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# Contents

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## AN ECLIPSE EXPEDITION TO CALIFORNIA

BY S. A. MITCHELL

Professor of Astronomy, University of Virginia

The Leander McCormick Observatory was enabled to equip and send an expedition to observe the total eclipse of the sun of September 10, 1923 through a grant of money from the Board of Visitors supplemented by a gift from the Draper fund of the National Academy of Sciences. With splendid generosity, the Leander McCormick estate gave an amount of money equal to the two other grants.

Fortunately it was unnecessary to spend any of these funds on the purchase of special eclipse equipment nor was it necessary to disorganize the regular work of the Observatory by taking any of its special apparatus on the eclipse trip. The writer of this article had already observed four total eclipses of the sun, each time a member of a party from the United States Naval Observatory. Accordingly, arrangements had been made with the superintendent of the Naval Observatory that in the event that the government observatory would send out an eclipse expedition, the writer would go along in his usual capacity as head of the spectroscopic part of the eclipse program. A special eclipse appropriation not having been passed by Congress, a Naval Observatory eclipse expedition thus being impossible, the spectroscopic apparatus was loaned to the Leander McCormick Observatory.

On September 10, 1923, the moon's shadow touched the earth's surface at sunrise in the Pacific off the coast of Japan. The shadow traversed the ocean at a speed well over a thousand miles per hour and appeared off the coast of southern

# MATTHEW FONTAINE MAURY

By C. Alphonso Smith

There is a peculiar propriety in the erection of a memorial to Matthew Fontaine Maury in Goshen Pass. Of all the pleasant places of earth, it was this place that swam last before his dying vision. It was from the beauty of this spot, treasured in his memory, that he passed into the realm of changeless and unfading beauty. It was the flowers that grow here, between Laurel Run and Anchor Rock, that he wished placed upon his coffined body as the last and only tribute of affection:

"Wait till the laurel bursts its buds,
And creeping ivy flings its graces
About the lichen'd rocks, and floods
Of sunshine fill the shady places.

"Then, when the sky, the air, the grass,
Sweet Nature all, is glad and tender,
Then bear me through the Goshen Pass
Amid its flush of May-day splendor."

Fifty years ago they bore him lovingly through this Pass and heaped the flowers upon him. Today we wish him to abide here. As he did not forget Goshen Pass, so Goshen Pass has not forgotten him. This tablet is the pledge of a mutual love and constancy that will know neither variableness nor the shadow of turning.

## II

This is neither the time nor the place for a biography of Matthew Fontaine Maury. I shall attempt only to say what seems to me the distinctive contribution that Maury has made to science and to civilization. That he has made such a con-

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Address delivered by C. Alphonso Smith, Head of the Department of English, U. S. Naval Academy, Annapolis, Maryland, at the unveiling of a tablet to Maury in Goshen Pass, Virginia, June 9, 1923. The substance of this address was also delivered before the University of Virginia Summer School, August 10, 1923, and at the unveiling of the Maury portrait presented to the U. S. Naval Academy by the United Daughters of the Confederacy, November 20, 1923.

tribution is evident. Why, for example, should a distinguished writer who had never heard of Maury till he visited Virginia, add after a few days of investigation: "Yet there is no one living in the United States, or in any civilized country, whose daily life is not affected through the scientific researches and attainments of this man?" Why is it that the United States Government publishes through the Hydrographic Office in Washington four great charts every month and puts at the top of each: "Founded upon the researches made and the data collected by Lieut. M. F. Maury, U. S. Navy?" This is a recognition paid to no other naval officer and these charts perform a service and have for three quarters of a century performed a service without parallel among government publications. Something that Maury thought and something that he did have plainly become the heritage of the ages and this heritage has grown rather than diminished with every passing year.

The great thought on which Maury was to build came to him at the age of twenty-five. It was in the year 1831. This thought was that the sea, if investigated, would be found to have its laws as constant, as uniform, as invariable as those of the land. Nature to Maury was one and indivisible. She was as sovereign over the three-fourths of the world which was fluid as over the one-fourth which was solid. The waves, the winds, the storms, the currents, the depths, and the temperatures of the sea were believed by Maury to constitute a system, a complex of cause and effect, constant in its regularity, perfect in its orderliness, and so mathematically interrelated that the mind of man could by patient investigation understand its phenomena and even forecast its processes. It was more than a theory with Maury. It was a faith, the kind of antecedent faith that had led Columbus, Galileo, Harvey, and Newton to their respective goals.

Tennyson makes Columbus say from his chains,

> "The golden guess
> Is morning-star to the full round of truth.
> No guess-work! I was certain of my goal."

So was Maury. Eleven years were to pass before he could put his faith to the test of actual proof. But the very intensity of his belief, the vividness with which he saw and felt the integrity of nature and the inviolability of her laws on sea as well as on land, was to him in the nature of a demonstration.

It was easy for men to believe, even before proof came, that the quiet land was the abode of natural law. Its regularly recurrent seasons, its testimonials of evenly laid strata, its ancient forms of animal and vegetable life, its visible adaptations of form and function to climate and soil, all spoke of an orderly development which by investigation man could in part understand and control. But the sea was different. It was the very symbol of caprice and lawlessness; it suggested the unknown and the unknowable. If it had its laws, they seemed beyond the reach of rational explanation. When Byron wrote, a few years before,

> "Roll on, thou deep and dark blue Ocean, roll!
> Ten thousand fleets sweep over thee in vain;
> Man marks the earth with ruin, his control
> Stops with the shore."

he expressed the prevailing attitude. Fleets did sweep over the ocean in vain so far as collective research or helpful data were concerned. Man's control did stop with the shore so far as control was dependent on the understanding of winds and currents and a compliance with their inexorable demands. When Baron von Humboldt, twenty-five years later, wrote his monumental *Cosmos,* conditions were practically the same. Though his book was considered the last word on science up to the year 1844, his scant treatment of "oceanic discoveries" is but added proof that Maury was an unheralded pioneer. Had Humboldt deferred his discussion of the ocean until 1855, Maury's name instead of being unmentioned would have led the list of marine discoverers; for in 1855, Humboldt had recognized in Maury the master scientist of the sea and had acclaimed him as a world benefactor.

Whether Maury at the age of twenty-five had thought of any definite means of proving his faith in the sea, I do not know. I think that he had. In a letter written to his brother in 1833, Maury speaks of resigning from the Navy, adding, however, "I have too many notions." These notions held him, and they seem to imply not merely a new view about the sea but some hoped for plan of carrying this view into effect. In the meanwhile, though only "a passed midshipman," he was growing in knowledge, range, and power. In 1836, he published his *Navigation,* a book that almost immediately displaced all rivals and remained till recent years the authoritative text on that subject. It is interesting to recall that Edgar Allan Poe was one of the first to proclaim the merits of the new book and to welcome in it the new spirit of research that was beginning to manifest itself in the American navy. In 1839, Maury's leg was broken in a stage-coach accident and he limped the rest of his life. He at once turned all the more resolutely to study and investigation and began to publish in the *Southern Literary Messenger* a series of articles called "Scraps from the Lucky Bag of Harry Bluff, U. S. N." Nobody knew who the author was but the criticisms of the navy, though severe, were so wisely constructive that naval officers not only welcomed them but set about embodying them in a new and better naval organization. There can be little doubt that the Naval Academy, founded at Annapolis in 1845, is the product of the suggestions made by Maury in these articles.

## III

In 1842 the great opportunity came. Maury was sent to Washington and placed in charge of the Depot of Charts and Instruments which he quickly converted into the National Observatory and Hydrographical Department of the United States. The man, the hour, and the task had met; and Maury was about to become the best known and most widely honored American living. He was to make our Hydrographic Office the observed of all observatories, and he was to prove to all

scientists and to the mariners of all seas that the ocean is as law-abiding as the land.

The method that he pursued was almost as fruitful as the results obtained. It was the method of coöperation. He had blank forms, abstract logs, as he called them, prepared and sent out to all ships that would use them. These called for a sort of recorded diary of temperatures, air pressures, depths, winds, and currents over every surface of every sea that was traversed. The sea was asked to grant a continuous interview and thus to have its autobiography written. This it did willingly, never having been persuasively asked before. As soon as a thousand co-workers had submitted their chapters, Maury was ready with his pilot charts and sailing directions, and these with a few changes but with Maury's name at the top are still piloting the ships of all the seas.

The effect on navigation was immediate and dramatic. As it was on the *Falmouth,* sailing from New York to Rio de Janeiro, that Maury had first thought about uniform winds and currents, he determined to make the first test of his charts on this route. The voyage was cut in half. In 1848, gold was discovered in California and our great clipper ships began to race with their freights from New York around Cape Horn to San Francisco. The average voyage was 183 days; it was reduced at once by Maury to 135 days. One American clipper, the *Flying Cloud,* keeping close to Maury's sea lanes, accomplished the trip in 89 days, making 374 miles in one day. No Atlantic steamer of the time had made such a day's run. So favoring were the winds along Maury's routes that many an American clipper covered the 16,000 miles from New York to San Francisco without having to reef her topsails more than twice. Gold was discovered a little later in Australia and the average trip from England to the Australian mines was reduced from 124 days to 97 days. The annual saving to the United States alone on freight to and from South America, China, and the East Indies was estimated at 5 million dollars. Maury found that zigzag routes had been followed from time

immemorial on the trip from New York to Cape Horn and that the Atlantic was crossed nearly three times needlessly on each voyage. Sailors had heard of terrible currents if they sailed straight, currents which Maury found to be mythical but the fear of which had lengthened the voyages and multiplied the disasters of ships for more than two hundred years. It is easy to estimate the saving of time and money that Maury effected; it is impossible to estimate the number of lives saved or the number of shipwrecks avoided.

## IV

But Maury's pinnacle moment was yet to come. His system of sea lanes had been utilized chiefly by American ships, his co-workers also being chiefly Americans. Wonders had been accomplished, it is true. Rivalry at sea had been stimulated; new instruments of measurement had been devised and old ones improved; Americanism had been quickened; a new pride in our naval prowess had been aroused; and the whole nation had thrilled time and again when the news had come that an American clipper, following Maury's sea paths, had shown her heels to a British steamer, burdened with the coal that she had to carry on the long voyage to Australia. But Maury wanted all nations to coöperate with the United States Observatory and all ships and shipping to be correspondingly benefited.

An international conference was therefore called to meet in Brussels in August, 1853, a memorable date not only for navigation but for international goodwill and coöperation. It was the first League of Nations. Belgium, Holland, Denmark, Norway, Sweden, Russia, France, Portugal, Great Britain, and the United States attended. Maury was at once nominated for president, but declined the honor in favor of the great Belgian scientist, Quetelet. The conference lasted sixteen days. At its close Maury's meteorological charts had been unanimously adopted and nineteen-twentieths of the shipping of the world had come within the compass of his vast and beneficent design. When the count was made fifty years later

it was found that Dutch seamen had turned in 3½ million of the prescribed log books accurately filled out, American seamen 5½ million, British seamen 7 million, and German seamen more than 10½ million. Maury, however, did not wait for these. One year after the great Conference had met, he was enabled from the data received to publish the first depth-map of the North Atlantic and to point out the pathway for the first cable. In 1855 he published his *Physical Geography of the Sea* and inaugurated a new science. It was the first book to embrace the entire sea as its theme and thus to bring three-fourths of the world into the domain of recognized and intelligible principle. If some of its conclusions have been overthrown, as of course they have, let it be remembered that they were overthrown by a method of continuous coöperation which Maury originated and by the testimony of log books which he had drawn up. The trans-Atlantic sea routes, however, which Maury had already charted, have been changed in only one detail since his death. After the wreck of the *Titanic* in 1912, the great liners agreed to dip a little further south to avoid the icebergs. This was not a modification of sea lane; it was a modification only in the time of changing from Maury's more northern to his more southern route.

But the Brussels Conference was more than a scientific triumph. It meant a new era in history. Never before had the great nations of the world come together to plan for the common welfare and to exclude no nation from their counsels. It was agreed that if war came, Maury's log books should in no case be destroyed. Even if the ship were sunk in battle, the nations pledged themselves to rescue the log books and to transmit them to their destination. The data must not be lost. The observations of each must be harvested for the good of all. The past and the present must extend a helping hand to the future. Maury felt keenly the greatness of the moment and sought to turn the consideration of the Conference from himself to the vast moral import of what they were witnessing. When Quetelet at the first meeting thanked Maury in behalf

of all the delegates for his services to navigation, Maury replied:

"I am extremely grateful for the sympathy you have expressed and the praise you have been pleased to bestow on my humble efforts. On my part, I beg to thank you for the kind assistance that you have afforded me. Allow me to add, that we are taking part in a proceeding to which we should vainly seek for a parallel in history. Heretofore, when naval officers of different nations met in such numbers, it was to deliberate at the cannons' mouths upon the most efficacious means of destroying the human species. Today, on the contrary, we see assembled the delegates of almost every maritime nation, for the noble purpose of serving humanity by seeking to render navigation more and more secure. I think, gentlemen, we may congratulate ourselves with pride upon the opening of this new era."

## V

One other contribution to the new era Maury was yet to make, but a strange and tragic history was to release him for his new task. He had thought much and written much about the benefits that would accrue to the farmer if weather conditions could be anticipated on land as well as they had been anticipated on the sea. In the concluding remarks that he made in Brussels he expressed the hope that the time would soon come when a general system of observations would be established embracing both land and sea. In 1858 he wrote in one of his Sailing Directions to Accompany the Wind and Current Charts:

"As much as we have accomplished at sea more yet can be accomplished through the magnetic telegraph on land. With a properly devised system of meteorological observations to be made at certain stations wherever the telegraph spreads its meshes, and to be reported daily by telegrams to a properly organized office, the shipping in the harbors of our seaport towns, the husbandman in the field, and the traveler on the

road may all be warned of every extensive storm that visits our shores and while yet it is a great way off."

But there seemed little likelihood that Maury would ever have the opportunity to lead a crusade for a great Weather Bureau on land, though no one was so well fitted for it as he. Every moment of his time was occupied at the Naval Observatory. He had no thought of resigning. He was devoted to his tasks and problems. He was the recognized authority on marine meteorology in all lands. Honors such as no other American had ever received had come to him and were continuing to come to him from foreign governments. But all this was changed in the twinkling of an eye. War came, Maury resigned his position, was sent by the Confederate Government on a diplomatic mission to England, and did not see his native land again until 1868. In that year the University of Cambridge bestowed upon him and upon Tennyson the degree of LL.D. In the same year he declined the directorship of the French Imperial Observatory and accepted the call to the chair of physics in the Virginia Military Institute at Lexington.

Now began the last chapter in Maury's life. The thought of helping the farmers, especially the cotton planters, by the establishment of a more effective Weather Bureau in Washington, inspired him with a zeal and enthusiasm that knew no bounds. He traveled and lectured in every section of the United States. The international mind had always been his and in a short time England and Russia were sending him resolutions of thanks for the stimulation of agriculture which his far-flung addresses had inspired. The chair of physics at the Virginia Military Institute had become the most potent platform in the United States for the propagation of the new movement.

But he had overtaxed his strength. Returning from a lecture in St. Louis he knew that his career was near its close. He must have known also that the victory had been won, that his sea charts had set the standard for the land charts, and that the task of interpreting nature in terms of help rather than of

hindrance for mankind had been permanently advanced by his efforts. The end came quietly on February 1, 1873. "Do I drag my anchors?" he asked with a smile. "Yes," said his son. "All is well," he replied.

We dedicate this tablet to one who, though dead, yet lives and leads. We dedicate it to the founder of a new science, to the pilot of every ship that sails, to the herald of the new era of international coöperation. Matthew Fontaine Maury summed the past and projected the future. Over land and sea his spirit broods in abiding benediction.