JOSEPH LE CONTE.

BY MARCUS BENJAMIN, PH.D.

In 1891 the American Association for the Advancement of Science met in Washington, D. C., under the presidency of Professor Albert B. Prescott, of the University of Michigan, and this year it met in Rochester, N. Y., under the guidance of Professor Joseph Le Conte, of the University of California. As we have previously said, the office of president in the American Association, in virtue of an unwritten law, passes from a representative of the physical sciences to one of the natural sciences, and so the chemist of last year is succeeded this year by a geologist.

The name Le Conte is a distinguished one in the annals of American science, and a sketch of its most famous living representative would be incomplete without some genealogical history of the family. It is of French origin, and owing to the political and religious troubles subsequent to the edict of Nantes in 1685, its first American ancestor, William Le Conte, a Huguenot, came to the new world and settled in New Rochelle, near New York City, in 1698. Descendants of the family still reside in that place.

Toward the beginning of the century Louis Le Conte, a great-grandson of William, removed to Liberty County, Georgia, where he had come into possession of the estate of Woodmanston. He devoted himself largely to the dilettante study of the sciences, and was a botanist of considerable reputation, sending from time to time the results of his discoveries to friends in New York, who communicated them to the Lyceum of Natural History, as the New York Academy of Sciences was then called. He did not neglect the physical sciences and was an ardent student in the domain of chemistry and astronomy. At frequent intervals his brother, Major John Sutton Le Conte, of the United States Engineer Corps, paid visits to the home in Georgia, and together they discussed the scientific questions of the time.

It was here and under such influences that Joseph Le Conte was born on February 26, 1823. He was one of the younger members of the family, which included four sons and three daughters. His elder brother John, born in December, 1818, likewise became a scientist of national reputation, and from 1869 till his death in Berkeley, Cal., last spring, was professor of physics in the University of California, as well as president of that institution for a part of the time.

The elementary studies of young Le Conte were pursued at a neighboring school in Liberty County, where, from year to year, new teachers were called to the charge of the pupils of a few of the leading families in the vicinity. This fondness for science was a natural consequence of his association with his father, and his habits of observation were the result of his country life with outdoor sports. Game of all kinds abounded in that part of Georgia, and he was a natural sportsman from his earliest boyhood. As he grew older his practical knowledge acquired in the chemical laboratory in his father's attic or in the botanical garden adjoining the home became of use to him in his extensive ramblings for scientific purposes.

Among the different teachers under whose instruction he passed, none perhaps had greater influence upon his mind than did the youthful law student Alexander H. Stephens, then earning his education by teaching, and who subsequently left a permanent impression on the history of his State and country by his statesmanship. It was under his tuition that he was prepared for college, and then, following in the footsteps of his elder brother, entered the Franklin College of the University of Georgia, where, in 1841, he received his degree of A.B.

Then, choosing medicine as his profession, he went to New York and studied at the College of Physicians and Surgeons, where he took his doctor's degree in 1845. Then turning homeward, he entered on the practice of his profession in the pleasant city of Macon, Ga., but finding the study of science more interesting than that of medicine, his success as a practitioner was not sufficient to induce him to continue in that field.

Cambridge, Massachusetts, was at that time the Mecca of all students in natural science. There, under the magnetic influence of Louis Agassiz, that famous and brilliant group of naturalists who to-day are the pride of American science was educated; among the best known of whom may be named Alpheus Hyatt, Edward S. Morse, Frederick W. Putnam, A. S. Packard, Samuel H. Scudder, N. S. Shaler, and A. E. Verrill, all of whom have a world-wide reputation.

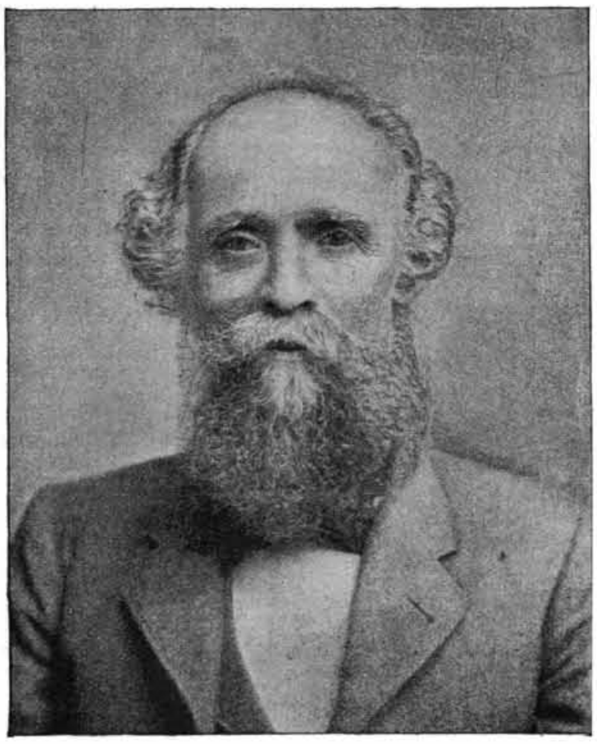
To Cambridge, therefore, Le Conte directed his steps and entered the Lawrence Scientific School. His medical studies made the course a comparatively easy one for him, and in 1851, after spending a year at that institution, he received the degree of B.S.

During the winter of 1851, in company with Agassiz, he spent several months on the keys and reefs of Florida, studying their mode of formation, from which grew his paper, "On the Agency of the Gulf Stream in the Formation of the Peninsula and Keys of Florida," subsequently published in 1856. On leaving Cambridge he was called to the chair of natural science in Oglethorpe University, in Milledgeville, Ga., but a year later relinquished this charge to accept the professorship of geology and natural history in the University of Georgia, in Athens. Here he remained from 1852 till 1856, busily engaged in teaching and lecturing, with but little time at his disposal for original research.

He was then called to the chair of chemistry and geology in the South Carolina College. A more congenial locality could scarcely have been found. Columbia was the political capital of the State, as well as the site of the State University. It was within easy reach of Charleston and Savannah, and in ante-bellum days one of the most attractive spots in the Southern States. His reputation was fast becoming national, and in 1857 he was invited by Joseph Henry, secretary of the Smithsonian Institution, to deliver his lectures on "Coal" and on "Coral Reefs" before that institution.

Of his contributions to science, written at this time, may be mentioned the following: "Place of Organic Science and Geology in a Scheme of Education" (1857); "Morphology and its Relation to Fine Art" (1858); "Principles of a Liberal Education" (1859); "Correlation of Physical, Chemical and Vital Forces" (1859); "Relation of Organic Science to Social Science" (1860); "Importance of National History in the School, and the General Relation of the School, the College and the University to Each Other and to Active Life" (1861).

With the breaking out of the civil war came four long years of cruel hardships. In 1862, all able-bodied men over eighteen years of age were enlisted in the



PROF. JOSEPH LE CONTE.

Confederate army, and the College of South Carolina closed its doors, so that its students might serve their State in the field. Professor Le Conte was a loyal son of the South, and accepting the situation as one of necessity, at once entered the Confederate service, and was for two years chemist in the government laboratory for the manufacture of medicines. Later he became chemist to the niter and mining bureau, and so continued until the close of the war.

Subsequently, when the University of South Carolina was organized out of what was left of the old college, Professor Le Conte was restored to the chair of chemistry and geology, and also was assigned to the charge of chemistry and pharmacy in the medical department.

The educational institutions of the South were slow to recover from the disastrous effects of the war. With limited resources and inadequate support they have persisted in their course, and now the University of South Carolina is again one of the foremost colleges in the South. She has failed to resume her place among the older universities of the Eastern States, and is not equal to many of the newly and richly endowed institutions of the Union. It was, therefore, but natural when an opportunity came to Professor Le Conte in the shape of a call to the chair of geology and natural history in the University of California, organized in 1868, that he should regard the proffer as one of advancement, and leave Columbia.

He removed to California, and was present at the opening of the first session of the new university in September, 1869, since when he has continued to remain on the Pacific coast till last summer.

His laboratory, on the heights of Berkeley, overlooks the Bay of San Francisco, and directly opposite is the Golden Gate, through which, in the afternoons, may be seen the last glimpses of the setting sun as it sinks out of sight into the ocean beyond, while the metropolis of the West is a little to the left. It was here one afternoon in March of last year that Professor Le Conte told the present writer how the university had granted him a year's leave of absence, and that he was about to visit the East and renew his acquaintance among the scientific men, many of whom he had not seen since before the war.

Later, in August, he was present at the meeting of the American Association—the first that he had attended in fully a quarter of a century, but among his former colleagues many had gone. Agassiz, his teacher, was sleeping the long sleep in Mount Auburn, beneath a huge granite bowlder brought from the glaciers of Switzerland—the scene of his early triumphs. Henry, the scholarly first secretary of the Smithsonian Institution, and Bache, the great superintendent of the Coast Survey—they and the two Sillimans, father and son, the able Edward Hitchcock, the courtly William B. Rogers, the learned Barnard, the skillful Lawrence Smith, the genial Asa Gray, and many others had passed away. Of those who had made geology a specialty, Dana, Newberry, and T. Sterry Hunt were unable to be present, but a younger generation, who knew him from his work, greeted him with enthusiasm, and from the moment of his advent in Washington until the time of his election, the name of no other candidate for the presidency was seriously considered.

Subsequent to his arrival in California he devoted considerable attention to geology. His summer vacations were spent in geological rambles with students in the high sierras or in tours through Oregon, Washington, and British Columbia. These expeditions gave rise to such papers as his "Theory of Formation of the Greater Features of the Earth's Surface" (1872); "Ancient Glaciers of the Sierras" (1873); "Some Tributaries of the Lake Valley Glaciers" (1875); "The Great Lava Flood of the Northwest, and the Structure and Age of the Cascade Mountains" (1874); and "Structure and Mode of Formation of the Coast Ranges of California" (1876).

From the rich experiences gained by so keen an observer of nature grew the desire to record his impressions in book form, and so, in 1878, he published his "Elements of Geology," a text book for colleges and for the general reader, which has since passed through several editions, the latest of which, issued in 1891, brought forth the statement that "this standard work has now, after fourteen years, been thoroughly revised in all its parts, and for the American student of geology leaves little that could be desired." It is essentially an American book, and the examples and applications cited are almost entirely derived from this country. In 1884 he issued an abridged edition of this work, which he called "Compend of Geology," and which was especially designed for use as a text book.

Besides geology, he has devoted his attention very largely to the phenomena and theory of binocular vision, and from 1869 to 1877 he published various investigations included under the following titles: "Adjustments of the Eye" (1868), "Relation of the Eyes on the Optic Axis on Convergence" (1869), "The Horoptic" (1869), "A New Mode of Representing Binocular Phenomena" (1870), "Theory of Stereoscopy" (1871), "So-called Images of Illusion" (1872), "Position of the Eyes in Sleep" (1875), "Law of Corresponding Points in Relation to the Law of Direction" (1875), "Comparative Physiology of the Binocular Vision" (1875), and "Structure of the Crystalline Lens and its Relation to Periscopism" (1877). These he collected and issued in book form, under the title of "Sight: An Exposition of the Principles of Monocular and Binocular Vision," which was published in New York in 1880.

In addition to the foregoing he has published two volumes of essays. The first of these, originally issued in 1873, is entitled "Religion and Science," and was a series of Sunday lectures on the relation of natural and revealed religion, or the truths revealed in nature and scripture. Professor Le Conte is an evolutionist of the most thorough-going type, and in 1873 his views were regarded as somewhat radical, but the book was favorably received and recommended "to those who desire to examine closely the strong foundations on which the Christian faith is reared."

In his latest book, "Evolution and its Relation to Religious Thought," he emphasizes his belief in that hypothesis, and boldly says: "We regard the law of evolution as thoroughly established. . . . It is not only certain as—it is far more certain than—the law of gravitation." His aim is to show that "the spirit of man was indeed derived from God, but not directly; created, indeed, but only by natural process of evolution; that it indeed pre-existed, but only as embryo in the womb of nature; slowly developing through geologist time, and finally coming to birth as living soul in man. At this last stage of its development it attained to immortality." Five editions of this book have been called for.

Professor Le Conte is not without honors. The University of Georgia has conferred upon him the degree of LL.D., and shortly after his removal to California he was elected a member of the National Academy of Sciences. Besides being a member of the American

Philosophical Society, he holds either honorary or corresponding relations to many scientific associations, including the Academies of Science in New York and Philadelphia. He has been a member of the Association for the Advancement of Science for many years, and at one of its earlier meetings served as secretary.

No worthier selection could have been made by the American Association from among its more than 2,000 members, for its president, and in the choice of Professor Le Conte a graceful tribute is paid the members from the Pacific States, who showed, nearly twenty-five years ago, their foresight and wisdom in calling him to their first and best scientific educational institution.

Meteorites.

Geologists are indebted to Mr. J. R. Eastman for a concise account of the Mexican meteorites. In a paper read before the Philosophical Society of Washington, January 2, 1892, he presented the latest and most complete information upon the subject, in a compact form ready for reference. A list of the iron meteorites with a table of their weights was given, followed by remarks as to the relative occurrence of iron and stony meteorites.

From the available data the ratio of weight of the former to the latter is as 1 to 12·23. The aggregate weight of meteoric iron observed and discovered to date on this continent is about 153 tons. If the above ratio is true in all cases there should have been a fall of about 1,880 tons of stony meteorites, or in all over 2,000 tons of meteoric matter precipitated upon the earth.

Mr. Eastman offers the following theory to account for the apparent excess of iron over stony meteorites: When a stony meteorite falls to the earth it generally breaks into many fragments, and the ruptured surfaces plainly indicate the nature of the catastrophe. The author knew of no case where an iron meteorite showed any indication of having been twisted, broken, or torn from another mass of the same material.

The true type of meteorite which reaches the earth from outer space is probably like that which fell in Iowa County, Iowa, on February 12, 1875. This meteorite is composed almost wholly of stony matter, but scattered through the mass are small grains of nickeliferous iron. This iron may exist in the stony matrix in all forms and sizes, from the microscopic nodule to the mass weighing several tons. When the stony mass comes in contact with the earth's atmosphere the impact breaks up the matrix, sets free the iron bodies, and they reach the earth in the same condition, so far as mass and figure are concerned, as they exist in the original formation. In such cases it is probable that the stony portion of the original body is rent into such minute fragments by the explosion that they would not reach the earth in any appreciable size. The larger the masses of iron the more complete would be the destruction of the original body, and the larger stony meteorites would be those that contain the smaller granules of iron.—*Amer. Naturalist.*

Photo. Prints in Colors.

Prof. Vogel exhibited recently before the Physical Society, Berlin, a remarkably fine series of colored prints of oil paintings, etc., prepared in accordance with his method by Messrs. Vogel and Ulrich. The method consists in first taking a red, a yellow, and a blue negative of the object on plates specially sensitized for colors. The three negatives are then printed on to one and the same paper by means of complementarily colored rollers or stones. In order to obtain the colors exactly complementary to those of the negatives, the colors used for printing were either the colored sensitizers themselves or some substances whose equivalence to these had been determined spectroscopically. The application of the physical principles involved in the above yielded an approximate reproduction of the natural colors which was surprisingly complete, and will become more so as more and more colored substances are discovered suitable as sensitizers. Prof. Koenig described his new spectrophotometer. Its chief improvement consists in the introduction of Lummer and Brodhun's glass cube, which is, however, so modified as to admit of the measurement of the relative intensities of the parallel rays falling into it.

A NEW PARACHUTE.

At the time of the ascension of the Jupiter, the results of which made so strong an impression upon the public, Mr. Capazza invited a few persons to witness an experiment, the simple announcement of which was well calculated to give the chills. It was laconically stated therein that after reaching an altitude of

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from 3,000 to 6,000 feet, Mr. Capazza would rip open his balloon in order to effect his descent by means of a parachute of his invention. The experiment was to be made at the Villette gas works, and let us say just here that it was a perfect success.

To tell the truth, the Capazza parachute does not constitute an invention in the proper sense of the word. Mr. Capazza has contented himself with improving, by simplifying, what was already known, and especially with more rationally applying the laws that govern the operation of analogous apparatus. In the preceding experiments with parachutes, the apparatus was defective, and, at the moment of acting, remained inert, or else, on the contrary, spreading abruptly, gave a shock which was dangerous for the system as a whole. Moreover, during the descent, the apparatus was wanting in stability and oscillated in the air in a perilous manner. Mr. Capazza's idea consists, in the main, in ascending with his parachute *wide open.* To this effect, his balloon is absolutely free from all fastenings and is not provided with a netting. What takes the place of the latter is the parachute itself, which covers the entire upper part and extends below its "equator."

The balloon covered with its parachute is inflated in the usual manner. It is held by its ascensional force against the parachute and remains in place as long as it is inflated. The parachute is provided throughout its circumference with a band of strong canvas, to which, throvgh the intermedium of metallic eyelets, are hooked fine cords that unite in pairs below and terminate in cords that hold the car at a considerable distance (95 feet) from the balloon. Such a length, unusual up to the present, has the effect of drawing more obliquely upon the edges of the parachute, leaving more liberty to the latter to hold itself open, and to preserve its static equilibrium automatically. Moreover, a sort of conical chimney of canvas placed at the summit of the parachute assures the flow of the gas contained in the balloon when the latter bursts, by accident or otherwise, and afterward serves to allow of the escape of the superabundant air during the descent.

The inflation of the balloon was effected normally, as shown in one of our engravings, except during a sudden squall which gave the persons who held the balloon all the work that they wanted to do. This picturesque incident has been rendered by our artist with much accuracy.

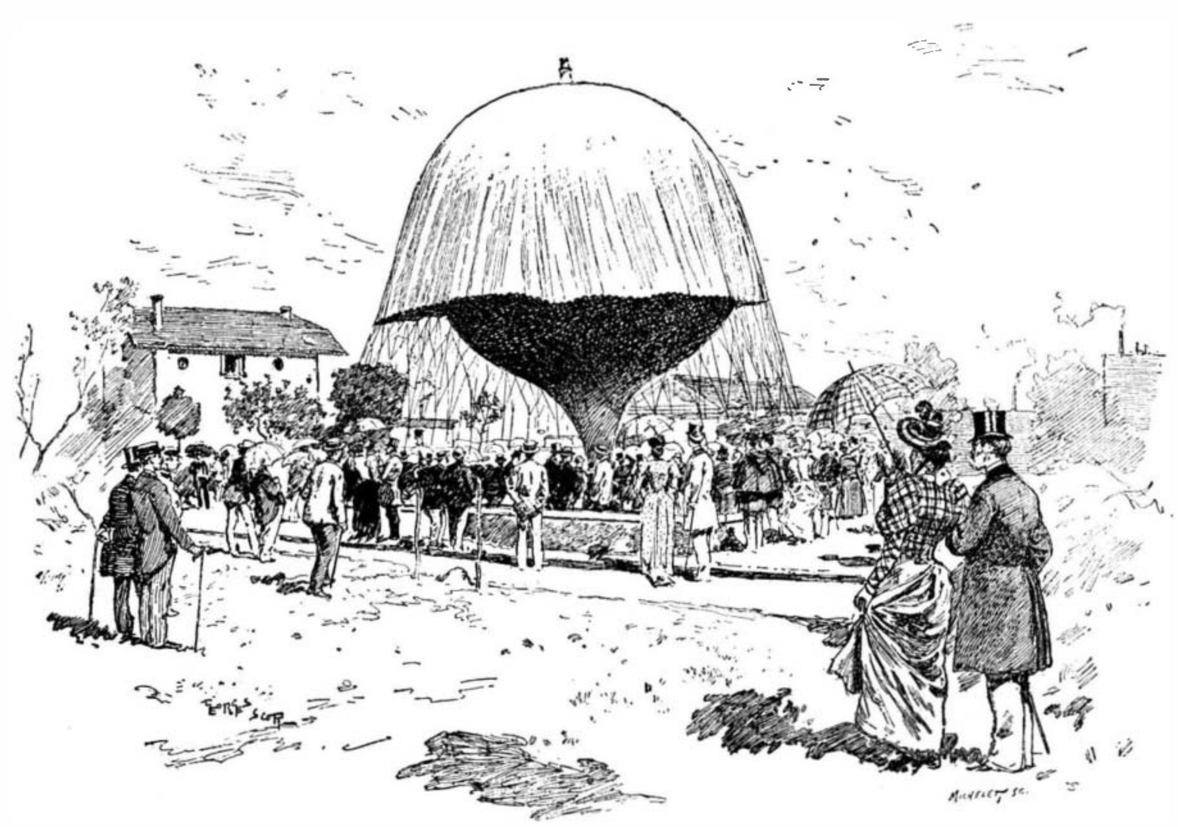
The ascension took place along about five o'clock. Mr. Capazza, alone in his car, rapidly reached an altitude of 4,300 feet, at which he ripped open his balloon. The excitement of the spectators was at a high pitch when the latter was seen to abruptly change form, hang beneath the parachute and then drop upon the ring, while the parachute kept immovable. The descent was made at the very moderate velocity of 4¼ feet per second, and the aeronaut reached earth without difficulty in a wheat field at Drancy. The experiment seems conclusive, and we may believe that the Capazza parachute will hereafter become reglementary for ascensions.—*L'Illustration.*

What are Diatoms?

The plants in question are so small as to be seen only with the aid of the microscope; those of ordinary size, when magnified about three hundred and fifty diameters, appear about a quarter of an inch long. Others are much larger. They are curious little plants with a silica shell, which, in certain places, is provided with little apertures through which living parts of the plant protrude. In this way they are enabled to move about freely in the water by which they are generally surrounded, for, though they are not all strictly water plants, they all need considerable water to enable them to thrive, and so are always found in wet places.

Owing to their freedom of motion, they were at one time supposed to be animals. Now it is known that they are plants, as they can perform all the functions of plants, and no animal, with all his superiority, high nature, etc., is able to do this. They are found everywhere in all inhabited countries, and in fact all over the seas. So it may be readily granted that a plant so common and widespread as this should be quite familiar to every one.

Again, not only are the living plants so widespread and common, but the shells of the dead ones remain intact for many years; and in certain localities these tiny shells are so numerous as to form a large portion of the soil. Some of the best known of these localities are the sites of Richmond, Va., and Berlin, in Germany.—*Emily L. Gregory, Popular Science Monthly.*



THE BALLOON AND ITS PARACHUTE.