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ASLO Lifetime Achievement Award

The first Lifetime Achievement Award of the American Society of Limnology and Oceanography was presented to Kenneth H. Mann in recognition of his significant achievements in the aquatic sciences, his contributions to the stature of these fields, and his role as a model for those at earlier career stages. The award was presented by President John T. Lehman at the 57th Annual Meeting of ASLO in Miami, Florida. Lehman's remarks and Mann's response are presented below.

Kenneth H. Mann

I am delighted to be the one whose pleasant duty is to announce the first recipient of the ASLO Lifetime Achievement Award. It comes as no surprise to anyone that among the nearly 4,000 members of our society, we are privileged with the intellectual pioneers of limnology, oceanography, and related fields. What we recognize as the modern scope of this science owes almost everything to our colleagues who laid the intellectual foundations and conducted the antecedent work upon which we build our present understanding.

These are the people who found time in their busy personal and professional lives to forge a unique scientific society based on common intellectual principles recognizable in either fresh or salt water. These are the people who created the journal wherein they archived their discoveries of new knowledge. The science we practice today is their legacy. When we celebrate the lifetime achievements of a member, we must recognize that we are recounting the history and evolution of our own discipline.

The common goals of our members who supported our Society and who promoted its journal played no small part in helping us recognize their lifetime achievements and in helping us benefit from them.

It was not easy for the selection committee, chaired by Dr. Bess Ward, to name our first recipient from among the rich pool of candidates who deserve our sincere praise. That said, however, I think you will agree that the first recipient of our new annual award establishes a high standard of professional achievement.

The first ASLO Lifetime Achievement Award is given to Kenneth H. Mann, Scientist Emeritus, Bedford Institute of Oceanography. As limnologists and oceanographers we owe Dr. Mann profound thanks for his prescient studies of freshwater and coastal marine ecosystems. Through more than 150 research publications and textbooks, he has enriched our knowledge of detrital food webs, decomposition processes, kelp bed ecology, fish production, coastal zone management, and energy flow in marine ecosystems.

In the words of one nominator, "Mann's contributions to our field consist not only of his original contributions in ecosystem research, but in equal measure his lucid syntheses of knowledge across the entire field, not only bringing together various aspects of biological oceanography but physical oceanography and systems science as well."

It is a tremendous honor for me to have this privilege to recognize Ken Mann's innovative and influential career.

The challenges and rewards of ecosystem science: Remarks by K. H. Mann

The occasion of an award for lifetime achievement seems to demand an attempt to see a pattern in the activities of the years that have slipped by, so with your kind indulgence I shall try to do so. I began my scientific career in England as an organismal zoologist, researching the physiology and distributional ecology of freshwater leeches. My attention was focused on individuals and populations. However, even during this phase, there was some indication of interest in lakes and ponds as ecosystems. In trying to characterize, by the chemical composition of the water, some small ponds in which the leeches lived I noted that there were strong seasonal fluctuations in dissolved calcium, bicarbonate, and sulfate, and this was explicable in terms of seasonal fluctuations in primary production and decomposition. Observations on these interactions were the subject of my first paper in *Limnology and Oceanography* (Mann 1958).

My interest in ecosystems was given an enormous boost when, at an international limnological meeting in Austria in 1959 I heard Tommy Edmondson (1961) give a review paper which included energy budgets for individuals and populations of *Daphnia,* and reference to the pioneer ecosystem studies of the Odums. I went away and read avidly in the field and was hooked. The idea that nature consists of a range of systems on a variety of scales from the smallest pool to the world ocean, all operating on the same basic principles, seemed to me to be one of the great unifying ideas of science. Of course, it has its roots firmly in the writings of Elton, Hutchinson, and Lindeman.

I wrote a successful proposal for an ecosystem energy-flow study of part of the River Thames, inspired by Odum's (1957) paper on the trophic structure and productivity of Silver Springs, Florida. At that time, almost all research in ecosystem science was in North America, so when, after a few years' work on the River Thames, I was invited to move to Canada and take an ecosystem approach to a marine bay, there was no hesitation in accepting.

My new appointment was to the Fisheries Research Board of Canada, and it was part of the justification for funding that we would work toward an ability to make useful predictions about fish and shellfish stocks. The models in use for fisheries management assumed a constant supply of food and constant natural mortality, so there was no room to take account of variations in the timing or magnitude of plankton production, or of competition or predation. By emphasizing that fish stocks were part of large ecosystems and that major ecosystem changes would have major consequences for fish stocks, we hoped to reduce the amount of uncertainty inherent in fish stock management. There was much resistance to the acceptance of these ideas, but it is interesting to note that, a quarter of a century later, following the recent collapse of the northern cod stocks off Newfoundland and Labrador and severe problems with groundfish stocks on the whole eastern seaboard, the idea of taking an ecosystem approach to fisheries management is beginning to be taken seriously.

Now comes the hard question: what does it mean to take an ecosystem approach to fisheries management? For many years people pinned their hopes on massive simulation models which couple many processes. It now seems clear that a model that couples a large number of equations representing physical and biological processes, each with its appropriate variance, will inevitably have unacceptably wide confidence limits on its output, unless we understand all the feedbacks and constraints that limit the range of output, which we most certainly do not. In the present state of the art, such models are of little value for predictive purposes and their size and complexity may also limit their heuristic value. Even if this were not the case, it is not practicable to collect information on all aspects of an ecosystem in order to manage its fish populations.

An alternative approach is to observe a total ecosystem in operation and look for regularities in its behavior. For example, in some systems there are regularities in the relationship between physical oceanographic parameters and the productivity of species of interest. Peruvian anchovy production responds to changes in El Niño-Southern Oscillation, northern cod stocks off Newfoundland and Labrador respond to changes in the North Atlantic Oscillation, and lobster stocks in the Gulf of St. Lawrence respond to changes in the runoff of the St. Lawrence River (reviewed by Mann and Drinkwater 1994). These regularities can be used to improve the power of forecasts for management purposes. The mechanisms connecting the input and the output involve many ecosystem processes acting in an integrated manner. We need to understand them and model them, but at the present state of the art it seems that phenomenological studies of connections between selected properties of the ecosystems offer the best hope of prediction.

When adverse environmental conditions coincide with heavy fishing mortality, collapse of a stock can occur. As ecologists, we note that unexploited virgin stocks had almost certainly evolved to absorb the environmental variations of ages past, but they are not equipped to absorb the combined effects of environmental variability and heavy predation by man. The large biomass and broad spectrum of year classes characteristic of unexploited stocks was part of the mechanism for buffering against environmental variability. By reducing the biomass and eliminating older year classes,

a normal consequence of exploitation, we reduce the resilience of the system. I believe we are coming close to the realization that the only way to have truly sustainable yields from fish and shellfish stocks is to greatly reduce present levels of exploitation.

The journey of discovery that has brought me to this perspective has been exciting and rewarding. I owe a debt of gratitude to my wife Isabel, who has given me encouragement and practical support in numerous ways over a period of more than 48 years; to the 24 graduate students and 15 postdocs who provided a never-ending supply of fresh ideas; to numerous colleagues in Reading University, in the Bedford Institute of Oceanography, and in Dalhousie University, who provided the collegiate atmosphere in which scientific endeavors flourish. And especially, I thank officers and members of this Society, for providing continuing occasions for stimulating meetings and publications, and for their kindness in awarding me this honor.

References

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Lindeman Award

The 1994 Lindeman Award was presented to David C. Smith (Scripps Institution of Oceanography) for "Intense hydrolytic enzyme activity on marine aggregates and implications for rapid particle dissolution" (Smith, D. C., M. Simon, A. Alldredge, and F. Azam. 1992. Nature **359:** 139–142). This award is presented annually in honor of Raymond L. Lindeman (1915–1942) and is intended to recognize an outstanding paper written by a limnologist or oceanography who is no more than 35 years old in the year of publication.

ASLO/ONR Student Poster Awards

1994 AGU-ASLO Ocean Sciences Meeting in San Diego, California:

Three awards were presented: Lidewijde Maria Eijsink (University of Utrecht) for "Various phosphorus phases in sediments from the eastern Mediterranean; a comparison of some sequential extraction methods" (L. M. Eijsink and G. J. de Lange); Eric L. Canuteson (Scripps Institution of Oceanography) for "Construction and testing of an ocean bottom absolute gravity meter" (E. L. Canuteson, J. A. Hildebrand, P. R. Parker, and M. A. Zumberge); and Michael R. Penn (Michigan Technological University) for "Seasonal and vertical variability in the phosphorus fractions of the seston in a calcareous, hypereutrophic lake (M. R. Penn, M. T. Auer, and E. Van Orman).

1994 ASLO/PSA Meeting in Miami, Florida:

There were 42 posters entered in the Student Poster Award competition at the ASLO '94 annual meeting. Three awards were presented: Deanna L. Erdner (Massachusetts Institute of Technology-Woods Hole Oceanographic Institution) for "A Molecular response to iron limitation in marine phytoplankton" (D. L. Erdner, N. Price, and D. M. Anderson); Jennifer I. Tougas (University of Georgia) for "Scleractinian coral settlement to artificial substrata in the Florida Keys: Work in progress" (J. I. Tougas and J. W. Porter); and Yvonne Vadeboncoeur (Notre Dame University) for "Impact of whole-lake nutrient enrichment on the ratio of benthic to pelagic chlorophyll" (Y. Vadeboncoeur, D. M. Lodge, D. L. Christensen, and K. L. Cottingham).

A student must be an ASLO member and first author of the research presented, which must not have been presented at meetings elsewhere. Work in any area of aquatic science is eligible.