An interview with Paul Komar

By

Peter Ruggiero

Twenty years ago this spring, I took Paul Komar's "Beach Processes" class as a naive first-year graduate student at Oregon State University. That class significantly inspired my career path and many subsequent life choices since. I have been truly blessed to know and work with Paul, first as his student and then as a collaborator for now over two decades. In the nearshore processes community Paul is probably best known for his pioneering work on longshore sediment transport (with Doug Inman) and then for his highly influential textbook, "Beach Processes and Sedimentation." Like thousands of other students of waves and beaches, I first learned the fundamentals from Paul and his unparalleled text.

Those who know Paul well know that beaches are just one of his many interests and that he has published widely in a dazzling array of fields. Hopefully the below interview will demonstrate how impressive and varied Paul's science has been. Over the years, I have particularly enjoyed hearing Paul's stories regarding being a graduate student at Scripps in the 1960s, as well as his long-term interactions with the legendary figure in sediment transport, Brigadier Ralph Alger Bagnold. Some of those stories are repeated below.

Finally, anyone that has seen Paul deliver a talk knows what a wonderful wit he possesses. Over the years, even during our arguments (I am usually wrong), I find myself laughing due to Paul's way with words and impeccable delivery. Paul's numerous contributions to ASBPA and our profession in general are beyond impressive.

■ **What first prompted your interests in oceanography and coastal studies?**

It's not easy to trace the origin of those interests, in that I grew up in Michigan and I didn't even see the ocean for the first time until I was 12 years old. And I didn't see it again until years later when I became a student at the Scripps Institution of Oceanography. However, I was always interested in sciences; living in Michigan, that involved collecting organisms from ponds and streams near my home, and the variety of stones found in gravel pits, which I had been told were carried there from Canada by the glaciers. I had fair size collections of both, and learned enough from library books to know what I was collecting. The only connection with coasts were our frequent summer family visits to beaches on Lake Michigan, where I came to recognize that the sand in the beach had also come from Canada, carried by the glaciers, and that all the different colored grains were from the varieties of rocks I had collected in gravel pits. I also remember being impressed by the beaches that were covered by trees that had recently tumbled down from the high eroding sand dunes, wondering about the fate of homes I could see atop those dunes. Largely forgotten for many years, those childhood impressions returned decades later when I was developing a thesis project in geology, for a Master's degree at the University of Michigan.

■ **When you entered college, were you already directed toward a career in science?**

Not at all. The Russians had launched Sputnik the year I graduated from high school, one consequence being that America was in a panic to train more engineers and I was swept along by that urgency. But even then I missed the mark, as I had decided to become an electrical engineer, which was more my father's interest. It wasn't too long after entering college that I decided against engineering, although I continued to focus on courses in math, physics, and chemistry, thinking that someday I might be a high school teacher. Unfortunately, the result was another wrong turn in that the math courses were esoteric subjects such as "Non-Euclidian Geometry" and "Symbolic Logic." I know there must be reasons for studying those subjects, although I still don't know what they are and the courses have never been useful in my career. In spite of not understanding their significance and why I was studying them, I did reasonably well -- to the extent I was offered a scholarship to continue toward a Master's degree in mathematics. Fortunately that only required taking more courses, and I survived. Had I known what my future held, that someday I would become an oceanographer, my course work might have been directed more toward differential equations, etc.; however such practical courses were taken by engineers, not by real mathematicians like they were trying to train me to be.

■ **Having obtained both undergraduate and MS degrees in math, you seem to have been still no closer to a career in oceanography.**

Actually I was somewhat closer, to the extent of having decided to start over in my education to study geology, my boyhood interest. During my senior undergraduate year I had time to take a couple of electives, one having been in archeology (still one of my interests), the second being a general course in geology. The latter altered the direction of my life, including the recognition that I could actually pursue a career in what had been one of my hobbies. This did require starting over, beginning with undergraduate courses, so it took me another three years to complete a second Master's degree at Michigan. But I was completely absorbed in the material, did very well, and the university provided me with still another scholarship. When it came time to choose a thesis topic, I remembered those childhood experiences on Lake Michigan beaches, specifically those about the compositions and grain sizes of the beach sands. In geology there was growing interest in studying modern-day sediments in order to better interpret the environments of ancient sediments found in the rock records, and by coincidence I had read a couple of journal papers about analyzing grain-size distributions to distinguish between marine/beach sands versus wind-blown dune sands. The resulting title of my thesis was "An Evaluation of Methods of Differentiating Beach and Dune Sands by Application to Lake Michigan Environments." One of the methods applied was the sorting of the heavy minerals within the sands, selectively blowing the quartz and feldspars into the dunes, leaving behind concentrations of black-sand deposits on the beaches -- an interest that has remained with me over the years with research concerning the physics of mineral sorting, on beaches in the U.S. Pacific Northwest and also along the Nile Delta contrasting its eroding and accreting shores.

Ralph Bagnold (left) and Douglas Inman, taken at Scripps in the late 1960s by Paul Komar.

■ So you finally had decided on a career in coastal studies in 1965, when you moved on to the Scripps Institution of Oceanography.

It was one option, but my initial thought had been to work with Professor Francis Shepard, a well-known scientist ("the father of marine geology") who had written textbooks and a large number of journal papers about beaches, which I had read in connection with my MS thesis research. Arriving at Scripps, however, I discovered he had retired and was away indefinitely, travelling in Africa. But during that trip Shepard decided he didn't like being retired, so he returned to work and I got to know him quite well, his office having been almost directly across the hall from mine. For a while it looked like my goal might not be coastal research. I think that I've had only two of what might be considered to be "eureka moments," and one came early in my studies at Scripps when I was reading a new publication by Shepard about the Monterey submarine channel off the California coast, formed by the flow and sediment deposition from turbidity currents. As reported in his paper, that channel has a large meander with the levees on the outside of the bend being much higher than those on the inside. My "moment" came in recognizing that this difference in levee heights reflected the cross-channel slope of the flow as it passed through the meander and that one could use this morphology to calculate the flow velocities of the turbidity currents, there having been some controversy amongst marine geologists as to their possible magnitudes. This idea developed into my first journal publication, and I still feel that it is one of my best. For a number of years thereafter I continued with my interests in turbidity currents, both their hydraulics and interpretations of their sediment deposits, but I never really considered that to be a possible Ph.D. thesis topic to pursue at Scripps.

■ You worked with Professor Inman in coastal research. How did that come about?

I don't remember exactly, but soon after my arrival at Scripps I became aware of his strong program in coastal studies, and I remember that at some stage I went to talk with him and he was looking for a student to work on an investigation to measure longshore sand transport rates using fluorescent tracers. This immediately interested me, and became my Ph.D. thesis research. The sand-tracer experiments were very demanding, with extensive field work to inject and then collect samples of the dispersed tracers, followed by months of counting the grains in each of the samples. The fieldwork was exciting in that most of it was undertaken on a coarse sand beach in Baja California, on the shore of the Gulf of California. By the end of that study, however, I never wanted to look at another tracer grain — and I haven't. Important in the study was testing two models relating the sand transport rates to the magnitudes of the wave power and longshore currents, which had been formulated by Inman and Bagnold. Particularly memorable for me was a visit to Scripps by Bagnold, not just because of his publications with Inman related to beach-sand transport, but because I was also familiar with his 1930s research on wind-blown sand transport and desert landforms, and had read his 1935 book, "Libyan Sands," about his exploration of the desert in western Egypt and Libya, using Model-T cars converted for desert travel. This visit by Bagnold to Scripps was my introduction to a long association with him, having later visited him at his home in England, and still later with my having retyped and edited his autobiography, "Sand, Wind & War" (University of Arizona Press, 1990), having been provided with a single-spaced copy Bagnold had typed when he was in his nineties and nearly blind. I was awestruck by this opportunity to interact on a personal basis with Bagnold, an explorer, a Brigadier General who led a commando group against Rommel in North Africa during World War II, and a renowned scientist.

■ Those must have been exciting years as a student at Scripps, the late 1960s, when so many well-known scientists and students were involved in research, leading to important discoveries.

At that time most significant were the early discoveries associated with sea-floor spreading, later to become global plate tectonics. I was excited about going to Scripps in that while in geology at Michigan, I had written a term paper about continental drift, with the professor of the course having dismissed it as an "absurd idea." This pronouncement whetted my interest, and I found in searching the literature that some of the earliest and important papers proposing the hypothesis of sea-floor spreading were just being published. I felt that they presented compelling evidence, and I was fully convinced in the validity of continental drift and sea-floor spreading, that they were not absurd ideas. Looking forward to learning more at Scripps about these new discoveries, I was dismayed to find the professors did not accept any of this evidence, remaining strongly opposed to the hypothesis. I later learned that it took members of our class of students to finally convince them.

There were plenty of "big names" at Scripps, which made seminars extremely interesting when they presented their current research and interacted in debates, sometimes vigorously. I particularly remember one occasion when Walter Munk was talking about early in Earth's history when the Moon was much closer and would have generated enormous tides that swept entirely around the globe; this led to a lively discussion with Harold Urey, a Nobel Prize winner in chemistry (1935). I also met Michael Longuet-Higgins for the first time, who was then on the Oceanography faculty at Oregon State University, visiting Scripps to present a seminar. I was present when he and Inman had a "difference of opinion." I don't remember about what, all I remember is their discussion leaving me rather stunned scientists of their caliber could hold such different views, and that Inman could be challenged about anything. I felt Longuet-Higgins' sting myself several years later, when I presented a seminar in England and he was in the audience. I had referred to the "longshore component of the wave power" in the context of sand transport on beaches, and he took exception to that being an "absurd concept" (which it is). However, having just skewered me in the seminar, he invited me to accompanying him on his daily walk through the adjacent countryside, during which our conversations were pleasant and ranged widely. Having a "difference of opinion" in a scientific context does not necessarily extend to a personal basis, at least it shouldn't.

In terms of coastal studies, I view this period when I was a student at Scripps as having been the beginning of something of a "golden age" in research internationally, with Professor Inman and his series of students having played significant roles. Extremely important to me personally was that for about two years Tony Bowen and I shared an office, he having been a couple of years ahead of me and well into his thesis research on the generation of rip currents, so I was able to watch while he undertook his experiments in a large wave basin, and he was also fully involved in our field studies. As a beginning student in coastal studies, I was incredibly fortunate to have Tony as an office mate, willing to answer my too-often stupid questions. Somewhat later students included Bob Guza, Ron Flick, and Dave Aubrey, to name just a few, all of whom I got to know either while we overlapped as students or soon thereafter.

■ **I understand that having graduated from Scripps, you then spent a post-doc year in England, at what was then the Wallingford Hydraulics Research Station.**

The first half of the year was at HRS Wallingford, but I had been awarded a NATO post-doctoral fellowship to undertake research at Saint Andrews University in Scotland. This requires some explanation, in that almost none of my post-doc research was coastal. I mentioned that I have experienced two "eureka moments" in my life. The second occurred during my last year at Scripps, when I attended a seminar concerned with the dikes and sills found on the Isle of Skye, where molten lava had been injected into fractures within already-solid rock, forming well-defined layers. Of interest was that the fluid magma already contained crystals of olivine, so in a sense the process was one of a viscous fluid containing sand-sized particles, with those grains having become concentrated toward the center of the flow, migrating away from the walls of the bounding rock. It occurred to me that this sorting could be accounted for by Bagnold's analysis of grain dispersive pressures when mixtures of sand and water are sheared, which he had applied to bedload transport but with it also explaining this concentration of olivine grains at the center of the flowing magma. I proposed this as a research topic in my application to NATO, accounting for Saint Andrews being my main post-doc destination. I wrote two papers on this work during my post-doc, but never did any more research on this topic. Over the years, once in presenting an invited coastal talk at Woods Hole, I met individuals who knew me only for that work, thinking that I was an igneous petrologist and had been totally nonproductive for the rest of my career!

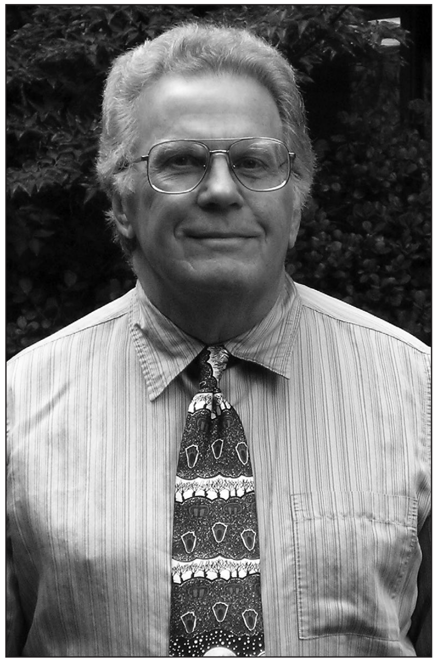
I had actually already completed all of the analyses for this magma-flow research while still a student at Scripps, only requiring that I write the papers. Although I didn't tell NATO that, I convinced them I should spend the first six months at HRS in England, to provide me with the opportunity to interact with coastal engineers. I benefited considerably from that visit, but the only coastal work I actually did at HRS was when they called on me for advice on how to get rid of a rip current that formed in their wave-basin experiments, fouling up their results by dominating the morphology of the sand beach.

What was an aggravation for them was exceedingly interesting to me, in that the rip current formed a large cusp on the shore, but then the rip disappeared while the cusp remained, even though it should have been flattened by the waves that continued to break obliquely along the cusp flanks. Analyses showed that this sustained equilibrium resulted from a longshore variation in wave heights and setup opposing and balancing the force of the obliquely breaking waves. Otherwise, while at HRS I had plenty of free time to read a range of coastal publications, taking detailed notes, knowing that when I returned to the U.S. and Oregon State University, I would be expected to develop and teach a course in coastal processes. Although I had no thoughts of it at that time, those extensive notes became the framework of what would become my textbook "Beach Processes and Sedimentation," published six years later in 1976.

■ **With your return to the U.S. in 1970 you joined the faculty in Oceanography at Oregon State University. Was it a challenge to develop a coastal research program, and what did you decide to focus on?**

Even before my arrival it had been arranged for me to obtain research funding from Sea Grant, the objective of the grant being wide open to "study the Oregon coast." My first student was Tom Terich, for many years in Geography at Western Washington University in Bellingham, with his Ph.D. having concerned the erosion of Bayocean Spit caused by jetty construction, a "plum" topic in that an entire community on the spit had been lost during the first half of the 20th century. Almost as if also having been pre-arranged, significant erosion began in a new development of expensive homes on Siletz Spit, becoming the MS-thesis research of another student, Cary Rea. (Both Tom and Cary have recently retired, making me feel rather old.) Sea Grant continued to provide support for our coastal studies over the years, not much money but enough to support one or two students. That suited me, because I had made the decision to keep the program small so I could be directly involved in the research, which focused mainly on the processes responsible for coastal erosion and flooding impacts. I don't mean this as a criticism, but I had seen Professor Inman spending nearly all of his time raising money for research and to support multiple students, his contact with any one study therefore being rather limited. That's what it takes to do big-time research, but that's not what I wanted.

This decision also freed me to pursue other research interests. My first publication after having arrived at Oregon State was co-authored with Professor Vern Kulm, based on their measurements of sand ripples on the continental shelf, relating their depths of occurrence and ripple lengths to the seasonality of wave conditions. I also returned to work on the hydraulics of turbidity currents, relying to a significant degree on Gary Griggs' Ph.D. thesis recently completed at OSU, concerned with the morphology of the Cascade Submarine Channel off the Oregon coast. Similar to my earlier analyses of the Monterey Channel, I developed numerical models of the flows, including a hydraulic jump at the base of the canyon, matched to the variations in dimensions of the channel that systematically changed along its length. I also became fascinated by the settling velocities of sediment grains, particularly the effects of their particle shapes. In one set of experiments we used basalt pebbles from a beach on the coast, selected for the regularity of their triaxial-ellipsoidal shapes, and also cylindrical shapes cut from glass rods. These were settled in glycerin, yielding Reynolds Numbers that are equivalent to silt and sand grains settling in water. Having completed those experiments, I found that the resulting settling-velocity equations, accounting for the particle shapes, agreed remarkably well with measurements obtained by biologists of the settling velocities of copepod and euphausid fecal pellets. This may seem like a curious study, but it was significant in that the results are important to what is called the "fecal pellet express," explaining how sediments and



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biological remains near the ocean's surface quickly reach the sea-floor deposits and are preserved. Without their resulting records in the sediments, it would not have been possible to investigate the thousands of years of changes in ocean's water temperatures and circulation, responding to Ice Age climate variations.

■ **I remember you mentioning having undertaken research on Mars. What was that about?**

I can thank Bob Dolan at the University of Virginia for my involvement in that NASA-funded research, having suggested my name when asked if he knew anyone who could undertake analyses of sediment transport by floods on Mars. This was a substantial diversion from Oceanography, although it fit with my general interests in flow hydraulics (e.g. turbidity currents) and sediment sorting by grain sizes and densities, but in the context of Mars the interest was in photographic evidence for floods that could have entrained and transported VW-sized boulders. I initially completed analyses on the flow hydraulics of the floods that had eroded the huge outflow channels on Mars, based on the morphologies and dimensions of the channels, the first of such assessments for the Martian floods. The resulting magnitudes of flow discharges and rates of erosion were comparable to those estimated for the Missoula Ice Age floods that had carved the Channel Scablands in eastern Washington. But more fundamental was my work on flow competence, the relationship between the flood discharges and the largest cobbles to boulders that could be transported. My analyses were based on data from terrestrial streams and rivers, and here I worked closely with Paul Carling in England, who had been collecting such data. In having completed those analyses, I didn't realize that I was toppling the "equal mobility" paradigm held mainly by American fluvial geologists, the idea that in gravel-bed streams all sizes are entrained together, governed by the largest grains in the bed armoring. It didn't help that I was a complete outsider, an oceanographer, and to make matters worse I had used the same data sets they accepted as having proved equal mobility. The result was that I never could get any of my papers published in American journals, but they were all readily accepted in Europe. It was an exciting diversion from my oceanographic research, not just the research itself concerning the extreme floods that had occurred on Mars, but also in having been able to attend planetary geology conferences to learn about the incredible discoveries being made following the Viking Mars missions.

■ **You've been at OSU now for 42 years. When are you going to retire?**

Are you hinting that I should? I've been having too much fun, working with you and Jonathan Allan in our investigations of climate controls on U.S. Pacific Northwest erosion hazards. With that research being a mix of oceanography, geology and coastal engineering, all directed toward management applications, it fits perfectly into my long-term coastal interests. Even though you were in Ocean Engineering working with Bill McDougal, I view you as having been my last graduate student since we worked together in your thesis research, and Jonathan Allan was my last post-doc, so our investigations together in this recent climate related research represent something of a revival for me. Besides, what else am I to do in old age?

■ **Don't you have hobbies? I know that you travel a lot.**

I have been fortunate to travel extensively over the years, both in connection with my work and on vacations. In 1965, having completed my MS at Michigan and before heading off to Scripps, my wife and I spent a couple of months in Europe on something of a Grand Tour, having bought a VW Bug, sleeping in it several times when we couldn't find cheap accommodation. This was my first introduction to international travel, being hooked on it ever since. Over the years many of our vacations came just prior to or after attending coastal engineering conferences, so that took us to a number of countries throughout the world. Since my post-doc in England and Scotland back in 1969, we have frequently returned there, and I'm now in the process of revisiting as much of its coast as I can before I no longer feel safe driving on the left side of the road. In recent years I've been involved is consulting work in New Zealand, and with repeated trips it is like a second home with a number of friends to visit. I'm amazed at how much of the world I've managed to see, including all 50 states in the U.S., and nearly every country in Europe. Particularly exciting were work-related stays in Egypt, India, China and Japan. This year our vacation was three weeks in Turkey, and we will likely return to New Zealand this fall.

Hobbies? I've always been interested in history and my book reading takes that direction, ranging from ancient history to the 20th century. This links closely with my travel interests. For example, a few years ago I spent nearly three weeks in Rome, with a day trip to revisit the ruins of Pompeii. In preparation I read 11 books about their histories, and had a long list of sites I wanted to see. One of my primary interests, closest to being a hobby, is reading about British scientists and then visiting their homes or related sites during trips. Vacations for me are never meant to be relaxing. I need something to focus on, a reason to be there and to learn something new.

Someday I might retire from research, and I guess that would mean having more time for travel and watching movies. For my 2011 New Year's resolutions I decided to watch movies, having acquired a collection of videos and DVDs I had not viewed. Although I had not previously been much interested in movies, at most seeing 1-2 per year, I got carried away, including having subscribed to Netflix. The result was that last year I watched 173 films, and it must be over 250 by now. Essentially all are foreign films, French and Spanish being my favorites. I confess to being somewhat obsessed. I have a copy of "1001 Movies to Watch Before You Die." That should keep me occupied in retirement.

— Peter Ruggiero is an Associate Professor in the College of Earth, Ocean, and Atmospheric Sciences at Oregon State University, specializing in coastal geomorphology, coastal hazards, and nearshore processes.

BOOK REVIEW:

A Field Guide to the Southeast Coast & Gulf of Mexico

By

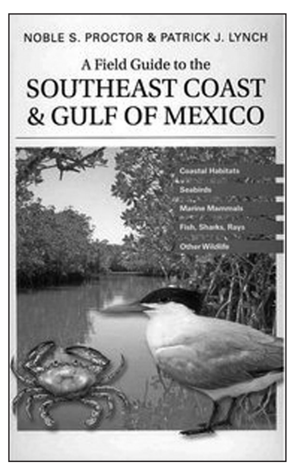
Noble Proctor and Patrick Lynch, illustrated by Patrick Lynch
Yale University Press, January 24, 2012, 386 pages. Paperback, US$24.

Reviewed by Brad Pickel

In the second book in their series, "A Field Guide to the Southeast Coast and Gulf of Mexico," Noble Proctor and Patrick Lynch continue down the Atlantic seaboard covering the coastal areas from Cape Hatteras, North Carolina, to the Florida Keys. While a number of field guides exist regarding specific flora and fauna, this book provides a well-organized, general reference book of not only the habitats that exist, but also the majority of plants and animals that call these areas home.

Due to its limitations in size at 386 pages, this field guide may not include the details that would be found in a birding guide or other animal specific guide. However, at over 600 species of flora and fauna most users will find the information to be more than enough to identify and appreciate the diversity of the southeast coast and Gulf of Mexico. Similar to other guides, the authors provide general descriptions, illustrations and photographs, habitat descriptions, and range maps of individual species.

In addition to specific information regarding individual species, the authors have also provided clear and concise descriptions of the following habitats: offshore areas, coral reef communities, seagrass beds, mangrove communities, salt marshes, maritime forests, semitropical beaches, and beach and dune communities. Common plants to each community are shown in community pictures and in individual descriptions. By showing pictures of the community as a whole, it provides the user a clear understanding of the relationships between individual species within their community.



As a general guide for the southeast coast and Gulf of Mexico, this book is useful to any nature lover who wants to be more knowledgeable about the coast. Personally, I have used this book to identify species within the South Carolina and Georgia areas and appreciate the clarity of information provided and the organization provided by the authors.