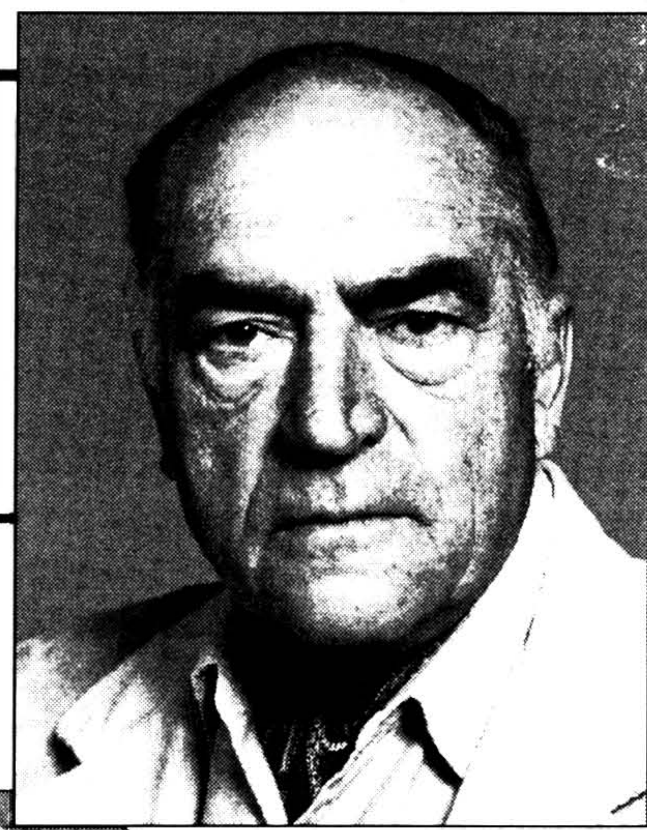
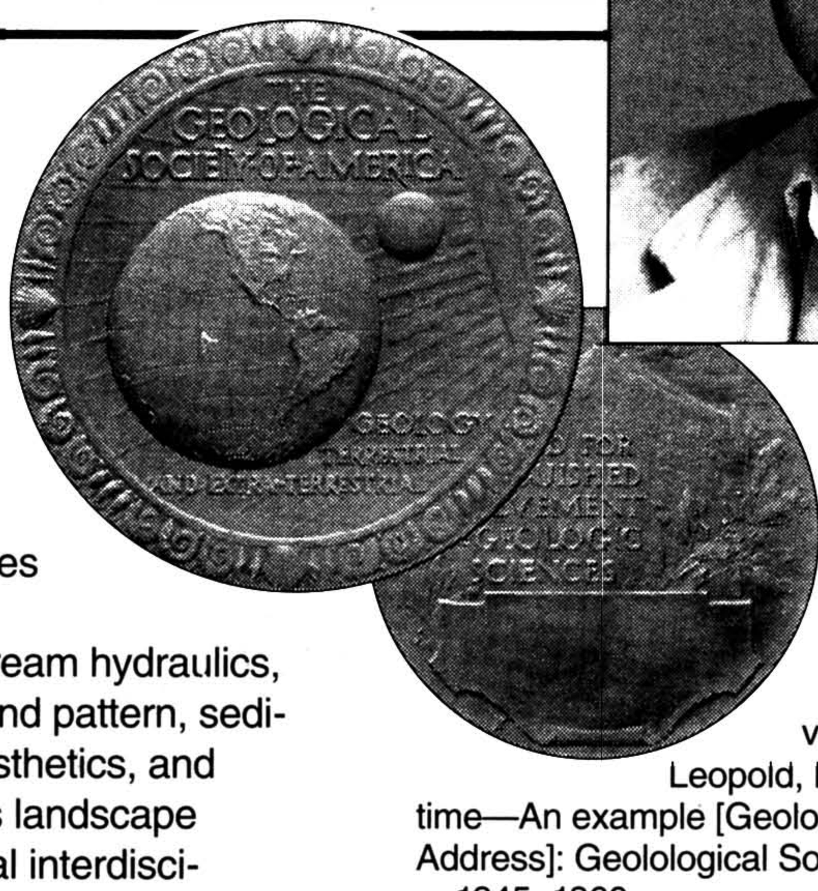
GEOLOGICAL SOCIETY OF AMERICA

MEDALS AND AWARDS FOR 1994

Presentation of the PENROSE MEDAL to LUNA B. LEOPOLD





Citation by WILLIAM B. BULL

Luna Leopold's achievements in geological research, education, and environmental policy are a legacy with influence extending into the future. In recognition of that, he is the 1994 Penrose Medalist. Luna's pioneering and provocative work includes studies of early storm warning, rainfall frequency and drought, downstream flow-velocity changes, stream hydraulics, alluvial stratigraphy and stream-channel form and pattern, sediment transport, urban hydrology, landscape aesthetics, and channel response to base-level change. Luna's landscape ecology studies identify and analyze truly crucial interdisciplinary problems, and his dynamic leadership facilitates application of geomorphic research to land-management decisions. The short list of references selected by the nominating committee is representative of the breadth and depth of research done by Luna Leopold.

Luna's background is rooted in a New Mexico family with diverse interests. His comprehensive academic degrees are a B.S. in civil engineering at the University of Wisconsin, Madison, a Masters in physics-meteorology at the University of California, Los Angeles, and a Ph.D. in geology at Harvard University. As Chief Hydrologist for the U.S. Geological Survey (1956–1966), and later as a professor at the University of California at Berkeley (1972–1986), Luna Leopold established a new intellectual basis for water research programs. His bold innovative steps and exceptional research productivity served by example to convert the Water Resources Division of the U.S. Geological Survey into the world's leading hydrologic research institution; a truly major accomplishment. He fostered three generations of quantitative, interdisciplinary earth scientists by being an exceptional mentor for colleagues and especially young scientists.

Luna encourages scientists to set career objectives a little higher than they have yet imagined, just as he challenges himself in research and public policy matters. Continually testing bold new hypotheses, Luna has the courage to accept the risk of failure. The result is a bold, exceptionally innovative career that has created a continuing aura of excitement for a new fluvial geomorphology with a landscape ecology flavor. His mix of skill, dedication, personality, and zest for life revolutionized theoretical and applied fluvial geomorphology.

Luna has a flair for recognizing field settings that allow him to delve into how flowing water shapes landscapes, and how humans alter geomorphic processes. Many "river boys and girls" are fortunate to share field experiences with Luna. They find him to be forthright, dedicated, and formidable; yet flexible, highly considerate, and humorous. As a result of working with Luna, many scientists and engineers better appreciate the need for geomorphic concepts to be soundly based in field observations. They also share his enthusiasm for understanding more about geomorphic processes and landscape evolution, and the societal benefits of such studies.

Our debt to Luna is boundless; his inspiration enriches our geologic research endeavors. Geologists, ecologists, engineers, foresters, and policy makers have a different view of rivers, indeed a reverence for rivers, because of Luna Leopold.

Selected Publications of Luna B. Leopold

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Leopold, L. B., 1994, A view of the river: Cambridge, Massachusetts, Harvard University Press, 298 p.

Response by LUNA B. LEOPOLD

Just 105 years ago, the eminent geologist Sir Archibald Geikie addressed the Oxford University Scientific Club. In his paper he commented on the opportunity offered to, and by implication the responsibility of, the geologist to study the effects of humans on the physical environment.

"Prominent among these changes," he said, "has been the clearing of the dense woodlands that once covered so large a proportion of the surface.… But man's influence on the landscape has not consisted wholly in removing what he found to be obnoxious. He has introduced many forms of vegetation among those indigenous to the country. He has converted thousands of square miles of scrub, marsh, and woodland into gardens, parks, meadows, and corn-fields. He has replaced some parts of the primeval forest by plantations of a different type … (including) trees which seem to have had no place in the original flora."

Sir Archibald's thoughts strike a resonance in the current discussion of biodiversity, loss of species, desertification, and the tensions over the distribution of limited water supplies. The effect of human use on landscapes has been more far-reaching than Sir Archibald might have imagined. These changes have involved geomorphic, pedologic, biologic, chemical, and hydrologic functions—in other words, all aspects of ecology. The understanding of and possible amelioration of the effects of such influences is merely one part of the larger science of geology as we know it.

We face practical problems in land management that perhaps can be solved as we learn more about basic biophysical processes operating under a variety of conditions. To maintain the integrity of these natural systems we must develop the basic science that may underlie solutions. Let me mention samples of these practical problems.

The effects of the floods of 1993 and 1994 have prompted legislation that will govern how river valleys will function after even further regulation. National policy in which geologic aspects are not only prominent but essential is being formulated under our very noses. Yet as I read the technical material, geologists seem not included in discussions of alternative policies.

There is a need for evaluating the ecologic health of a piece of landscape. Management decisions continue to be made without a technical determination of the effects of such decisions on the ecosystem, many of which involve effects on soils, vegetation, water chemistry, erosion, and geomorphic stability. Managers struggle to find principles that underlie stability.

Consider the effect of massive logging of forests on stream morphology and chemistry, on landslides, erosion, and water availability. Despite a growing awareness of the advantages of maintaining biodiversity, it is ironic that the policy of the United States Government is to plant in clear-cut areas only one species of tree, leading as an end result to a monoculture of an even-age stand. The long-term effect of such a policy is within the scope of geomorphology, if that subscience is broadened to become a new and much-needed one that might be called biogeomorphology.

Though there are plenty of basic problems touching on our science, geology has allowed many parts of its core to be sloughed off to other disciplines only too eager to take over, but generally unprepared to do the job alone. Hydrology has been preempted by engineers. Climatology practically no longer exists, but its importance is ever more important as climatic change, an early concern of geologists, now is in the public mind. Soil erosion and its myriad aspects in pedology, hydrology, and sedimentology have been assimilated by agriculturists. After years of touting its importance, we still cannot compute satisfactorily the probable erosion rate of any segment of landscape larger than small fields of cropland.

The old idea of physiography or physical geography as a part of geology seems to have been gradually eroded. I draw the distinction between physiography as a combination of many scientific subdisciplines, and the separate units such as geomorphology. This combination has been replaced by greater specialization in which pure science points toward increasingly abstract problems, pursued through computer models and mathematical generalizations devoid of field observation.

In the earth sciences we cannot afford to close our eyes to the practical problems generated by human exploitation of natural systems on which we depend. Formulation of clear statements of the underlying nature of these practical problems will lead us to engage in innovative combinations of our basic sciences involving new interactions not heretofore contemplated.

Perhaps from the award of the Penrose Medal to a physiographer of the old school, our younger colleagues will see that physical geology has been, and again can be, the locus of intersecting ideas that affect many parts of a civilized society, and is central to many of the public policies of the nation.