

Biographical Sketch
of
Distinguished Professor Emeritus, F.R.S. Clifford H. Mortimer

(Prepared by Professor Emeritus Art Brooks for the International Limnological Society
Newsletter in honor of Clifford's 99th.)

Clifford H. Mortimer, FRS, Distinguished Professor Emeritus of Biological Sciences and the Center for Great Lakes Studies at the University of Wisconsin-Milwaukee, took the day off from his writing on February 27th 2010 to celebrate his 99th birthday with family and friends.

Biographical sketches generally start with a listing of one's degrees and early publications and work forward in chronological order. In this case I will start with the remarkably productive 9th decade of a distinguished nonagenarian and work toward the beginning. Another reason for taking this tack is that the more recent years are those most familiar to me. I arrived at the Center for Great Lakes Studies as a Postdoctoral Fellow in 1972 and joined the faculty in Biological Sciences a year later. I have maintained a close friendship with Professor Mortimer over the past 38 years and feel honored to have been asked to prepare this note.

Full citations to works cited below, a full bibliography and a 2009 radio interview with Professor Mortimer are available online at: <http://www.glwi.uwm.edu/profiles/chmortimer>.

Professor Mortimer's current writing is focused on a manuscript dealing with the physics governing the density variations of fresh water as influenced by temperature, pressure and chemical composition. He includes an historical review of previous work to develop density tables for pure water and examines in detail the variables that influence water density in lakes. The manuscript will be submitted for review by mid-2010.

In 2006 a publication by C.H. Mortimer appeared in *Limnology and Oceanography* (51:1914-1955) titled, *Inertial oscillations and related internal beat pulsations and surges in Lakes Michigan and Ontario*, that was based upon data collected in 1963 that had waited for a time in retirement when the analysis could be conducted quietly without interruption. All the calculations were done on a hand calculator with the figures also drawn by hand, but scanned and properly lettered to satisfy the editor. This paper was preceded in 2005 by, *Internal seiche dynamics in Lake Geneva*, co-authored by U. Lemmin, and E. Baeuerle (L&O 50:207-216).

What might normally be the crowning achievement of one's career before retirement, a book titled, *Lake Michigan in Motion: Responses of an Inland Sea to Weather, Earth-Spin, and Human Activities*, was published by the University of Wisconsin Press in 2004, 28 years after Professor Mortimer's retirement. With over 300 pages and 187 illustrations, the book chronicles three centuries of observations of the Great Lakes by native peoples, early explorers and contemporary scientists. The physical geography and geology of the

basin is covered along with chapters on sediment and water chemistry, ecology, human influences, and of course, the internal motions of waves and currents.

Much of the 1990's was spent preparing materials for "the book" and work on the papers cited above published in the new millennium. The American Society of Limnology and Oceanography bestowed the "Lifetime Achievement Award" upon Professor Mortimer at the 1996 annual meeting of the Society in Milwaukee, at which a special symposium was held in his honor. The 1980's were very productive years with eleven publications and reports.

Never one to be left behind by technological advancements, Professor Mortimer took a leap into space spending several weeks at the Goddard Space Flight Center in Maryland reviewing National Aeronautics and Space Administration (NASA) tapes of images taken by the Coastal Zone Color Scanner satellite over Southern Lake Michigan. This research resulted in the publication of, *Revelations and testable hypotheses arising from Coastal Zone Color Scanner images of Southern Lake Michigan*, in 1988. (L&O. 33:203-226).

In 1987 he was granted an Honorary Docteur degree at Ecole Polytechnique Federale de Lausanne and in 1985 he was awarded an Honorary Degree of Doctor of Science by the University of Wisconsin-Milwaukee. In 1981 he retired for the second time, but this time it was from his academic role and he was granted Distinguished Professor Emeritus status. His first retirement was from the directorship of the Center for Great Lakes Studies, which was mandatory for administrators reaching age 65. Concurrently, he was awarded "Life Membership" by the American Society of Limnology and Oceanography. Work continued with European and British colleagues on the internal motions and biology of Swiss lakes (four publications), and a paper examining water motions in Green Bay, Lake Michigan using numerical models developed by former student, E. J. Fee, the present journal editor of Limnology and Oceanography.

The oxygen content of fresh waters was addressed in 1981 (Mitt. Int. Verein. Limnol. 22: 23pp). A review of 15,000 pages of court documents from a law suit over the pollution of Lake Michigan resulted in a 156 page scientist's assessment of the court proceedings. The judge's final decision was viewed to be based more on the personalities of the witnesses than the testimony they provided. (*The Lake Michigan Pollution Case: A Review and Commentary on the Limnological and Other Issues*). The decade began with the publication of a review and analysis of data collected during the 1972 International Field Year on the Great Lakes (IFYGL), (Center for Great Lakes Studies Special Report No. 37, 1980).

An American-Soviet symposium on the use of mathematical models in 1978 led to a paper on the importance of model verification (EPA Rpt. 600/9-78-024). The symposium also included a trip to Lake Baikal. Another paper in 1979 with W.H. Graf, examined *Strategies for coupling data collection and analysis with dynamic modeling of lake motions*.

There was a flurry of activity in the 1970's with graduate students and post doctoral fellows collecting data on IFYGL cruises and performing analysis of physical processes in Lakes Ontario and Michigan. There were 8 papers published during the decade relating to the IFYGL program as well as others that focused on continuing Lake Michigan research. Professor Mortimer's classic paper, *Lake Hydrodynamics*, was published in 1974 (Mitt. Internat. Verein. Limnol. 20:124-197). The illustrations developed for this paper have appeared in several textbooks and have helped many students understand the dynamics of internal motions in lakes. A 1971 paper, *Chemical exchanges between sediments and water in the Great Lakes –speculations on probable regulatory mechanisms* (L&O. 16:387-404) harkened back to his earlier research on sediment – water exchanges in English lakes.

The 70's were also busy with service to professional associations. He was elected President of the International Association for Great Lakes Research in 1973 and served as President of the American Society of Limnology and Oceanography in 1970.

The 1950's and 60's saw major changes in Professor Mortimer's research focus and geographical location. The former was strongly influenced by his wartime duties, more on that later, and the latter by opportunities that arose serendipitously. In 1966 he was offered a position as Distinguished Professor of Zoology at the University of Wisconsin-Milwaukee and the Directorship of a newly formed Center for Great Lakes Studies. Acceptance of that position led to his resignation as Director of the Scottish Marine Biological Station at Millport Scotland, where he had served since 1956, and a move to Milwaukee, Wisconsin USA. Seeds for this move were sown in 1962-63 while on a Brittingham Visiting Professorship at the University of Wisconsin-Madison, arranged by Professor A.D. Hasler, and a prior visit to that campus in 1953 at the invitation of the American Society of Limnology and Oceanography (ASLO) to address the annual meeting there. He was also asked to prepare material for a biography of E. A. Birge that resulted in an essay, *E. A. Birge an explorer of lakes*, a chapter in *E.A. Birge, a memoir*, by G. C. Sellery, University of Wisconsin Press 1956. Following his time in Madison, ASLO organized a three month lecture tour of limnological and marine stations across North America. During these visits to Wisconsin Professor Mortimer discovered temperature records at domestic water intakes in Lake Michigan that enabled him to deduce internal motions in the lake and to produce the research papers concerning these motions in the volumes noted above. Nearly 30 papers were published on lake motions and related methodology during the 1950's and 60's. Some focused on the English lakes, others on Lake Michigan.

Two noteworthy awards were bestowed on Professor Mortimer during this period. In 1965 he was awarded the Naumann Medal of the International Association of Limnology (SIL) and in 1958 he was elected to the Fellowship of the Royal Society of London. Among the accolades he received upon becoming a Fellow of the Royal Society (F.R.S.) was one letter that I will include here.

*Istituto Italiano di Idrobiologia
Verbania Pallanza*

May 8

Dear Mortimer

I have just been looking over recent numbers of Nature, and have so learnt of your election to the Royal Society. Please accept my congratulations; I am delighted both for your sake and for the recognition due to limnology.

Sincerely

(signed)

Evelyn Hutchinson

[Professor of Zoology at Yale University, on leave at Pallanza]

The 1940's were a tumultuous time for the world and the career path of Professor Mortimer. However, for him the decade ended as it began at the Freshwater Biological Association (FBA) on Lake Windermere in the English Lake District. His time at the FBA was interrupted by a secondment to the Royal Naval Scientific Service, Oceanographic Group at the Admiralty Research Laboratory from 1941-46. Duties with the Oceanographic Group included studies of waves and tides in the English Channel and shore patrols with other scientists, including Francis Crick.

Upon his return to Windermere with a new-found interest in physical limnology and miles of war-surplus electrical cables and other equipment, he set about to study the internal oscillations of Windermere and other lochs through the deployment of strings of thermistors to monitor temperature fluctuations about the thermocline. These investigations led to several publications that appeared in the early 1950's .

Professor Mortimer's initial appointment with the FBA in 1935 was with the condition that he continue the chemical analysis of lake water begun by Professor W.H. Pearsall, F.R.S. These studies drew his attention to the sediment-water interface and the importance of oxidation-reduction potential gradients that influence seasonal processes in lakes. Two papers written before his naval secondment have become classics on the subject and are cited in numerous textbooks and research papers. (*The exchange of dissolved substances between mud and water in lakes.* J. Ecol. 29:280-329 and J. Ecol. 30:147-201). These papers were published well before most of the readers of this sketch and the author were born!

In 1946 he was awarded the degree of Doctor of Science (D. Sc) by his Alma Mater, the University of Manchester, having received his B.Sc degree in Zoology there in 1932.

Post-graduate research was conducted at the Kaiser Wilhem Institut fur Biologie, Berlin-Dahlem, on the cytology and the environmental control of parthenogenesis in Cladocera. He was awarded a Doctor of Philosophy degree from the University of Berlin in

1935. Three papers were published detailing his cytological and genetics research on Cladocera in 1935-36.

Thus began the multiple careers of a truly distinguished scientist. Beginning with Cladoceran cytology and genetics, the geochemical studies of sediment-water interactions and continuing to date with the physical limnology of large lakes. Throughout his career, not only did Professor Mortimer distinguish himself as a research scientist and academic Professor, but he also was an adept administrator who understood the needs of the scientist for whom he was responsible. Having conducted research in most areas of the discipline, he could discuss the details of colleagues' work, contribute helpful suggestions, and provide them with the facilities and support required of their research.

The breadth and depth of his limnological and oceanographic knowledge has been demonstrated to me many times at seminars covering a wide range of topics. Distinguished Professor Mortimer would almost always ask the first question of a speaker, pointing out something he had done or observed decades earlier that was right to the point of the lecture at hand. At age 99-plus he is still vigorously writing, trying to meet the deadline for his next paper.

(Clifford did not make that deadline. He died peacefully on May 11, 2010.)