and by Reeds,[15] well-developed gallery networks, highly suggestive of excavation by ground-water solution; but they possess also one or more well-defined levels, independent of their bedding planes, and suggestive of control by water-table streams during pauses in regional elevation. How these levels are to be explained, and whether they have been determined by thrust planes I can not say.

OBSERVATIONAL STUDY OF CAVERNS

It is desirable that caverns should be studied with especial attention to the detailed form of their rock walls and to the general pattern of their galleries. During such study the attempt should be made to explain every element of their form by each one of the afore-discussed theories. Care should be taken not to be distracted from the primary study of cavern excavation by the secondary fascinations of dripstone replenishment. Each of the two theories should be impartially considered in its relation to the physiographic evolution of the cavern district, and a provisional place should be found under each theory for every cavern feature, large and small. Thus in time a good theory of limestone caverns may be established.

EDGAR FAHS SMITH: PROVOST, CHEMIST, FRIEND

By CHARLES FRANKLIN THWING

PRESIDENT EMERITUS OF WESTERN RESERVE UNIVERSITY

OFTEN have I wished I might make a book seeking to interpret the most loved teachers of our colleges. What a rich treasury it would indeed be of dear souls loving and loved. In it I would tell of "Old Peabo" of Harvard, who embodied the great phrases of Paul's eulogy on charity. Included, too, would be Shaler, also of Harvard, of whom it was said, "Late in life he was fond of telling the story of his once having overheard two students talking together. 'Where's the old man?' asked one. 'Hush!' said the other, 'if he hears you call him old man, he'll walk your d—d legs off.'"[1] Chief among the worthies would be North of Hamilton, whose other and more affectionate name was "Old Greek." Of him a graduate wrote, "Professor North, I love you because you inspired in me a desire to do my best and to realize in my life what God has made possible."[2] Of course, too, a place would be had for Garman of Amherst. Of Garman Principal Stearns of Andover has written:

> To him hundreds of Amherst men owe the best inspiration of their lives. Those who have enjoyed the privilege of sitting as disciples at his feet realize as none others can what a rare privilege has been theirs. He taught us the beauty of truth. Through him the spiritual world was brought near and its glory revealed. He made us feel the presence of the Divine within us, and he stirred as few men have been able to do within the hearts of his pupils the desire to serve. The wonderful influence he exerted over the minds and lives of his students was unique in the educational world. Sluggish minds were stimulated to activity; careless minds were taught the value of accuracy; indifference was changed to eager desire. To many an Amherst man the most sacred and cherished memory of college days will always be that morning hour in Walker Hall where intellect was quickened and ambition aroused.[3]

The interpreter also would not leave out Wright of Middlebury, who held higher hope for his students than they had for themselves. One of these students wrote to him saying, "I am trying to catch up with your ideals for me." In the list I should want to include from a wholly different zone Osler, the teacher of medical students in three universities, Jowett of Baliol, and Tholuck of Halle, a theologian gifted with wit and humor, and with paternal love for his students.

Yet as noble, as inspiring, as formative, as loved, and as loving as any other of the noble group is Edgar Fahs Smith. Of the fourteen provosts in the university I have known four: Pepper, the refounder, the inspiring teacher; Harrison, the watchful and insistent financier; Penniman, the present head, the faithful conservator and the broad-minded administrator; and Smith, whom Penniman succeeded, and of whom I now write in a way most personal.

On the campus of the University of Pennsylvania, within sight of a laboratory which he planned and in which he worked, stands a statue bearing this inscription:

[15] C. A. Reeds, "The Endless Caverns of the Shenandoah Valley" [Virginia]. New York, 1925.

[1] "The Autobiography of Nathaniel Southgate Shaler," p. 369.

[2] S. N. D. North, "Old Greek. A Memoir of Edward North with Selections from his Lectures," p. 138.

[3] Eliza Miner Garman, "Letters, Lectures and Addresses of Charles Edward Garman," p. 581.

EDGAR FAHS SMITH
Provost 1911–1920
Teacher Inventor Friend

The four words represent the four-square relation of his life. Each word, illuminating, represents either the service he gave, or the contribution he made, or the relations he held. I can not but believe, however, that the last word, Friend, is the more and most important.

The nine years of his provostship were perhaps the most trying of all the decades of his life. He accepted the great office and undertook its duties under the earnest persuasiveness of the board of trustees. He was reluctant to give up his daily and double work of teaching and of research. Technically, during his administrative period, he continued his professorship. The opportunities of the professorship were his life. He, however, accepted the provostship under the promise, as he understood, that he should have no responsibility for the financial relationships of the university. Especially did he insist that he should be free from any specific or implied duty of raising funds either for endowment or for meeting current expenses. For such undertakings his immediate predecessor, Harrison, had peculiar power. Hardly, however, had he been placed in the provostship when it became plain that the trustees were relying on him for important financial duties. He once said to me, with tears in his voice, "It almost killed me." Possibly one might soberly say that the financial condition became a cause which ultimately contributed to his early death.

Of course one might add that Smith should have known! For he is not the first of college presidents who has learned that honest and high-purposing boards of college trustees allow themselves to give happy promises of immunity from specific labors in financial administration to a newly elected president, promises which it seems later so easy to forget or to neglect.

Yet it is as teacher, as investigator and as friend that, as declares the monument, the personality is most beautiful and preeminent. This trinity of great forces and qualities are wonderfully joined together in a noble unity of personality. Edgar Smith's service as teacher opened the door to friendships, and the friendships ministered unto his work as a teacher. His teaching, too, was constantly reinforced by his researches, and his teaching contributed certain human impulses unto his investigations. His work was indeed a unity, as his personality was a unit. Too many teachers make their teaching and their personality independent parts of their one character. Such divisions or subdivisions are, or at least should be, impossible.

But to these three constructive elements are to be added—and the addition could have fittingly been written on his monument—his service as a writer. For his books, biographical and theoretical, were the normal expression of the studies of the laboratory and of the library. Their number is indeed colossal, and their variety nothing less than immense.

This is not the place to give in detail the contributions which he made, through writing and research, to chemistry organic, inorganic, analytical, electro and historical. To name even the investigations, the experiments, the discoveries, would bear both the writer and the reader too far afield. Perhaps the most important contributions were those devoted to electrochemistry,

> . . . a domain in which he was a pioneer and soon became a recognized leader of international reputation. In the hands of this master craftsman, the electric current became a tool of undreamed usefulness and possibilities, opening up wholly new methods of analysis, separation and determination. About half of all the research papers he published were based upon new applications of the electric current. His introduction of the rotating anode together with the employment of currents of high amperage and high voltage marked a new epoch in the development of electroanalysis. His books on electrochemistry quickly became and have since remained the standard texts in this country, while the Harrison Laboratory was soon known throughout the world for its leadership in this branch of chemistry.[4]

His biographies of chemists, too, numbered more than a score, and his interpretations of chemistry historical and theoretical almost an equal number.[5]

To the scholar even, and to one who is not a scholar,

[4] SCIENCE, May 31, 1929, p. 560.

[5] Separate books, brochures or articles have been published by him concerning the following chemists: Theodore G. Wormley, Jr. (1897); Robert Empie Rogers (1905); George F. Barker (1907); Fairman Rogers (1909); Robert Hare, an American chemist (1917); James Woodhouse (1918); James Cutbush (1919); Franklin Bache (1922); James Curtis Booth (1922); Samuel Latham Mitchill (1922); Charles Baskerville (1923); Martin Hans Boye (1924); John Griscom (1925); James Blythe Rogers (1927); Priestley in America (1920); Priestleyana (1922) and the Priestley Medal Lecture (1926). More general treatises, written wholly or largely from the historical point of view, were: "Chemistry in America" (1914), "Men of Science from the Keystone State" (1914), "Chemistry in Old Philadelphia" (1918), "The American Spirit in Chemistry" (1919), "Progress of Chemistry" (1921), "Our Science" (1922), "A Half Century of Mineral Chemistry in America, 1876–1926" (1926); "Observations on Teaching the History of Chemistry" (1926), "Early Science in Philadelphia" (1926), "Fragments Relating to the History of Chemistry in America" (1926), "A Look Backward" (1927), "A Glance at the Early Organic Chemistry of America" (1927) and "Old Chemistries" (1927). SCIENCE, May 31, 1929, p. 564.

it is inevitable that the thought and heart turn to Smith as a friend. For as a friend I knew and loved him. As an adopted son of the University of Pennsylvania I join with tens of thousands of the real sons of Alma Mater in declaring that he was chief among our dearest. Toward him one has the feeling which an American soldier declared in saying that he went to France for flag and for country, but that he went over the top for mother. For Smith helped his students to carry chemistry into life. Its methods were life's methods, its principles life's principles, its prophecies, its rewards prophetic of life's happiness. To his students he was at once a father and an elder brother. Their sorrows were his sorrows, their triumphs his triumphs, their achievements gave to him a sense of glory, with their slowness of advance or their rapid progress he sympathized, and in the rapidity and height of their advancements he rejoiced. His simplicity, his altruism, his sense of reality, his sturdy honesty, the depth of his thoughtfulness, the breadth of his tolerance, his vision of ideals, inspired, quickened, moved his students. His devotion to them was structural and formative in manhood. He was their friend. He wrote, as a last sentence to his interpretation of Wetherill, "He was one of those Golden Natures who help us form Ideals of Life." The sentence itself we have a right to think of as autobiographic.

OBITUARY

MEMORIALS

THE Edgar Fahs Smith Memorial Collection in the History of Chemistry, which was presented to the University of Pennsylvania two years ago, has been endowed by Mrs. Edgar F. Smith. The collection has been placed in the Harrison Laboratory of Chemistry, and comprises rare books in chemistry, portrait prints and engravings, manuscripts and autograph letters. A catalogue is in course of preparation and will shortly be available for distribution. Miss Eva V. Armstrong, who was formerly Dr. Smith's secretary, has been appointed curator.

A PORTRAIT of Dr. William Stewart Halsted, until his death in 1922 professor of surgery in the Johns Hopkins University, painted by Mr. Casilear Cole, has been presented by Dr. Halsted's family to the Duke University School of Medicine and Hospital. One of the surgical wards of the Duke Hospital is named Halsted Hall.

A BUST of Carl Friedrich Gauss, the distinguished mathematician and physicist, has been placed in the Massachusetts Institute of Technology in memory of his great-grandson, Carl Friedrich Gauss, an alumnus of the institute in the class of 1900. The bust, originally sent by the German Government to the Chicago World's Fair in 1893, was recently presented to the institute by the mother, sister and brother of the late Mr. Gauss.

A TRUST fund for botanical research has been established at the University of Minnesota as the result of a request made by the late Dr. J. Arthur Harris a year ago on his death-bed. He asked that nothing be spent on flowers for his funeral, but that the money be put into a trust fund for research in botany. The fund, contributed by university staff members and others, now amounts to $1,066. Dr. Harris was head of the department of botany of the University of Minnesota and was also connected with the Agricultural Experiment Station. He was an authority on biometrics, and one of the four authors of "The Measurement of Man," a study in that field adopted by the Scientific Book Club last summer.

RECENT DEATHS

DR. JOHN HENRY COMSTOCK, emeritus professor of entomology at Cornell University, died at Ithaca on March 20, after a prolonged illness. He was eighty-two years old. Mrs. Comstock, also professor emeritus at Cornell University, died last year.

CAPTAIN HENRY MARTYN PAUL, assistant astronomer at the Naval Observatory from 1875 to 1880 and from 1883 to 1897, professor of mathematics in the U. S. Navy from 1897 to 1913, died on March 15, at the age of eighty years.

DR. EDWARD VERNON HOWELL, founder of the School of Pharmacy of the University of North Carolina, and dean for thirty-three years, died on February 14, at the age of fifty-nine years.

FRANK M. DORSEY, formerly chief of the development division, Chemical Warfare Service, died on February 10, at the age of fifty-two years.

THE death is announced at the age of forty-six years of Dr. Paul Trendelenburg, professor of pharmacology and director of the Berlin Pharmacologic Institute.

PROFESSOR ENRICO SERENI, head of the department of physiology at the Naples Zoological Station, died suddenly on March 1. He was thirty-one years old.

Nature reports the death of Mr. J. D. H. Dickson, senior fellow of Peterhouse and author of numerous papers on thermodynamics and thermoelectricity, on February 6, aged eighty-one years; of Mr. D. T. Jones, chairman of the Fishery Board for Scotland, on February 4, aged sixty-five years, and of Dr. Albert Schamelhout, secretary of the International Pharmaceutical Federation, on January 20, aged sixty years.