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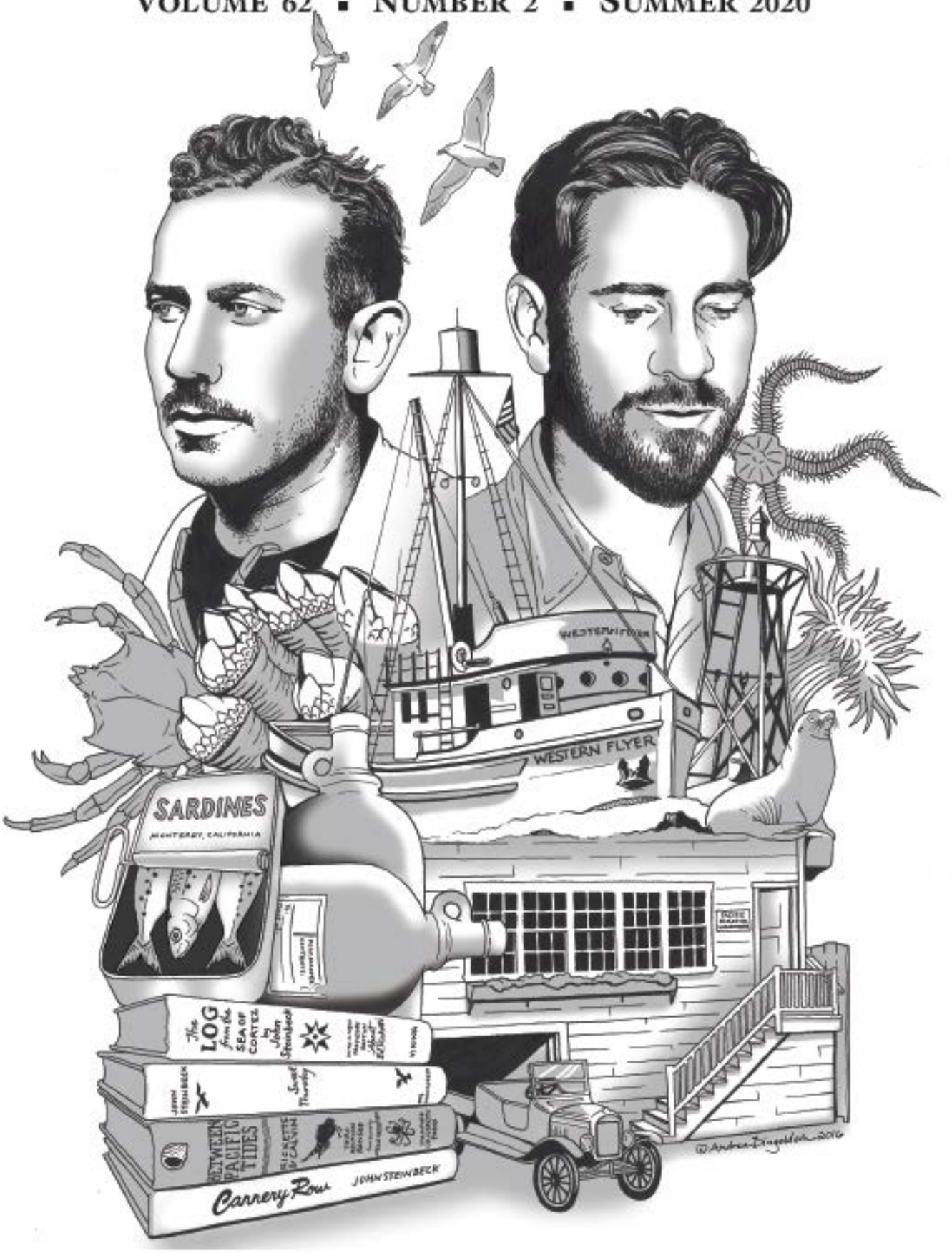

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The 1940 Ricketts-Steinbeck Sea of Cortez Expedition: An 80-Year Retrospective

Guest Edited by Richard C. Brusca

Dedicated to the Western Flyer Foundation

Publishing the Southwest

Dedicated to the Western Flyer Foundation

It has been 80 years since John Steinbeck and Ed Ricketts sailed aboard the *Western Flyer* into the Sea of Cortez—a voyage that changed both of their lives and forever altered the arc of environmentalism and marine biology in North America. The contributors to this volume were inspired by their reflections on that voyage and those two remarkable individuals. A sublime attribute of the voyage and the book it spawned was the seamless blending of art, science, and philosophy. I thank Andrea Dingeldein for the use of her wonderful drawing, which captures the essence of the Ed Ricketts/John Steinbeck relationship and graces the cover of this special issue (see more of her work at www.thelocalnaturalist.com).

The expedition and the book, and so much that was later influenced by that amalgamation of ideas, also inspired creation of the Western Flyer Foundation, committed to restoring the purse seiner that Steinbeck and Ricketts chartered for their famous 1940 expedition. The boat is being fully restored and will soon be back in the water. This volume of *Journal of the Southwest* is dedicated to that foundation and its goal of cross-disciplinary learning that will be core to the educational mission of the restored *Western Flyer* (www.westernflyer.org). This compilation of essays offers another blend of art, philosophy, and science, influenced by the unique mélange that took place between two people and a boat 80 years ago.

My review of the Steinbeck-Ricketts 1940 expedition, with an annotated cruise log and species list, seemed long overdue. Hopefully it will provide grist for the mills of other scientists and writers in the years ahead.

Lindsey Haskin and I explore the influence of Steinbeck and others on Ricketts's thinking during his intellectual growth as a scientist. We walk readers through some of the steps in Ricketts's personal and professional life that helped shape the most influential, enduring, non-degreed marine biologist and invertebrate zoologist that America has ever seen.

Don Kohrs's essay on Ed Ricketts's life up to the 1940 Sea of Cortez expedition is illuminating and carefully researched. It includes his childhood years, the founding of Pacific Biological Laboratories, and the writing/publishing of *Between Pacific Tides.*

Kevin Bailey and Chris Chase explore the long and not-always illustrious history of the *Western Flyer*, the boat that wouldn't die. The *Flyer* had a life of her own, and she became an unexpected, deeply personal symbol of science, adventure, freedom, and camaraderie—eventually taking her place in American history. From sardine and salmon seiner, to bottom trawler, to Alaskan crab fisher, to private and government research vessel, the boat sank twice but is now being faithfully restored by the Western Flyer Foundation.

Katharine Rodger explores Ricketts's influence on Steinbeck's writing, giving the topic a new twist by examining the former's influence on *how* Steinbeck wrote. Rodger explores Ricketts's belief that only when one has mastered the form or craftsmanship of their art—be it poetry, prose, painting, music, or science—can the content or truth of that art be executed with purity. It would seem that both Steinbeck and Ricketts attained that aspiration in their unique creativity.

"Got Squid," a look at the long-term oceanography of the Sea of Cortez through the lens of Humboldt squid, a species not recorded by the Steinbeck-Ricketts expedition, is historical-ecological science at its best. W. F. Gilly and colleagues carefully analyze the history of Humboldt squid records and physical oceanography of the Gulf, coming to intriguing conclusions.

Susan Shillinglaw considers the meaning of Steinbeck and Ricketts's holistic approach and how that is reflected in their book, most pointedly in their admonition that we should look "from the tide pool to the stars and then back to the tide pool again." She examines the significance of "participation" in the intertidal region and the implication of breaking through, a concept vital to both men's thinking.

Richard McCourt and Josie Iselin provide a delightful look at the "other" Sea of Cortez expedition in 1940, that of the Allan Hancock Foundation and pioneering Pacific phycologist E. Yale Dawson. Dawson would go on to produce the algal equivalent of the Steinbeck-Ricketts invertebrate catalogue.

John Gregg's humble yet astute essay describes his deep belief that combining art and science, as did Steinbeck and Ricketts, is needed in modern society. Further, integrating disciplines is a critically needed approach for teaching youngsters how to be more well-rounded citizens and critical thinkers. He also describes how his nearly accidental discovery of the book *Sea of Cortez* helped shape his own life, eventually leading him to track down the *Western Flyer* and purchase it, almost directly off the seafloor.

Richard Astro's overview of the history of scholarly research on Steinbeck and Ricketts, beginning with the story of how he basically "founded the field," is a wonderful ride and perfect closing essay for this volume.

I most graciously thank the many anonymous peers who were kind enough to review the articles in this special issue of *JSW*. Naming you would compromise the review process, but you know who you are.

— R. C. Brusca, Tucson, Arizona
Summer 2020

The Making of a Marine Biologist: Ed Ricketts

Richard C. Brusca and T. Lindsey Haskin

Edward F. Ricketts (1897–1948) transformed marine biology on the west coast of North America. And, remarkably, he propelled the emergence of important new perspectives on coastal biology and ecology without ever publishing a professional academic research paper. He played an important role in the emergence of marine ecology as a scientific discipline and a career option for young biologists. Environmentalism, as we know it today, did not exist in the 1930s and 1940s, and the field of ecology itself was still a fairly obscure scientific discipline (Hedgpeth 1978a; Lannoo 2010). Ricketts was engaging with both ecology (the science) and environmentalism (the personal philosophy) at a pivotal point in time. He was a pioneer who explored ecology's many facets and implications in remarkable ways. His life was a web of interconnectedness and it reflected his view that everyone and everything is inextricably linked to everything else.

Ricketts's impact stems largely from his two landmark books, *Between Pacific Tides* and *Sea of Cortez: A Leisurely Journal of Travel and Research*, but he and his ideas powerfully influenced many others—including Nobel laureate John Steinbeck and renowned mythologist Joseph Campbell—and his ideas continue to influence scientists, writers, artists, and musicians today. Ed loved teaching, and his ideas and writing continue to teach us, even 72 years after his death. His legacy is inextricably intertwined with that of celebrated author John Steinbeck, with whom he forged a deep friendship and intellectual collaboration grounded in shared ideas about science, art, nature, and humanity that were groundbreaking for their time. An understanding of the intellectual and professional development of either of these great men cannot be achieved without reflecting on their close friendship.

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Early Years

Ricketts was fascinated by natural history from an early age (Rodger 2002, 2015; Kohrs, this volume). Katharine Rodger (2002) notes that he was, "from birth, a child of intelligence and rare charm.… He began speaking very young and began using whole but simple sentences before he was a year old." His family lived in Mitchell, South Dakota, during his formative years and he spent much of his time outdoors exploring nature (Rodger 2006). In a letter to D. M. Clay, Ricketts once said, "At the age of six, I was ruined for any ordinary activities when an uncle….gave me some natural history curios and an old zoology textbook. There I saw for the first time those magical and incorrect words, 'coral insects' " (Ricketts, undated, in Rodger 2002).

Ricketts's college education proceeded in fits and starts. He did not consider formal (school) learning a necessity and never graduated from a university. Learning seems to have been his university goal, not degree-getting. Even so, he placed high value on knowledge and learning in general, and passionately drove himself in that direction.

His university studies began at Illinois State Normal School in 1915, where he took three courses in zoology before dropping out to "explore the country" and try his hand at various jobs in Texas and New Mexico. According to Joel Hedgpeth (1978b), he left school to "escape" an affair with an older, married woman. In September 1917, the army drafted Ed and he clerked in the Medical Corps at Camp Grant, Illinois. The World War I armistice prompted his March 1919 discharge and he enrolled at the University of Chicago. Like all new college students, Ricketts spent the next two years satisfying academic prerequisites. Then, he dropped out again to "take a walk." He passed November and December of 1920 strolling from Indianapolis, Indiana, to Savannah, Georgia—a distance of nearly 800 miles—to escape from what John McCosker (1995) claimed was another dalliance with an older, married woman (Hedgpeth 1978a; Rodger 2002). Four years later, Ricketts published an account of that trip in the June 1925 issue of *Travel* magazine ("Vagabonding through Dixie," Ricketts 1925).

Ricketts returned to the University of Chicago in 1921, taking courses in biology and psychology (Hedgpeth 1995). In the fall of 1922 he took a course from pioneering animal ecologist Warder Clyde Allee, who imbued Ed with a view of animal communities that deeply influenced the way he looked at tide pools and life in general. In a letter that Allee

wrote to Joel Hedgpeth in 1950, he remembered Ricketts as "a member of a small group of 'Ishmaelites' who tended sometimes to be disturbing, but were always stimulating" (Hedgpeth 1978a). In addition to Allee, the ideas of two other pioneering sociobiologists, Alfred E. Emerson and William Emerson Ritter, also greatly influenced Ricketts's views.

W. C. Allee (1885–1955) was a visionary biologist who saw animal "societies" as windows providing insight into human society, an idea that forever influenced Ricketts's thinking and writing (e.g., Allee 1923a,b, 1931, 1938). Allee also analyzed how physical factors control the distribution of littoral marine species, concluding that predictable communities of animal species are tied to specific aspects of their physical habitat (Allee 1923a,b). In addition to laying foundational ideas in ecology, Allee helped launch the discipline known today as sociobiology—which explores how biology influences social behavior among animals. His groundbreaking 1938 book, *The Social Life of Animals*, explored revolutionary ideas about animal aggregations and cooperation, group organization and behavior, caste and social hierarchy among animals, and their implications for understanding human behavior. Key among them was the radical idea that cooperation is an innate drive propelling animal behavior, perhaps more powerfully than the drive to compete. Allee suggested that different kinds of organisms lived together in associations that gave survival value to all, and in ways that could, theoretically, be understood and thus predicted (Allee 1931). Hannibal (2016) astutely recognized that Allee, a practicing Quaker, "sought to integrate ethics and science and argued that animals benefit from living in cooperation." She further recognized that Allee "expressly looked for biological grounds upon which to argue the benefits and naturalness of cooperative human societies, posing the idea in counterbalance to the every-organism-for-itself way of looking at Darwin's definition of natural selection."

Allee studied social behavior of animals in both aquatic and terrestrial environments. He and his colleague, Alfred Emerson (1896–1976), were central figures in what became known as the "Chicago school" of ecology. Emerson developed a model of biological evolution in which the social group constitutes a "superorganism" that is the primary unit of natural selection. Much of Emerson's extensive research involved the study of termite physiology, morphology, and behavior.

William Ritter (1856–1944) is perhaps best known for founding Scripps Institution of Oceanography in La Jolla, California. However, before that, while on the faculty at the University of California at Berkeley,

he introduced a school of thought called "organicism." The term had been used before, but Ritter was the first to posit a theory applying it to biology. In 1919, he published what he considered his magnum opus, a 400-page treatise titled *The Unity of the Organism; or, the Organismal Conception of Life*, which postulates how all life is organized around interrelationships among things, living in a complex web.

Allee, Emerson, and Ritter fostered the idea that groups of co-occurring organisms constitute something more than simply the sum of the individuals (Allee et al. 1949). Just as a human is more than simply the sum of its millions of cells (due to specialization and cooperation among those cells), aggregations and colonies of individuals function in ways that are unique from each individual. In Allee's views, even co-occurring groups of differing species constitute a unique "community" of life that has qualities greater than, and not recognizable, in each individual species alone. Ritter worked on colonial tunicates (phylum Chordata, subphylum Urochordata) that showed specialization of individuals that helped the entire colony survive (Ritter 1919). Like Emerson, Ritter speculated beyond these colonial organisms to suggest that aggregations such as ant and termite colonies also function as single organisms, or "superorganisms." And he felt that the principles governing these "lower forms" could be extended to human society (Ritter 1915, 1919; Ritter and Bailey 1928).

In 1923, Ed Ricketts and his former college roommate, Albert Galigher, cooked up an idea to open a biological supply business on the Pacific Coast. They moved from Chicago to the Monterey Peninsula (California) and established Pacific Biological Laboratories (PBL) at 165 Fountain Avenue in Pacific Grove. Ricketts's wife, Nan, and their 3-month-old son, Ed Jr. (born 23 August 1923), followed a few months later. The first location of PBL was short-lived, and eventually the lab moved to 740 Ocean View Avenue, on the waterfront in Monterey—the location that John Steinbeck made famous in his novel *Cannery Row*. Later, when the street was renamed Cannery Row, the number was changed to 800.

At the time, Hopkins Marine Station (founded in 1892 at Lovers Point in Pacific Grove, and relocated to its present location at Point Cabrillo in 1917) was an intellectual magnet on the Monterey Peninsula with a single building that still stands today as the Agassiz Building.

As soon as he arrived, Ricketts immediately began combing the tide pools of the Monterey Peninsula, collecting biological specimens that

Pacific Biological Laboratories ("Western Biological Laboratories" in Steinbeck's *Cannery Row*) began selling to schools and labs throughout the country. In 1929, Ricketts designed and had printed an expansive, upgraded version of the PBL Catalogue that was a prototype for what was to become the "phyletic catalogue" of his groundbreaking book, *Between Pacific Tides*. Although only three phyla—sponges, cnidarians, and ctenophores—were included in this catalogue, it was the first of a planned series that was supplanted by the book itself, as further editions of the lab catalogue never materialized.

Ed Ricketts, 1936. Photograph by Ralph Buchsbaum, courtesy Vicki Pearse.

No guides existed to familiarize Ricketts with Pacific tide-pool life. Instead, he had to pore through original and often obscure scientific literature to identify the creatures he collected. He also built a lengthy list of specialist correspondents around the country with whom he consulted (see Brusca, this volume). Ricketts's ecological views took shape on collecting trips that carried him from Puget Sound, Canada, to Baja California, Mexico. Ed, Nan, and their three children visited Puget Sound many times, renting cottages in Hoodsport, Washington, a picturesque coastal town hugging the placid waters of Hood Canal, where their hosts and regular seasonal visitors came to know them well.

As Ricketts scoured Pacific Coast tide pools, an emerging sense of animal community organization, influenced strongly by Allee's, Emerson's, and Ritter's views of ecology, took form. Ed's keen observational skills led him to conclude that seashore life of the Pacific Northwest could be segregated into broad biogeographic assemblages. He quickly learned that fauna of the Pacific Coast of North America splits into two fundamental groups. North of Point Conception (California) a cold-temperate fauna dominates, and to the south a warm-temperate one. Within each of these, exposed outer coastlines and protected inner waterways and bays also host distinct faunas. In particular, the outer coast of Vancouver Island, the Queen Charlottes, and the far northwest shores have a markedly different fauna than that inhabiting the calmer and more protected waters of the Inside Passage and Puget Sound.

Ed Ricketts, in a tide pool near Port Townsend, Washington.

During the 1930s and early 1940s, Ricketts built a large circle of friends—the "Lab Group." Ed's broad interests and interdisciplinary thinking were reflected in this rare assemblage of intellectuals and artists, who gathered regularly to share stories, ideas, and adult libations. Some of the people who drifted into and out of the group and influenced Ricketts's thinking included mythologist Joseph Campbell (e.g., *The Hero with a Thousand Faces*, *The Power of Myth*), modernist novelist and painter Henry Miller (e.g., *Tropic of Cancer*, *Tropic of Capricorn*, *Black Spring*), and avant-garde composer John Cage (e.g., *Sonatas and Interludes*). Other friends included Ritchie and Tal Lovejoy; Jack and Sasha Calvin; attorney Webster "Toby" Street; Francis Whitaker (a Monterey artist-blacksmith); Bruce Ariss (a Monterey artist and designer who accompanied Ricketts on collecting excursions to Mexico and who, later in life, was set director for the *I Love Lucy* show); Lincoln Steffens (news journalist and writer); and artist Jim (and wife Peggy) Fitzgerald. Fred Strong appeared on the scene during these years, eventually marrying Ed's sister Frances in 1932. It was, again, Hannibal's (2016) take on those years of the Lab Group that might best capture the essence of things: "Pacific Grove in the 1930s was something like East Hampton in the 1970s. The vibe was festive, with a higher purpose, and among the parties and the fun, lasting contributions were being created by foundational artists."

Professional biologists also visited Ed at the Lab, including Waldo Schmitt from the Smithsonian Institution, Libbie Hyman from the American Museum of Natural History, and Torsten Gislén of the University of Lund, Sweden. The Gislén family spent 2 years in the U.S., most of their time in the Monterey area where they rented a house in Pacific Grove near the Ricketts's home. This broad cross-section of intellectuals, artists, and unemployed devotees of life played a profound role in shaping Ricketts's thinking, especially his holistic view of life. They helped him see the value of interconnections and cross-disciplinary thinking—ultimately the core strength of the yet-to-fully-emerge discipline of ecology. However, none of these friendships were as deep or consequential as the one he formed with John Steinbeck in the formative days of their respective careers. And, appropriately, ecology played a fundamental role in their friendship.

Steinbeck and Ricketts met in 1930, when Steinbeck was 28 years old and Ricketts 33. This was just 2 years after Steinbeck met his wife-to-be, Carol Henning, at Lake Tahoe and finished his first novel, *Cup of Gold*

(1929; a historical novel about the 17th-century pirate Henry Morgan, inspired by Steinbeck's first sea voyage from California to New York, via the Panama Canal) (DeMott 1995; Shillinglaw 2006). As soon as Steinbeck and Ricketts met, they struck up a friendship and discovered that they shared fascinations with marine biology, literature, philosophy, art, music, and alcohol. Some might add "women" to their list of shared interests, but it seems to us that Ricketts, far more than Steinbeck, appreciated the fairer sex, viewed them as equals, and valued spending quality time with them. Although, by today's standards, Ricketts's ongoing extramarital affairs, especially with much younger women, might be viewed as risqué.

As Hedgpeth (1978b) noted, "frequent love is possible [but] it requires a vitality of mind, which Ed certainly had." And, "sexual intercourse was a lovely and holy thing to Ed, an expression of body and spirit, that 'divinely superfluous beauty' for which almost any price was not too great." Ricketts's broad, interdisciplinary interests, including sexuality (both his own, and that of the tide-pool creatures he studied), were as much a part of his life and his thinking as was zoology. This was the milieu in which Ricketts easily convinced Steinbeck—who was already familiar with the subject—that ecology was one of the most important emerging disciplines in human cultural growth.

The two spent countless hours discussing the nuances of ecological concepts and their implications for understanding human behavior. Ideas they explored emerged in both of their writings. Steinbeck accompanied Ricketts on collecting excursions. They both saw tide pools as living examples of cooperation among life forms and real-life laboratories for exploring the "holistic view" of life they'd learned about from the writings of Allee, Ritter, and Emerson.

Hedgpeth (1971) notes a "scrap of paper" on which Ricketts had written, "I have been especially interested in John Steinbeck's notions because they developed widely the holistic concepts being felt specifically in modern biology." This suggests that Steinbeck was thinking about the ideas promulgated by Allee, Emerson, and Ritter before he ever met Ricketts. Allee visited Hopkins in mid-March 1923, just before the summer session began, and it is likely he spread his emerging ideas about groups of organisms acting as "superorganisms" around the lab. Steinbeck was enrolled at Stanford at the time and took a zoology course at Hopkins that summer, taught by Charles Vincent Taylor, who probably presented Allee's ideas in his lectures (Astro 1973, 1976, 1995; Hedgpeth 1978a;

Benson 1984). It has also been suggested that Ritter was a visiting professor at Hopkins that fateful summer, but the Hopkins Marine Station Visitor Logbook for 1923 does not record Ritter as having visited that year. (Of course, it's possible, though unlikely, that he visited but did not sign the logbook.) That same summer, Daniel Trembly MacDougal (first director of Tucson's Desert Botanical Laboratory, then of the Carnegie Institution of Washington, D.C.) also visited the lab. MacDougal had earlier published the first modern description of the Colorado River delta and uppermost Gulf of California (MacDougal 1906).

Recognizing Animal Communities and *Between Pacific Tides*

Ed Ricketts was by nature a generalist who synthesized ideas, combining "all his experience, observation, and reading into an integrated whole, a total picture" (Hedgpeth 1978a). What Ricketts discovered in the tide pools he studied coalesced into a schematic diagram of littoral ecology that he premiered in one of the most pivotal books ever written about marine biology—*Between Pacific Tides* (Ricketts and Calvin 1939). Building on Allee's intertidal research in Massachusetts, Ricketts catalogued how environmental conditions predict the presence/absence of species and particular communities on Pacific shores, and how these species form cooperative associations. Ricketts also embraced new ecological ideas, such as competitive exclusion, and wrote with an understanding of food webs that was on the forefront of science at the time.

Ricketts collaborated on *Between Pacific Tides* with his friend Jack Calvin, who helped Ed on many collecting trips, provided photographs for *Between Pacific Tides*, and edited the manuscript. Calvin was a scholar in his own right—a writer, environmentalist, photographer, illustrator, and eventually a printer. He held a master's degree in English literature from Stanford (where he and Steinbeck first met), and he wrote several books and a column for the Carmel *Pinecone* (titled "The Boojum"). Calvin, with his wife, Sasha Kashevaroff, and her mother, came to California from Juneau (Alaska) in the late 1920s. Before moving to Carmel, Calvin taught high school in Mountain View (California). Jack built a cottage for Sasha and himself in Carmel in 1929, but in 1931 the couple returned to Alaska, this time moving to Sitka where Jack founded

that state's oldest conservation group, the Sitka Conservation Society, which still survives. Among other activities today, it encourages citizen scientists to help monitor human impacts in the Tongass National Forest (Hannibal 2016). According to Calvin (Rodger 2015), it was he who suggested that Ricketts write about the local marine life.

In 1932, Calvin and his wife sailed their 33-foot motorboat, *Grampus*, to Tacoma (Washington), where Ricketts and the budding writer Joseph Campbell joined them. Campbell, still a "starving artist," had moved to Pacific Grove (near Monterey) a few months earlier and lived next door to Ed and Nan on 4th Street, in a house known locally as "Canary Cottage" where he traded work for rent. The foursome sailed on the *Grampus* from Tacoma to Sitka via the Inside Passage, on a collecting trip for Ricketts and for a chance to accumulate more data for his planned book on the Pacific Northwest. The *Grampus* charter was "funded" by a commercial contract (with Pacific Biological Laboratories) to collect specimens, especially the commerically important small hydromedusa *Gonionemus vertens*. At Sitka, Sasha's sister Xenia Kashevaroff (who was, at one point, Ricketts's lover) joined the voyage for the final leg of the 1,100-mile sea journey to Juneau.

Immediately after the *Grampus* expedition, Ed prepared a typescript from his notes (titled "Notes and observations, mostly ecological, resulting from northern Pacific collecting trips chiefly in southeastern Alaska, with special reference to wave shock as a factor in littoral ecology," aka the "Wave Shock Essay"), about a fourth of which is reproduced in Hedgpeth (1978a) and all of which is reproduced in Straley (2015). Although never formally published, the Wave Shock Essay was read and edited by at least three other scientists: Walter K. Fisher, George E. MacGinitie, and Waldo Schmitt. As noted by Miner et al. (2015), his experiences during the *Grampus* expedition firmly cemented recognition of three distinct kinds of coastal habitats in Ricketts's mind, as he would codify in *Between Pacific Tides*: open coasts, protected outer coasts, and bays and estuaries.

Ricketts worked to polish the final version of the manuscript for *Between Pacific Tides* during the *Grampus* expedition, and while the group was in Sitka, Joseph Campbell read it and offered his editorial suggestions. In Juneau, the group visited Sasha Calvin's family, including her father, Andrew Petrovich Kashevaroff, the Russian Orthodox priest at the town's St. Nicholas Church. On 26 August 1932, Ricketts and Campbell boarded the *Princess Louise* and departed for Seattle; it would be the last trip they took together (Mondor 2015).

Ricketts explored the biological significance of tides more than any scientist preceding him (and most after him). In the early 1930s, he got caught up in a hypothesis by G. H. Darwin, son of Charles Darwin. The younger Darwin postulated that, as time has passed since the formation of the Earth, day length has gradually gotten longer, due partly to the drag of the tides on the planet's rotation. He even put a number on it, declaring that day length has increased by about 1 minute every 6 million years. In addition, he estimated that the lunar month was becoming longer as the moon's distance from the Earth increased. As a result of these two factors, G. H. Darwin reasoned, tides have gradually decreased since the Earth's oceans first formed. Thus, tides of the past would have been greater, and long ago, much greater. The stronger tides would have had a greater influence on Earth's life forms, on land and in the sea. Reasoning forward from this idea, Ricketts concluded that Cambrian tides might have been a dominant environmental factor for littoral animals that indelibly imprinted adaptive traits that survive in their genes to the present day. In this regard, Ricketts wrote (in an unpublished 1934 manuscript):

> Consider especially [the tide's] influence on gonads turgid with eggs or sperm, already almost bursting and awaiting only some "last straw." Note also the dehiscence of ova thru the body wall of the polychaete worms of ancient lineage, dating back almost unchanged to the Cambrian…. There is tied up to the most primitive and powerful social (collective) instinct, a rhythm "memory" which affects everything, and which in the past was probably far more potent than it is now.

Of critical importance was Ed's thoughtful approach to understanding the influence of tides on seashore life. Although he did not "discover" the phenomenon of intertidal zonation, which dates back at least to Pruvot's work in 1897, the year Ed was born, Ricketts was the first person to systematize and index the concept for a broad region (the Pacific Coast of North America) and to cast it in a contemporary ecological context.

Many of Ricketts's ideas were liberally borrowed and published upon by academic scientists, such as Maxwell S. Doty, Thomas Alan Stephenson, and Eugene Kozloff. However, none of these academic scientists gave Ricketts his due credit for codifying, in great detail, the concept of intertidal zonation. Prior to *Between Pacific Tides*, books on seashore life in North America were organized taxonomically, phylum by phylum,

species by species. One of the first, and most well known, of these was *Seashore Animals of the Pacific Coast*, by Johnson and Snook. (1927). Well after *Between Pacific Tides* made its debut, more such books continued to be organized taxonomically, e.g., MacGinitie and MacGinitie (1949, 1968), Brusca (1973, 1980), Brusca and Brusca (1978), Morris et al. (1980), Carlton (2007). Eugene Kozloff's two editions on seashore life in the northeast Pacific (1973, 1983) came the closest to Ricketts's approach, organized as chapters treating docks and pilings, rocky shores of Puget Sound, rocky shores of the open coast, sandy beaches, and bays and marshes. However, within each of these broad habitat categories, animals were still mostly described in a linear and taxonomic fashion.

In his 1983 volume, Kozloff clearly attempted to treat the seashore in a fashion that captured both Ricketts's schema and the traditional taxonomic approach. The closest thing we have today to Ricketts's dream of an "outer shores" guide is Chapter 5 in that book, which examines the outer shores from Vancouver Island to Northern California. Surprisingly, Kozloff never mentions Ricketts's ideas, or *Between Pacific Tides*, failing to even include that landmark book in his compiled list of references—a grievous and almost certainly purposeful oversight.

Flattely and Walton (1922) toyed with the idea of presenting seashore life from an ecological point of view. As they suggested in the preface to their book: "Hitherto, the authors of works dealing with the sea-shore have confined themselves almost entirely to describing and classifying the different forms of life occurring between tidemarks. The main idea underlying the present work, on the other hand, is to treat the plants and animals inhabiting the sea-shore from the ecological standpoint." But they failed to achieve that goal, and their treatise on British shores ended up being a dry, basic marine ecology text.

The British naturalist and marine biologist T. A. Stephenson visited Pacific Grove to study the intertidal zonation near Hopkins Marine Station and had at least one lengthy conversation with Ed Ricketts about littoral ecology (Hedgpeth 1978a). Ed, in his usual generous way, subsequently wrote Steinbeck that he considered Stephenson one of the world's greatest zoologists, and probably the greatest ecologist (Hedgpeth 1978a). However, Stephenson's monumental monograph (*Life Between Tidemarks on Rocky Shores*), published posthumously and with a title unsettlingly similar to Ed's own *Between Pacific Tides*, does not even mention Ed or his work (Stephenson and Stephenson 1972). Like Kozloff's lack of acknowledgment for the work of Ed Ricketts, Stephenson

seems to have snubbed Ed because he was not a member of the PhD/academic "card-carrying club." But Stephenson's work is not synthetic, or barely so at best, and it is trite in its descriptive approach, contributing little to the fledgling field of ecology.

In contrast, far more important was Sven Ekman's book, *Tiergeographie des Meeres* (1935), the English (and updated) translation of which appeared in 1953. Ed Ricketts (and RCB, as a young marine biology student) found Ekman's synthesis of profound importance—"a magnificent thing," Ed called it (and he must have read the original German version). Even today, no marine ecologist should fail to read Ekman's treatise, if only to ponder that such a beautifully synthetic work could have been written in the 1930s.

Ed Ricketts was not infrequently criticized by his scientific colleagues for using anthropomorphic language to describe animals and animal communities. But one might ask, is not "desire" a perfectly useful word to describe individuals of a species that are feeling the innate urge to mate? When the waters warm, or the currents change just so, or the moon is full, does not their body physiology give them the same urges we humans have when conditions trigger our own desires to mate? Though largely disregarded by his contemporaries of the time, Ricketts's *Between Pacific Tides* has outlasted and outsold all of these other publications. Since its original release by Stanford University Press in 1939, this celebrated text has gone through five additional editions (1948, 1952, 1962, 1968, 1985). It is the all-time best-selling book published by Stanford University Press.

As the field of ecology gradually emerged, it began to give scientific underpinning to what is now called environmentalism. This view of the natural world collided with the anthropocentric view that long dominated science and philosophy and was at the foundation of America's emergence as an economic and industrial power. The waves of European immigrants that came to the New World, drawn by the promise of opportunities, claimed a divinely granted right to exploit what was viewed as a limitless supply of natural resources, declaring it was their "Manifest Destiny" to do so. The adherents to this outlook assumed that the land and the natural resources were put there specifically for European Christians to use as they saw fit and they claimed a moral obligation to remove any obstacles, including indigenous people, that stood in their way. However, within a century, the limits of nature's bounty became evident and scientists who studied the intricacies of natural systems began to challenge

the notion that natural resources were inexhaustible. Ever since, a debate has raged in America that pits science against a host of traditional social, economic, political, and religious philosophies. As Ricketts waded through Pacific Coast tide pools, he immersed himself in this emerging debate.

Ricketts, along with his best friend John Steinbeck, explored this emerging argument's intricacies and nuances through a collaborative, multidisciplinary prism whose spectrum ranged from biology and quantum physics to classical music and poetry. They saw animal ecology as a particularly revealing window into human sociology (Davis 2004), despite the fact that the nascent field was struggling to find acceptance. A letter from Joseph Grinnell to Aldo Leopold in 1939 described the field's precarious status: "Some of our potent professors do not grant the worthiness, or even the existence, of a field [called] ecology" (Meine 1988). And Leopold himself, in *A Sand County Almanac* (1949), said, "Ecology is an infant just learning to talk. Its working days lie in the future."

The Great Depression brought Manifest Destiny and other philosophies underpinning American expansion into question, stimulating widespread philosophical exploration. Ricketts's lab was hit hard, as businesses across the country failed. John Steinbeck had a much better time of it financially, due to the success of his books.

In the late 1930s Steinbeck produced three novels that established him as one of the twentieth century's leading authors and strongest advocates of social justice. *In Dubious Battle* (1936), *Of Mice and Men* (1937), and *The Grapes of Wrath* (1939) were emotionally charged and politically controversial stories set in Depression-ridden California. All three explored the importance of individual responsibility as a key aspect of social strength—a theme Steinbeck went on to explore for the rest of his life (Beegel et al. 1997). *The Grapes of Wrath*, in particular, ignited a storm of controversy. Despite the fact that the literary world hailed it as a grand achievement with some calling Steinbeck "America's greatest living writer," California's powerful and conservative agricultural community, including the influential Associated Farmers Organization, reacted violently. They condemned Steinbeck for his harsh (though realistic) portrayal of agribusiness farms and the terrible ways in which migrant farmers were treated. At the same time Eleanor Roosevelt was publicly praising his work, they branded Steinbeck an unpatriotic communist. Steinbeck even received death threats and was accused of being a "drug fiend." Conservatives burned copies of his book across the nation, and the conservative backlash led the FBI and J. Edgar Hoover

to begin investigating him. This public reaction struck Steinbeck deeply and in the spring of 1939, on the brink of despair, he declared an end to his career as a novelist. He returned to the lab on Cannery Row to work with his best friend and make a "new start."

Sea of Cortez

Ed Ricketts provided Steinbeck a path for the conflicted writer to remove himself physically and emotionally from the turmoil haunting him after publication of *The Grapes of Wrath*. Ricketts had traveled and collected along the northwest coast of the Baja California Peninsula, where the warm-temperate fauna was essentially the same as in Southern California. But he had long desired to travel to the Sea of Cortez, or Gulf of California, which is home to a tropical-subtropical fauna that he knew would be very different from anything else he had ever experienced. So he suggested to Steinbeck that they start planning an extended trip there. Steinbeck jumped at the idea, and their plans soon reached beyond the Gulf of California to include a series of additional ambitious projects.

First, they would travel to the Sea of Cortez to study its intertidal life and write a handbook. They also planned a handbook to the marine life of San Francisco Bay. Ricketts's notes on the planned San Francisco Bay book suggest it would be, first and foremost, a field guide for the lay audience and beginning biology classes in the Bay Area. It would not have a lengthy bibliography, or treat the natural history of each species in great depth, instead referencing *Between Pacific Tides* and Johnson and Snook's *Seashore Animals of the Pacific Coast* (1927) for additional information. However, Ricketts's 20-page proposal (Ricketts, unpublished) also notes that the book will contain "frequent considerations of an ecological and sociological nature," and "the physical architecture of the book" would "derive through the method of sociology"; a study of the "principle of co-operation, in demonstrating survival value of the primitive tendency toward aggregation by animals subjected to unfavorable conditions, may throw light on some of the problems of social organization." His proposal also argued that the book's approach would be convenient and interesting for "the nostalgic layman who respects *Novalis dictum*, 'Philosophy is properly homesickness, the wish to be everywhere at home.' "

After completing their guidebook to San Francisco Bay, they would

prepare a study of the open coast of the Pacific Northwest, which Ed referred to as the "outer shores." This would be a companion volume to *Between Pacific Tides* and the book they planned to write based on the Sea of Cortez. The entire northeast Pacific Coast would thus be "catalogued." A planned fourth book would be a grand synthesis of Pacific coastal ecology.

By any measure, 1940 was a watershed year. World War II had "officially" commenced the year before, when Britain and France declared war on Germany, which had already conquered much of Eastern Europe. In one year, Germany overran Norway, Denmark, Holland, Belgium, and Luxembourg. Italy and Japan allied with Hitler and the Axis was born. By mid-1940, Germany's forces had marched into Paris and its bombers began pounding England. In 1940, Franklin D. Roosevelt was reelected president of the United States for a third term, Ernest Hemingway published *For Whom the Bell Tolls*, Carl Sandberg received the Pulitzer Prize for *Abraham Lincoln: The War Years*, Charlie Chaplin's classic film *The Great Dictator* premiered, and Walt Disney's *Fantasia* was released. In 1940 John Steinbeck was awarded the Pulitzer Prize for *The Grapes of Wrath* and Hollywood quickly turned it into a movie. In 1940, the then territory of Baja California Sur had a population of 51,471. It was also the year that the legendary Hotel Perla de la Paz opened, and the first air service to La Paz began.

For the Monterey sardine fishing industry 1940 was a banner year. Sardines were so plentiful in Monterey Bay in those days that the fleet of mostly Sicilian-owned purse seiners home-ported in Monterey Harbor simply fished locally, motoring out of the harbor before sunset to make their first set just after dark. By morning their fish holds bulged with sardines that they delivered to the canneries surrounding Ed's lab on Cannery Row. The sardine fishing season ended each March, and in 1940 the fishermen's association threw a big party. Boats were decorated and the revelry continued for an entire weekend. As soon as the party ended, one boat in the fleet embarked on an extraordinary trip.

The *Western Flyer*, a 77-foot wooden purse seiner under the command of her owner and captain, Tony Berry, motored past the harbor breakwater, rounded Point Pinos, the southern boundary of Monterey Bay, and turned into the open Pacific. Onboard were the captain and his crew of three deckhands along with five passengers. Two would disembark in San Diego, Webster Street and Herb Klein. The other three continued south along the Baja California Peninsula, en route to the Sea of Cortez:

Ed Ricketts, John Steinbeck (who chartered the vessel for the voyage), and Steinbeck's wife, Carol. The *Western Flyer*'s fish hold was no longer configured to transport freshly caught sardines. Instead, it was stocked with the means to scientifically collect, preserve, and study marine life. For the next 6 weeks, the *Western Flyer* was no longer a fishing boat, she was a research vessel and she steered a course for the Sea of Cortez.

Western Flyer, on an early sea trial, fully rigged (1937). Photograph probably by Martin Petrich Jr. (per Clare Petrich). Courtesy of the Petrich Family Collections.

The three friends spent each day examining the rocky shores, sandy beaches, mangrove swamps, and other varied habitats in the intertidal region of the Gulf of California. Each evening, Ricketts preserved the specimens he deemed worth keeping and made journal entries detailing the day's collecting activities and the habitat conditions encountered before joining the others aboard for beer and conversations that stretched late into the night. The tale of the voyage scribed by Steinbeck and Ricketts makes up the first half of their book and illustrates how the two friends delved deep into the philosophical underpinnings of ecology and sociology, applying what they observed in the tide pools and while interacting with people they met on the journey. Some events sparked alarm about what the future might hold for the rich biodiversity they encountered and the prosperity of the people they met in Mexico. Of particular concern was the indiscriminate and wasteful harvesting of marine resources.

They spent a day aboard a Japanese shrimp trawler at work and learned that the net is weighted with a lead line that scrapes the seafloor clean as the vessel steams forward. Everything in its path is dislodged from the seabed and captured in the huge net that is brought aboard and dumped on the deck. Deckhands then pick through the mounds of marine life to separate out the shrimp, which make up but a tiny fraction of the total catch. The remaining fish and other sea creatures caught in the trawl are simply pushed over the side as waste and left to die. Steinbeck and Ricketts decried the tremendous destruction they witnessed. Their calls for ending the practice preceded by decades the coining of the term "bycatch" by which biologists and conservationists now refer to the millions of tons of sea life that are killed and discarded in this manner each year.

Despite the carnage, Steinbeck and Ricketts didn't blame or condemn the men on the vessel. Instead, they accepted the reality of what they saw and explained it in terms that linked back to concepts they learned from Allee, Ritter, and Emerson, in particular the holistic-superorganism view, which they applied when they wrote of the men working on the destructive Japanese shrimp boats:

> They were good men, but they were caught in a large destructive machine, good men doing a bad thing.

And of those facilitating the work they wrote:

> The Mexican official and the Japanese captain were both good men,

> but by their association in a project directed honestly or dishonestly by forces behind and above them, they were committing a true crime against nature and against the immediate welfare of Mexico and the eventual welfare of the whole human species.

Instead of blaming the individuals, Steinbeck and Ricketts concluded that, like the U.S. Navy artillery gunners they met preparing for war in San Diego on a refueling stop before entering Mexican waters, they didn't fully understand the scale of the destruction that the "organism" of which they were a part was capable. Steinbeck and Ricketts speculated that if the navy men could see the death and devastation their guns caused in the places where their shells landed, or if the crewmen aboard the shrimp trawler could see the destruction they caused to the seafloor and understand its implications for future generations of people who would depend upon the sea for food and incomes, neither would likely continue doing what they did. But these individuals remained focused on performing their own specific functions without concern for the devastation wrought by the larger societal "machine" of which they were a small part. Rather than concern themselves with its impact, they simply focused their attention on doing what was demanded of them.

The successes of the Japanese shrimp fleet got the attention of the Mexican government. Also, the war began to substantially reduce the number of foreign fishing boats in Mexican waters, especially Japanese fleets. In 1944, for the first time ever, Mexican fisheries took a larger catch from the country than did foreigners. And, by 1948, a major political push in Mexico City began to expand the national fisheries and exclude foreigners.

Sea of Cortez: A Leisurely Journal of Travel and Research is a very different book from *Between Pacific Tides.* In fact, it is really two books. The 277-page Narrative is literary prose written as a "daily log" of the trip that reflects philosophically on natural history and sociology. The 306-page Phyletic Catalogue is a detailed list of the species taken on the expedition, along with bibliographic and natural history information on each. Thus the book does not follow the habitat-community approach of *Between Pacific Tides,* which was the result of years of intensive study and a massive accumulation of observational data. In contrast, *Sea of Cortez* was the result of a brief 24 days of observation in the Gulf, at just 21 locations, and could not possibly have had the biological depth of *Between Pacific Tides.*

At its core, the Narrative is Steinbeck and Ricketts's attempt to

motivate readers to broaden their perspectives on their links to nature and humanity as a whole. It is also the clearest and most overt exploration of their ideas about life in which they demonstrate how ecological concepts shine a new and exciting light on our personal links to the totality of existence—what they termed the "ALL." Steinbeck and Ricketts encourage readers to be curious and look beyond their personal horizons to consider how their actions influence not just their immediate neighbors and surroundings, but also those unseen beneath the waves, over the next hill, and on the other side of the planet. They did so by "looking from the tide pool to the stars and back again," and by applying scientific and philosophical ecological concepts to what they saw and experienced on their expedition while reveling in and celebrating their fascination with the interconnections and interdependencies linking it all together.

Hints of everything they learned about ecology and biology from their college days to the moment they boarded the *Western Flyer* can be found on the book's pages. From Allee to Ritter to *Between Pacific Tides* and *The Grapes of Wrath* and everything in between, it is all there. Perhaps more than any other book, *Sea of Cortez* inspired countless young people to abandon more lucrative career paths and become marine biologists and conservationists, especially along the Pacific Coast, from Mexico to Alaska. According to many, it did so not simply by illustrating the real-life significance of biology and ecology, but also by convincing young readers that science can be a lot more fun than they had ever imagined.

The *Western Flyer* returned to Monterey from the Sea of Cortez in late April 1940, but several months passed before Steinbeck and Ricketts began writing their book about the voyage. A few weeks after returning, Steinbeck and his wife, Carol, flew to Mexico City with Herb and Rosa Kline to begin filming a movie based on another of his stories, *The Forgotten Village* (1941). Ricketts soon followed, driving Steinbeck's car down to them, arriving in Mexico City in early June 1940. Being in Mexico City gave Ricketts a vitally important opportunity to work in the library of Mexico's National University (Universidad Nacional Autónoma de México) and research subjects for the second part of the book—the Phyletic Catalogue. Over the course of his visits to Mexico, Ed developed a great fondness for Mexican culture and people. He found their acceptance of "what is" fit comfortably into his non-teleological framework of thinking. He also found Steinbeck's screenplay (*The Forgotten Village*) at odds with this view, resulting in a temporary falling

out between the two. Ricketts left Mexico City in late June, traveling by train via Guadalajara, Tepic, Mazatlán, Guaymas, and Tucson before returning to Monterey.

Back in Monterey, Ricketts immersed himself in preparing the second, more scientific part of *Sea of Cortez*—the Phyletic Catalogue—employing the same methodology he had used to prepare *Between Pacific Tides*. A hired photographer prepared black-and-white and color plates of specimens collected on the trip. Ricketts also reached out to his international network of correspondent taxonomists for help verifying the identities of the creatures they had collected. He also consulted experts at Stanford University's Hopkins Marine Station in Monterey. Walter K. Fisher (1878–1953) had been director of Hopkins Marine Station since Ricketts established Pacific Biological Laboratories. Fisher was an expert on starfish, spoon worms (Echiura), and peanut worms (Sipuncula) whom Ed consulted over the years, even though Fisher harshly criticized and antagonized Ricketts.

Fisher scorned Ed's writing style, labeling it convoluted and overly philosophical. Less than enthusiastic opinions of *Between Pacific Tides* from Fisher (and another well-known California marine biologist, George MacGinitie), as well as Stanford University Press's concern that a sufficient market did not exist, had delayed acceptance of the book. Many historians suspect that Fisher was the inspiration, if not the direct target, for the tirade against crusty-minded "dry-ball" professors in the *Sea of Cortez*. According to Hedgpeth (1978b), Fisher thought the book "a bunch of rubbish except for the solid material of the appendix." Despite their difficult relationship, Fisher played a key role in identifying specimens from the Steinbeck-Ricketts Sea of Cortez expedition. And, of course, Fisher often got rare and important specimens from Ricketts for his own research. Two of the undescribed spoon worms collected on the Sea of Cortez expedition were later named and described by Fisher (*Ochetostoma edax* and *Thalassema steinbecki*). It is noteworthy that, although Fisher honored John Steinbeck with a species name, he failed to do so for Ed Ricketts.

Steinbeck returned to Monterey from Mexico and began work on his part of *Sea of Cortez* in January 1941. Working from Ricketts's journal and collecting notes, as well as *Western Flyer* captain Tony Berry's ship log, Steinbeck crafted the Narrative portion of the book. Steinbeck did not keep a formal notebook on the trip. Much if not most of the ideas for the book appear in Ricketts's original notes from the expedition. Once Ricketts compiled the scientific portion of the book, he worked

with Steinbeck to prepare instructions for the book's layout that were sent, along with the manuscript, to Steinbeck's publisher in New York, Viking Press.

Sea of Cortez was released on December 5, 1941, a Friday. Events two days later doomed the book to relative obscurity. The December 7 Japanese attack on Pearl Harbor pushed nature, science, and travel out of the public consciousness. America entered the second global war in half a century. Steinbeck and Ricketts were swept up in the war effort too.

After the Sea of Cortez

Ricketts was drafted into the army in October 1942 and worked as a lab technician in the venereal disease section of the induction center at the Presidio of Monterey. There, he allegedly became infamous for a mixed drink he invented, which Steinbeck claimed was known as "Ricketts's Folly" (Steinbeck claimed it was a blend of grain alcohol, codeine, and grenadine; a colorful exaggeration, we suspect). Ricketts's son, Ed Jr., was drafted the year his father was discharged, in 1943, and ended up being stationed in New Guinea.

In 1942, Steinbeck released a book titled *The Moon Is Down* that was inspired by radio reports of the Norwegian resistance fighting against the invading Nazis that he had heard aboard the *Western Flyer*. He also divorced his wife Carol and married Gwyn Conger with whom he moved to New York City. He then spent the majority of 1943 in Europe reporting on the war effort for the *New York Herald Tribune*.

Upon discharge from the military, due to lack of business at Pacific Biological Laboratories, Ricketts went to work for California Packing Corporation as a chemist (where he worked at least through 1947). In the 1930s, Ricketts began compiling data on sardine catches and oceanographic conditions, recording population fluctuations, and contributing occasional commentaries to the yearly sardine supplements published in the *Monterey Peninsula Herald*. Throughout the 1940s, he studied and chronicled the disappearance of the sardines in Monterey Bay, applying a "holistic" view to identify over-harvesting, combined with oceanographic cycles, as the cause of the decline. However, none of his work on sardines was ever published in the professional literature. In 1945, Steinbeck published his novel *Cannery Row*, which made Ricketts a local celebrity and gained him national fame.

In the 1947 annual Sardine Edition of the *Herald* (March 7), Ricketts documented, in more detail than anyone else had ever done, the central California sardine situation. He countered the popular notion in the fishing community that the drop in sardine numbers was due to a "change in the currents." Ricketts presented a step-by-step description of the factors that influence sardine production, beginning with upwellings, how they work, and that they are tied to sea surface temperatures, which fluctuated from one year to the next (using sea temperature data from Hopkins Marine Station). He described the link between upwellings and nutrient supplies to the phytoplankton community, and the link between phytoplankton standing crops and zooplankton production, which sardines rely on for food and their ability to produce offspring. He then described how excessive fishing pressure during years of depressed upwelling (and thus, reduced zooplankton populations) suppressed sardine recruitment for subsequent years. Today, this food web approach, combined with an understanding of basic oceanography, seems almost elementary. But in the 1940s, it was on the cutting edge of science and was a measure of Ed Ricketts's broad, interdisciplinary way of thinking.

In Ed's article for the 1948 Sardine Edition of the *Herald* (April 2), he countered two new ideas floating around in the fishing community—that the reduction in catch was due either to the dumping of munitions in the bay by the military or to atomic bomb tests. Using data from government records, he showed that the most recent banner year for sardine catch was in 1936, and since then there had been a gradual decline due to over-harvesting combined with fluctuations in oceanographic conditions.

In a letter to Torsten Gislén (27 December 1938), Ricketts foreshadowed what was to come.

> The canneries are going strong—they will extract every single sardine out of the ocean if legislation doesn't restrain them, already the signs of depletion are serious. Funny how Americans can't learn the lesson that the north European countries have known for a century.

Eight years later, in a letter to his friend Ritchie Lovejoy (22 October 1946), Ricketts summarized pretty much everything that was known about the sardines off central California. He was the first scientist to provide a credible explanation of California's teetering sardine situation in the 1940s. The conservation warnings of Ricketts and others went unheeded, the catch collapsed, and by the late 1940s the Monterey sardine industry was all but dead.

In 1942, Ricketts returned to Hoodsport to begin collecting and gathering new data for his planned book, *The Outer Shores*, a term he used for the rugged, wave-exposed coastlines of the Pacific Northwest (e.g., Vancouver Island, Haida Gwaii [the Queen Charlotte Islands], the islands of northeast Alaska). He made the trip accompanied by his new girlfriend. Early in the spring of 1940, just before departing for the Sea of Cortez, Ed had met Toni Jackson (Toni Seixas Solomons Jackson), divorced with a 6-year-old daughter. Not long after returning from the expedition, Toni and her daughter, Kay, moved into the lab. Toni's father was Theodore Solomons, the explorer who had worked out and defined the John Muir Trail. Although Ed and Toni eventually "married," it was presumably not legal because Ed and Nan had never divorced. Ricketts was very fond of Kay, but in 1945 the child was diagnosed with a brain tumor, from which she died a few years later (on 5 October 1947).

In October 1944, Steinbeck and Gwyn (and their new baby boy, Thom) moved back to the Monterey Peninsula, purchasing a house known as the "de Soto adobe," not far from Ed's lab. It was during this time that the two men seriously developed their plan for their new book, *The Outer Shores*. Their close friendship proved to be enduring, although for Steinbeck the people of Monterey were not as he remembered them from their earlier, halcyon days together there.

Ricketts spent the summers of 1945 and 1946 on Vancouver Island, and in summer 1946 went on to the Queen Charlotte Islands (now known as Haida Gwaii) and Prince Rupert (British Columbia) doing fieldwork for the planned book. In Haida Gwaii, Ed, accompanied by Toni, landed (by steamship) at New Masset, on Graham Island (the largest in the archipelago), a village of just a hundred or so houses and a few hundred people (the population today not much higher, around 800 people). In the 1940s, the outer shores of British Columbia were still in a pioneering stage, and travel was mostly by boat. Even in the mid-1950s, when RCB's family began their many annual summer treks to Campbell River (on the inner coast of Vancouver Island), most of that island beyond Victoria remained primitive and lacked paved roads.

Ed Jr. accompanied them on the 1946 trip to Vancouver and the Queen Charlottes. It was on the 1945 and 1946 trips, working in the Inland Passage, that Ed finally concluded that his book on northwestern shores would have to be limited to the outermost coasts of Vancouver Island and the Queen Charlottes; the fauna of the Inland Passage shores, being so distinct, would require a separate book. Of course, there was

no internet then, and tide tables were difficult to come by, especially for remote areas. But Ed and Ed Jr. measured and graphed the tides manually. Ed Jr. carefully calculated tidal flow patterns that allowed his father to plot animal and algal distributions in the intertidal zone. One of the fundamental phenomena Ed discovered was that, on the outer shores, the beach region between +6-foot and +8-foot tides is uncovered by every low tide, and covered by every high tide—that is, animals and algae in this zone are uncovered and covered twice daily. Thirty years later, RCB extended this idea, speaking to its universality using the Sea of Cortez as a new model. For that region, his "Zone 2, the *Tetraclita-Nerita* Zone," was characterized by the presence of *Tetraclita rubescens* (= *T. squamosa*), *Nerita scabricosta*, *Mexacanthina* (=*Acanthina*) *angelica*, *Lottia atrata*, *Tegula rugosa*, and several other animals (Brusca 1973, 1980).

Ricketts was a liberal-minded, intellectual existentialist who didn't hesitate to explore the philosophical implications of biology and their application to human existence. In his notes from the 1945 trip to the west coast of Vancouver Island (sent to Steinbeck for "rendering"), Ed explored the nature of the emerging science of ecology, noting:

> I got to thinking about the ecological method, the value of building, or trying to build, whole pictures. No one can controvert it. An ecologist has to consider the parts each in its place and as related to, rather than as subsidiary to the whole. It would undoubtedly be good if political leaders, if there are such, would get to know that method. If they could realize no man is an island to himself, any more than the animals are that make up the community, that make up a region, that make up a coastline, he'd be careful to look at more than his own narrow segment.

Kay's death in 1947 proved too much for Toni and Ed's relationship to bear, and they separated. Toni left Monterey and moved to Southern California. There, she met and began living with another marine biologist, Ben Volcani (they married and moved to Palestine in 1948). Later that year, Ed met and began dating Alice Campbell, a 25-year-old philosophy and music major at the University of California, Berkeley. Ricketts and Steinbeck began planning another trip to the Queen Charlottes, this time to include Alice. Ed and Alice married on 2 January 1948, but, again, most historians conclude it was not a legal marriage because Ed and Nan's divorce was never finalized.

In February 1948, Steinbeck visited Ricketts in Monterey to finalize plans for the upcoming Queen Charlotte Islands expedition and the

book they hoped it would spawn. They decided to embark in late May. After Steinbeck returned to New York, Ed mailed him all his notes from his previous work for *The Outer Shores.* He included a note that read, "Well, Jnny [sic] boy, this is it, this is 30, the trips of 1945 and 46 are over, it's your book now, and God bless you."

On May 8, 1948, a few days after returning the proofs he'd reviewed for the second edition of *Between Pacific Tides,* Ed hopped into his 1936 Buick to make a quick run to the store. As he drove across the railroad tracks on Drake Street (off Cannery Row) in Monterey, the Buick stalled on the tracks just as the southbound express came through a blind crossing. Unable to stop, the locomotive smashed into Ed's car. He was rushed to the hospital where he lingered a few days before passing away. Steinbeck bolted from New York to be at his side but arrived too late to bid his best friend farewell.

Three years after Ed Ricketts died, Steinbeck's editor convinced him to republish just the Narrative portion of their 1941 book under the title *The Log from the Sea of Cortez* (1951). This new edition begins with a heartfelt homage written by Steinbeck about his dearest friend. Among the touching passages describing this extraordinary individual, Steinbeck refers to the expedition he planned to make with Ricketts to the outer shores, writing,

> At the time of Ed's death our plans were completed, tickets bought, containers and collecting equipment ready for a long collecting trip to the Queen Charlotte Islands, which reach so deep into the Pacific Ocean. There was one deep bay with a long and narrow opening where we thought we might observe some changes in animal forms due to a specialized life and a long period of isolation. Ed was to have started within a month and I was to have joined him there. Maybe someone else will study that little island sea. The light has gone out of it for me.

For unclear reasons the 1951 *Log* did not include Ed's name on the byline—a serious and sad omission, especially given that Ed's treatise on non-teleological thinking was in the book, and the fact that so many academic writers had failed to acknowledge Ed's contributions to their own publications. Steinbeck must surely have been aware of these academic slights during Ed's career. It has been speculated that Steinbeck pushed to keep Ed's name on the book but the publisher refused (perhaps thinking it would dilute Steinbeck's name).

Long after Ricketts's death, the Pacific Northwest field notes and journals he sent to Steinbeck were edited by Joel Hedgpeth and published in a little two-volume set titled *The Outer Shores* (1978). Ed's notes reveal how consistently forward-thinking he was in terms of ecology. In them, Ricketts describes observations leading him to believe that the lower limit of animals in the intertidal zone has "nothing to do with a need for the tidal rhythm" but instead "is due to the workings of a biological…. factor," whereas the upper limit "is probably a function of increasing tidal exposure." This is now viewed as a fundamental generalization of littoral ecology. The roles of competition and predation as mechanisms structuring communities and regulating littoral distributions, and the overarching roles of certain dominant species ("keystone species"), were codified in the classic research papers of Joseph Connell and Robert Paine in the 1960s, and thereafter by a long lineage of their students. But Ricketts explored and discussed these same concepts 25 years before Connell's and Paine's work was published. The profound role of wave energy/shock on beach communities led him to accurately conclude that "the fauna of the surf-swept rocks outside Sitka resembles that of the similarly exposed California coast nearly 2000 miles distant, more than it does that of similar type of bottom protected from surf only three miles away."

Ed's notes were filled with philosophical meanderings, commonly those that invoke his holistic views of ecology. For example, he frequently referred to a biological community as a "society of species," and he defined ecology as "that science which deals with the framework of relations between an animal or a society of animals and its environment…. this is the method of sociology" (Ricketts, unpublished). Particularly good insight into the mind of Ed Ricketts can be found in this comment (Ricketts, unpublished):

> Even the two chief philosophies of human society are paralleled on the shore: those dedicated to the principle that the individual serves the state, chiefly as a unit or cog in that supra-personal social organization that is the colony; and those based on the democratic principle that the state serves the all-important individual. The latter are exemplified by the octopus and by other actively predacious animals which, by their individual skill through intelligence and sensory ability, function as free entities; the former by the sponges, corals, barnacles, compound tunicates, etc., which very definitely function as a group in competitive food getting, in colonizing every

> available square inch of suitable area, and in reproducing, and in which the colonial individual is almost entirely lost sight of before the coherent unity of the community.

Throughout the 1930s and into the 1940s, Ed worked on three philosophical essays. None of them were ever formally published, not even with John Steinbeck's and Paul de Kruif's (*Microbe Hunters*, 1926) efforts and support. However, one of them ("Essay on Non-teleological Thinking") did make it verbatim into *Sea of Cortez* (the "Easter Sunday Sermon" in Chapter 14). The other two essays were *The Philosophy of Breaking Through* and *The Spiritual Morphology of Poetry*. The latter was a short treatise arguing how poetry can be a vehicle for individual transcendence. Ed had all three of these philosophical narratives widely reviewed by his friends, and Steinbeck and Campbell gave him feedback on several versions of them. These essays have also been widely critiqued by modern writers, such as Richard Astro, Joel Hedgpeth, Katharine Rodger, and others. The pieces no doubt influenced some of Steinbeck's novels. As Jackson Benson (1984) observed, one of Steinbeck's most famous novels, *Of Mice and Men*, seems to have been written from a purely non-teleological point of view—no cause and effect, no heroes or villains; it is simply "what is."

Reflections

Ricketts was a pioneer of community ecology on the Pacific Coast of America. In his 1945 "Outer Shores Transcript," sent to Steinbeck for review, he stated succinctly that, "Ecology is the science of relationships" (Rodger 2006). Being a generalist (and a synthesizer) distinguished him from other scientists, especially biologists, who increasingly moved toward specialization, or reductionism, which steered the field of biology away from communities, to species, cells, and eventually DNA. While biologists built taller and taller intellectual silos for their work, Ricketts tore down walls that increasingly blocked a much grander and awe-inspiring vista of the totality of existence and the inextricable links joining all of its components. His driving passion was systems, not species. As Lannoo (2010) put it, "Both men [Steinbeck and Ricketts] had grave suspicions about an emphasis on reductionism at the expense of holistic understanding."

Ed Ricketts was one of those rare individuals who, by his very nature,

was both a mystic and a scientist. Hedgpeth (1978b) remarked that one of Ed's favorite bits of advice was, "When you are caught by the tide, don't fight it, drift with it and see where it takes you"—pure Zen, indeed. Of course, Zen can be that enlightenment attained through meditation, self-contemplation, or intuition (rather than through faith and devotion), and Ed often expressed this view. His observations of Tony Berry at the helm of the *Western Flyer* evoked in him a Zen-like sense of boats, sailing, and the sea:

> One thing doesn't shift as you approach [the horizon on a boat] because there's no real approaching: the compass-point 170°; the abstract, Schiller's and Goethe's "Ideal"….to be worked out in terms of reality. Someone said of the tide pool area: "the world under a rock." So it could be said of navigation: "The world within the horizon."

Had he lived another decade, he would likely have embraced Alan Watts's groundbreaking book *The Way of Zen*. Many of the ideas Ed expressed are also echoed in the writings of Hermann Hesse (1877–1962), although he seems not to have read much, or any, of Hesse's work. Hedgpeth always felt Ricketts had more in common with Hesse than with Steinbeck (Hesse was one of Hedgpeth's favorite writers). Hannibal (2016) probably had it right, when she said, "The story of Ed Ricketts is a case study of the hero's journey eventually articulated by Joseph Campbell. Whatever else he did or didn't do, Ricketts followed his bliss."

Ed Ricketts is also a cultural hero in the field of marine biology. More than anything else, it was the writings of Ed Ricketts (and stories told about him by Joel Hedgpeth and John Steinbeck) that influenced RCB's own earliest inclinations toward marine biology, invertebrate zoology, and the Sea of Cortez. After all, Ed seemed to have lived just as he wished, with enough to eat and drink, great books and music to enjoy, good friends to spend time with, traveling up and down the coast tide-pooling, and unabashedly enjoying intimate relationships with his lady friends. Who wouldn't want a life like that, and if becoming a marine biologist was all that was needed, it seems like a no-brainer.

Not much has been written about Joel Hedgpeth's relationship with Ed Ricketts. Joel Hedgpeth and RCB had many discussions about Ricketts and Steinbeck from 1959 through the early 1990s. Joel first met Ed when they began corresponding in 1935, about the sea spiders (Pycnogonida) to be included in *Between Pacific Tides*, although they

did not meet face-to-face until 1938 or perhaps 1939. After that, Joel visited Monterey and Ed several times a year. Joel knew Steinbeck too, but he knew Ed far better. Joel was never part of the inner circle of friends, the Lab Group—probably in part because he chose to remain an aloof academic figure himself. We view Hedgpeth as a biologist's version of Gore Vidal—critical, cynical, caustic, a skeptic of the human condition, and bordering slightly on misanthropic. Joel's view of the world was proffered forth by Jerome Tichenor (pseudonym for Hedgpeth) in *Poems in Contempt of Progress* (1974). Tichenor's poem "Miltonesque" could have been written by Ricketts. And certainly Ed would have approved of Tichenor's "The Oyster" (first published in the *Maryland Tidewater News* around 1950):

> Consider the case of the oyster,
> Which passes its time in the moisture:
> Of sex alternate,
> It chooses not to mate,
> But lives in a self-contained cloister.

Two of Joel's edited books eventually became marine biologists' "bibles"—his 1957/1963 two-volume *Treatise on Marine Ecology and Paleoecology*, and his 1952–1985 revisions of *Between Pacific Tides*. In the early years, Joel and Gary J. Brusca (RCB's brother) worked together at the University of the Pacific's (UOP) marine laboratory (Pacific Marine Station) in Dillon Beach, California (at the mouth of Tomales Bay), where RCB spent his summers. Joel became director of the Dillon Beach lab when he took a professorship in zoology at UOP in 1957 (in 1963 he left UOP for an ill-fated position at Oregon State University). Later, Joel and RCB taught a 5-week summer course together, in Mexico, for the University of Arizona, titled "Marine Ecology of the Sea of Cortez." In the evenings, after his third gin and tonic, Joel would be inclined to wax philosophical on Ed Ricketts and *Between Pacific Tides*, or to pull out his Irish harp to entertain whoever was around with his plucking and his bawdy Celtic ditties, stirring memories of Steinbeck and Ricketts's famous line from *Sea of Cortez*, "Your true biologist will sing you a song as loud and off-key as will a blacksmith." One of the things Joel confirmed was the fact that a healthy sex drive was a significant motivator (and occasional liability) for Ricketts. Indeed, he had a pattern of taking long out-of-town trips after affairs with women had ended. As Steinbeck and

Ricketts proclaimed in *Sea of Cortez*, "At least [a true biologist] does not confuse a low hormone productivity with moral ethics."

Joel's curious behavior was probably partly due to what he viewed as a "disfigurement" of his face, resulting from a childhood accident when he was playing with a blasting cap and it exploded. He also lost some fingers in that event. However, it was likely also that Joel was simply socially uncomfortable and so put on airs, an aloof persona of detached intellectualism to cover his awkwardness. In any event, he certainly marched to his own drummer. He left the University of Texas without completing his PhD, due to what he called "an internecine dispute" (Schram and Newman 2007). He returned to UC Berkeley, where he'd taken his master's degree under S. F. Light (of "Light's Manual" fame), and completed his PhD there.

It was Waldo Schmitt, at the National Museum of Natural History, who first formally introduced Hedgpeth and Ricketts (Hedgpeth 1996). Although Joel's graduate work had been on crustaceans, he soon moved on to pycnogonids (sea spiders), and Ed needed help with that obscure group of marine arachnids. Schram and Newman (2007) suggest that Steinbeck's *Sweet Thursday* (1954) character, "Old Jingleballicks," might have been modeled after Joel Hedgpeth. However, that would have been Steinbeck's personal decision. As Hedgpeth (1996) noted, Ed called many people he disliked or considered incompetent "Jingleballicks." It seems more likely that Steinbeck's character was an amalgam of several people (one can only speculate who those might have been). Joel came to greatly value his friendship with Ed (Hedgpeth 1976). Hedgpeth eventually adopted the *nom de plume* of Jerome Tichenor. Under this name, he wrote scathing letters to newspaper editors and published his poetry (e.g., *Poems in Contempt of Progress*). He also claimed Professor Tichenor was president (and sole member) of the "Society for the Prevention of Progress." Had Ed lived longer, he likely would have been elected the second member of the society.

At least two oral histories of Hedgpeth have been compiled. In Robert Calvert's interview with Joel (done in 1976, in New Orleans), Hedgpeth expressed that he, and others, including Joseph Campbell, felt that Steinbeck didn't really "understand what Ed Ricketts was all about." In Ann Lage's interview with Joel (conducted in 1992), Hedgpeth notes that Ricketts recognized the phenomenon of "competitive exclusion" before most American scientists even knew what the phrase meant (Hedgpeth 1996). Ricketts had read the abstract of an obscure 1932

paper by Argentinian biologist Angel Cabrera, and realized it was what he was seeing in California tide pools.

Although the Ecological Society of America was founded in 1920, the field remained largely marginalized for another 20 years. Growing from the seeds planted by Allee, Ritter, Emerson, Ricketts, Leopold, and others, ecology was finally popularized in the 1960s with the newly emerging environmental movement. Another marine biologist, Rachel Carson, gave ecology and environmentalism/conservation a large boost with her popular books, *The Sea Around Us* (1951) and *Silent Spring* (1962). By the mid-1970s, colleges and universities had begun to retool their biology curricula to put ecology front and center, combining the traditional zoology and botany departments into new "ecology and evolutionary biology" departments. The field has gone through several popular movements, some of which tended to lose sight of its roots in natural history (e.g., mathematical and theoretical ecology). Today, it seems to be reaching maturity, or at least a stasis of some kind. And since the turn of the 21st century, with the dramatic rise of molecular biology and no end in sight as new techniques continue to come online, the field of ecology has become less popular. However, trends suggest that ecologists may soon come to embrace molecular methods to perhaps revitalize their field once again, as has begun to happen in so many other subdisciplines of biology. Hopefully, such a trend will not again lose sight of the wellspring of ecology—natural history observation. One cannot help but wonder what Ricketts would have to say about a "molecular transect" in the sea, in which tiny water samples are analyzed to reveal the hundreds of species living in the area based on nothing but tiny fragments of DNA floating with the currents.

Perhaps Ed Ricketts will inspire a new generation of biologists to explore the broader implications of their work by emulating his ability to explore links between ecology, philosophy, and human society. As he wrote in a proposal for a book on littoral ecology:

> The great problems facing mankind today are social problems. From the lowest to the highest forms in the series, all animals are at some time in their lives immersed in some society; the social medium is the condition necessary to conservation and renewal of life….social facts are subject to laws and these are the same everywhere that such facts appear, so that they constitute a considerable and uniform domain in nature, a homogeneous whole thoroughly integrated in all its parts. Light may well be shed on the social problems of

Homo sapiens by a consideration of the social adaptations achieved on the humbler group levels.

There is no doubt that the fields of ecology and environmentalism that Ed Ricketts helped spawn will be part of Western consciousness for a very long time to come.

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Bibliography

Allee, W. C. 1923a. Studies in marine ecology: I. The distribution of common littoral invertebrates of the Woods Hole region. *Biological Bulletin* 18: 167–191.

Allee, W. C. 1923b. Studies in marine ecology: III. Some physical factors related to the distribution of littoral invertebrates. *Biological Bulletin* 18: 205–253.

Allee, W. C. 1931. *Animal Aggregations.* University of Chicago Press, Illinois.

Allee, W. C. 1938. *The Social Life of Animals.* W. W. Norton, New York.

Allee, W. C., A. E. Emerson, O. Park, T. Park, and K. P. Schmidt. 1949. *Principles of Animal Ecology.* Saunders, Philadelphia.

Astro, R. 1973. *John Steinbeck and Edward F. Ricketts: The Shaping of a Novelist.* University of Minnesota Press, Minneapolis.

Astro, R. 1976. Edward F. Ricketts. Western Writers Series. Boise State University Press, Idaho.

Astro, R. 1995. Introduction to *The Log from the Sea of Cortez.* Penguin Classics, Reprint Edition.

Astro, R., and T. Hayashi (eds.). 1971. *Steinbeck: The Man and His Work.* Oregon State University Press, Corvallis.

Bailey, K. M. 2015. *The Western Flyer: Steinbeck's Boat, the Sea of Cortez, and the Saga of Pacific Fisheries.* University of Chicago Press, Illinois.

Beegel, S. F., S. Shillinglaw, and W. N. Tiffney Jr. 1997. *Steinbeck and the Environment: Interdisciplinary Approaches.* University of Alabama Press, Tuscaloosa.

Benson, J. J. 1984. *The True Adventures of John Steinbeck, Writer.* Viking Press, New York.

Brusca, R. C. 1973. *A Handbook to the Common Intertidal Invertebrates of the Gulf of California.* University of Arizona Press, Tucson.

Brusca, R. C. 1980. *Common Intertidal Invertebrates of the Gulf of California.* 2nd Edition. University of Arizona Press, Tucson.

Brusca, G. J., and R. C. Brusca. 1978. *A Naturalist's Seashore Guide: Common Marine Life of the Northern California Coast and Adjacent Shores.* Mad River Press, Eureka, California.

Cabrera, A. 1932. La incompatibilidad ecologica: Una ley biologica interesante. *Anales de la Sociedad Científica Argentina* 114(5/6): 243–260.

Carlton, J. T. 2007. *The Light and Smith Manual: Intertidal Invertebrates from Central California to Oregon.* 4th Edition. University of California Press, Berkeley.

Davis, M. K. 2004. *Edward F. Ricketts: Man of Science and Conscience.* Steinbeck Studies, San Jose, California, Vol. 15, No. 2, pp. 15–22.

DeMott, R. 1995. Introduction. In J. Steinbeck, *To a God Unknown.* Penguin Books, New York.

Ekman, S. 1953 [1935]. Translated from the Swedish by Elizabeth Palmer. *The Zoogeography of the Sea.* Sidgwick and Jackson, London.

Flattely, F. W., and C. L. Walton. 1922. *The Biology of the Sea-Shore.* Macmillan, London.

Hannibal, M. E. 2016. *Citizen Scientist: Searching for Heroes and Hope in an Age of Extinction.* The Experiment, New York.

Hedgpeth, J. W. (ed.). 1957, 1963. *Treatise on Marine Ecology and Paleoecology.* 2 volumes. Geological Society of America, Boulder, Colorado.

Hedgpeth, J. W. 1971. Philosophy on Cannery Row. In R. Astro and T. Hayashi (eds.), *Steinbeck: The Man and His Work*. Oregon State University Press, Corvallis, pp. 89–129.

Hedgpeth, J. W. 1976. Oral History Report [with Robert Calvert], Texas A&M University, College Station.

Hedgpeth, J. W. 1978a. *The Outer Shores*. Part 1: *Ed Ricketts and John Steinbeck Explore the Pacific Coast*. Mad River Press, Eureka, California.

Hedgpeth, J. W. 1978b. *The Outer Shores*. Part 2: *Breaking Through*. Mad River Press, Eureka, California.

Hedgpeth, J. W. 1995. Ed Ricketts (1897–1948), Marine Biologist. In S. Shillinglaw, *Steinbeck Newsletter*, Vol. 9, No. 1, pp. 17–18.

Hedgpeth, J. W. 1996. "Marine biologist and environmentalist: Pycnogonids, progress, and preserving bays, salmon, and other living things," an oral history conducted in 1992 by Ann Lage, Regional Oral History Office, Bancroft Library, University of California, Berkeley.

Johnson, M. E., and H. J. Snook. 1927. *Seashore Animals of the Pacific Coast*. Macmillan, New York.

Kozloff, E. N. 1973. *Seashore Life of Puget Sound, the Strait of Georgia, and the San Juan Archipelago*. University of Washington Press, Seattle.

Kozloff, E. N. 1983. *Seashore Life of the Northern Pacific Coast: An Illustrated Guide to Northern California, Oregon, Washington, and British Columbia*. University of Washington Press, Seattle. (An expanded edition of Kozloff's 1973 book.)

Lannoo, M. J. 2010. *Leopold's Shack and Ricketts' Lab: The Emergence of Environmentalism*. University of California Press, Berkeley.

Leopold, A. S. 1949. *A Sand County Almanac and Sketches Here and There*. Oxford University Press, New York.

MacDougal, D. T. 1906. The delta of the Río Colorado. *Bulletin of the American Geographical Society* 38: 1–16.

MacGinitie, G. E., and N. MacGinitie. 1949; 1968, 2nd Edition. *Natural History of Marine Animals*. McGraw-Hill, New York.

McCosker, J. E. 1995. Ed Ricketts: A Role Model for Marine Biologists. In S. Shillinglaw, *Steinbeck Newsletter*, Vol. 9, No. 1, pp. 12–14.

Meine, C. 1988. *Aldo Leopold: His Life and Work*. University of Wisconsin Press, Madison.

Miner, C. M., D. P. Lohse, P. T. Raimondi, and J. S. Pearse. 2015. The legacy of a naturalist: How Ricketts's wave shock idea helped shape a century of shoreline research. In J. M. Straley (ed.), *Ed Ricketts, from Cannery Row to Sitka, Alaska: Science, History, and Reflections along the Pacific Coast*. Shorefast Edition, Juneau, Alaska, pp. 73–86.

Mondor, C. 2015. The Grampus. In J. M. Straley (ed.), *Ed Ricketts, from Cannery Row to Sitka, Alaska: Science, History, and Reflections along the Pacific Coast*. Shorefast Edition, Juneau, Alaska, pp. 33–41.

Morris, R. H., D. P. Abbott, and E. C. Haderlie. 1980. *Intertidal Invertebrates of California*. Stanford University Press, California.

Pruvot, G., 1897. Essai sur les fonds et les faunes de la Manche occidentale (Côtes de Bretagne), comparés à ceux du Golfe du Lion. *Archives de Zoologie Expérimentale et G*énérale 5(3): 511–617.

Ricketts, E. F. Undated (cf. Ricketts and Calvin, 1939). Suggested outline for handbook of marine invertebrates of the San Francisco Bay area. Held in the Stanford University Libraries Special Collections.

Ricketts, E. F. 1925. Vagabonding through Dixie. *Travel*, June 1925, pp. 16–18, 44, 48.

Ricketts, E. F., and J. Calvin. 1939. *Between Pacific Tides*. Stanford University Press, California.

Ricketts, E. F., and J. Calvin. 1948. *Between Pacific Tides*. Revised Edition. Stanford University Press, California. (Foreword by John Steinbeck.)

Ricketts, E. F., and J. Calvin. 1952. Revised by J. W. Hedgpeth. *Between Pacific Tides*. Third Edition. Stanford University Press, California. (Foreword by John Steinbeck.)

Ricketts, E. F., and J. Calvin. 1962. With Further Revisions by J. W. Hedgpeth. *Between Pacific Tides*. Third Edition. Stanford University Press, California. (Foreword by John Steinbeck.)

Ricketts, E. F., and J. Calvin. Revised by J. W. Hedgpeth. 1968. *Between Pacific Tides*. Fourth Edition. Stanford University Press, California.

Ricketts, E. F., J. Calvin, and J. W. Hedgpeth. Revised by D. W. Phillips. 1985. *Between Pacific Tides*. Fourth Edition. Stanford University Press, California.

Ritter, W. E. 1915. *War, Science and Civilization*. Richard G. Badger, Gorham Press, Boston.

Ritter, W. E. 1919. *The Unity of the Organism; or, the Organismal Conception of Life*. 2 volumes. Richard G. Badger, Gorham Press, Boston.

Ritter, W. E., and E. W. Bailey. 1928. The organismal conception: Its place in science and its bearing on philosophy. *University of California Publications in Zoology* 31: 307–358.

Rodger, K. A. (ed.). 2002. *Renaissance Man of Cannery Row: The Life and Letters of Edward F. Ricketts*. University of Alabama Press, Tuscaloosa.

Rodger, K. A. (ed.). 2006. *Breaking Through: Essays, Journals, and Travelogues of Edward F. Ricketts*. University of California Press, Berkeley.

Rodger, K. A. 2015. Ed Ricketts and the Ecology of a Science Writer. In J. M. Straley (ed.), *Ed Ricketts, from Cannery Row to Sitka, Alaska: Science, History, and Reflections along the Pacific Coast*. Shorefast Edition, Juneau, Alaska, pp. 11–21.

Schram, F. R., and W. A. Newman. 2007. Joel W. Hedgpeth: 29 September 1911–28 July 2006. *Journal of Crustacean Biology* 27(2): 383–389.

Shillinglaw, S. (with photos by Nancy Burnett). 2006. *A Journey into Steinbeck's California*. Roaring Forties Press, Berkeley, California.

Steinbeck, J. 1929. *Cup of Gold*. Robert M. McBride and Co., New York.

Steinbeck, J. 1936. *In Dubious Battle*. Covici-Friede, New York.

Steinbeck, J. 1937. *Of Mice and Men*. Covici-Friede, New York.

Steinbeck, J. 1939. *The Grapes of Wrath*. Viking Press–James Lloyd, New York.

Steinbeck, J. 1941. *The Forgotten Village*. Viking Press, New York.

Steinbeck, J. 1942. *The Moon Is Down*. Viking Press, New York.

Steinbeck, J. 1945. *Cannery Row*. Viking Press, New York.

Steinbeck, J. 1951. *The Log from the Sea of Cortez*. Penguin Books, New York.

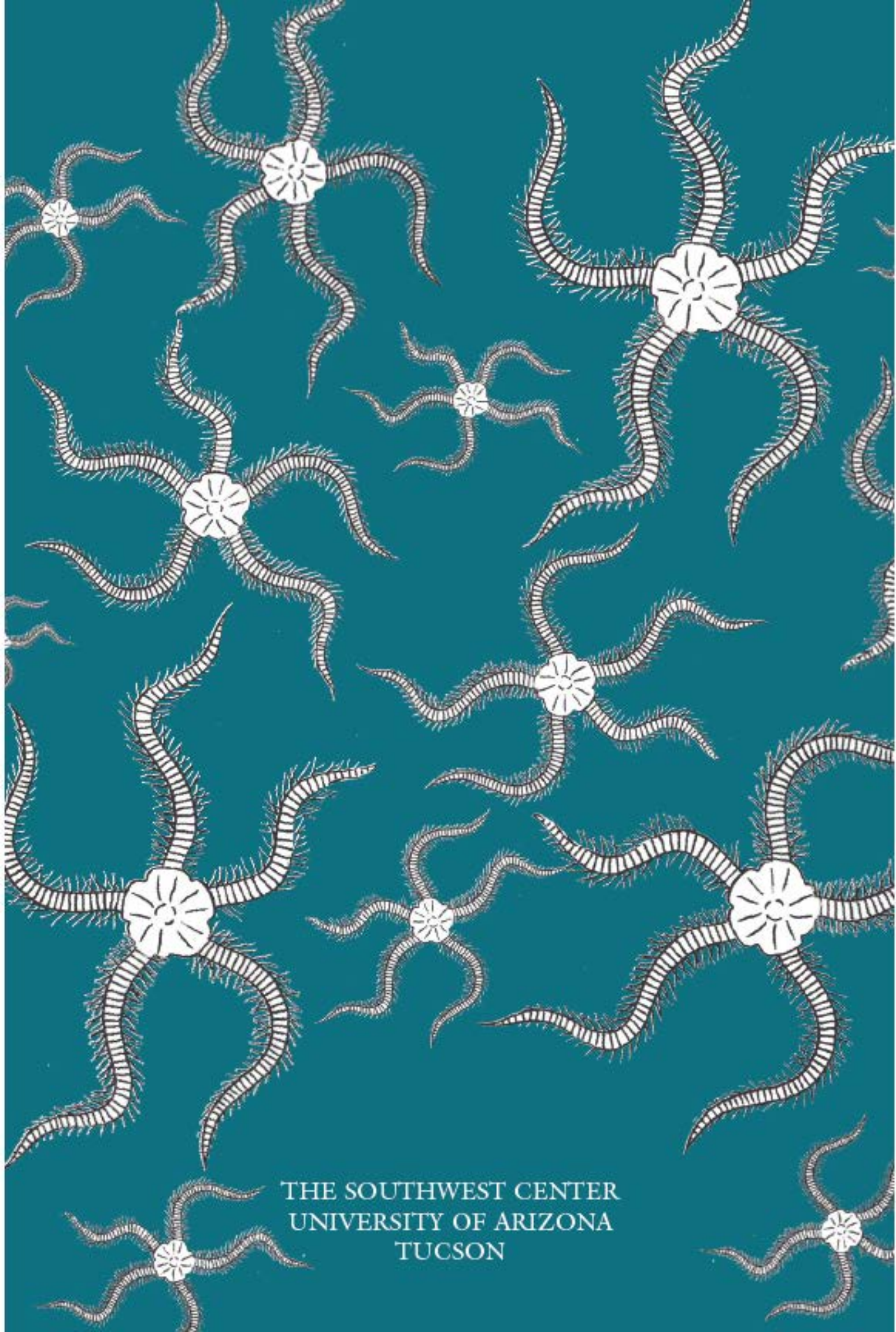
Steinbeck, J. 1954. *Sweet Thursday*. Viking Press, New York.Steinbeck, J., and E. F. Ricketts. 1941. *Sea of Cortez: A Leisurely Journal of Travel and Research*. Viking Press, New York.

Stephenson, T. A., and A. Stephenson. 1972. *Life Between Tidemarks on Rocky Shores*. W. H. Freeman, San Francisco.

Straley, J. M. (ed.). 2015. *Ed Ricketts, from Cannery Row to Sitka, Alaska: Science, History, and Reflections along the Pacific Coast*. Shorefast Edition, Juneau, Alaska.

Tamm, E. E. 2004. *Beyond the Outer Shores: The Untold Odyssey of Ed Ricketts, the Pioneering Ecologist Who Inspired John Steinbeck and Joseph Campbell*. Four Walls Eight Windows, New York.

Tichenor, J. (aka Joel W. Hedgpeth). 1974. *Poems in Contempt of Progress*. Boxwood Press, Pacific Grove, California.



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