

1993 RAY K. LINSLEY AWARD

Citation

Ladies and Gentlemen. Today we honor Professor Wilfried Brutsaert for his achievements in the field of hydrology by presenting him with the Ray K. Linsley Award.

For the past 19 years, Dr. Brutsaert has been Professor of Civil and Environmental Engineering at Cornell University. He teaches courses in hydrology, flow in porous media, boundary layer meteorology, fluid mechanics, and geohydrology. His contributions to the published literature has covered a wide range of topics within the field of hydrology. His papers have dealt with problems concerning flow in partly saturated soils, ground water, rainfall-runoff relations, evaporation from water and land surfaces, and other surface-atmospheric transport processes. His work, particularly on regional evaporation, is having a major impact in the fields of large scale hydrology and meteorology.

As a result of his contributions in hydrologic research, he has received numerous honors and awards, most notable is the Robert E. Horton Award given by the American Geophysical Union, which he received in 1988. This year, he was chosen the Robert E. Horton Memorial Lecturer by the American Meteorological Society. He has the distinction of being a fellow of both AGU and AMS.

Due to Dr. Brutsaert's reputation and character, his peers elected him President of the Hydrology section of AGU in 1992. He has served as associate editor of several national and international journals including *Water Resources Research* and is presently serving as an associate editor for *Boundary Layer Meteorology*. His book "Evaporation into the Atmosphere" published in 1982 is well known and often cited in the literature. It has also been translated into Russian.

With this brief introduction, I can only mention a few of Dr. Brutsaert's many achievements. His efforts in the fields of hydrology and meteorology have been outstanding. He is considered by many to be "a leader in evaporation research."

I feel very fortunate to have had the opportunity to work with Wilfried both as a student and as a colleague, and to have been given the privilege of introducing him to you.

William P. Kustas

1993 RAY K. LINSLEY AWARD

Acceptance Speech

On this occasion the American Institute of Hydrology pays tribute to the life and the work of Ray K. Linsley. It seems to me, that it is only proper and fitting to highlight the significance of this work and of his ideas to the present state of the discipline of hydrology.

From my perspective, Linsley main fundamental contributions are two fold. One major contribution, I have always felt, was the publication of the book "Applied Hydrology" in 1949, written by him in cooperation with Max Kohler and Joseph Paulhus. At the time of its publications, there were various other texts in hydrology in existence, all of them emphasizing different aspects of this broad field. As a matter of fact, at that time the discipline of hydrology was still not well defined and there was really no universal agreement on the intellectual domain hydrology is supposed to cover. One example of this uncertainty, even among hydrologists, is that as recently as 1964, Heindl and price still felt it necessary to publish a paper entitled, "What is Hydrology?" on the occasion of the International Hydrologic Decade. In many respects, hydrology is still a developing science, and therefore some degree of uncertainty will unavoidable be with us for some time to come. What made the 1949 book by Linsley et al, such a major breakthrough and put it apart from all the others, I feel now in retrospect, is the fact that it provided an internally consistent codification of the domain of hydrology, through its choice of topics.

Hydrology is now generally accepted to deal with the water cycle over the land surfaces of the Earth, mostly without direct human intervention. The subject matter covered in the book by Linsley et al. illustrates this clearly.

This 1949 book was followed by a more succinct version in 1959, namely "Hydrology for Engineers," which became probably even more popular as a course textbook, than the original version and which went through several editions. Literally generations of engineers and other applied hydrologists have received their first exposure to the field through these two books. As a result, more than anything else, both books have shaped the thinking of most practitioners presently active, not only in the United States but in many other countries world-wide as well.

The second major contribution of Ray Linsley was that he had the vision to seize the opportunity of the advent of digital computation. Indeed, he was the first, together with his graduate students, to put the digital computer to work in hydrologic simulation at the basin scale. This was done by considering the most relevant physical mechanisms and by describing these

1993 RAY K. LINSLEY AWARD - ACCEPTANCE SPEECH

mechanisms by efficient mathematical functions. The resulting set of algorithms and code became known and famous as the Stanford Watershed Model. The Stanford Model went through different versions and improvements, and since then the basic philosophy has become the basis of numerous more sophisticated models developed by others. Of course, now after more than a quarter of a century, it is easier to find defects both in the conceptualizations and in the parameterizations of the basic hydrologic phenomena in the Stanford Model. However, such criticisms miss the point. The point is that Linsley started a movement, which is still continuing today, to bring a more rational and physically-based approach to applied and operational hydrology on the basis of modern computational technology. For this we will always be in his debt.

On a more personal level, now that he is no longer with us, I am sorry that I only met Ray Linsley twice, and then each time only for a few minutes. However, in my work as a hydrologist, I did interact with several of his former graduate students and I would like to take this opportunity to pay tribute to them. Dr. James Liggett has been a close colleague of mine at Cornell for the past 30 years; all this time our fates have been closely intertwined and even now we continue to interact almost daily. Dr. James Morgali, now at the University of the Pacific, was helpful with his ideas on surface runoff. Dr. Steve Burges of the University of Washington, has been a steadfast and cheerful companion in numerous professional activities; he is now President-Elect of the Hydrology Section of the AGU. Dr. Doug James, currently President of the American Institute of Hydrology, also provides leadership to our community at large as head of the Hydrology Program at the National Science Foundation. To all of them my heartfelt thanks for their support and for their dedication to our common cause over the years.

It is not uncommon on occasions like this for the awardee, while he or she has the rostrum, with a captive audience like you, to moralize a bit and possibly to point out certain real or imagined fallacies and misconceptions prevailing in the profession. Don't worry!! I will not do this but merely express my satisfaction and elation at the general state of health of our field. My perception is that all of us have the good fortune of living in an era of great excitement in hydrology. By any criterion, hydrology is not the place where the action is. One illustration of this is the fact that at the moment, for people like me in engineering, there are at least three professional or scientific associations that deal with hydrology; these are (alphabetically) AGU, AIH and ASCE. (And I don't even mention the more specialized organizations for forest hydrology, groundwater, soil water physics, etc.) Although each one of the three I just mentioned has ostensibly carved out its own domain of operation, there is considerable overlap and fuzziness at the edges. Some don't like this, because they fear that it could lead to confusion and discord. In my opinion, this pluralism is a sign of health and that there should be room for all three organizations to flourish.

Clearly, ours is a field on the move. By all accounts, we are now experiencing the emergence of hydrology, from an art based on sheer intuition, to a mature physical science solidly based on

BRUTSAERT

experimental observation and with a rapidly growing body of sound theory. Many factors are responsible for this development. I only have to mention the rapid advances in instrumentation and remote sensing from space, allowing observations over a broad spectrum of spatial and temporal scales. Computational power continues to increase, allowing the verification and validation of new practical procedures and theoretical concepts. At the same time, the human environment is under a more intense siege than ever before; there is the problem of global change, with possible disaster scenarios of nuclear winter, global warming and other climate changes. Hydrology is a critical component here. All these developments are posing formidable challenges and also tremendous opportunities for us all. The coming years in hydrology should be exhilarating and rewarding.

Many thanks again to the members of the Linsley Award Committee, with their Chairman Dr. Delbert Franz and Dr. Dave Dawdy, for their confidence.

Wilfried H. Brutsaert