Orrin Hedron Pilkey Jr. (1934-2024)

A Tribute to a SEPM Leader and Explorer from Shore to Deep-Sea On 13 December 2024 our profession lost a modern "pioneer" of sedimentary geology, and SEPM lost one of its most significant leaders of the late 20th century, with the passing of Orrin H. Pilkey, Jr. Orrin, world-renowned coastal geologist and James B. Duke Professor Emeritus, Nicholas School of the Environment, Duke University, was 90 at the time of his death. In the months prior to his passing, he was working on still another book in his long line of publications ranging from technical papers (over 250) to books (50), editorships, and communicating the importance of marine and coastal science to the public through numerous op-eds, video productions, and public lectures. Early in his career at Duke he developed an introductory Oceanography course for nonmajors, jointly taught with a marine biologist, that continued in popularity for decades. Each year he took several busloads of students in this course to Shackleford Banks to share the field experiences of science. He was not just a dedicated researcher, but an honest-to-God dedicated teacher. A rare person in the current "publish-or-perish" generation.

Orrin's graduate-level courses and seminars were current in content and often led to students' choices for thesis topics or group projects that led to publications. He incorporated his own global experience and stories of adventures in all his courses, generating environmental knowledge for several generations of students. Orrin's favorite course was an annual "Coastal Seminar" led by his PhD students and including MS students as well as undergraduates (and good wine, too). The course dug into the details, origins, and evolution of coastal engineering models, and especially their limitations, , and (often) their misleading results. The social points were made that such information was not clearly presented to the public nor funders. The course led to numerous papers and op-eds that criticized the application of such models to real-world settings and their promises of unrealistic replenished-beach persistence times and maintenance costs.

His coastal field trips were popular real-world "events" for students at all levels, often accompanied by TV and print reporters, local community coastal planners, insurance agents, and state and federal coastal personnel. He was an educator beyond the classroom, whether a guest at a grade school, a paper in a high-school teachers' journal (e.g. *Let the Lighthouse Fall In*, 1974), or speeches to environmental groups and a wide variety of civic organizations. His collective professional work, spanning more than 65 years, is matched by few of his peers, and his adventures in research cruises and field work could be the basis for books or movies.

From the time of his birth in New York City during the Great Depression, Orrin was influenced by his father's career as a civil engineer (designing bridges and later LSTs during WWII). The family moved to Chicago during WWII where Orrin attended grade school, and in a small-world story he learned later in life that another kid who lived in the same apartment building was Jim Howard, later his colleague and research collaborator at the University of Georgia. The family then moved to eastern Washington where his father worked at the Hanford nuclear facility. Here in his teen years Orrin became an enthusiastic arrowhead and relics collector, as well as developing his interest in geology. On the negative side, residents of that area were exposed to the Hanford radioactive toxins discharged into the air and water at that time, resulting in Orrin, his brother, and most of their classmates, experiencing lifetimes of thyroid problems.

Orrin's professional journey began at Washington State University where he earned his B.S. in geology (1957). It was there he met his wife of sixty years, Sharlene, who passed away in

2015. During summers of his high school and college years Orrin and his brother worked as smokejumpers, fighting forest fires in the Pacific Northwest. In 2012 Orrin briefly reunited with the same Trimotor Ford aircraft from which they jumped–the plane still on tour 67 years later! After a short stint of active duty in the U.S. Army (followed by eight years in the reserves, attaining the rank of Captain), Orrin began working toward his M.S. at University of Montana in 1959. His focus on sedimentary geology crystallized at Florida State University where he earned his Ph.D. (1962) under the influence of William Tanner and his mentor Donn Gorsline (President/Editor SEPM/JSP in the 1970s).

Orrin's first academic appointment was as a research professor at the University of Geogia's Marine Institute, Sapelo Island (1962-1965), where he began extensive studies of sediments from beaches, the shelf, and continental slope off the southeastern U. S. coast (interacting with several important Georgia sedimentologists of the time). His research vessel was a converted shrimp-boat. He once noted that during this time he spent half of his life at sea, but the work stimulated a lifetime focus on the southern U. S. coastal and marine environments, and that interest extended to similar environments globally. In 1965 Orrin accepted a geology faculty appointment at Duke University, drawn by the lure of Duke's new ocean-going research vessel R/V *Eastward*, which allowed Orrin to extend his research to the deep ocean on cruises of days-to-weeks in length.

Duke provided impetus for his research interests in two major areas: deep-sea basins and international projects. In the first case, he capitalized on the school's marine lab being the home port of R/V *Eastward* (part of the NSF's research fleet). There he established a record of successful grant proposals supporting research cruises from the shelf into the deep-sea, not just off the Southeastern U. S., but marine basins from the Western Atlantic to the Caribbean, and the Mediterranean. And most every cruise was the basis for one or more graduate-student thesis projects, resulting in a plethora of published results.

The 1970s were a time when there was much interest in turbidites, and the debate for modern deep-sea sediments was turbidity currents vs other bottom currents. Orrin's collective basin studies helped shed light on both processes. Perhaps the most noteworthy was the discovery of the 'black shell turbidite' in the late 1970s (e.g., Elmore, R.D., et al., 1979, "*Black Shell turbidite, Hatteras Abyssal Plain, western Atlantic Ocean*" GSA Bull., v. 90, p. 1165-1176), a turbidity-current deposit correlated over an area of 44,000 km^2. The Black shell turbidite is generally considered to be the largest-volume turbidite correlated (maximum thickness is 400 cm) in a modern sedimentary environment. The deposit is also the longest distance (500 km) over which a single catastrophic event has been traced, ancient or recent. By necessity, R/V *Eastward* often made ports outside the U.S., and Orrin began collaborations with geologists from other countries, including them in cruises as well as other sedimentary studies.

His early international outreach began with a field study of the sediments of the Lake of Tunis, Tunisia, and studies of the Arabian Sea and Persian Gulf sediments. As his influence grew, he was called upon to develop conferences and provide consultations to Korea, Portugal, Colombia, the Marshall Islands, and in his retirement a co-operative arrangement with Ulster University, Northern Ireland. His work took him to all seven continents and nearly all of the seven seas! To paraphrase H.H. Read, "the best coastal geologist is he who has seen the most beaches." Orrin certainly must be in the running for the "most beaches", culminating with a book replete with artistic imaginings of islands by celebrated batik artist Mary Edna Fraser ("*A Celebration of the World's Barrier Islands*" 2003, Columbia University Press). Then in 2011 Orrin and his PhD student Matt Stutz published "*Open-Ocean Barrier Islands: Global Influence*

of Climatic, Oceanographic, and Depositional Settings" (Journal of Coastal Research, v. 27, p. 208–222) which added over 650 previously unrecognized barrier islands globally, increasing the world's inventory of barrier islands to more than 2,150. This report generated extensive media attention, both nationally and internationally.

Orrin began as a mineralogist/petrologist, investigating provenance of beach heavy minerals and mapping shelf sediments, then evolving into studying deep sea sediments, before turning his attention to hurricane impacts and coastal hazards. He adapted his interests to what was at hand, much in the same way he adapted to the unpredicted events of cruises or field conditions. On a 1975 cruise to piston core the Hatteras abyssal plain, *Eastward's* winch broke making it impossible to do deep-water piston coring. Instead of throwing in the towel and heading home he redirected the focus to the narrow insular shelf of Puerto Rico. He had spent a sabbatical in Puerto Rico in 1971 and gained an appreciation for insular-shelf dynamics. Hurricane Eloise had just passed over Puerto Rico with 33 inches of rainfall causing major flooding of the rivers on the northern coast. So, Orrin spent the rest of the 1975 cruise time box-dredging the surficial sediments around the island. The major finding was the presence of lenses of muddy sediments on the shelf off those rivers with major flooding on the northern coast. Subsequent resampling of many of the northern-coast shelf sediment lenses with graduate student, Dave Bush, led Orrin to develop a model of rapid cross-shelf sediment transport on the high wave energy coast. This finding expanded to an entirely new research focus resulting in at least five M.S. and Ph.D. studies of shelf-sediment transport on the northern coast/shelf of Puerto Rico. These works were applied in the search for sand resources for concrete aggregate and potential beach replenishment.

Paralleling his active teaching/research tracks, Orrin was remarkably active in a wide range of professional activities, most especially with SEPM. Five years into his post-doctorate career, Orrin was a bit tardy in joining SEPM but quickly became a participating member in 1968. Under the influence of his Florida State mentor, Donn Gorsline, who was SEPM President and Journal Editor in the 1970s, Orrin took on these same SEPM roles. From the late 1960s through the early 1990s Orrin was an SEPM leader and frequent coauthor/coeditor of SEPM publications (see below). At the same time as these SEPM activities, Orrin was continuously active on numerous boards, committees, and programs of other organizations, universities, as well as state and local agencies.

Ironically, it was Hurricane Camille striking the Mississippi coast in August 1969 that put another iron in the fire of Orrin's research interests and moved much of his focus back to shorelines and barrier islands. The storm severely damaged his parents' home in Waveland, MS, and Orrin and his brother were called on to help clean up the damage and restore their residence. Together with their father they generated the book "*Coastal Design, A Guide for Planners, Developers and Homeowners"* (1979, Van Nostrand Reinhold) and Orrin's "*How to Live with an Island"* (1975, North Carolina Dept. of Natural and Economic Resources). The latter was the precursor to the "*Living with the Shoreline*" series of 22 books (Duke University Press), of which Orrin was co-editor of all and co-author of most of the volumes. "*From Currituck to Calabash: Living with North Carolina's Barrier Islands"* (1978) was the first book in the series dedicated to an entire state describing the many negative aspects and impacts of coastal living such as coastal hazards, environmental impact of development—e.g., dune and forest removal, lack of proper coastal planning and management, lack of proper building codes and construction methods needed in a high-hazard zone (his engineer father, Orrin Pilkey, Sr., was a co-author and wrote a chapter on proper coastal-construction), and more. With almost every state covered, several of

the Living-with-the-Shore series volumes were rewritten, not simply updated second editions, but new books with different titles, different authors, and new techniques of mapping hazard zones which included the entire island not just the open-ocean beach. An associated book, "*The Beaches are Moving: The Drowning of the American Shoreline"* (1979, Anchor-Doubleday), garnered public attention and led to the production of a PBS documentary of the same name. This popularity launched Orrin's greater attention to producing more books for the public, as well as documentaries, public presentations, and newspaper Op-Eds (well over 50 that he continued to produce into his 80s). And he didn't overlook the younger audience, producing two children's books with his son Charles ("*Lessons from the Sand*" 2016; "*The Magic Dolphin*" 2018).

The research for all these book projects expanded Orrin's experience of coastal problems for virtually all U.S. shorelines as well as for numerous foreign nations. He took on the engineering community for their reliance on shore-hardening structural "solutions" to coastal erosion; backed up by documenting the negative impacts of seawalls and groin fields in terms of causing beach loss and encouraging unsafe development in high-risk coastal zones. He was also an outspoken critic of the short comings of modeling (e.g., "*Useless Arithmetic: Why Environmental Scientists Can't Predict the Future*" 2007, Columbia University Press; co-authored by his daughter Linda). As his role, and that of his students, grew in providing guidance to local, state, and federal coastal managers and legislators (e.g., FEMA, National Park Service, Congressional Committees) Orrin saw the need for a program to centralize science information. In 1986 he formed the *Program for the Study of Developed Shorelines* (PSDS) at Duke University (transferred to Western Carolina University in 2006) which provided a source of documentary information in support of coastal management. The earliest significant outcome of PSDS was to produce an inventory of U. S. beach nourishment projects in terms of dates, locations, costs, and sand volumes. The results impetus was probably the reason why the USACE finally produced similar data summaries.

As dedicated to his professional career as he was, Orrin was without question the consummate family man. He included his children in his field work, in extended stays away from home (e.g., Sapelo Island, Tunis, Woods Hole, Puerto Rico), on field trips to various parts of the world, and as working members on research cruises. His coauthors included his father, brother, and even his children. Moreover, the Pilkey household was the epicenter of Orrin's world and to a large degree that of his students. The home was a gathering place for graduate students to participate in fellowship and an informal part of their education; departmental visitors/guests; research collaborators; and neighbors who were included with the professionals. All made welcome and fed amply by Sharlene Pilkey, Orrin's spouse of 60 years (and the true head of the household). Not surprisingly, Orrin made his students, and sometimes even professional guests, earn their food and fun by putting them to work around the 14-acre Pilkey country homestead clearing brush, cutting firewood, hauling rocks, building a fence around Sharlene's garden, and "culling" his flocks of various fowl (including how to kill, clean, and dress chickens, geese, and even the Thanksgiving turkey)! All prepared scrumptiously and served to the hard-working students. Their home was a beacon to all and a respite for anyone and everyone within Orrin's very wide sphere of influence.

Orrin's contributions to science, society, and our profession were recognized in his lifetime by a dozen professional awards from AAPG, AGI, GSA, SEPM, and environmental groups, as well as an honorary degree. Duke University had earlier recognized his accomplishments via the *Orrin Pilkey Marine Sciences and Conservation Genetics Center*

building at the Duke Marine Lab, Beaufort, NC. There on July 21, 2025, a memorial service was held with family, colleagues, alumni, and friends in attendance. Those in attendance were representative of Orrin's greater legacies: a role model; influencing multiple generations of coastal scientists; his specific coastal research that guided legislators, coastal planners and managers; his professional leadership; and a disseminator of science for society.

SEPM Activities

1968 Joined SEPM
1971-1972 Chairman, SEPM Shepard Medal Committee
1978-1983 Editor, Journal of Sedimentary Petrology
1978-1986 SEPM Council
1982-1986 SEPM Publications Committee
1983 SEPM Leadership Award (president service)
1983 SEPM Service Award (editorship)
1984 President-Elect SEPM
1985-1986 President SEPM
1986 Program Chairman SEPM Mid-year meeting
1986 SEPM Leadership Award
1986-1989 President SEPM Foundation
1987 Francis Shepard Medal for Excellence in Marine Geology
1988-1992 Vice President SEPM for Fund Raising (SEPM Foundation)
1992 Honorary Membership, The Society for the Study of Sediments (SEPM)

A Selected Sequential List of Orrin H. Pilkey's SEPM Publications

Giles, R.T. and Pilkey, O.H., 1965, Atlantic beach and dune sediments of the southern United States: *Journal of Sedimentary Petrology*, v. 35(4), p. 900-910.

Pilkey, O.H., Schnitker, D. and Pevear, D.R., 1966, Oolites on the Georgia continental shelf edge: *Journal of Sedimentary Petrology*, v. 36(2), p. 462-467.

Pilkey, O.H., and Blackwelder, B.W., 1968, Mineralogy of the sand size carbonate fraction of some Recent marine terrigenous and carbonate sediments: *Journal of Sedimentary Petrology*, v. 38, no. 3, p. 799-810.

Pilkey, O.H, Blackwelder, B.W., Doyle, L.J., Estes, E.L., and Terlecky, P.M., 1969, Aspects of carbonate sedimentation on the Atlantic continental shelf off the southern United States: *Journal of Sedimentary Petrology*, v. 39, no. 2, p. 744-768.

Field, M.E., and Pilkey, O.H., 1971, Deposition of deep-sea sands: Comparison of two areas of the Carolina continental rise: *Journal of Sedimentary Petrology*, v. 41, no. 2, p. 526-536.

Rodolfo, K.A., Buss, B.A., and Pilkey, O.H., 1971, Suspended sediment increase due to Hurricane Gerda in continental shelf waters off Cape Lookout, North Carolina: *Journal of Sedimentary Petrology*, v. 41, no. 4, p. 1121-1125.

Blackwelder, P.L., and Pilkey, O.H., 1972, Electron Microscopy of Quartz Grain Surface Textures: The U.S. Eastern Atlantic Continental Margin. *Journal of Sedimentary Petrology*, v. 42, no. 3, p. 520-526.

Fritz, S.J., and Pilkey, O.H., 1975, Distinguishing bottom and turbidity current coarse layers on the Continental Rise: *Journal of Sedimentary Petrology*, v. 45, p. 57-62.

Schneidermann, N., Pilkey, O.H., and Saunders, C. 1976, Sedimentation on the Puerto Rico insular shelf: *Journal of Sedimentary Petrology*, v. 46, p. 167-173.

Cleary, W.J., and Pilkey, O.H., 1977, Morphology and sediments of three ocean basin entry points, Hatteras Abyssal Plain: *Journal of Sedimentary Petrology*, v. 47, no. 3, p. 1157-1170.

Pilkey, O.H., Trumbull, J.V.A., and Bush, D.M., 1978, Equilibrium shelf sedimentation, Rio de La Plata Shelf, Puerto Rico: *Journal of Sedimentary Petrology*, v. 48, no. 2, p. 389-400.

Thornton, S.E., Pilkey, O.H., and Lynts, G.W., 1978, A lagoonal crustose coralline algal micro-ridge: Bahiret el Bibane, Tunisia: *Journal of Sedimentary Petrology*, v. 48, no. 3, p. 743-750.

Doyle, L.J., and Pilkey, O.H., 1979, The Geology of Continental Slopes: *Society of Economic Paleontologists and Mineralogists Special Publication* no. 27, 374p.

Doyle, L.J., O.H. Pilkey, and C.C. Woo. 1979. Sedimentation on the eastern United States continental slope. In Doyle, L.J. and O.H. Pilkey (eds.), Geology of continental slopes: *Society of Economic Paleontologists and Mineralogists Special Publication* no. 27, p. 119-129.

Park, Y.A., and O.H. Pilkey. 1981. Detrital Mica: Environmental Significance of roundness and grain surface textures: *Journal of Sedimentary Petrology* 51 (1): 113-120.

Pilkey, O.H., and M. Wilcox. 1981. Citation analysis of principal sedimentary journals: *Journal of Sedimentary Petrology* 51 (3): 1044-1045.

Pilkey, O.H. 1983. Editorial: A look back: *Journal of Sedimentary Petrology* 53 (2): 351-352.

Nummedal, D., O.H. Pilkey, and J.D. Howard (eds.), 1987, Sea Level Rise and Coastal Evolution (Armstrong Price Symposium): *Society of Economic Paleontologists and Mineralogists Special Publication* no. 41, 266p.

Pilkey, O.H., and T.W. Davis. 1987. An analysis of Coastal Recession Models, North Carolina Coast: In Nummedal, D., O.H. Pilkey, and J.D. Howard (eds.), Sea Level Rise and Coastal Evolution: *Society of Economic Paleontologists and Mineralogists Special Publication* no. 41, p. 59-68.

Pilkey, O.H., Hokanson, C., 1991, A Proposed Classification of Basin Plains, in Shepherd (ed.), From Shoreline to Abyss: *Society of Economic Paleontologists and Mineralogists Special Publication* no. 46, p. 249-257.

Pilkey, O.H., Jr. and Thieler, E.R., 1992, Erosion of the United States shoreline: *Society of Economic Paleontologists and Mineralogists Special Publication* no. 48 (Quaternary Coasts of the United States; Marine and Lacustrine Systems), p. 3-7.

Thieler, E.R., Pilkey, O.H., Cleary, W.J., and Schwab, W.C., 2001, Modern sedimentation on the shoreface and inner continental shelf at Wrightsville Beach, North Carolina, U.S.A.: *Journal of Sedimentary Research*, v. 71, no. 6, p. 958-970.

Cooper, J.A.G., and Pilkey, O.H., 2004, Longshore Drift: Trapped in an Expected Universe: *Journal of Sedimentary Duke University Marine Laboratory, Dr. Orrin H. Pilkey Research Laboratory Research*, v. 74, p. 599-606.

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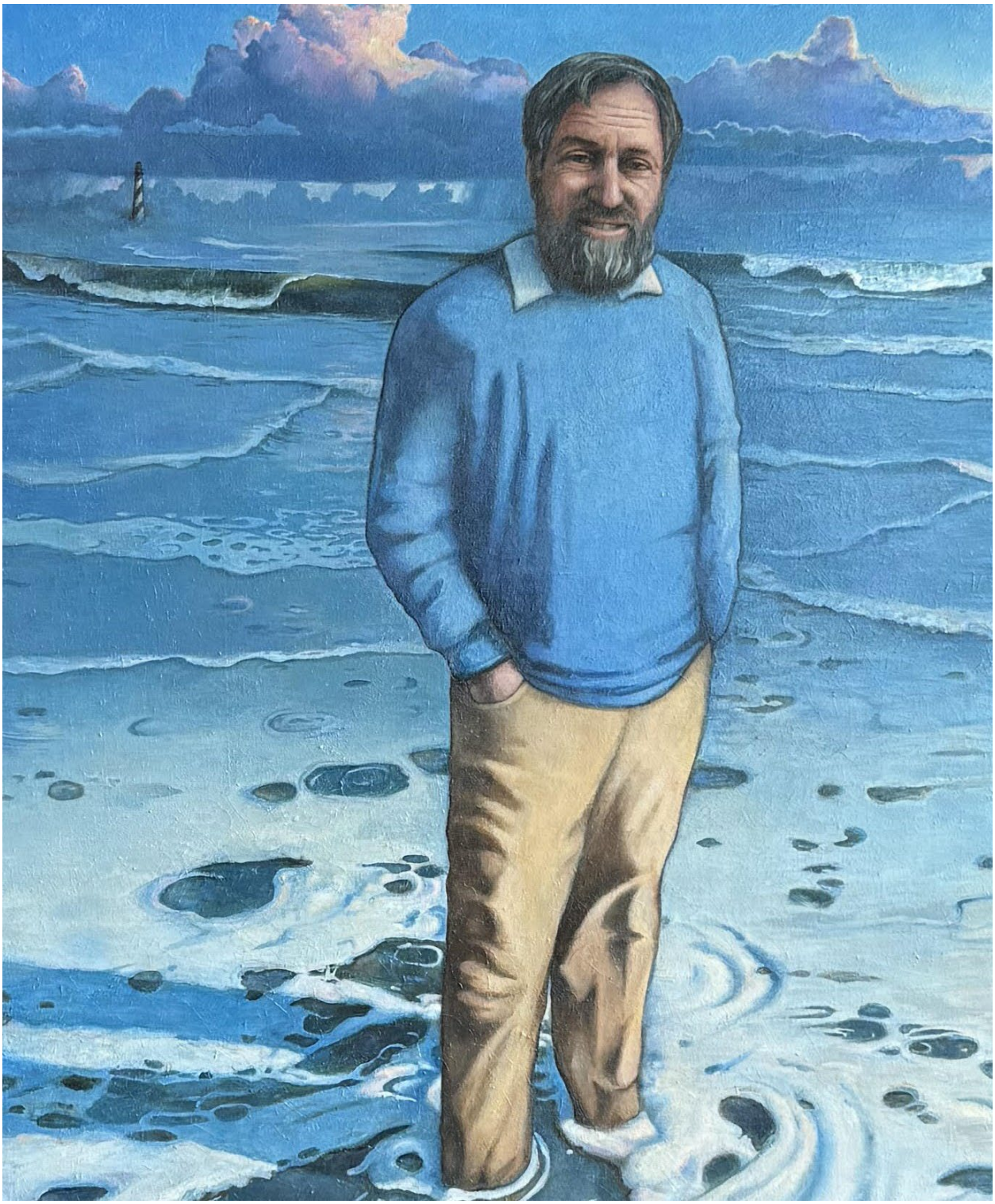
Portrait of Orrin H. Pilkey by his son Charles Pilkey, dedicated at Orrin's memorial celebration at the Dr. Orrin H. Pilkey Research Laboratory, Duke University Marine Laboratory, Beaufort, North Carolina on July 21, 2024.



Orrin Pilkey's 2012 "reuniting' with the Ford Trimotor plane from which he and his brother Walter were smokejumpers in the 1950s.