of radiation energy into terms of quantity usable on all types of generators has been a serious problem. The biological dose has been in general the only "measuring stick," and there a human error in interpretation has vitiated much work. The development of a biophysical quantity will afford some further knowledge of the process which has taken place in irradiated tissue. With the establishment in the last year by the International Congress of a physical unit of the *r*, or Roentgen unit, there is in sight a standardization of x-radiation dosage on a uniform scale. This is of value both in diagnostic exposures and in therapy. The collaboration of the Bureau of Standards in maintaining a standard scale is a further step forward toward a universal standard of measurements.

With the continuance of the interest and the close cooperation and enthusiasm of the physicist, the biologist, and the Roentgenologist in the study of the effect of x-radiation on tissue, and its relation especially to the combat of the neoplasm, we may anticipate much of value to medicine and *"les malades,"* and of interest to science as a whole.

OBITUARY

MATTHEW FONTAINE MAURY[1]

FINE Virginia blood flowed in the veins of Matthew Fontaine Maury. His grandfather, James Maury, was an Episcopal clergyman who kept a small school in Albemarle County, which numbered among its pupils Jefferson, Madison and Monroe, three distinguished presidents of the United States who had much to do with starting out the University of Virginia in the way that it should go. Born in 1806, the fourth son in a large family, he soon imbibed among pioneer surroundings courage and self-reliance, a love of honor and independence of thought, and, best of all, a burning desire to know and to achieve. In a curious manner he became interested as a boy in the study of mathematics, which was to play such an important part in his future life. He relates the incident in these words, "My first ambition to become a mathematician was excited by an old cobbler, Neal by name, who lived not far from my father's house, and who used to send the shoes home to his customers with the soles all scratched over with little x's and y's."

At the age of nineteen, he became a midshipman in the United States Navy, and his first cruise was on the *Brandywine,* which carried back to France the great Lafayette after his memorable visit to the United States. Maury started his career with a determination to overcome all obstacles, no matter how disagreeable the task. The success he had in life was attained not so much by a great brilliancy of mind but rather as the result of sheer hard work. In his own words, he says:

> When I became old enough to reflect, it was the aim at which all my energies were directed to make myself a useful man. I soon found that occupation, for some useful end or other, was the true secret of happiness. . . . When I went on board ship, I set out to make everything bend to my profession. I was required to study Spanish; and that nothing might be lost, I got a Spanish work in navigation and studied that. . . . I used to draw problems in spherical trigonometry with chalk on the shot, and put them in the racks where I could see them as I walked the deck.

So well did he school himself by these methods that when his book on navigation was published in 1836, the first nautical work ever to come from the pen of an American naval officer, it soon became the standard treatise on the subject.

The navy of one hundred years ago was unfortunately in a condition of dry rot, and some one with courage was needed to come forward and point out the remedies. Maury accepted the challenge and wrote a series of articles dealing with reforms. At first he wrote under a pseudonym, but he soon won the sympathy and approval of the officers of the Navy. So excellent were the reforms suggested that when the author became known, the President of the United States had all but decided to allow him to put his theories into practice by making him the Secretary of the Navy, in spite of the fact that his rank was but that of lieutenant.

So famous had his writings made him by this time that he was appointed in 1842 as head of the Depot of Charts and Instruments. Here was the opportunity for Maury to show his worth. When he took charge, the office was a very small one, but it grew quickly in size and importance until its name was changed to that of the United States Naval Observatory. The superintendent, although a naval officer, knew little of the science of astronomy. With characteristic determination he immediately started out to teach himself. To those of us who are familiar with telescopes vastly greater than he had ever dreamed of, it is interesting to read the enthusiastic manner with which he describes the passage of a star through the field of view of a transit instrument. His enthusiasm and his love of work affected his subordinates to such a degree that soon the Naval Observatory took rank with the two national observatories of

[1] Address given on the occasion of the unveiling of his bust at the Hall of Fame of New York University, May 14, 1931.

Europe, founded nearly two centuries earlier, Paris and Greenwich.

In addition to his ability to do hard work, Maury was fortunately gifted with a lively imagination. He, therefore, planned for the Naval Observatory a very ambitious scheme, that of making a catalogue of all the stars down to the tenth magnitude that could be seen from the latitude of Washington. This comprehensive project was too great a task for any one observatory to handle and so perforce it was necessary to await the time when it could be taken up by many observatories working in cooperation. Such a catalogue was actually completed some fifty years later under the auspices of the Astronomische Gesellschaft, or German Astronomical Society. Maury was superintendent of the Naval Observatory for nearly twenty years, resigning his post at the outbreak of the Civil War.

His name is best known to us now from the pilot charts issued each month at Washington, at the top of which are found these words, "Founded upon the researches made and the data collected by Lieutenant M. F. Maury, U. S. Navy." In the year 1831 he was appointed sailing master of the *Falmouth*. Before proceeding to Rio he had sought from all the books available information on the winds, weather and currents likely to be found on the cruise. Search as he would there was no published information. Maury had a brilliant thought, beautifully described by one of my colleagues at the University, which 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 was to Maury 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 ever forecast its processes."

Maury determined to make the sea give up her secrets by observing her vagaries. His own observations on his trip to Rio availed but little. Many observers spread over many seas and over long intervals of time were needed. But how to secure them, and how wait patiently while the observations were being accumulated? Help came from an unexpected quarter. In the observatory offices where Maury went in 1842 there was a collection of what was regarded as so much rubbish, old log books of past generations of naval vessels, apparently fit only for a bonfire. It took five years of hard work to bring order out of chaos, and it was not until 1847 that he published his first "Wind and Current Chart." But what good were his precepts? Were they only the vapid musings of a fossilized old astronomer, or would the time of passage of a ship from one port to another actually be shortened? That was the real test. And what a triumph was in store! The average voyage by a sailing vessel from New York to Rio had been 55 days. By following Maury's directions, a barque early in 1848 on its trip south made the voyage in 35 days and returned in 40 days. When ship captains found that they could have a copy of his sailing directions by agreeing to make observations and to send them in to Washington, Maury was able to write that by 1851 he had more than one thousand ships in all the oceans observing for him.

Gold was discovered in California in 1849. In rushing supplies from New York to San Francisco, 15,000 miles distant, time was undoubtedly money. The average voyage was 180 days. The clipper ships of those days had exciting races. As Maury wrote, "Some of the most glorious trials of speed and prowess that the world ever witnessed, among ships that walk the waters, have taken place over it. Here the modern clipper ship—the noblest work that has ever come from the hands of man—has been sent, guided by the lights of science, to contend with the elements, to outstrip steam and astonish the world." Many ships made the voyage in 110 days, the record for a clipper ship is 90 days.

It has been estimated that Maury's charts made an annual saving to the commerce of the United States of those days of more than two million dollars, while British commerce saved each year the sum of ten million dollars.

Maury's fame was still in the ascendancy. In 1853 an international congress was held in Brussels, the first League of Nations. At its close Maury's charts were adopted and plans were made for further cooperation by nineteen twentieths of the shipping of the world. Transatlantic sea lanes were adopted which have remained almost unchanged to the present. One year after the conference had met he published the first depth map of the North Atlantic and he later assisted in laying the first Atlantic cable. In 1855 he published his "Physical Geography of the Sea" and inaugurated a new science.

He strongly urged that systematic observations of weather conditions should be made all over the United States and the results be telegraphed to a central bureau. Political jealousies retarded this movement and it was not until many years later that the U. S. Weather Bureau was organized. Maury has been frequently referred to as the father of the U. S. Naval Academy.

Scientists when great are usually modest. Sir Isaac Newton was buried in Westminster Abbey with royal honors. Of himself he has said, "I have been but as a child playing on the seashore; now finding some pebble rather more polished and now some shell more agreeably variegated than another, while the immense ocean of truth extended itself unexplained before me." And so it was with Maury. He did not lay claims to great discoveries. "I only bring together," he wrote, "the observations that others have made, and then leave it to the observations themselves to discover their own meaning in their own way."

His life should be an inspiration to every youth of to-day, showing as it does so clearly that hard work, with enthusiasm and imagination, will overcome nearly all difficulties.

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MEMORIALS

THE *Journal* of the American Medical Association states that ceremonies in memory of Fernand Widal were recently held in Paris. Professor Pasteur Valléry-Radot (grandson of Pasteur), who was a pupil of Fernand Widal and who is now an associate professor at the Medical School, delivered an address on the work of his former teacher. He described his methods of work and experimentation and recalled the discoveries for which science is indebted to him.

Nature states that at a special meeting of the council of the Ray Society on April 30, the following resolution was adopted: "The Council of the Ray Society desire to place on record the profound grief felt by them on hearing of the death of their president, Professor W. C. M'Intosh, F.R.S., on April 1 last. Professor M'Intosh had belonged to the society since 1863 and had been president since 1913. He had not only shown his practical interest in its success by his exceptionally long period of membership, but he had given the most devoted service to the society by his frequent journeys from St. Andrews to London, in order to attend the meetings of the council, at which he nearly always presided. The council direct that this record of their appreciation of the value of their late president's work be sent to Dr. R. T. Gunther, his nearest surviving relative, with the expression of their sincerest sympathy."

RECENT DEATHS

DR. SOLON IRVING BAILEY, professor emeritus of astronomy at Harvard University, from 1892 to 1919 in charge of the Arequipa branch of Harvard College Observatory, died on June 5, in his seventy-seventh year.

DR. FRANK WIGGLESWORTH CLARKE, chief chemist of the U. S. Geological Survey, *retired,* well known for his work on the constants, atomic weights, geochemistry and other subjects, died at his home in Chevy Chase, Maryland, on May 23, in his eighty-fifth year.

DR. EDWARD HART, professor emeritus of chemistry at Lafayette College, died on June 6, at the age of seventy-six years.

DR. SAMUEL W. BEYER, dean of the industrial science division of Iowa State College, was fatally hurt when his automobile was struck by a passenger train on June 2. Dr. Beyer, who was sixty-six years of age, was known for his work in economic geology.

THE death is announced of Dr. Carroll Gideon Bull, professor of immunology in the School of Hygiene and Public Health of the Johns Hopkins University.

DR. BENSON AMBROSE COHOE, professor of therapeutics at the University of Pittsburgh Medical School since 1920, died on May 27, at the age of fifty-six years.

WILLIAM DOBINSON HALLIBURTON, emeritus professor of physiology at King's College, London, died on May 21, at the age of seventy-one years.

PROFESSOR JOSEPH EDWARDS, principal and professor of mathematics and physics at Queen's College, London, died on May 30, in his seventy-eighth year.

MR. ST. GEORGE LITTLEDALE, known for his explorations in central Asia, died on April 16, at the age of seventy-nine years.

SCIENTIFIC EVENTS

RECONSTRUCTION OF THE ROYAL INSTITUTION

THE *British Medical Journal* states that the rebuilding of a considerable part of the Royal Institution became imperative some two years ago, after a series of explosions in Albemarle Street, which compelled the attention of the managers to the dangerous condition of the lecture theater. This historic room, the scene of the Friday evening discourses and experiments of Davy, of Faraday, and of a long line of distinguished scientific men over a period of one hundred and thirty years, had remained almost unchanged since it was completed under the supervision of the founder of the institution, Count Rumford, in 1802.