The Scripps Institution: Origin of a Habitat for Ocean Science

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The Scripps Institution: Origin of a Habitat for Ocean Science

The Scripps name has been associated with marine science for nearly ninety years. But the Scripps Institution of Oceanography was named only in 1925, after more than 20 years of existence. My aim is to describe the first years of the Scripps Institution's existence, beginning about 1903. In 1925, when my story is near an end, oceanography was represented in the United States only by the Scripps Institution of Oceanography. Even then, it was an anomaly.

When the Marine Biological Association of San Diego opened its laboratory in 1903, that being the ancestor of the Scripps Institution, there was no professional oceanography in North America. When George McEwen came here in 1912 as the first full-time employee and physical oceanographer of the laboratory, he was told by his instructors at the University of Illinois that there was no such profession as oceanographer, which is what he hoped to call himself. In 1903 and even by 1925 the profession was rather fluid and certainly terminology was. Alexander Agassiz, for example, had coined the term "thalassography" for oceanography in 1888. That didn't last, perhaps happily, but the word oceanography had no well-defined meaning, and did not settle into consistent usage until well on in this century, probably until the mid-1920's or later. There was no North American model of oceanography as a profession either in 1903 or considerably later. But there was a European model. This European model was the Copenhagen program of 1893 and 1894, about which I won't say more, except that it was the ancestor of a major international organization centered in

western Europe, the International Council for the Exploration of the Sea (ICES), which was founded in 1902, centered in Copenhagen and in Oslo.

I'd like to begin by saying something about the early days of the Scripps Institution, primarily by putting it in a Californian context. La Jolla seems the least likely of places for the transplantation of a European idea, like that of ICES, into a North American context. That leads us immediately to ask, was it actually transplanted or was the plant another species, one that was endemic to California? As we'll see, oceanography at Scripps was something of a hybrid species, owing something to Europe and something to the Californian environment. Let us go back to 1903 and see what California looked like at that time, or at least try to evoke the surroundings in which the Scripps Institution began as the laboratory of the Marine Biological Association of San Diego.

In 1903 the state was well beyond the gold rush of 1848-49, which led to statehood in 1850. Nonetheless, David Starr Jordan's comment of 1898 was probably not too far off the mark, although he may have been a trifle acerbic. In that year he said "that California is commercially asleep, that her industries are gambling ventures, that her local politics is in the hands of local pickpockets, that her small towns are the shabbiest in Christendom, that her saloons control more constituents than her churches, that she is the slave of corporations, that she knows no such thing as public opinion, that she has not yet learned to distinguish enterprise from highway robbery nor reform from blackmail." He also added, feeling perhaps that he'd gone too far, I think, that there was some social strength in California life and this was derived, in his words, "from scenery, climate and freedom of life."

A great deal had happened by 1903 since the completion of the railroad to the coast in 1869. The gold rush mentality was only a part of late 19th century California life. The physical environment was quite well known. The U.S. Coast Survey had come to California in 1850, and its chief officer, George Davidson, had become a powerful force, not just in charting the California coast but also in scientific affairs through the California Academy and eventually through his role in the University of California. The California Geological Survey, which had a very short life between 1860 and 1868, under Josiah Dwight Whitney, had pioneered peak-to-peak triangulation, which allowed the mapping of California very rapidly and very efficiently. As a result, partly because of this and later surveys, the topography and the mineral resources of the state were extremely well known by late in the century. This led in part to an unbridled exploitation of the environment. But this was also the California of John Muir, who had arrived here in 1868. Yosemite had been preserved in 1864, before Muir's arrival; eventually it became a national park. There were moves to save the remaining redwoods as the century proceeded; the Sierra Club was established in 1892, not long before marine science began here in the San Diego region. By the time of the Hetch-Hetchy controversy, when part of Yosemite was flooded for water and power, there was a powerful environmental lobby as well as an even more powerful group of exploiters in California.

By 1903 population was shifting south, away from central California—San Francisco, in particular—to this region, especially to Los Angeles. The explosive growth of San Francisco had slowed somewhat by late in the century. That city had grown from a few dozen people to 25,000 within a few months in 1850, at the time

of the gold rush. This was almost paralleled by Los Angeles, but considerably later. By 1910 Los Angeles was the largest city. To give you some idea how population grew in southern California, Los Angeles County in 1860 had only 11,000 people, and by 1900 it had 110,000 people.

Intellectually and academically, the California Academy had been founded in 1853 in San Francisco, and it served as the first focus of intellectual life, at least for scientists, in the state. The University of California was founded in 1868, originally in Oakland, moving shortly thereafter to Berkeley, and it was already a distinguished university by 1899 when Benjamin Ide Wheeler became president. He remained president until 1919. It was he who began a major era of growth, adding famous faculty, and it was during his tenure of office as well that the Scripps Institution of Oceanography had its origins. Public funding to the University of California greatly increased in the 1890's and a number of accessory institutions—the Lick Observatory, for example—and eventually this institution were founded, although relatively little money came from UC to Scripps at the beginning. Outside the University of California, Leland Stanford Jr. University had been founded in 1891 under David Starr Jordan, a young and dynamic man who brought ideas from the east, from Indiana University where he had been president. The Throop Polytechnic Institute was well under way; that's better now known as CalTech. UCLA had had its origins in a small religious college, and became the second campus of the University of California in 1919.

Closer to home, narrowing in now on the original laboratory, San Diego in 1903 was a small city of 17,000. It was surrounded by bare hills and by brush in all directions. La Jolla was even smaller; it was described as a small dusty village in 1903. It was something of a resort; one

suspects it may have been a last resort for some San Diegans—there wasn't really anywhere else to go. But on Sundays they would take the San Diego, Pacific Beach and La Jolla Railroad up to La Jolla and enjoy the beach or the small city park—and also perhaps visit, after 1905 for a few years, the modest laboratory and aquarium of the Marine Biological Association of San Diego, which existed in that city park until 1910.

Let's now look at the growth of the Scripps Laboratory. There have been very good accounts of this by Helen Raitt and Beatrice Moulton (1967) and by Elizabeth Shor (1978) and in various papers. So, I'll only give a brief outline. The laboratory that I'm talking about found its personification in William Emerson Ritter (Figure 1), a zoologist from Wisconsin who had been a student of Joseph LeConte's at Berkeley in the

Figure 1.
William Emerson Ritter, 1897.

late 1880's, and then a doctoral student of Alexander Agassiz and of E. L. Mark at Harvard up to 1891, when he returned to California. Ritter was appointed a lecturer and chairman of Zoology, which was a division of a much larger department, a more broadly based one, in 1891, and had become a full professor of zoology by 1902.

William Ritter married Mary Bennett, a physician, in 1891, and on their honeymoon they came here to San Diego. Here they met Drs. Fred and Charlotte Baker of San Diego. Fred Baker (Figure 2) was not only an amateur conchologist, he was an enthusiast for a marine station in this area. It was Baker who encouraged Ritter to work in San Diego and eventually to establish the laboratory here. But it took some time. Ritter and his students and some colleagues worked at Pacific Grove in 1892, on Santa Catalina Island

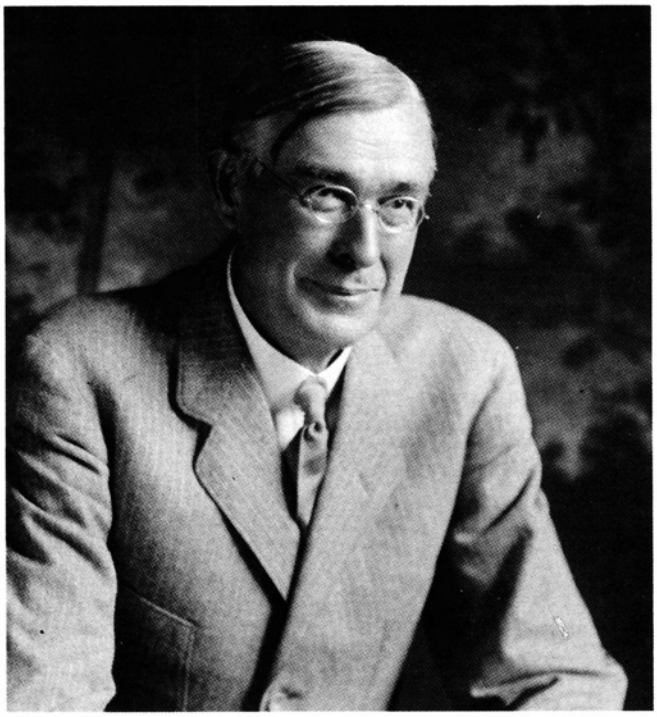

Figure 2.
Fred Baker, San Diego physician, 1914

in 1893, and through various years in San Pedro near Long Beach, and when that area was developed they had to look for a new site. It was then that Fred Baker's suggestion that San Diego might be a possibility came to the fore.

Ritter arranged with Baker to establish a field lab in the boat-house of the Coronado Hotel in the summer of 1903, which was the beginning of what is now the Scripps Institution of Oceanography. During that first summer Ritter met Edward Willis Scripps (Figure 3), newspaper magnate, very wealthy man, and his half-sister Ellen Browning Scripps (Figure 4)—both of whom

Figure 3.
Edward Willis Scripps, newspaper magnate.

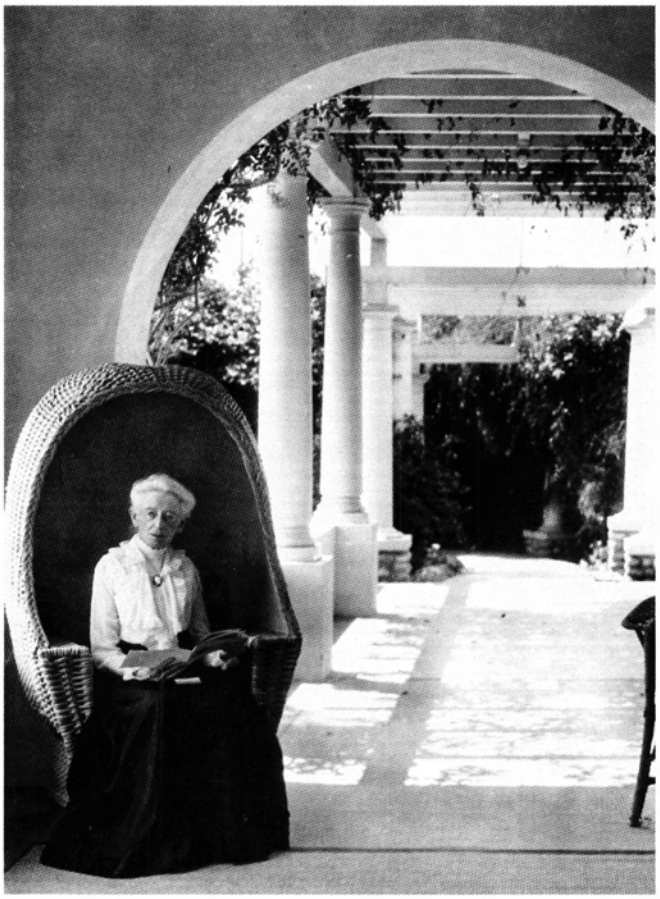

Figure 4.
Ellen Browning Scripps at her home in La Jolla, 1927. Photo courtesy of La Jolla Historical Society.

were to become the major benefactors of the original lab and eventually the Scripps Institution of Oceanography.

The Marine Biological Association of San Diego was incorporated in 1903; it got local support from business interests and from the two Scrippses, a great deal of the local business help coming through the influence of Fred Baker and his colleagues in the San Diego Chamber of Commerce. Things went so well that a move to quarters larger than the Coronado Hotel boathouse soon became necessary. A small laboratory (Figure 5) was built in La Jolla, its construction supervised by one of Ritter's colleagues from Berkeley, Charles Atwood Kofoid. Books and equipment were donated by many eminent scientists, among them Alexander Agassiz. With Scripps family funds a vessel was acquired, as one of E. W. Scripps's yachts was converted for use by the laboratory. A year or so later, after that ship had been lost, the vessel *Alexander Agassiz* (Figure 6) was built. It was in use until 1917.

Ritter began to appoint staff on a part-time basis. George McEwen was the first in 1908, spending his summers here while he finished his undergraduate degree at Stanford, then going on to doctoral work in physics. The city park site proved not to be satisfactory; it was small, it was being encroached upon, there was the threat of a

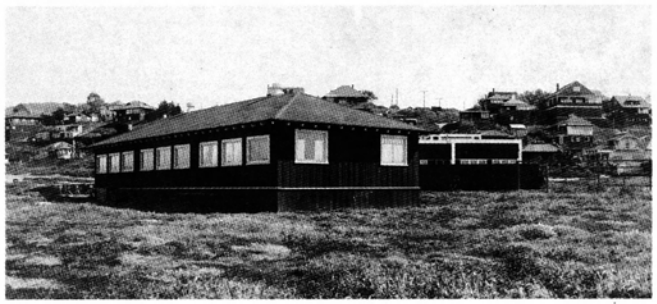

Figure 5. *Laboratory in La Jolla Cove that housed the Marine Biological Association, 1905.*

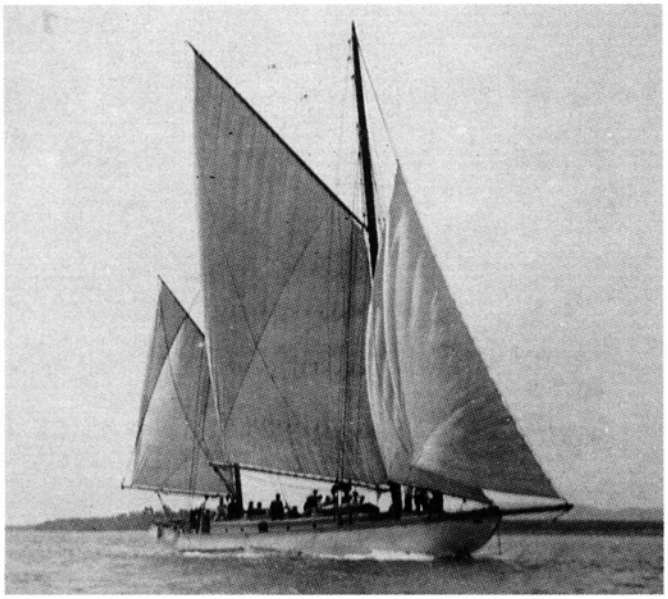

Figure 6.
The laboratory's ship, ***Alexander Agassiz****, 1907.*

sewer going into La Jolla Cove, which would reduce the water quality. So with E. W. Scripps's stimulus, Ritter and others looked for a new site. That new site (Figure 7), of course, is the one that the institution is on now, to the north of La Jolla as it then was: a 170-acre site which was occupied slowly between 1907 and 1910, as the Ritters moved here in 1909 to take up permanent residence, William Ritter turning over the professorship and headship of zoology at Berkeley to his colleague Kofoid. The George H. Scripps Building (Figure 8) was completed in 1910. It included the residence for the Ritters.

The relationship with the University of California was not all that clear right from the beginning, but by 1912 Ritter had negotiated a connection with the University of California, and under the new name of Scripps Institution for Biological Research, the institution became equivalent to a department of the University of California in Berkeley. Major developments took place between 1912 and 1916, such as, for

Figure 7.
Site purchased for the laboratory in 1907.

Figure 8.
George H. Scripps Laboratory and seawater tower, 1910.

Figure 9.
Cottages for staff and visitors, 1927.

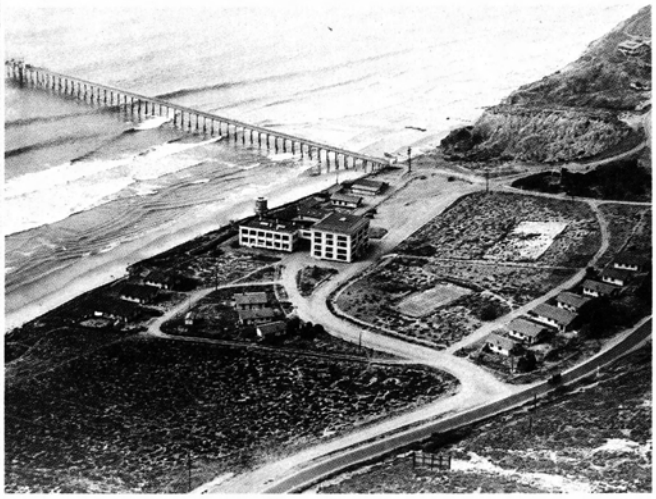

Figure 11. *Aerial view of Scripps Institution, 1925.*

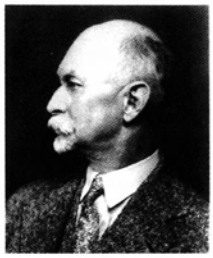

Figure 10.
Thomas Wayland Vaughan, second director of Scripps Institution.

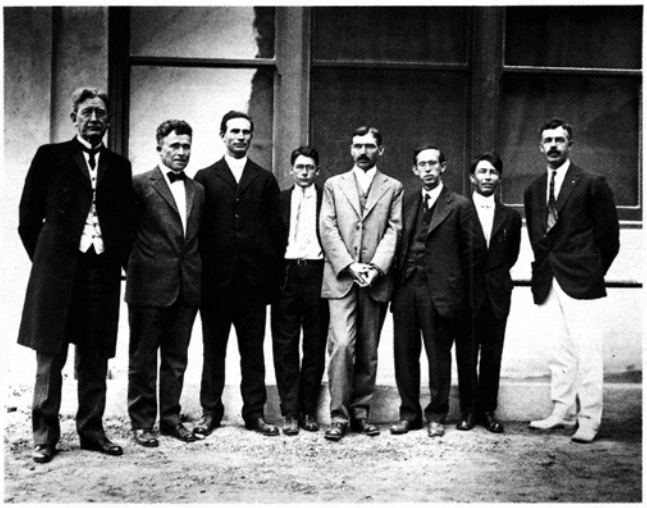

Figure 12.
Staff of Scripps Institution, 1916 (Ritter on left).
Photo courtesy of San Diego Historical Society, Photographic Collection.

example, the addition of cottages (Figure 9) for the staff, which apparently leaked like sieves and when they weren't leaking let the wind blow through. Nonetheless, they were at least shelters and gave some unity to the campus. A museum and library were added. The pier was finished in 1915, and all of this was commemorated in a major ceremony in 1916. A simple program of research was under way, mainly on plankton and hydrography.

By 1924 a substantial laboratory existed which was taken over by Thomas Wayland Vaughan (Figure 10), the second director. Vaughan oversaw the transition from a marine lab to an oceanographic institution. Why did this happen? It's never been entirely clear, and in fact Francis Sumner, at the time he retired in 1944, claimed that "the motives behind the change on Ritter's part are somewhat inscrutable." They remain somewhat inscrutable, but we do know that Ritter was interested in having his rather small marine biological laboratory (Figure 11) become an oceanographic institution, and that Vaughan was recruited to bring it about. And certainly he attempted to do just that.

The reasons for these changes of direction are rather little known, and it's at this point that my account begins to diverge somewhat from the standard account of Scripps history. I want to say something about the reasons for this change, based partly on the character and abilities of Ritter, partly on the west coast model of the marine lab that Ritter attempted to establish, and on the visions of Kofoid, his sidekick, and also on the European development of oceanography.

In 1916 the staff of the Scripps Institution of Oceanography included Ritter and a very small

group of relatively young men (Figure 12). According to Francis Sumner, in 1944: "Every new bit of information gathered by one of us, whatever its subject matter, seemed to fit in some way into his framework of thought."

What was Ritter's framework of thought? It proves to be a very interesting one. Let's first see how the laboratory fitted into it. Ritter as a young man of 18 in 1874 (Figure 13) shows the strong personality that was evident in the older Ritter. Later we see Ritter at the microscope (Figure 14); this was in the boat-house of the Coronado Hotel in that second summer. The laboratory was intended by Ritter to have very broad aims; he thought of it as being something like an astronomical observatory, devoted primarily to biology

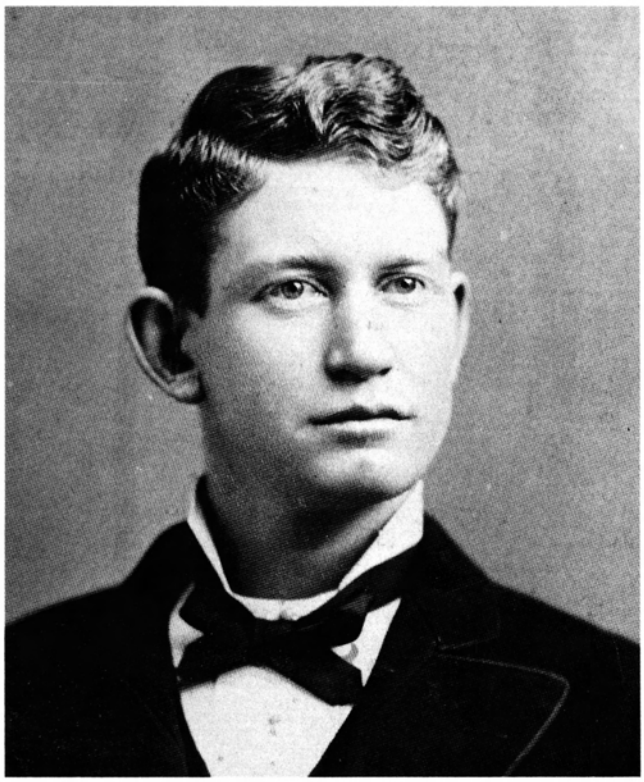

Figure 13.
William E. Ritter as a young man in Wisconsin.

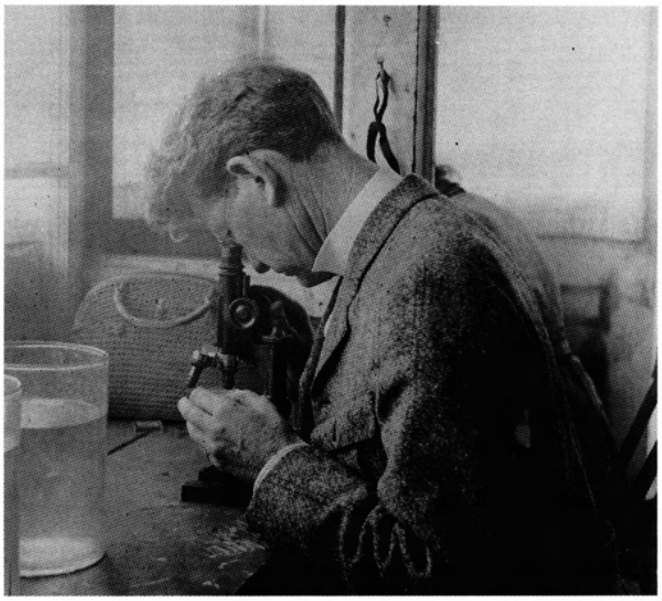

Figure 14.
Ritter at age 48, at Coronado Boathouse, 1904.

but using the talents of the team to bring information to bear on the biological attributes of marine animals. Teams of specialists, just as in astronomical observatories, would share their expertise and especially provide the knowledge that the biologists needed.

The aim of the laboratory was to conduct a biological survey and then to put organisms in the context of their environment. It was characteristic of Ritter that he opposed over-concentration on experimental biology. He saw experiment as a supplement and a complement to field studies. It was inevitable that he would find himself in opposition to his erstwhile colleague at Berkeley, Jacques Loeb, who espoused what one recent historian of science has called "the engineering ideal" in biology, the reduction of biological properties to the mechanical properties of the parts of the organism. Ritter believed that this was to be eschewed, that studies should be of the whole organism, and that these studies should follow a sequence from systematics to the environment to the behavior of the organism in that

environment, including their physiology, and to a synthesis of the relationships of the whole organism to its environment. He was unusual in espousing the importance of mathematics in biology, especially statistics, a most unusual attribute, especially in North America at that time. Statistics would be useful to show how organisms varied in their use of environment and secondarily they could be used to allow the analysis of the various cycles and periodicities that he saw in nature, ranging from embryological and ontogenetic development to the changes of population that he saw around him.

Ritter's ideas centered around the unity of nature: Nature was orderly, it was unified all the way from protists through man to the non-living environment. He believed that one had to examine a whole range of phenomena to shed light on the scientific problems of the day and of science in general.

It's very interesting to look at Ritter's beliefs in a little more detail. For example, Ritter believed that the psychic traits—the emotional and psychological properties—especially of man, but of organisms in general, originated in physical-chemical interactions. He was not a vitalist, unlike a number of his colleagues and certainly many European biologists at this time. Instead, he saw the traits of organisms emerging from the whole organism, from the interaction of its parts. He believed that one could not understand organisms by studying only their elements; in fact, in Ritter's view one might liken the organism to a house which was composed of bricks. But the bricks did not constitute the house. The whole organism, the house, was by far the more important. His idea of the unity of nature was pulled together over the years in what Ritter called his organismal philosophy, or "the organismal conception of life."

The organismal conception of life seems to have been largely original with Ritter, but on the other hand it seems also to have owed some of its ideas and background to the French philosopher Henri Bergson, whose book *Evolution Creatrice* appeared about the time of Ritter's first publications, and also later to Alfred North Whitehead and particularly to his theory of organisms as it was expressed in *Science and the Modern World.* Ritter summarized this as follows:

> *In all parts of nature and in nature itself as one gigantic whole, wholes are so related to their parts that not only does the existence of the whole depend on the orderly cooperation and inter-dependence of its parts, but the whole exercises a measure of determinative control over its parts.*

I think that Ritter would have been a member of J. E. Lovelock's Gaia community if such had existed at the time. And as I have mentioned, he viewed the organism as being the predominant biological entity; organisms, for example, were differentiated into cells, not composed of cells—the distinction being a very important one. The implications of this organismal conception for philosophy and for science were very great in Ritter's view.

In 1919 Ritter defined science as follows—this is also characteristic of the man:

> *"The great body of observational and reflective truth concerning external or material nature and the great body of observational and reflective truth concerning the internal or spiritual nature of man."*

He believed that it was impossible to separate the biological from the spiritual, the mechanical and physiological aspects of biological life from its emotional and psychological aspects, so that science looked within as well as outside humans. Science expressed the highest qualities of human nature and it had great significance for what he called "the higher intellectual and spiritual life."

Ritter said in 1916 that "the chief end of science is to show in detail and literally how we live, move and have our being in nature. . .Nature is man's maker as well as his sustainer." He went on from this to say that "All men should be naturalists." A full quotation, I think, is in order to see just what he meant and how he expressed it:

> *All men should be naturalists in the sense that they should be sympathetic in their feeling for nature, painstaking in acquiring knowledge of nature, eager in identifying their whole selves with nature, and critical in examining their own mental and physical processes in order to validate both their feelings and knowledge.*

Ritter was a complex person, with a highly developed scientific and personal philosophy. His personality and his ideas dominated the laboratory. Even the skeptical Sumner, who looked on this somewhat askance, found his own work "altogether relevant to the liberal and somewhat nebulous 'program' of the biological station."

Ritter's viewpoint was not a wholly unusual one in the early twentieth century. There are, however, some quite unusual aspects about it; the mix is unusual. For example, a non-vital mysticism of this sort is rare in biological scien-

tists of the time. Vitalism was not rare but non-vital mysticism was. Quantitative science was certainly a rarity, at least in North American biological science at this time. The proto-ecology that Ritter stressed—the emphasis on the environment, and the organism's relationship to it—was also rare, and his view of philosophical biology seems to have been far better developed than was the philosophy of most of his colleagues, certainly on the west coast and probably elsewhere.

What was the origin of these ideas? Here I have to speculate. The information, at least as I see it now, is too complex and too little analyzed to allow us to know for sure. But I think we have to search for the influence of Joseph LeConte in Ritter's thoughts. LeConte (Figure 15) came to the University of California in 1869 as professor of natural history and geology; he also taught chemistry and a little bit of theology as well—that was the way things worked in those days in many universities. He was a southerner from Georgia, a refugee from the Civil War-ravaged University of South Carolina, when he came to Berkeley. LeConte's *Elements of Geology*, which was first published in 1877, inspired Ritter to

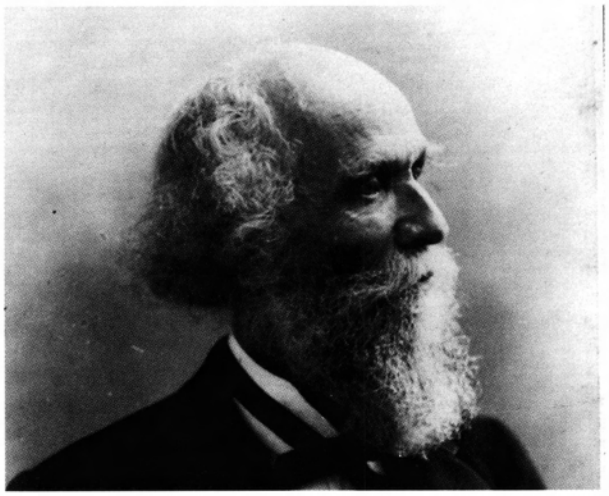

Figure 15.
Joseph LeConte, Berkeley professor, about 1890.
Photo courtesy of University of California Archives.

come to California in 1885, as a relatively mature student. Ritter studied with LeConte between 1886 and 1888, taking his undergraduate degree at Berkeley before going to Harvard for his Ph.D. Ritter returned to California in 1891 as a zoologist and as a colleague of Joseph LeConte, who died in 1901.

LeConte was famed as a teacher, and one of his students is quoted as having said in 1892: "We leave [his] lecture room with a feeling that we have been in the presence of something high and worthy." Can you imagine any undergraduate saying that of anyone under any circumstances in the 1990's? The main link with LeConte may be the following. First, LeConte was a Lamarckist. But what is most important about that is that LeConte was an evolutionist; he had been "converted" (in his own words) to evolution in the 1870's. He saw evolution as a universal principle which went through cyclical developments, although he rejected natural selection, just as Ritter did. Natural selection, incidentally, was accepted by very few biologists in the post-Darwinian decade and well into the twentieth century. Ritter called it "the struggle of survival doctrine," rather disparagingly. Believing that nothing worthy, especially in human mental and emotional life, could come merely out of struggle and survival, he saw altruism and cooperation as far more important.

At any rate, the two were united in seeing human traits, including morality, as the result of evolutionary progress and improvement. According to LeConte, improvement came about through "the conscious voluntary cooperation of the human spirit in the work of its own evolution"—a sentiment that might well have been penned by Ritter.

Second was their interest in education. Both were devoted to the improvement of the public

and of the human species, and they believed that improving the species and educating the mass of humanity was a duty of individual humans.

Third, both were united in their emphasis on the esthetic in nature. Ritter loved his California Acorn Woodpeckers; I think he also loved his fellow human beings. There is no question that he loved animals in general and the Californian environment. LeConte before him knew and traveled with John Muir, and was immensely impressed by the beauties of Yosemite and other areas of the California mountains.

Fourth, both were interested in the physiological basis of psychological traits. LeConte had published quite influential and distinguished works on physiological optics; Ritter was deeply interested in the physical and physiological basis of behavior and ethics.

And finally, certainly more negatively, something else that united them, was their attitude to other races. LeConte was a genteel racist in a very traditional Southern mold; parenthetically, he was also a male supremacist, although again a rather genteel one. Ritter, for his part, saw a yellow peril of Asian peoples, especially the Japanese, over-running North America, because of their superior ability to cope with adverse circumstances and to colonize new areas.

There were major differences between Ritter and LeConte too. LeConte, for example, was a vitalist and a theist; Ritter, for his part, was a non-vitalist and far less theistic. Nonetheless, the links between them appear very strong and are certainly worthy of more research.

We must search also for influences from another colleague. Ritter's early attempts to found a laboratory in San Diego arose out of ideas he shared with Charles Atwood Kofoid

(Figure 16). Kofoid had come to California in 1900 from the University of Illinois. He was assistant, then associate, director of Ritter's laboratory for years, and succeeded Ritter as Head of the Berkeley Zoology Department in 1909.

Kofoid went to Europe in 1908-1909 on a mission from the U.S. Bureau of Education to study European marine and freshwater laboratories, and to buy equipment for the University of California and for Ritter. Kofoid's statement (in his report on the trip) about the role of marine labs is revealing:

> *The causal analysis of the problems surrounding a living organism calls for exact and thorough knowledge of both the animal and its environing factors, and necessitates the aid of chemical, physical,*

Figure 16. *Charles Atwood Kofoid, Ritter's colleague.*

> *hydrographical and meteorological research in close correlation with the biological and subordinate to it. The biological station of the future is thus coming to be a marine or fresh-water observatory with a broader basis and wider scope of action.*

To Kofoid, the epitome of this was Europe's International Council for the Exploration of the Sea, founded in 1902. He called it "the first example of international and scientific cooperation which the present century has witnessed." The United States should follow its example by creating two major marine laboratories, one on each coast, "unique" facilities for training education, as Kofoid said, for promoting "the development and expansion of the spirit of research." These words could have been penned by Ritter.

Kofoid's and Ritter's unity of purpose is also seen in their correspondence in 1908, while Kofoid was in Europe. In two letters that year, Kofoid wrote of his attempts to recruit D. J. Matthews, an English hydrographer, and V. W. Ekman, a Swedish physicist, for the University of California. American biological stations had devoted themselves mainly to educating teachers, but Kofoid and Ritter had something else in mind, a laboratory or laboratories modeled on ICES, carrying out the research of teams of investigators with varied talents, including the physical sciences.

By 1912, Ritter and Kofoid had seen their ideal realized in a small way: they had begun the unusual project of a marine laboratory linked to the University of California which was devoted to multidisciplinary study of the environment, not to teaching and to experimental biology. Thus they broke out of the mold established by the Marine Biological Laboratory (Figure 17) in 1888,

the Hopkins Marine Laboratory in 1892, the Puget Sound Biological Laboratory in 1904 and others, by attempting to follow what they saw as a European pattern embodied in ICES.

Their success was far from complete. It was inhibited by tight funding, the problems of working out a relationship with Berkeley, and even shipwreck. But the Scripps laboratory of 1912 had the potential, realized a dozen years later, to become a leader in the newly professionalizing field of oceanography.

Ritter and his successor T. Wayland Vaughan had achieved only a partial victory by the mid-1920's. Scripps remained smaller and more narrowly oriented than they wished—but then that was true of American marine science elsewhere. Under Ritter, the Scripps laboratory looked back to Joseph LeConte and overseas to the style of science exemplified by the International Council for the Exploration of the Seas. Later, begun by Vaughan and completed by his successor Harald Sverdrup in the late 1930's, the ideas embodied in the name The Scripps Institution of Oceanography were realized fully. But that is another story for another time.

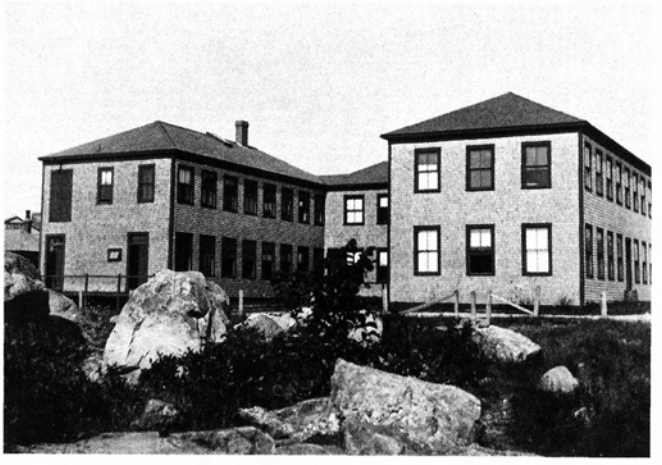

Figure 17.
Old Main Building, Marine Biological Laboratory, Woods Hole, Mass., 1892.
Photo courtesy of Marine Biological Laboratory Archives

Biography of Eric L. Mills

Eric Mills is a professor of oceanography at Dalhousie University in Halifax, Nova Scotia, Canada, and was chairman of the oceanography department there from 1990-1992. He was born in Toronto and raised in Ottawa, Canada. He became a historian of science after a long career as a practicing marine biologist. Dr. Mills received his doctoral degree at Yale University in 1964 and was privileged to have had as his advisors both G. Evelyn Hutchinson, who is perhaps the most influential ecologist of this century, and Gordon Riley, one of the most pre-eminent biological oceanographers of this century. Initially, Dr. Mills devoted himself to studies of marine amphipods, particularly those of the deep sea, and later he became concerned with ecosystem structure and dynamics. In addition he is a dedicated ornithologist, and his many research trips have given him the opportunity to investigate and publish about seabirds. He published his first paper on the history of marine science in 1972, not surprisingly on a British amphipod specialist by the name of Stebbing. His historical studies since have included several studies of the Challenger Expedition, including editorship of a centenary volume commemorating the visit by *H.M.S. Challenger* to Halifax, and an excellent history of deep-sea biology which is very widely read and very useful ("Problems of deep-sea biology: an historical perspective," pp. 1-79 in *The Sea. Volume 8. Deep-sea Biology*). He has published many papers on biological oceanography, culminating in the publication in 1988 of the book *Biological Oceanography: An Early History 1870 to 1960.*