

The Jerlov Award of The Oceanography Society as presented to Raymond C. Smith, November 2002

Introductory remarks by Tommy Dickey • University of California • Santa Barbara, California USA



It is a great honor to be able to review a few of the many accomplishments of Ray Smith on this occasion of the presentation of the second Jerlov Award. First I would like to acknowledge and thank my esteemed colleagues who wrote letters in support of Ray's nomination. These include Ken Carder, Curt Davis, Dave Karl, Curt Mobley, Dave Siegel, Charlie Yentsch, and Ron Zaneveld.

Ray received his Ph.D. in high energy physics from Stanford University in 1961. Following two years as a research fellow and lecturer at Harvard University and Northeastern University, he joined the Visibility Laboratory of Scripps Institution of Oceanography where he was a major intellectual force and was responsible for much of the suc-

cess of the Vis Lab. In 1981, Ray then joined the faculty of the University of California, Santa Barbara (UCSB). There he has been an active educator with several students completing graduate degrees under his direction. In 1994, Ray officially "retired" and became Professor Emeritus at UCSB. Ray's research efforts have continued at a high level in terms of both quality and quantity. Thus far, he has authored or co-authored over 100 articles that have had major impacts on optical oceanography and other areas of oceanography and environmental science.

Ray's accomplishments include the development of several novel optical instruments including spectral radiometers to measure in the visible to the ultraviolet (UV). These were integrated into a bio-optical profiling system called BOPS. BOPS was the forerunner for many similar systems that have been used for a host of bio-optical studies including calibration and validation of aircraft and satellite ocean color remote measurements.

Ray was one of the early proponents of interdisciplinary oceanographic studies and the term "bio-optics" was, to my knowledge, first used in a classic Smith and Baker *Limnology and Oceanography* paper in 1978. Ray has been a major contributor to several programs involving optics and bio-optics. These include: Warm Core Rings, FRONTS, the Optical Dynamics Experiment, BIOWATT, Marine Light in the Mixed Layer, Water Colors, ICECOLORS, and the Antarctic Palmer Station Long-Term Ecological Research program. Ray is also well known for his work in the Arctic, Crater Lake, and Lake Tahoe.

Importantly, Ray led early efforts to place ocean optics on a sound scientific basis in terms of traceable optical standards, terminologies, and units. One of his most quoted and utilized papers dealt with the quantification of the optical properties of "pure" seawater, required as a standard for many interpretive and modeling applications. In the context of this nomination, it is also interesting to mention Ray's research concerning optical classification of natural waters—work that Nils Jerlov likely would have found most interesting. Ray also led a group of BIOWATT investigators in developing the first credible estimate of an oceanic "photon budget."

Ray was one of the early proponents of and major contributors to the establishment of optical remote sensing from space. Much of his work has been important for the development of ocean color remote sensing algorithms, which expand the spatial domain of optical observations to regions and virtually the entirety of the world oceans.

Ray began work in UV radiation in the late 1970s. Within the past decade, Ray and colleagues have led groundbreaking studies dedicated to oceanographic and ecological effects of increased UV radiation off Antarctica in the Southern Ocean caused by the growing ozone hole. Importantly, research by Ray and co-workers stimulated a host of important ecosystem studies involving planktonic bacteria, fish larvae, and even terrestrial plants and animals.

Ray's scientific work in ocean optics has been the focus of this nomination. However, his contributions have extended well beyond, into studies of ecosystems,

population dynamics, cetaceans, sea ice, glaciology, and climatology.

Ray's seemingly limitless energy and enthusiasm have set high standards for his students as well as peers. I would like to conclude with just a few quotes from the supporting letters. Charlie Yentsch stated that "Ray, among a large group of scientists, has put more effort into making ocean color a legitimate area of optics than any other researcher." Dave Karl noted that "... several of his many scientific papers might qualify as 'landmark' stature." Ron Zaneveld summarized his support by stating "Thanks to the vision and energy of researchers such as Professor Smith, we now have functioning ocean color satellites," and "There is no doubt that he has significantly advanced our knowledge of how light interacts with the ocean." Ken Carder stated, "Surely, Ray is a perfect example of a researcher who followed in the steps of Nils Jerlov, ..." And finally, Curt Mobley's assessment included the following statements, "Without Ray's contributions over the last forty years, optical oceanography in general, and bio-optics and instrumentation in particular, would not be so nearly advanced as they now are. He is second to none in deserving the Jerlov Award." Curt also warns everyone to think twice before accepting an invitation from Ray to go mountain biking. In Curt's words "Ray is extremely honed, and you will be eating his dust all day."

Ray Smith's remarks upon acceptance

I am overwhelmed and most grateful to accept this honor. It is most humbling, since I know there are many of my colleagues and those in the audience, who have made significant contributions in ocean optics. And, as Andre Morel stated two years ago when he received this honor, it is especially humbling to be nominated by one's peers.

In accepting the Jerlov Award I must do so within the context of accepting it for my University of California Marine Bio-Optics (UCMBO) team, those program managers that supported my research over the years, my graduate students and last, but certainly not least, my mentor from the Visibility Laboratory, John Tyler.

My research team includes: Karen Baker, who has worked with me since 1975; Charleen Johnson, who has worked with me since 1972; David Menzies, who joined our UCMBO team in 1982; Sharon Stammerjohn, who joined us when we began working in the Southern ocean in the early 90s; and most recently Kirk Ireson. This team has been wonderfully supportive, understanding and fully professional in every way, and I must say, in accepting this award, I'm doing so for this research team—we've been a team for three decades.

My mentor at the Visibility Laboratory was John Tyler, an outstanding scientist and wonderful individual who was also the Chairman of SCOR (Scientific

Committee on Ocean Research) Working Group 15. SCOR, in cooperation with IAPSO and UNESCO, formed this working group in November 1963 (39 years ago) on Photosynthetic Radiant Energy to identify exactly what measurement of irradiance is required by biological oceanographers, and to recommend apparatus and procedure for measuring photosynthetic radiant energy in the sea. You may recall that Working Group 15 was originally composed of four biologists and four physicists: Prof. Alexander A. Ivanoff (France), Prof. Nils Jerlov (Denmark) for whom this award is named, Dr. Harry R. Jitts (Australia), Dr. Yulen Ochakovsky (USSR), Dr. Yatsuka Saijo (Japan), Dr. John Steele (then in Scotland), Dr. E. Steemann Nielsen (Denmark) and John Tyler (USA, Chair). I mention this bit of history because I believe it is important to recognize, in the spirit of this Jerlov Award, that ocean optics began by melting various traditional disciplines and being multidisciplinary and international.

Thank you all so much for this honor. 

Nils Gunnar Jerlov was an early leader in the area of ocean optics research. His name is recognized widely within the entire international oceanographic research community. His theoretical and experimental work on ocean optical and related processes helped form the foundation of modern ocean optical research. He proposed the concept of an optical ocean water mass classification and the Jerlov water types are familiar to many outside of the ocean optics community. His book *Marine Optics*, published in 1976, remains widely referenced and is considered required reading for all students of ocean optics and ocean color remote sensing.

The Oceanography Society (TOS) commemorates Dr. Jerlov and his many contributions to the study of light in the ocean with an international award, established in his name, to recognize outstanding achievements in ocean optics and ocean color remote sensing research.

TOS is responsible for setting award policy, garnering nominations from the international research community, and selecting a recipient from those nominated. To be eligible for nomination, the recipient's work must deal directly with the processes governing the interaction of light with the ocean and/or the consequences of such interactions. The award may be issued in recognition of research (theoretical or applied, field-based or laboratory-based, a landmark paper or lifetime achievement), a pattern of excellence in education, a history of service to the international ocean optics research community, or contributions to all of the above. In the end, the nominated individual must have significantly advanced our knowledge of how light interacts with the ocean. The award is issued biennially and presented at appropriate TOS-sponsored conferences. The nomination deadline for the next award is June 1, 2004.