This volume brings to a close the work started thirty years ago with a study of Hill's papers made at the suggestion of my former teacher and friend, George Darwin. The undertaking of a complete recalculation of the moon's motions and later of tables which should make the theory available for practical and scientific use was no ambitious plan formed at the beginning but grew naturally out of the desire to continue the work as each stage in it was reached. Some part of it has always been in progress and there have been long periods during which it has been my sole occupation outside of the duties connected with an academic position and of the hours given to recreation. The word "finis" brings with it some feeling of regret. The time spent in actual calculation was often a relief from attempts to solve more difficult problems in other lines. To what extent it has been worth while as a contribution to the subject must be left to the future and to others for judgment. My hope is that it will give some aid in unravelling the tangled skeins of problems which our nearest celestial neighbor has never failed to present, and that the satisfaction to myself in seeing the work finally brought to a conclusion will be shared by those who have been interested in watching its progress.

THE DIRECTOR OF THE BUREAU OF MINES

The nomination of Dr. Frederick G. Cottrell for director of the Bureau of Mines, Department of the Interior, was sent to the Senate on May 5 by President Wilson, to take the place of Dr. Van. H. Manning, resigned. Dr. Cottrell was the assistant director of the bureau under Dr. Manning.

Frederick G. Cottrell, chemist, metallurgist and inventor, was born in Oakland, Calif., January 10, 1877. He attended school in Oakland and matriculated at the University of California in 1892. As a university student he gave especial attention to science, particularly chemistry. After graduation in 1896, with the degree of bachelor of science, he was a Le Conte fellow at the University in 1896–1897 and taught chemistry at the Oakland High School in 1897–1900. Then he went to Europe, where in 1901 and 1902 he studied at the University of Berlin and the University of Leipzig, receiving from the latter the degree of doctor of philosophy in 1902. On his return to this country in 1902, he was appointed instructor in physical chemistry at the University of California, and in 1906 was appointed assistant professor, holding this position until 1911. While at the university Dr. Cottrell's chief contributions to science were researches relating to the electrical precipitation of fume and fine particles suspended in the gases of smelter, blast furnace or cement works flues, and he finally evolved what is known as the Cottrell process for this purpose. This invention was first utilized at the Selby smelter in California for removing fumes from the waste gases of a sulphuric acid plant at the smelter, thereby abating a nuisance that threatened to necessitate shutting down the works. Subsequently this electrical precipitation process was installed at other smelters to remove fume and solid particles contained in the escaping gases, and it was also successfully used at cement plants, notably near Riverside, Calif., to prevent the dust from calcining kilns from damaging nearby orange groves and vegetation. To-day the Cottrell process of fume and dust removal is in world-wide use, and is recovering materials heretofore wasted to the value of many thousands of dollars. One of the latest installations is at a large smelting plant in Japan; while the largest installation is at the Anaconda smelter, Anaconda, Mont. Dr. Cottrell in a desire to encourage scientific research turned over his extensive patent rights to a non-dividend-paying corporation, known as the Research Corporation, a body formed for that purpose. A fundamental requirement in the incorporation is that all net profits shall be devoted to the interests of scientific research.

In 1911 when Dr J. A. Holmes, the first director of the Bureau of Mines, was serving as a member of commissions appointed by the government to study alleged damages from smoke and fumes from the Selby and the Anaconda smelters, and the Bureau of Mines was investigating at length the smelter-smoke problem, Dr. Cottrell, because of his scientific attainments and his special knowledge of metallurgical problems, was appointed chief physical chemist in the bureau. In 1914 he

was appointed chief chemist, in 1916, chief metallurgist, and in 1919, assistant director.

Aside from his work on smelter smoke Dr. Cottrell has been intimately connected with work on the separation and purification of gases by liquification and fractional distillation. During the world war and subsequently the development of the Norton or Bureau of Mines process for the recovery of helium from natural gas has been his special care, and it was chiefly through his efforts that a plant for recovering helium on a large scale for military aeronautics has been erected near Petrolia, Texas.

Dr. Cottrell is a member of the American Chemical Society, Mining and Metallurgical Society of America, the American Electrochemical Society, the American Institute of Mining and Metallurgical Engineers, and the American Association for the Advancement of Science. He was awarded the Perkin medal by the New York Section of the Society of Chemical Industry in 1919 in recognition of his work on electrical precipitation.

SCIENTIFIC NOTES AND NEWS

DR. AUGUSTUS TROWBRIDGE, professor of physics at Princeton University, during the war lieutenant colonel and head of the sound ranging service of the A. E. F., has accepted appointment as chairman of the division of astronomy, mathematics and physics of the National Research Council for the year beginning on July 1.

DR. HUBERT WORK, of Colorado, first speaker of the house of delegates of the American Medical Association, has been elected president of the association.

THE council of the British Medical Association, at the meeting of April 14, resolved unanimously to recommend the Annual Representative Meeting that Dr. David Drummond, should be elected president of the association for the year 1921–22, to take office at the Annual Meeting to be held at Newcastle-on-Tyne in 1921. Dr. Drummond is vice-chancellor and professor of medicine, University of Durham, and consulting physician, Royal Victoria Infirmary, Newcastle. The council decided also to accept an invitation from the Glasgow and West of Scotland Branch to hold the annual meeting of 1922 in Glasgow.

DR. OTTO KLOTZ, director of the Dominion Observatory, has been elected president of the Seismological Society of America.

DR. WILLIAM H. WELCH and Dr. Ira Remsen, both of Johns Hopkins University, have been appointed to the Board of Electors for the Hall of Fame of New York University.

DR. JOHN H. FINLEY has received the gold medal of the Geographical Society of Paris, in recognition of the English edition of his book, "The French in the Heart of America." The French edition of the same work was crowned by the *Academie* with an award of 1,500 francs.

PROFESSOR RAY S. OWEN, of the department of topographic and highway engineering of the University of Wisconsin, has been made Officier d'Academie by the French government for his work in the intelligence department of the army.

THE Howard Taylor Ricketts prize of the University of Chicago for 1920 has been awarded to Ivan C. Hall for his work on "Studies in Anaerobiology." This prize is awarded annually on May 3, this being the anniversary of the death of Dr. Ricketts from typhus fever while engaged in investigative work on this disease in Mexico City in 1910.

THE Boylston Prize of $300 has been awarded to Messrs. Stuart Mudd, Samuel B. Grant and Alfred Goldman, fourth year students of medicine, for their research on "The Effect of Chilling on the Mucous Membrane of the Throat and Tonsil," performed in the pathological laboratory of the Washington University School of Medicine.

DR. LYMAN J. BRIGGS, formerly physicist in the Bureau of Plant Industry, U. S. Department of Agriculture, who had been on temporary assignment to the Bureau of Standards for research on aeroplane problems during the war, has been transferred per-