1990 R.K. LINSLEY AWARD

Citation given by Peter O. Wolf

Response

Mr. President, Honored Guests and fellow members of AIH. Thank you - nice things do, indeed, happen to old people. I'm sure I don't deserve this award, but you may be assured I shall treasure it very much both personally and professionally. One suspects that on an occasion like this he should reflect a little about the past and possible future of hydrologic life. One random thought on the future. Future hydrologists are going to have to know a lot more chemistry and biology than those of my vintage. Clearly, much change and advancement lies ahead, but I'm finally old enough to realize we are seldom wise enough to quantify the future. A comment or two about the changes I've witnessed and the lessons I've learned may prove of interest to some.

Two major developments should be acknowledged. First one must cite the growth in the hydrologic literature; from almost nil to near overwhelming. When I took my first graduate course in Hydrology (1946), we utilized a text titled "Elements of Hydrology" by Adolph Meyer. The book had been initially copyrighted in 1917 and revised in 1928. Thus, it was about 20 years old when I encountered it. The option was the text of equal vintage authored by D.W. Mead. Both were almost entirely descriptive with much space devoted to the techniques for measuring streamflow and precipitation. There was essentially no information on hydrograph development or groundwater analysis. Then, as now, textbooks lagged actual developments. For example, the most important surface water contributions of the 1930's, i.e., the introduction of unitgraph concepts, and the most important groundwater contribution of the 1930's, i.e., the presentation of the non-equilibrium well equations, could not be found in a common publication. This major void in the literature was filled by the first Linsley, Kohler and Paulhus offering in 1949.

The other truly significant advancement witnessed during my hydrologic career was not in the science of hydrology, but in the science of electronics. I'm sure 'tis most difficult for many in this room, who have spent their entire careers with the assistance of electronic devices ranging from hand held calculators to mainframe computers, to visualize the labor involved in hydrologic calculations a short 35 years ago. A couple of illustrations may provide some perspective. Early in my water resources planning career I became preoccupied with the realization that when developing surface water supplies one really deals with two natural resources. First, there is the water, though of finite dimension in any given catchment, it is replenishable in the timestream of the hydrologic cycle. Second, are the potential impoundment sites which are also of finite number and size, but not replenishable, and which came off the production line a long time ago. Allocation of their space among difference water management functions is an important and often irreversible decision. Moreover, in the mid-fifties the allocation process among different management functions was subject to distortion, primarily because flood control stage in both large and small sites was subsidized by federal policies whereas most beneficial use of water was not. I concluded the only objective way of allocating space would be to compare water supply production capability of alternative sites and allocations on a risk of storage deficiency basis. I remember well the look of horror on the face of my USGS cooperator, when I told him we needed to complete a statewide analysis in two years though neither the methodology nor the labor requirement was well defined. Nonetheless, two years later we had lowflow frequency curves for durations ranging from 1 day to 96 months for 113 gages, and we had developed there from statewide storage - yield - probability relationships. No computer processing had been utilized because it didn't exist. The job was done with manual tabulating, manual plotting and graphical multi-regression procedures. That work led to major revisions in federal project design in Kansas, and has served as a basis for private sector design and public sector regulation of water supply storage in Kansas for the past 35 years. It also lead indirectly to the passage of the federal water supply act of 1958. This was a classic example of an applied need fulfilled by evolving hydrologic techniques. Later, when modern computer based stochastic programs became available and confirmed the results we had obtained with the study, those involved with the study gained much satisfaction.

Another similar example may be of interest to the groundwater people in the audience. Again, in the mid-fifties it was my privilege to direct the year by year analytical reconstitution of an available 18 year pumping record for a field of 55 wells which was impacting a 200 square mile area in south central Kansas. We had the benefit of good pumping records and an annual survey of water level changes. Thus, we had a basis for correcting the non-equilibrium equations for the effect of recharge. 'Tisn't much of a job nowadays, even on a desktop computer, but believe me it's a helluva task using a slide rule to calculate the effect of 55 wells on a quarter mile grid over a 200 square mile area. Again, I remember the disbelief on one of my assistant's faces when I told him what I wanted done. When we successfully completed the 18-year reconstitution, the disbelief was replaced by anticipated excitement when I told him to repeat the exercise using some alternative pumping patterns. Frankly, until we performed that analysis, I wasn't sure I could fully accept the underlying theory of the non-equilibrium equations, let alone the assumptions relative to superposition of multiple well effects.

This brings me to the major lesson I have gleaned from my experiences in the hydrologic arena. It's a point I've long tried to instill in students and a concept that has stood the test of time for me. First, always remember that good theory is good practice. Hydrology remains a hybrid between the art and the science. Nonetheless, good practice of the art is dependent on understanding the theory of the science; not the reverse.

The second observation is this. The challenge of hydrology, the technical romance if you would, resides in the fact that you are forever dealing with uncertain boundary conditions. You never see the exact same problem twice owing to variations in geology, precipitation patterns, antecedent histories, etc., etc., etc. Don't fear this situation. Become fundamentally sound in the theory, and your ability to accept and adjust for uncertainty in boundary conditions will reflect good judgement. Hydrology remains one of the few opportunities in technology where one's diagnostic capability is put to the test of both theory and experience - enjoy it as long as you can.

Finally, on such an occasion as this, one must express thanks to the many who have made one's career and life so pleasurable. First, of course, is my family, especially by wife, Lucy, of some 44 years who many of you know and who remains the best decision I ever made. Second, are the many staff who have been so supportive. Third, are the host of students whose accomplishments do so much to make an academician's life worthwhile. Finally, there are the many peers and elders to whom one is so deeply indebted for knowledge gained and lessons learned. Professionally speaking, I was quite lucky to have been the young kid on the block. It was my pleasure to associate with such giants as Ray Linsley, Dean Petersen, Ven Chow, Walter Langbein, Luna Leopold and countless others. Many, not all, of those just named have passed on and the young kid syndrome has long been replaced with an air of increasing loneliness. And that brings me back to where I started - nice things do happen to old people. I thank you so very much.

Robert L. Smith