were done with Bob Phinney, Charlie Sammis, and Hsi-Ping Liu.

"Lord Rayleigh's monograph 'The Theory of Sound' provided much needed help as Monsour Niazi, Bruce Julian, and Lane Johnson and I were finding large discontinuities in the mantle, now known as the '400' and the '670' km discontinuities. Rayleigh's book discusses anisotropy, a subject I worked on with Janice Regan, Jean-Paul Montagner, and Toshiro Tanimoto.

"Rayleigh fractionation theory was important in our work on mantle phase changes and mantle evolution, which involved Jay Bass and Jim Whitcomb.

"The Rayleigh number is, of course, important in convection and mantle stratification. Henri-Claude Nataf, Brad Hager, and Rick O'Connell helped me understand this. Hua-Wei Zhou and I worked on problems related to the chemical Rayleigh number.

"Then, of course, Adam Dziewonski and I wrote a paper on Rayleigh Principal Inversion of Rayleigh waves including non-Rayleigh scattering and implications for the mantle Rayleigh number.

"But all that Rayleigh work is deeply buried in past issues of *JGR*, just as our citationist has left the limelight of New York and is now buried on a small island in the middle of the Pacific.

"Which reminds me of the most famous lines in the English language, written exactly 400 years ago, give or take a few decades: 'Friends, Romans, countrymen, lend me your ears; I come to Barry Raleigh not to praise him.'"—*Don L. Anderson*

International Decade of East African Lakes

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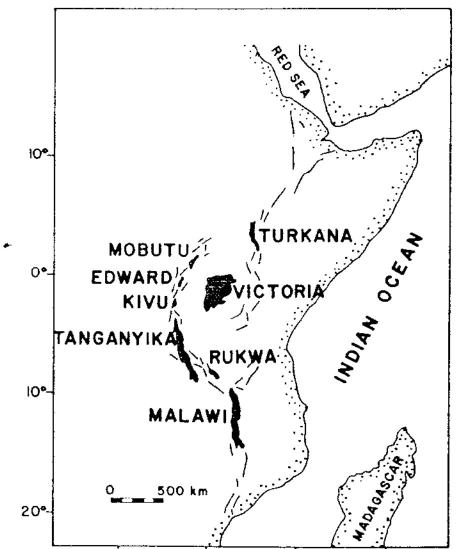
A workshop funded by the National Science Foundation's Climate Dynamics Program and Switzerland's National Climate Program convened in Bern, Switzerland on March 29–31 to discuss the establishment of a multinational, multidisciplinary study of the East African rift lakes. The 10-year project, entitled the International Decade of the East African Lakes (IDEAL), has two primary goals. The first is to obtain long, high-resolution records of climatic change in tropical East Africa. The second is to provide a comprehensive training program for African students and scientists and to strengthen African institutions' capabilities in the aquatic sciences, resulting in collaboration between African and northern hemisphere limnologists and paleoclimatologists.

The large lakes of the East African rift valley are among the oldest on Earth. Their underlying sediments contain an invaluable record of climatic change extending back several million years. This unique record of tropical climatic change on the African continent is the only one with sufficient temporal resolution to be compared directly to proxy records in tree rings and ice cores, and with sufficient temporal longevity and continuity to be compared directly to proxy records in deep-sea sediments. IDEAL therefore focuses on the study of lakes as archives of environmental and climate dynamics. Through better understanding of how large lakes at low latitudes respond to climatic forcing, we will be able to decipher the long records of climatic variability stored in the sediments of these complex natural systems. These records will make a major contribution to the study of global climatic change.

Meeting the project's goals will require a quantum increase—compared to past efforts—in international scientific cooperation



East Africa's major lakes.

on the rift lakes. The project will require shared-use facilities and equipment, including a transportable research vessel equipped with state-of-the-art oceanographic instrumentation. Access to these facilities may be patterned after any of several successful oceanographic programs, such as ODP, ALVIN, or GEOSECS. It is essential to establish intergovernmental agreements on permits, customs, and sharing of samples and data. An operational infrastructure must also be established to facilitate shipping and transportation, as well as survival and productivity in the field.

Four or five major rift lakes will be selected for long-term study. Under consider-