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Author

Price, Mary Lynn

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A BIOGRAPHY OF CONRAD LIMBAUGH

By Mary Lynn Price (2 May 2008)



Conrad Limbaugh was born in Chicago, Illinois on June 28, 1924, the son of Denton and Doris Daly Limbaugh. Denton Limbaugh worked at a variety of jobs, and was a poet who published

numerous volumes of poetry over the years.¹ In 1925 the family moved to Long Beach, California.

Limbaugh began skin diving as a teenager along the rocky coasts of Laguna Beach, Corona del Mar, and Palos Verdes, using “a crude face plate made of a coffee can and a piece of glass.”² During this time, he was introduced to the taxonomic classification of marine organisms by George MacGinitie of the Kerckhoff Marine Lab.

In 1942, Limbaugh enrolled in Compton Junior College, but did not complete the semester. He was called up for military service, and in 1943 was assigned to the U.S. Army Air Force. He was trained as a weather observer and eventually assigned to a small weather station in what was then the Yukon Territory. He was honorably discharged in January of 1946.

Limbaugh returned to school and received an Associate of Arts degree from Long Beach City College in 1947. He entered Whittier College soon after. He continued to skin dive and collect marine organisms. During the summer of 1948, Limbaugh studied marine invertebrates and ichthyology at Stanford’s Hopkins Marine Station in Pacific Grove, California. He received a Bachelor of Arts degree in Biology from Whittier College in 1949.

Later that year, Limbaugh began graduate studies in zoology at the University of California, Los Angeles. It was during this time that he first became aware of technological developments that allowed swimming underwater while breathing by means of a Self-Contained Underwater Breathing Apparatus, or SCUBA. Limbaugh describes the genesis of his diving on the new scuba apparatus:

During the winter of 1948-1949, I read of Jacques Cousteau’s invention, the Aqua-lung.³ This to me was the answer to how to make direct observations and to conduct experiments underwater. During my first semester (spring 1949) at UCLA, I convinced Dr. Boyd Walker that SCUBA was a valuable tool. He helped me obtain a unit, over the objection of some of the faculty.⁴

This Aqua-lung unit purchased by Professor Boyd Walker at Limbaugh’s insistence was one of the first units sold in the United States from the Westwood, California sporting goods store of René Bussoz. Limbaugh and his friend and fellow UCLA graduate student, Andreas Rechnitzer, taught themselves to use the new Aqua-lung without manuals or instruction (there were none available at the time), each one taking turns diving with the Aqua-lung unit while the other swam along and watched from the surface on snorkel.⁵ This nascent “buddy diving” approach would later become an integral part of the first scuba instruction program developed by Limbaugh in the years to come.

Limbaugh transferred to Scripps Institution of Oceanography in 1950, where he began studies under Dr. Carl Hubbs. Limbaugh describes early scientific scuba diving at Scripps as it pertained to the acquisition of that early Aqua-lung unit:

Diving began at Scripps in 1949 with one of the first U.S. Aqualungs. Actually, this first aqualung was the property of UCLA in the Zoological Department under Dr. Boyd Walker.⁶

In 1950 Limbaugh began to combine scuba diving with scientific research more directly, spending countless hours in the ocean observing the behavior of fishes and invertebrates, tagging fishes, and collecting specimens. His dives were carefully logged, with notes recording his observations that were often filled with subtle detail on fish habitat, interaction and behavior.⁷

As early as 1951, Limbaugh began to develop the basic guidelines for training other research students in scuba diving, and began instructing others at SIO. In a letter dated September 19, 1951, written by Scripps publicist Thomas Manar to Charles Blakeslee who was looking for potential authors for his planned monthly publication, *Skin Diver Magazine*, Manar writes,

Mr. Limbaugh has been using self-contained diving apparatus for the past year in his study of fish life in the kelp. He has drawn on his experience to formulate a set of precautionary rules on the use of such apparatus. Recently he has been instructing a group of men from the Submarine Geology Division in the use of such equipment....⁸

At this time, no formal standards for civilian scuba training and education existed in the United States. Nor did any systematic approach to training U.S. civilian research divers exist. Limbaugh and his diving colleagues were pioneering a new field in the U.S., and were learning by experience and, often, trial and error.

According to Edward Cargile, Limbaugh and Andreas Rechnitzer worked together on an early “Diving Training and Field Procedures Syllabus.”⁹

In the summer of 1953, Raymond Richards of the University of California, Berkeley died in a diving-related accident at the La Jolla Cove.¹⁰ The University diving program was temporarily halted pending development of a University-wide policy on the use of SCUBA and a more formalized course of instruction in diving skills and safety precautions.¹¹

On December 29, 1953, Limbaugh was officially appointed “Marine Diving Specialist” by Scripps Director Roger Revelle, and so became the first diving officer at Scripps.¹² Limbaugh’s duties required that he develop¹³ and “maintain a safe training program which will ensure a minimum of accidents. ... After the completion of the training course the diving officer will issue diving permits to the new divers. ... The diving officer will write a diving manual for the safe use of the aqua-lung.”¹⁴

Diving historian Eric Hanauer says of the early scuba training program at Scripps:

The curriculum was heavily influenced by the U.S. Navy's training as Underwater Demolition Teams (UDT) Commander Doug Fane often invited Limbaugh and other Scripps divers to participate with his men. This "boot camp" aspect continued as part of dive training for more than 20 years. Limbaugh's training course became the basis of the first public scuba certification, founded in Los Angeles County by Bev Morgan, Ramsey Parks and Al Tillman after they studied under Limbaugh.¹⁵

An early outline of Limbaugh's "*Diving Training Program; Requirements for a diving permit*" bears his name and the date, November 19, 1953.¹⁶ A more developed syllabus of the course Limbaugh developed is set forth in the "*Qualifications for a Diving Certificate*" and "*An Outline of Diving Regulations*," dated January 8, 1954 and bearing Limbaugh's name.¹⁷ This was subsequently revised in 1956, and again in 1958.¹⁸ These outlines and syllabi set the standards for dive training at Scripps; and numerous civilian dive training programs around the United States were based upon Limbaugh's program at Scripps.

A Scuba Certifying Board¹⁹ was instituted in late 1954 to oversee the certification of new divers, and set further parameters and requirements for dive training. The Certifying Board met officially for the first time on September 27, 1954.²⁰ The "Minutes of Certifying Board Meeting, September 27, 1954" indicate that the certifying board was to take formal responsibility for numerous aspects of dive training and certification oversight. In a follow-up memo dated June 13, 1955, there is reference to Limbaugh having been previously appointed both to the Board and as "Diver Training Officer."²¹

While Limbaugh was working on dive training during the early 1950s, he was also employed by the University of California under a research grant by the Kelco Company of San Diego to study the fish life in the kelp beds and the effects of kelp harvesting. This Kelco Fellowship actually began in 1950 under a 1949 agreement between the Kelco Company and the University, and was carried out under the guidance of Professor Carl Hubbs.²² The results of that study were published in 1955 as "*Fish Life in the Kelp Beds and the Effects of Kelp Harvesting*," a lengthy report widely used and distributed among both the scientific and the recreational diving and spearfishing communities.²³ This multiyear study represents Limbaugh's first major effort combining diving research and observation with "classical techniques" such as tows and microscopic analysis.

Limbaugh co-authored two other scientific papers published in the early 1950s,²⁴ but he became more widely known at that time for his articles on undersea life published in popular magazines, particularly *Skin Diver Magazine*, which became the seminal publication in the U.S. on recreational diving and spearfishing, with frequent articles on underwater photography.

An article and accompanying photos by Limbaugh on the California Sheepshead appeared in the first-ever edition of *Skin Diver Magazine* published in 1951.²⁵ His authoritative articles on diverse subjects such as California sea lions, killer whales, SCUBA diving rules and

regulations, groupers, shark attacks, rebreathers, and diving exposure suits would grace the pages of *Skin Diver Magazine* throughout the 1950s, providing thoughtful, scientific treatment of subjects of great interest to recreational divers and spearfishing enthusiasts.

Limbaugh's involvement with recreational circles of divers included his membership, by very exclusive invitation only, in one of the oldest skin diving clubs in the world, the San Diego Bottom Scratchers (first formed in 1933). He was inducted into the Bottom Scratchers in 1953, and joined an elite list of skin diving pioneers, including Glenn Orr, Ben Stone, Lamar Boren, Jim Stewart, Wheeler North, Jack Prodonovich and Wally Potts, and which would later include Dr. Carl Hubbs (who was initiated in 1955).²⁶

In addition to written logs, records and reports, Limbaugh also utilized underwater photography to document his marine life observations, applying his photographic skills in his diving research. He dived, corresponded, and shared ideas with other pioneering underwater photographers and cinematographers of the day, particularly those in the San Diego area. Civilian underwater imaging was in its infancy in the United States, and underwater photography was just beginning to spark the interest of recreational divers, often as an adjunct to their spearfishing activities.²⁷

Limbaugh became a popular speaker at local recreational dive clubs and community meetings. In many aspects of his life and work, he bridged the worlds of underwater scientific research and recreational diving circles, and in doing so contributed substantially to the development of both.

During the mid 1950s, Limbaugh began to travel to collect specimens and study the marine environment. Among the more notable expeditions in which he participated were two Scripps expeditions to Clipperton Island in 1956 and 1958 (the latter of which he led),²⁸ several to Guadalupe Island, Mexico, and at least two to Cabo San Lucas, Mexico.

He was also employed by Walt Disney Studios to work as a biologist and underwater cinematographer on filming projects for brief periods that took him to Northern California to film sea otters in 1953,²⁹ and the Bahamas to film coral reefs in 1956. While many of these expeditions were not officially part of his Scripps research, Limbaugh nonetheless used these expeditions as opportunities to collect marine specimens and further his underwater research, as well as hone his underwater imaging skills.

It was during the 1956 Disney Studios Bahamas engagement that Limbaugh had the opportunity to work with accomplished underwater photographers, Harry and Vern Pederson. The Pedersons had been making motion pictures in the Bahamas since 1952 of symbiotic cleaning behavior in a number of species of reef fishes and the colorful shrimp, *Periclimenes pedersoni*, named for them.³⁰ Limbaugh had earlier observed and recorded cleaning behavior in a number of fish species in California waters. The recognition that cleaning symbiosis was a widespread

behavior among marine species was an epiphany for Limbaugh, and became a subject that was one of his main foci in the remaining years of his life.

In 1956, he undertook with Andreas Rechnitzer a study for the Union Oil Company that culminated in the publication of *“An Oceanographic and Ecological Investigation of the Area Surrounding the Union Oil Company Santa Maria Refinery Outfall, Oso Flaco, California.”*³¹

This study was the result of one of many consulting projects in which Limbaugh was involved in the 1950s. He describes the relationship of Scripps to these endeavors in his *“Evaluation of Personal Scientific Abilities:”*

Occasionally outside organizations require my services. Sometimes I arrange a leave of absence and am paid by the outside organization. In some cases the University loans my services.³²

During the 1950s, Limbaugh also did a substantial amount of work under contract with the United States Navy. This work consisted of conducting a number of underwater surveys using scuba, participating in various operations at sea, submitting reports, and taking underwater photographs. Limbaugh had “secret” clearance registered with United States Navy Electronics Laboratory Security Branch.³³

What is evident from the field notes, writings, and correspondence contained in the Limbaugh Papers is that Limbaugh used every opportunity he could to further his underwater research and knowledge. Every “consulting” project was also an opportunity to collect and record. Many of his observations regarding marine life made while working on various consulting projects became the bases for papers that were later published posthumously through the efforts of his brother-in-law, Dr. Howard Feder.³⁴

By 1959, Limbaugh had published eight papers in scientific journals,³⁵ and numerous articles in popular diving publications, particularly *Skin Diver Magazine*. He was contacted frequently by other underwater researchers and asked to review and comment on articles prior to publication. Limbaugh participated in a number of radio programs through the University.³⁶ He also took part in television programs, such as “Gardens of the Sea,” aimed more at popular audiences.³⁷

The formation of Scientific Diving Consultants (SDC) took place in approximately 1957.³⁸ This was initially a private enterprise entity set up by Limbaugh, Wheeler North, Jim Stewart, Andreas Rechnitzer, Harrold Scotten, Ray Gilardi, Earl Murray and Chuck Fleming to handle consulting work and projects outside of the auspices of Scripps. The work of SDC included studies of sewage outfall effects on the marine environment, as well as filmmaking expeditions that resulted in groundbreaking underwater films. In 1959, SDC opened one of San Diego’s earliest dive shops, the Diving Locker, and brought in Charles “Chuck” Nicklin to manage the business. The Diving Locker would go on to become a mainstay of the San Diego diving

community, eventually coming under the sole ownership of the Nicklin family, and would play a role in the early careers of numerous renowned underwater imagers.³⁹

Of the underwater films in which Limbaugh was involved, two became well known in both scientific and recreational diving circles: “Rivers of Sand” and “Underwater Wonders.”⁴⁰ Both of these films carry the production credits of both Scripps and Scientific Diving Consultants, and were filmed by Limbaugh, Wheeler North and Jim Stewart. Ron Church edited both films, and contributed footage to “Underwater Wonders,” as did also Bev Morgan. These films premiered at the International Underwater Film Festival in Santa Monica in 1959 and 1960 respectively, and received honors, awards and accolades. “Rivers of Sand” contained footage of underwater sand flows that had never previously been filmed,⁴¹ and was a prime inspiration to many young underwater photographers of the time.⁴²

Limbaugh participated in the creation of underwater parks and preserves. Through his former UCLA classmate, marine biologist John Randall, Limbaugh was invited in 1958 to undertake an assessment of the feasibility of establishing an underwater park in the U.S. Virgin Islands. In California, his contribution toward establishing underwater preserve areas and parks was recognized at the dedication of the San Diego-La Jolla Underwater Park Ecological Reserve:

...the [California] State Legislature along with the California Department of Fish and Game and the City of San Diego, set aside a Marine Preserve along La Jolla’s coastline and marked it with a stone and plaque at The Cove, honoring Conrad Limbaugh.⁴³

Limbaugh’s most significant contribution in biology was his work on cleaning symbiosis. Initially while skin diving, Limbaugh noted symbiotic cleaning behavior among fishes in the waters off the California coast as early as 1949.⁴⁴ He stated in the 1961 *Scientific American* cover story, “*Cleaning Symbiosis*,” that “[O]bservations such as mine have been paralleled in the literature by other skin-diving biologists and by underwater photographers.”⁴⁵ Limbaugh goes on to list the 1952 to 1955 work of Vern and Harry Pederson, the 1953 writings of Austrian diver Hans Hass, the 1954 published notes of German biologist Irenäus Eibl-Eibesfeldt, and the work of John E. Randall.

What Limbaugh brought to the subject was context and a sense of the greater significance of his observations:

Recognition of cleaning symbiosis and its implications has come only in recent years. The gear and the technique of skin diving have given marine biologists a new approach to the direct observation of undersea life. They have discovered numerous examples of cleaning behavior, enough to establish already that the behavior represents one of the primary relationships in the community of life in the sea.⁴⁶

Limbaugh’s enthusiasm for the subject of cleaning symbiosis was extraordinary. Correspondence in the Limbaugh Papers evidences this fervor, as well as his ongoing

collaboration with both Fenner Chace, Jr. of the Smithsonian Institution and Harry Pederson. The work of the three was published shortly after Limbaugh's death, again through the efforts of Dr. Howard Feder, as "Shrimps That Clean Fishes," in the June 1961 Bulletin of Marine Science of the Gulf and Caribbean, with Limbaugh the senior author.⁴⁷

In January of 1957, Limbaugh submitted a written request to Dr. Carl Hubbs to change his thesis problem from a study of *Dendraster* species to "Symbiotic cleaning, its importance in biology."⁴⁸ It appears that a subject change actually had been a suggestion by Hubbs, himself. Limbaugh had attached to this written request a paper he had recently presented to the Western Society of Naturalists at Santa Barbara, California, which was apparently well received.

From the correspondence of the two men, it is evident that Carl Hubbs was very supportive of Limbaugh over the years throughout the 1950s as Limbaugh struggled academically to meet various University doctoral requirements, some imposed retroactively as the University sought to standardize degree requirements for obtaining a Ph.D.⁴⁹

In early 1960, Limbaugh was invited by Jacques Cousteau and other leaders of the European scientific diving community to attend the first meeting of the Confédération Mondiale des Activités Subaquatiques (CMAS), to be held in Barcelona, Spain. Limbaugh departed for Europe on March 4, 1960. At the conference, he presented a paper on cleaning symbiosis, and was voted a member of the board of directors of the new group, as well as the Chairman of Marine Biology.⁵⁰

During his visit to Spain and France, Limbaugh took the opportunity to dive in caves on islands along the coast of Spain and France.⁵¹ His wife, Nan Limbaugh Blackledge, described Connie's last week:

On March 13, 1960, Limbaugh was driven to Marseille [France] by Frédéric Dumas, along with Philippe Tailliez and François Clouzot. Later he made dives outside the harbor there and along the coast. ...

Limbaugh's death occurred on March 20, 1960, when he lost his way in the labyrinth that was the underground river at Port Miou, near Cassis, 20 miles from Marseille, France. Friends who had heard his talk on "cleaner fish" and shrimps had told him of the river underground where salt-water fish rid themselves of parasites by briefly swimming up across the interface into fresh water, quivering there a moment, then dropping back to their Mediterranean water. He would not have missed that sight. Yves Girault loaned him dive gear, François Clouzot drove the boat and remained outside the cave. Michel Poudevigne was [Limbaugh's] dive partner and guide. Entering the water from the boat outside the cave, the two first swam the 150 feet to where a chimney, open to the land surface, had sent eroding rocks to form a cone on the river's floor below. Limbaugh had a 16mm movie camera with him and wanted a shot up the chimney. To help him,

Poudevigne put his flashlight on the cone of rocks below and returned to give him a boost. Photography achieved,⁵² Poudevigne signaled or said he would pick up his flashlight on the cone of rocks below and be right back. But Limbaugh was gone when he returned.

Details of that day, and the search for him that lasted one week, can be read in letters from Dr. Wheeler North of Scripps, and Poudevigne, himself, to Mrs. Limbaugh.⁵³

One week later, the body of Conrad Limbaugh was found by professional cave divers some 350 feet from the entrance of the cave. Limbaugh was buried in a small cemetery overlooking the Mediterranean at Cassis, France. He was 35 years old. The scientific and recreational diving communities reacted with shock.

Thorough investigations into the cause of Limbaugh's death were undertaken, and the cause was deemed accidental.⁵⁴ In retrospect, contributing factors may have included Limbaugh's recent lengthy illness,⁵⁵ his lack of familiarity with both the borrowed equipment he was using and the cave in which he was diving, and the language barrier involved as Limbaugh did not speak French and his diving buddy, Poudevigne, did not speak English.⁵⁶

Limbaugh was survived by his wife, Nan (who has since remarried and is now Nan Blackledge); their two daughters, Peggy and Nancy; a son by a former marriage, Rocky MacDonald; a foster son, Mark Limbaugh; Limbaugh's father, Denton Limbaugh, his mother, Mrs. Doris Florer; his two sisters, Charmian Limbaugh Sorbello and Rosalind Limbaugh Feder; and his brother-in-law, Dr. Howard Feder.⁵⁷

Following Limbaugh's death, his brother-in-law, Dr. Howard Feder, spent several years bringing Limbaugh's unpublished manuscripts and notes to publication. With indefatigable commitment, Dr. Feder saw to the publication of eight additional scientific papers,⁵⁸ including the cover feature of the August 1961 volume of *Scientific American*, "*Cleaning Symbiosis.*"

A number of marine species have been named for Limbaugh, including *Chromis limbaughi*, *Holocanthus limbaughi*, *Elacanthus limbaughi*, *Chaenopsis limbaughi*, and *Cadlina limbaughorum*, the latter named for both Conrad and his wife, Nan Limbaugh Blackledge, also an accomplished diver and underwater photographer.

In the years since his death, Conrad Limbaugh is often spoken of and written about with reverence. He has inspired generations of divers. His contributions to scientific and recreational diving, as well as to a more widespread understanding of cleaning symbiosis, are invaluable.

As the great poet W. H. Auden wrote in the December 24, 1961 *London Sunday Times* of Limbaugh's *Scientific American* article:

If I ask myself what single piece of literature gave me greatest pleasure in 1961, it was an article in the "Scientific American" called "Cleaning Shrimps." Perhaps I should explain that it's concerned not with preparing shrimps for the table but with shrimps who live from cleaning fish.⁵⁹

Auden, who spent his life observing and writing about the human condition, no doubt was struck by Limbaugh's clear description of cooperative interaction between species.

Footnotes

¹ See for example, Denton Limbaugh, *This Dreadful Freedom* (1953), Scripps Library, Rare Book Collection.

² Limbaugh to Edwin T. Connell, Editor of *The American Magazine*, 1/21/52, Limbaugh Papers, MC86, "Footnotes: [Correspondence, General 1951-1952]," box 3, f47. Limbaugh's widow, Nan Limbaugh Blackledge, wrote a 2003 "*Biography of Conrad Limbaugh*" that covers his wide-ranging interests and numerous accomplishments, Limbaugh Papers, MC86, box 1, f11. This writer has drawn extensively upon information in that work, and is indebted to Mrs. Blackledge for her concise and thorough presentation.

³ Numerous forms of the word, "Aqua-lung" are encountered in the literature, and there exists a lack of consistency among and within sources as to whether it was written as one word or two, capitalized and/or hyphenated. The capitalized, hyphenated form has been adopted for the instant biography, unless quoting a written source where some other form has been used. The history of the term is interesting, involves trademark and proprietary considerations, but such a discussion is beyond the scope of this writing.

⁴ Conrad Limbaugh, "Evaluation of Personal Scientific Abilities," Fall, 1959, p. 4, Limbaugh Papers, MC86, box1, f21. According to Nan Limbaugh Blackledge, both Limbaugh and a fellow student, Ken Norris, first saw the Aqua-lung in Bussoz's sporting goods store and convinced Dr. Walker to purchase it. "*Biography of Conrad Limbaugh*," p. 2.

⁵ Eric Hanauer, "Scientific Diving at Scripps," *Oceanography*, Vol. 16, No. 3 (2003), p. 88.

⁶ Limbaugh, "Free Diving as a Scientific Technique," n.d., p. 2, Limbaugh Papers, MC86, box12, f256. In his use of the phrase, "free diving," Limbaugh is referring to diving with air supplied via SCUBA, in contrast to hardhat diving where the diver is heavily weighted and walks along the bottom with air supplied via a surface hose. The first scientific diver at SIO was Cheng Kwai Tseng, a biologist from China who used Japanese made abalone gear with surface-supplied air to collect algae off the San Diego coast as early as 1944, according to diving historian, Eric Hanauer, p. 88.

⁷ See Limbaugh's Dive Logs, Limbaugh Papers MC86, boxes 8 and 9, f171-190.

⁸ Letter from Manar to Blakeslee, Stewart Papers, MC29, "Diving Magazines, *The Skin Diver*, [1951-1958]" box 3.

⁹ Edward C. Cargile, "Dr. Andy Rechnitzer, HDS-USA Advisory Board," *Historical Diver*, Vol. 13, Issue 4, No. 45, p. 28. Cargile gives a date of 1951 for this syllabus. There is not a copy in the Limbaugh Collection.

¹⁰ In an undated document entitled, "Accident Report: Letter Describing Two Deaths At University of California," Diving Committee Chairman, Frank E. Snodgrass, described Raymond Richards as a faculty

member from the Berkeley campus “on temporary duty at Scripps.” S.I.O. Subject Files Records, 1890-1981, “*Diving Reports, Accidents, 1955*,” AC 6, box 6, f11.

¹¹ A number of interesting documents pertaining to the need for a formal, standardized dive training and certification program, Limbaugh’s appointment to take responsibility for developing such, and the initiation of a University-wide committee to oversee the matter can be found in the S.I.O. Subject Files Records, 1890-1981, “*Diving Reports, Accidents, 1955*,” AC 6, box 6, f11. Included in this folder is a copy of the November 2, 1953 letter from Roger Revelle to Robert Sproul, wherein Revelle lays out the importance of SCUBA to scientific research, and the need for a University-wide policy on the use of SCUBA.

¹² The appointment letter dated December 29, 1953 from George Mallory, Assistant Secretary and Assistant Treasurer for the Regents of the University of California, specifies that Limbaugh’s appointment as “Marine Diving Specialist (La Jolla)” is from July 1, 1953 to January 31, 1954, apparently backdating the initial appointment period. James Ronald Stewart Papers, MC29, “*Duties of Diving Officer [1953-1962]*,” box 3.

¹³ Limbaugh uses the phrase, “develop and maintain a safe aqualung training program” in a cover outline that accompanies a typed “Job Description for Conrad Limbaugh” signed by him. Please see footnote 14, below.

¹⁴ Excerpt from the detailed *Job Description Card*, Hubbs Papers, MC5, Subject Files, box 10, f120, “*Biographic, General, Limbaugh, Conrad, 1949-1972*.” It appears that Limbaugh, himself, supplied the wording for this lengthy description of the diving officer’s numerous and diverse duties, as a separate typed version of the “tasks,” entitled “Job Description for Conrad Limbaugh” which was signed by Limbaugh, can be found in the Stewart Papers, MC29, “*Duties of Diving Officer [1953-1962]*,” box 3. It would be Jim Stewart who would write the first formal diving safety manual, according to dive historian Eric Hanauer in “*Scientific Diving at Scripps*,” p. 88.

¹⁵ Hanauer, “*Scientific Diving at Scripps*,” p. 88.

¹⁶ Stewart Papers, “Diving Class [1953-1956],” box 6. Two early undated, handwritten papers by Limbaugh on dive training can be found in the Limbaugh Papers: “Aqua Lung Diving Training,” and “Safety Rules for the Use of Lung.” The first of these two papers states that the “present program has evolved as the result of 4 years of “aqualunging....” This would indicate a date of approximately 1953. Aqua Lung Diving Training, n.d. [Part 1 of 2]” and “[Part 2 of 2],” box 4, f77, f78.

¹⁷ The original document was apparently not retained in Limbaugh’s files. A copy of it can be found in the Stewart Papers, MC29, “*S.I.O. Certifying Board, 1954-1962*,” box 5.

¹⁸ Limbaugh Papers, MC86, “*Self-contained Underwater Breathing Apparatus (SCUBA) Policy, “Institute of Marine Resources/SIO, May 19, 1958*,” box 4, f86.

¹⁹ While the “Minutes of Certifying Board Meeting, September 27, 1954” do not list the Board members by name, a subsequent memorandum dated June 13, 1955 referencing those minutes was sent from Admiral Charles Wheelock to Frank Snodgrass, Earl Murray, Charles Fleming, Robert Huffer and Conrad Limbaugh, with a cc to Edwin Hamilton and Division Heads. At a “SCUBA Meeting” on June 13, 1955, it was proposed that the Scripps certifying committee be expanded into two boards, one with Scripps members, Huffer, Limbaugh, Snodgrass, Murray and Fleming; and a Naval Electronics Laboratory (NEL) board consisting of Hamilton, Dill, Buffington and Goode (no first names provided). Stewart Papers, MC29, “*S.I.O. Certifying Board, 1954-1962*,” box 5.

²⁰ Stewart Papers, MC29, “*Minutes of the Certifying Board Meeting, September 27, 1954*,” “*S.I.O. Certifying Board, 1954-1962*,” box 5.

²¹ *Memorandum*, Stewart Papers, MC29, “*S.I.O. Certifying Board, 1954-1962*,” box 5. It is interesting to note that in the minutes of the meeting that accompany the memo of the Certifying Board dated June 13, 1955, there is reference to “University diving” not yet having been resumed, but that “when University diving is resumed Scripps has been recommended to handle training and certification of all divers.”

²² Limbaugh, “*Evaluation of Personal Scientific Abilities*,” p. 6, Limbaugh Papers, MC86, box 1, f21. See also numerous letters pertaining to the Kelco Fellowship in the Limbaugh Biographical file of the Hubbs Papers box 10, f120, including a letter from Carl Hubbs to the technical director of Kelco, dated September 13, 1949, detailing Limbaugh’s qualifications as well as proposed salaries for the coming years of the agreement.

²³ Institute of Marine Resources reference 55-9 (1955), pp. 1-158.

²⁴ Andreas B. Rechnitzer and Conrad Limbaugh, “*Breeding Habits of Hyperporosopon argenteum, a Viviparous Fish of California*,” 1952, Limbaugh Papers, MC86, “*Reprints: 1952-1954*,” box 13, f282; Grace L. Orton and Limbaugh, “*Occurrence of an Oil Globule in Eggs of Pleuronectid Flat Fishes*,” 1953, Limbaugh Papers, MC86, box12, f271.

²⁵ Limbaugh Papers, MC86, “[*Reprints: n.d.*],” box 13, f281.

²⁶ The San Diego Bottom Scratchers was one of the world’s first diving clubs, and was initiated in 1933. As Eric Hanauer puts it in his book, *Diving Pioneers*, “[t]hat was about three years before Jacques Cousteau and Hans Hass began goggling in the Mediterranean, and a decade before the invention of the Aqualung.” 1994, p. 46. As of this writing, this book is still available through Aqua Quest Publications, Inc., www.aquaquest.com.

²⁷ San Diego was the center of a very lively and innovative early skin diving community, and this diving community later gave rise to a number of pioneering underwater imagers, both photographers and cinematographers, including Ron Church, Lamar Boren, Chuck Nicklin, and many others. These, in turn, inspired many of the well-known present day underwater imagers from the San Diego area, including Howard and Michele Hall, Marty Snyderman, Flip Nicklin, Bob Cranston, and Lance Milbrand, to name a few.

²⁸ The 1958 Clipperton Island expedition, which was an adjunct to the Scripps “Doldrums” expedition during the International Geophysical Year, included a young woman scientist, Marie-Helene Sachet. Sachet’s participation in this expedition was not readily endorsed by Limbaugh, and interesting correspondence regarding this aspect can be found among Limbaugh’s many letters of that year, both outgoing and incoming. Limbaugh Papers, MC86, box 2, f36, f38, f45, f46.

²⁹ Limbaugh, “*Observations on the California Sea Otter*,” *Journal of Mammology*, vol. 42, No. 2, 20 May 1961, p. 271.

³⁰ Limbaugh, “*Cleaning Symbiosis*,” *Scientific American*, August, 1961, p. 45, Limbaugh Papers, MC86, “*Footnotes: [Reprints by/about Conrad Limbaugh: Part 1 of 2]*,” box 13, f289. Extensive correspondence can be found in the Limbaugh Papers, Correspondence Series among Limbaugh, the Pedersons, Dr. Howard Chace, and others regarding the significance of these observations, and the plans for publication on the issue, Limbaugh Papers, MC86, box 2, f37 through f42, f45 and f46.

³¹ Rechnitzer, Andreas B. and Conrad Limbaugh, *Institute of Marine Resources reference 56-5* (1956), pp. 1-46.

³² Limbaugh Papers, MC86, box 1, f21.

³³ Limbaugh Papers, MC86, “*Navy Diving Work, September 4, 1951-August 7, 1953,*” and “*Navy Diving Work, October 2, 1953-January 3, 1956,*” box 4, f83 and f84.

³⁴ Dr. Howard Feder, husband of Limbaugh’s sister, Rosalind Limbaugh Feder, is a marine scientist who took it upon himself to publish many of Limbaugh’s papers following Limbaugh’s death on March 20, 1960. Dr. Feder is a retired faculty member of Hartnell College, and received his Ph.D. from Stanford University. It was through Dr. Feder’s efforts that many of Limbaugh’s most notable studies saw posthumous publication.

³⁵ In addition to the previous papers mentioned above, between 1955 and 1958, Limbaugh also published the following: Limbaugh and Andreas Rechnitzer, “*Visual Detection of Temperature Density Discontinuities in Water by Diving,*” *Science*, March 18, 1955, Vol. 121, 1-2; Limbaugh and Wheeler J. North, “*Fluorescent, Benthic Pacific Coast Coelenterates,*” *Nature*, 1956, Vol. 178, 489-498; Limbaugh and Francis B. Shepard, “*Submarine Canyons,*” *Geological Society of America, Memoir 67*, Vol. 1, Chapter 21, 633-639, 1957; Limbaugh, “*Marine Outfall Studies by Qualified Diving Investigators,*” *Engineering Bulletin*, Proceedings of the 12th Industrial Waste Conference, May 13-15, 1957, series 90.94, Purdue University, 210-216, 1958.

³⁶ Limbaugh Papers, MC86, “*University of California Radio Broadcast 3696, Strange Partners in the Sea, December 29, 1957,*” box 14, f331.

³⁷ Limbaugh Papers, MC86, “*Gardens of the Sea—Television Transcript, 1953,*” “*Reprints, n.d.,*” box 13, f281.

³⁸ In a letter to Bev Morgan dated November 25, 1957, Limbaugh refers to one of his films being “tied to partners,” and other material “done by our group (SDC)” in reference to Scientific Diving Consultants. Limbaugh Papers, MC 86, “*Correspondence Outgoing, January 4, 1957-February 19, 1958,*” box 2, f144.

³⁹ Eventually, Chuck Nicklin bought out the interests of the other founders. For more on the history of the Diving Locker, see the History section of Chuck Nicklin’s website, <http://chucknicklin.com>. The Diving Locker played a part in the beginnings of such notable underwater photographers and cinematographers as Flip Nicklin, Howard Hall, Marty Snyderman, and was also the site of the first meetings of the San Diego Underwater Photographic Society (SDUPS) founded by Ron Church in 1961.

⁴⁰ “*Rivers of Sand, Scientific Diving Consultants (Conrad Limbaugh, Wheeler North and James Stewart, c1959,*” Limbaugh Papers, MC86, box 18, f356.

⁴¹ The program from the 1960 Fourth International Underwater Film Festival contains a Memorial Page to Limbaugh, and lists him as “Honored Photographer” for 1958 (with his wife, Nan Limbaugh) and 1960, Limbaugh Papers, MC86, box 4, f74.

⁴² Interview with Charles “Chuck” Nicklin by Mary Lynn Price, June 9, 2001; interview with Jim Stewart by Mary Lynn Price, May 4, 2005.

⁴³ Blackledge, Nan Limbaugh, *Biography of Conrad Limbaugh*, p. 6, Limbaugh Papers, MC86, box 1, f11.

⁴⁴ Limbaugh, "Cleaning Symbiosis," *Scientific American*, August 1961, p. 42, Limbaugh Papers, MC86, *Footnotes: [Reprints By/About Conrad Limbaugh, Part 1 of 2]*, box 13, f298.

⁴⁵ "Cleaning Symbiosis," p. 45.

⁴⁶ "Cleaning Symbiosis," p. 42.

⁴⁷ Limbaugh, Harry Pederson, and Fenner A. Chace, Jr. "Shrimps that Clean Fishes," *Bulletin of Marine Science of the Gulf and Caribbean*, June 1961, Vol. 11, No. 2, pp. 237-257.

⁴⁸ Limbaugh to Hubbs, *Memorandum*, January 4, 1957, Limbaugh Papers, MC86, *Correspondence Outgoing: January 4, 1957-February 19, 1958*, box 2, f44.

⁴⁹ For a more thorough understanding of Limbaugh's academic struggles and Hubbs's ongoing support, the reader is directed to both the correspondence of Carl Hubbs. Hubbs Papers, MC5, *Subject Files*, box10, f120, and the correspondence of Limbaugh with others regarding his various academic issues and struggles, Limbaugh Papers, MC86, *Correspondence Outgoing: January 19, 1959-February 25, 1960*, box2, f46.

⁵⁰ Nan Limbaugh Blackledge, *Biography of Conrad Limbaugh*, p. 5.

⁵¹ See transcriptions of Limbaugh's last letters to his wife, Nan, for an account of how he spent his time while in Spain and France, Limbaugh Papers, MC86, "Footnotes: [Correspondence Regarding Death] 1960," box 3, f63.

⁵² The footage from this fateful dive was retrieved and is part of the collection, Limbaugh Papers, MC86, Films and Sound Recordings Series, "Caves, France, Barcelona and Last Dive, CMAS Meeting, 1960."

⁵³ Wheeler North to Nan Limbaugh, Friday, March 25, 1960, Limbaugh Papers, MC86, "Last Dive," box 3, f64.

⁵⁴ Limbaugh Papers, MC86, "Newspaper Clippings: 1960," box 11, f223.

⁵⁵ Limbaugh describes having "been ill for a number of months with double pneumonia followed by pleurisy," in a letter to Dr. Fenner Chace, dated February 1, 1960, written shortly before his trip to Europe. Limbaugh Papers, MC86, "Correspondence, Outgoing: January 19, 1959-February 25, 1960," box 2, f46. Limbaugh had been studying long hours for a number of months in his attempt to meet various doctoral requirements, some retroactively imposed, at a time when he was also working fulltime for the University. In addition, he was actively involved in the work of the Scientific Diving Consultants, and the Diving Locker (which had opened for business in 1959).

⁵⁶ North to Nan Limbaugh, March 25, 1960, Limbaugh Papers, MC86, "Last Dive," box 3, f64.

⁵⁷ Nan Limbaugh Blackledge, *Biography*, p.6.

⁵⁸ Limbaugh, "Life History and Ecological Notes on the Black Croaker," *California Fish and Game*, April, 1961, Vol. 47, No.2; Limbaugh, "Life History and Ecological Notes on the Tubenose Aulorhynchus flavidus, a Hemibranch Fish of Western North America," *Copeia*, 1962, No. 3, September 28, pp. 549-555; Limbaugh, Harry Pederson and Fenner A. Chace, Jr., "Shrimps That Clean Fishes," *Bulletin of Marine Science of the Gulf and Caribbean*, Vol. 11, No. 2, pp. 237-257; Limbaugh, "Observations on the California Sea Otter," *Journal of Mammalogy*, Vol. 42, No. 2, May 20, 1961, pp. 271-273; Limbaugh, "Sharks and Survival," Chapter 2,

Field Notes on Sharks; Limbaugh, "Observations on Fishes Associated with Kelp Beds in Southern California," State of California Department of Fish and Game, *Fish Bulletin 160*; Limbaugh, "Notes on the Life History of Two California Pomacentrids: *Garibaldi*, *Hypsypops rubicunda* (Girard), and *Blacksmiths*, *Chromis punctipinnis* (Cooper)," *Pacific Science*, Vol. XVII, No. 1, January, 1964.

⁵⁹ Limbaugh Papers, MC86, box 11, f224.