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An Early Example of International Oceanography: The Last Voyage of the *Carnegie* (1928–1929)

John R. Dolan 

The *Carnegie* was a very unusual ship, a non-magnetic 44-m brigantine schooner designed to conduct surveys of terrestrial magnetism. From 1909 to 1922, in 6 cruises, it navigated a total of 466,000 km and was then kept in storage in its homeport of Washington, D.C., from 1922 until 1927, when the vessel was overhauled and refitted for Cruise VII, a 3-year global cruise dedicated both to magnetism and also explicitly to oceanography. Cruise VII of the *Carnegie* ended prematurely and abruptly in November 1929 with an explosion during a refueling operation in Apia in the South Pacific. Famous for its tragic ending, little known today is that the cruise was one of close international collaborations and visits. A number of European organizations were involved from the early planning stages, and in equipping the ship. The cruise also included a visit to Japanese oceanographers. For the United States, Cruise VII of the *Carnegie* was quite possibly the first large-scale oceanographic campaign that relied on international collaboration, and the last until well after World War II. However, shown here is that oceanographers in the United States and elsewhere have long known that oceanography is an international affair.

The Department of Terrestrial Magnetism of the Carnegie Institution and the *Carnegie*

According to Louis Brown's history (2004), the Department of Terrestrial Magnetism was the brainchild of Louis Bauer, the

founder of the journal *Terrestrial Magnetism and Atmospheric Electricity* and one of the founders of the American Geophysical Union (AGU). His journal would later become the AGU's *Journal of Geophysical Research*. His Department of Terrestrial Magnetism was the first department of the Carnegie Institute of Washington. The vessel named the *Carnegie* was built to carry out measurements of the troublesome variability of terrestrial magnetism when navigation was largely compass based. It was built as much as possible without iron or steel to minimize any artifacts due to the ship itself when making measurements of magnetism. The irony of Andrew Carnegie, who made his fortune in steel, funding the construction of a 45-m steel-free ship has long been noted (Paul 1932). Launched in 1909, the *Carnegie* (Fig. 1) was the second ship built in the United States expressly for scientific research, the first having been the *Alexander Agassiz* in 1907 (Shor 2002).

In the 1920s, there was a growing interest in oceanography in the United States. For example, in 1924, there was the first U.S. Interagency Conference on Oceanography (Nelson 1980). However, there is no clear account of the exact motivation behind the focus on oceanography of Cruise VII of the *Carnegie*. One story is that the report of Henry Bigelow on the need for an American oceanographic vessel (after he lost use of the *Albatross*) was given to the new head of the Carnegie Institution, John Merriam, and then he saw a use for the Institution's idled *Carnegie* (Burstyn 1980). Another account is that despite being in storage, the *Carnegie*

was the only open-water research vessel in America in the late 1920s, so using it for oceanographic studies was a major motivation (Brown 2004). Yet, another account is that there was a desire to examine temporal changes in the magnetic field at the Department of Terrestrial Magnetism since the earlier *Carnegie* cruises, but investigating temporal changes was not sufficient justification for another costly cruise, so "modern" oceanography was added on (Schlee 1973).

Planning and equipping of Cruise VII

Regardless of the reasons, oceanography was to be a major component of Cruise VII. This would entail extensive modifications of the ship for its new mission. But before bringing the ship out of storage, identification of the oceanographic goals and the equipment needed was required. The Department of Terrestrial Magnetism had a ship but had not previously done oceanographic work. The cruise planning was an international effort with a list of the consulted parties representing a very broad cross section of oceanography in the 1920s. Equipment was obtained from the U.S. Navy as well as from European laboratories. The text below, describing the involvement of diverse domestic and foreign institutions, was used in several publications (Ault 1927, 1928; Fleming 1928; Fleming and Ault 1928a, b) describing the upcoming cruise, leaving little doubt as to a strong desire to acknowledge wide support both domestic and notably foreign as well.

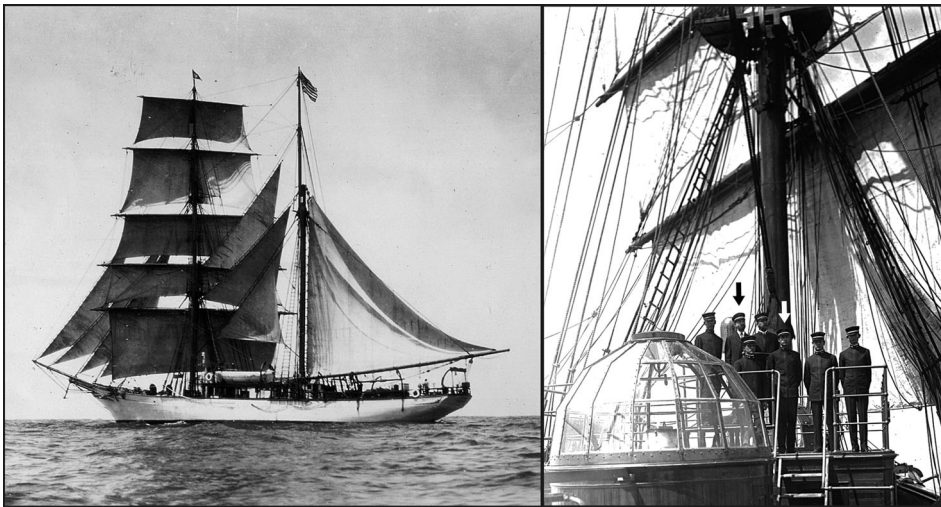


FIG. 1. Left panel shows the *Carnegie* under sail in its 1909 sea trial. Right panel shows officers on the bridge in 1910; the black arrow indicates Louis Bauer, founder and director of the Department of Terrestrial Magnetism; the white arrow indicates James Ault who would later command the *Carnegie* and become well known “for running a happy ship” (Brown 2004). In the foreground is the distinctive instrument cupola of the *Carnegie* allowing observational work in foul weather. The ship measured about 45 m in length and the crew numbered 25. Images courtesy of the Carnegie Institution of Washington, D.C.



FIG. 2. The scientific staff of the Voyage VII of the *Carnegie*. Sitting left to right are W. Parkinson (Senior Scientific Officer), J. Ault (Captain and Chief of Scientific Staff), and J. Paul (Surgeon and Observer). Standing left to right are F. Soule (Electric Expert), L. Jones (Radio Operator and Observer), W.E. Scott (Navigator and Commissary), H. Seiwell (Chemist and Biologist), and O. Torreson (Navigator and Executive Officer). Image from Paul’s (1932) *The Last Cruise of the Carnegie*.

Any statement of the proposed program would be incomplete without mention of the generous cooperation, expert advice, and contributions of special equipment and books received on all sides from interested organizations and investigators both in America and in Europe. Among these the Carnegie Institution of Washington is indebted to the following: United States Navy Department, including particularly its Hydrographic Office, Naval Research Laboratory, Signal Corps and Air Corps of the War Department, National Museum Bureau of Fisheries, Weather Bureau, Coast Guard, and Coast and Geodetic Survey; Scripps Institution of Oceanography of the University of California; Museum of Comparative Zoology of Harvard University; School of Geography of Clark University; American Radio Relay League; Geophysical Institute, Bergen, Norway; Marine Biological Association of the United Kingdom, Plymouth, England; German Atlantic Expedition of the *Meteor*, Institut für Meereskunde, Berlin, Germany; British Admiralty, London; Carlsberg Laboratorium, Bureau International pour l’Exploration de la Mer, and Laboratoire Hydrographique, Copenhagen, Denmark, and many others. Dr. H. L. Sverdrup of the Geophysical Institute at Bergen, Norway, research associate of the Carnegie Institution of Washington, is consulting oceanographer and physicist.

Cruise VII of the *Carnegie*, an international affair

The first leg of Cruise VII of the *Carnegie*, from Washington, D.C., to Europe began on 01 May 1928. It was both a shakedown cruise and one of obtaining precious advice and promised equipment. The first port of call was Plymouth, reached on 8th June, and included visits to scientists in Plymouth and London. Howard Seiwell was charged with collecting plankton and doing chemical analyses. However, he was new to plankton, and in Plymouth, was shown how the scientists of the Marine Biological Association collect plankton from their boat, the *Salpa*. Just before leaving Plymouth, the *Carnegie* scientists were told that the full 60 volumes of the *Challenger Reports* sent by the Royal Society of London had arrived. The scientists of the *Carnegie* (Fig. 2) decided finally

to take to the ship only those volumes they thought to be of most use for their work.

On 16th June, the *Carnegie* left Plymouth to sail to Hamburg and arrived on 22nd June. It was met by Haruld Svedrup, the consulting oceanographer. He had arrived earlier from the Bergen Geophysics Institute. They were soon formally greeted by very important personalities in German Oceanography (Fig. 3). During their 2-week stay in Germany, the scientific crew met with members of laboratories from Bergen, Hamburg, Berlin, and Helgoland. Albur Defant, the head of the *Institut für Meereskunde* and the recent *Meteor* Expedition (1925–1927), supplied 10,000 m of nonmagnetic aluminum–bronze wire for deep-water sounding and collecting water samples. Ault et al. were invited to Berlin and Ault addressed the Geographical and Oceanographic Societies in Berlin, introduced by Svedrup who gave a short description of Ault's talk in German for those in the audience who did not speak English. Meanwhile Seiwel visited the Marine Biological Station in Helgoland and vital repairs to the *Carnegie* were made. During the leg from Washington to Plymouth, they found that water leaked abundantly from deck into the cabins below. The repairs to the deck were made in a Hamburg shipyard. The *Carnegie's* new winches were moved apart from one another to allow simultaneous use on the advice of visitors with experience from the *Meteor* Expedition (Paul 1932). The Pettersson Plankton Pump, “the Plankton Catcher” (Pettersson 1928), tested by Haruld Svedrup in Norway, was installed (Paul 1932).

The equipment provided to the *Carnegie* by the German and Norwegian institutions would prove to be especially important to the heritage of Cruise VII. The physical data of Cruise VII were from water samples gathered from the Nansen bottles and thermometers using the wire supplied by Defant of the *Meteor* Expedition. The data would be used first by Svedrup to explain upwelling and the origin of deep water in the Pacific (Mills 2009) and later cited extensively in the classic of oceanography *The Oceans* (Svedrup et al. 1942). The physical data gathered by the *Carnegie* can be found today in the World Ocean Database (NOAA 2021). With regard to biological oceanography, three major monographs on planktonic organisms were published, based in part on the samples

gathered with the “plankton catcher” (Fig. 4), the device supplied by the Bergen Geophysical Institute. These important, albeit somewhat neglected works (Dolan 2011) include monographs on dinoflagellates (Graham 1941; Graham and Bronikovsky 1944), copepods (Wilson 1942), and tintinnid ciliates (Campbell 1942).

During the second leg in the Pacific, visits to foreign laboratories and institutions continued. Notably, the *Carnegie* scientific crew made an extensive visit to Japan, staying for 2 weeks in June 1929. The *Carnegie* docked in Yokohama, and the scientific crew had exchanges with Japanese oceanographers and other scientists in Yokohama, Kobe, Kyoto, and Tokyo. Several dinners were organized in their honor. The most impressive (Paul 1932) was at the Imperial Academy of Sciences in Tokyo where they were also presented with a copy of the *Proceedings of the third Pan-Pacific Science Congress* which had been held in Tokyo in 1926, a major scientific event of the time (Anon 1927). In Kobe, they visited the Imperial Marine Observatory and toured their oceanographic ship, the *Synupa Maru* (Fig. 5), built in 1927 expressly for oceanographic surveys

(Vaughan et al. 1937). Many years later, Koji Hidaki, who was a young oceanographer at the Imperial Marine Observatory in 1929, recalled the visit of the *Carnegie*, equipped with the latest oceanographic equipment, as a significant event in the history of Japanese Oceanography (Hidaki 1972).

From Yokohama, the *Carnegie* sailed and sampled across the North Pacific to San Francisco and there the crew enjoyed an extended shore leave. From San Francisco, the *Carnegie* sailed to Honolulu and then on to Apia in the South Pacific, arriving in late November. Over 150 stations had been sampled when the *Carnegie* reached Apia (Fig. 6). The cruise was slated to continue from there to sample around the Cape Horn and into the South Atlantic. However, in Apia tragedy struck on 29 November 1929. While loading gasoline, poured from barrels into the storage tank, an explosion and fire destroyed the vessel and led to the death of Captain Ault and a cabin boy. Luckily, they were the only fatalities and all the samples had been off-loaded. At that time, there was little consciousness of the danger of gasoline fumes. The exact trigger of the explosion remains unknown. It served though as a

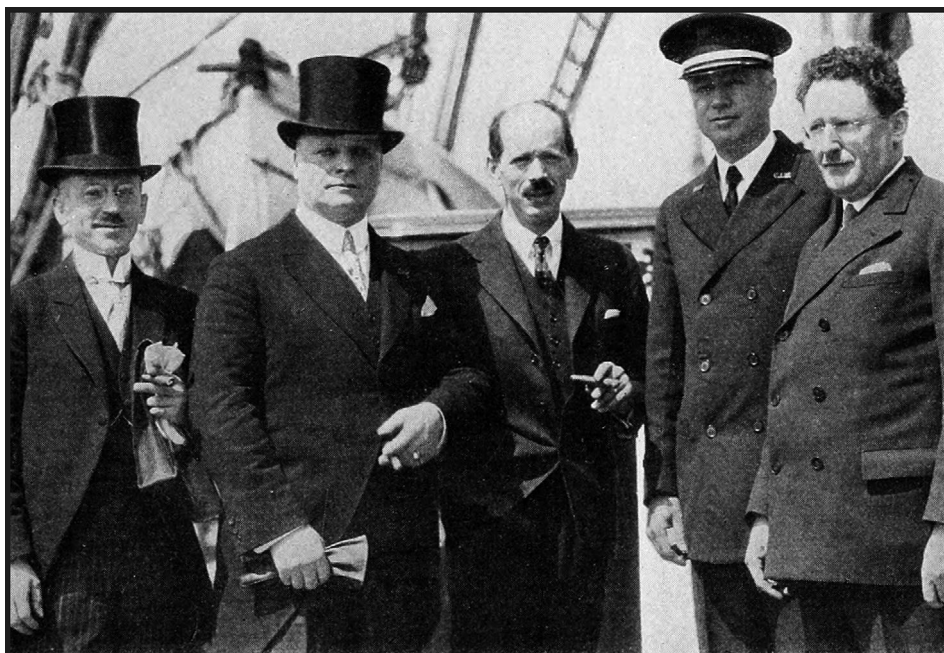


FIG. 3. Visitors on board in formal attire while docked in Hamburg (Germany): from left to right, Kurt Burath and Hugo Dominick of the Deutsche Seewarte (German Hydrographic Office) in Hamburg, Haruld Svedrup then of the Bergen Geophysical Institute (Norway), James Ault of the *Carnegie* and Albur Defant of the *Meteor* Expedition and Institut für Meereskunde in Berlin. Svedrup brought the Pettersson “Plankton Catcher” from Norway and Defant’s Institute supplied 10 km of aluminum-bronze wire to make deep-water soundings. Image from Paul’s (1932) *The Last Cruise of the Carnegie*.



FIG. 4. Seiwell working the “plankton catcher” on the *Carnegie*. The Pettersson “Plankton Catcher” was installed on the *Carnegie* when the vessel was in Hamburg. It was designed to provide quantitative samples collected from a known volume of water (Pettersson 1928). In practice, it proved difficult to use (Paul 1932) and mainly provided qualitative samples. Image from Paul’s (1932) *The Last Cruise of the Carnegie*.

stark warning of the dangers of gasoline, and subsequently diesel fuel became the preferred fuel for ships.

Conclusion

For the United States, Cruise VII of the *Carnegie* was quite possibly the first large-scale oceanographic campaign that relied on international collaboration. I have found no evidence of any other previous U.S. oceanographic campaigns with international participation. The period of international collaboration in science in the 1920s and 1930s would come to an abrupt halt with World War II. However, the *Carnegie* Cruise VII and the Pan-Pacific conferences, such as the one in Tokyo in 1926, show that oceanographers early on made great efforts to create ties and foster international collaborations. The Pacific Science Association had as its main goal “... to strengthen the bonds of peace of Pacific peoples by promoting a feeling of brotherhood among the scientist of the Pacific

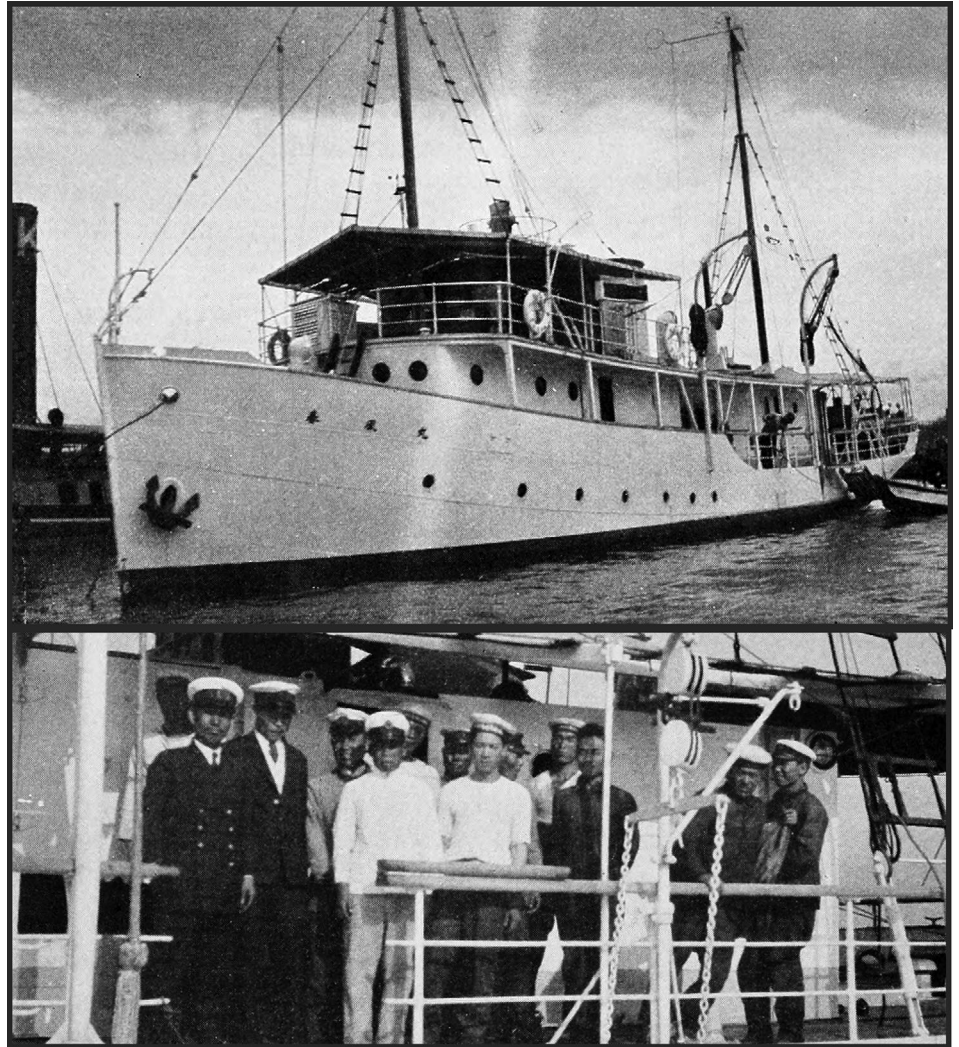
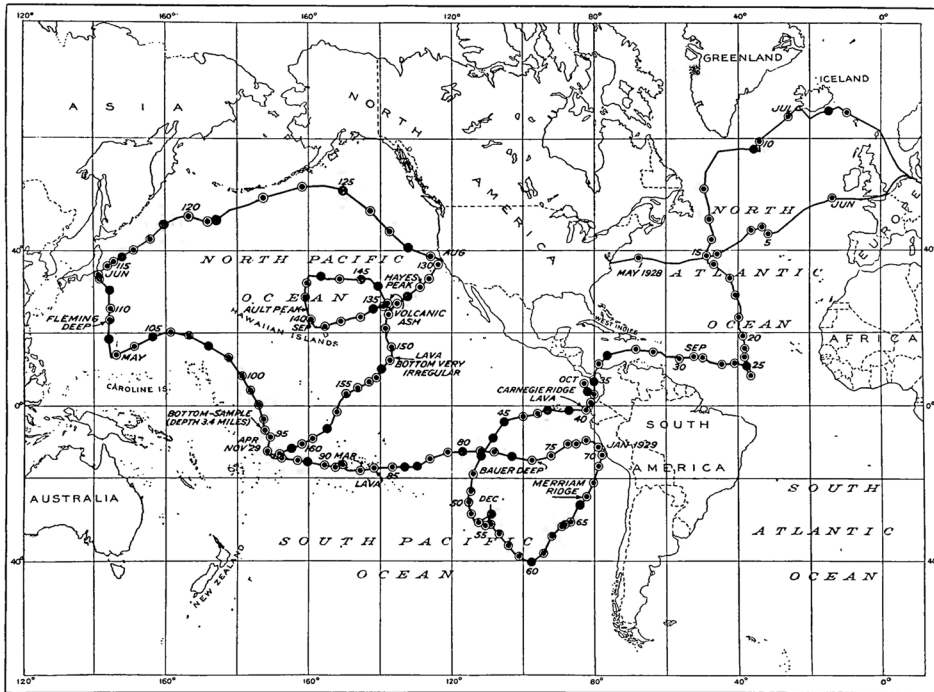


FIG. 5. Top panel: the *Synupa Maru*, a 33-m steel ship of the Imperial Marine Observatory at Kobe. Bottom panel: the Captain and 15 crew members of the *Synupa Maru*. The scientific crew of the *Carnegie* were shown the new ship and the equipment used for gathering physical data. Image from Paul’s (1932) *The Last Cruise of the Carnegie*.

countries” and its first incarnation was in a committee led by John Merriam who would later be president of the Carnegie Institution during Cruise VII (Rehbock 1991). As Antony Adler points out in his book “*Neptune’s Laboratory*” (Adler 2019), the major efforts to foster international collaborations in the inter-war period such as those to create Pan-Pacific collaborations have been often forgotten. At the 5th Pan-Pacific Science Conference in 1933, held in Vancouver Canada, 32 papers were presented in the Oceanography session: 4 from Japan, 19 from the U.S.A., 2 from Canada, 2 from the United Kingdom, 2 from Norway and 2 from the U.S.S.R. The Cruise VII of the *Carnegie* was represented by papers by Graham and by Sverdrup (Graham 1934;

Sverdrup 1934). The Pan-Pacific Science Association was active up to the eve of World War II. The 6th Pacific Science Congress was held in San Francisco and Berkeley in July and August of 1939, and like the Vancouver conference, had a strong international oceanographic component (Anon 1939).

The prewar international ties and collaborations have been forgotten probably due in no small part to the fact that during, and well after World War II, marine sciences in the United States were largely dictated by the interests of the U.S. Navy as Naomi Orskes has recently documented in surprising detail in her *Science on a Mission* (Orskes 2021). International collaborative efforts well-known today such as the North



MAP 1. Oceanographic stations, cruise VII of the Carnegie, 1928-1929

FIG. 6. The oceanographic stations completed by the Carnegie in 1928-1929. Image from Paul's (1932) *The Last Cruise of the Carnegie*.

Pacific Project (NORPAC) cruises date only back to the mid-1950s. In an anonymous description of the history of NORPAC (Anon 1956), it is noted that it was originally conceived as involving only U.S. and Canadian organizations without any indications as to why this was so. However, the history notes that when “distinguished Japanese scientists were asked if their country would participate, they agreed at once to do so” (italics in the original). Several Japanese institutes participated in NORPAC including the Marine Observatory of Kobe, operator of the *Synupa Maru* (Fig. 5) and Koji Hidaki was the representative of the University of Tokyo. Hopefully shown here is that oceanographers in the United States and elsewhere have long known that oceanography is unavoidably an international affair.

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