

Shark meets man: the research and academic life of Donald Richard Nelson (1937–1997)

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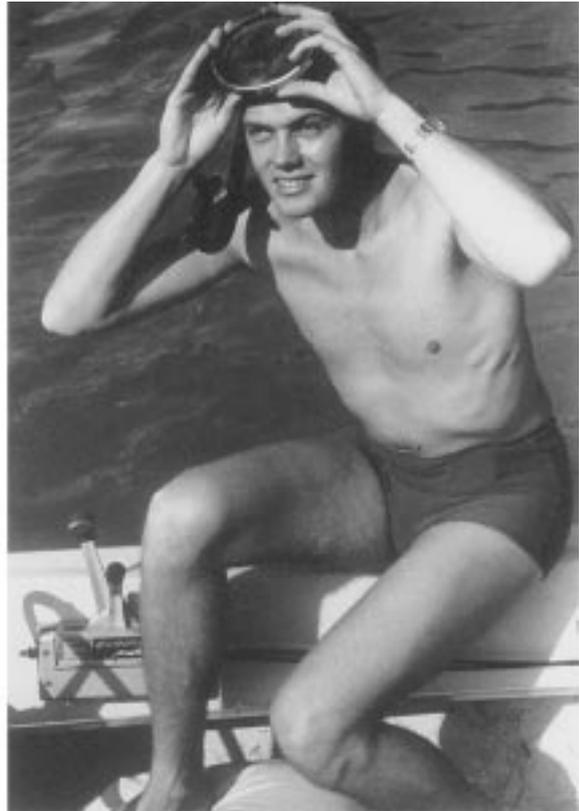
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Synopsis

This symposium is dedicated to the memory of Donald Richard Nelson, a pioneer in the study of shark behavior and sensory biology, a dedicated teacher, and friend to many. Don was an ultimate marine biologist who studied these enigmatic animals submerged in their own environment. He had many talents that ranged from expert diver to ethologist to cinematographer to engineer. Persistence and a critical approach to scientific challenges were his landmarks, and these qualities touched all of his students and many of his colleagues. His pleasant nature, never-ending friendship and dependable support are missed by many.



Don was born in Plainfield, New Jersey on 21 September 1937. He received his B.A. in Biology from Rutgers University in 1958, and entered graduate school at the University of Miami under the guidance of fish behaviorist Warren Wisby. In 1962 Don received a M.S. in Fisheries for his study on the behavior of penaeid shrimp, and then immediately commenced his doctoral work. Within one year Don's first scientific paper appeared in *Science* co-authored with his graduate student colleague, Sonny Gruber. This paper was the first to demonstrate attraction of sharks to low frequency sounds, and set the stage for Don's career in shark behavior and sensory biology. Don received a Ph.D. in Marine Biology in 1965 for his novel work on hearing and acoustic orientation in sharks.

Immediately following his graduate study, Don took his first and only academic appointment in the Biology Department at California State University at Long Beach. Here he launched a highly productive research career that included 25 field expeditions to sites in the Gulf of California, Marshall Islands, Polynesia, Australia and Bahamas. Over the next 30 years his laboratory produced nearly 50 publications, a remarkable statistic given the fact that many resulted from time-consuming field expeditions. Don's great knowledge of comparative animal behavior made him a highly respected teacher and scholar. For his academic duties Nelson taught a rigorous and challenging course in animal behavior in which the details of observation and synthesis were emphasized. In his last decade, he brought the joys of marine biology to literally thousands of undergraduates in his highly regarded Marine Natural History course. In it he developed an impressive interactive, multimedia CD-ROM with a large marine species database. Don was a member of several professional societies, and a founder of the American Elasmobranch Society in which he served as president in 1996.

In 1969 the Office of Naval Research awarded Don the first of many grants to perform experimental studies of hearing and acoustic orientation in sharks. His technical expertise with electronics equipment, which he acquired empirically for laboratory studies while in graduate school, led to excellent laboratory studies on hearing thresholds and diel behavior of small sharks. At the same time he and his students took traditional 'laboratory technology' into the field, and spent countless hours in the waters of the Pacific studying the behavior and ethology of sharks in their natural habitats, often with the support of the National Geographic

Society. This led to many important papers on shark sensory biology in the 1970's, perhaps most notable the study with graduate student Richard Johnson on acoustic attraction of Pacific reef sharks (Nelson & Johnson 1972).

As a young naturalist in the woods of New Jersey, Don studied bird behavior and was greatly influenced by the ethologists Konrad Lorenz and Niko Tinbergen. His interest in shark ethology is particularly evident in the paper on the agonistic display of the gray reef shark at Enewetak Atoll (Johnson & Nelson 1973). This milestone study was the first to show that shark attack behavior could be graded and involve a complex, predictable series of action patterns. It also demonstrated, in great detail, that shark attacks were not necessarily feeding motivated. While to many behaviorists this clearly appeared to be evidence for territorial behavior in sharks, Don's critical scientific mind was not convinced, and the function of the agonistic display in nature still remains to be demonstrated.

The shark research program in Nelson's laboratory at Long Beach State was known not only to the scientific world but also to the international public. Between 1968 and 1994, Don and his students were involved in the making of no less than 25 documentaries on television or educational films. His high profile in shark research was greatly complemented by his own cinematographer skills. Don spent thousands of hours filming his study subjects, and compiled a large library of 16-mm film that includes classic footage of the acoustic attraction and agonistic display experiments at Enewetak Atoll. Much of this footage still appears on television today.

Although Don's first love was to study sharks under the surface and 'tête-à-tête', he clearly recognized the limitations of directly working in the underwater world. Divers could not observe sharks for long periods of time, and almost nothing was known about shark movements under darkness. Thus, in the early 1970's he and his students embarked on a line of behavioral research that used a new technology known as ultrasonic telemetry. This occurred in the prehistoric era, before integrated circuits, lithium batteries and well-stocked telemetry vendors. There were even fewer biologists who could tackle the custom electronics designs needed for their research projects. Nevertheless, Don and his students (the present author included) spent countless weekends and holidays designing and soldering together ultrasonic transmitters from discrete transistors, capacitors and resistors. Working closely

for the next two decades with his student and colleague Jim McKibben, Nelson's laboratory pioneered the use of ultrasonic techniques and produced many important theses and papers on the movement patterns and home ranges of sharks. Don's technical approach to remote sensing is apparent even in his last senior author paper in which the rare megamouth shark was tracked off of the southern California coastline (Nelson et al. 1997).

Don's applied talents are evident even during the last years of his career. The discovery that the irritant effect of the Moses sole's pardaxin secretion was due to its surfactant properties led Nelson's laboratory to study the potency of cheap alternative surfactants and ways to apply them in the field. These experiments and potential for application to diver safety are found in his last published work, which is a part of this symposium volume (Sisneros & Nelson 2001).

Don supervised 21 Masters and 1 Ph.D. student (Peter Klimley at Scripps Institute of Oceanography) while at Cal State Long Beach, with many still active in elasmobranch research and participants of this symposium. All can tell you that his favorite tools were a pencil (or pen), paper (or napkin) and a cup of coffee, and with these he produced remarkable achievements in engineering design. Perhaps the most important gift he gave to his students was the confidence to view perspectives from both sides of the fence, and that there was almost always a workable solution to a logistic problem. Each of us still carry that confidence with us today, and recognize that gift more than ever since Don's passing on 7 March 1997 after a lengthy bout with melanoma skin cancer.

Don is survived by his wonderful wife, Ginger, who fully understood and supported his fascination with his animals. She was instrumental in coordinating efforts for the Nelson symposium at Guelph, and establishing the Nelson Research Fund, which is now administered by the American Elasmobranch Society. This perpetual fund now supports student research projects in shark behavior and sensory biology, with the goal of helping young scientists to view, as did Don, the secrets of these shrouded animals.

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