

SUPREME SURGEON

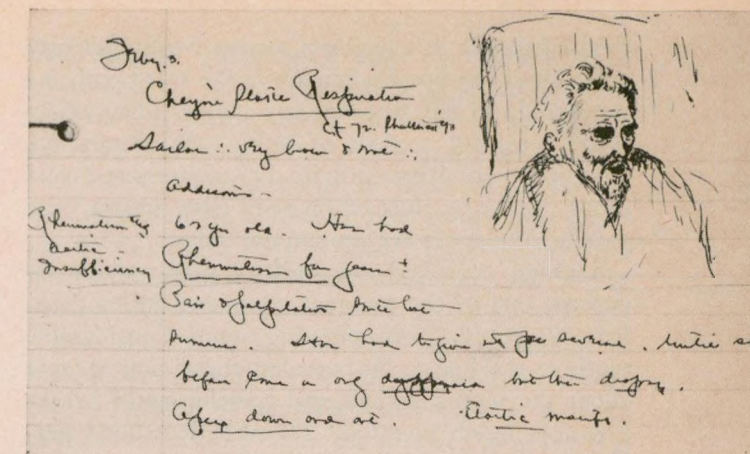
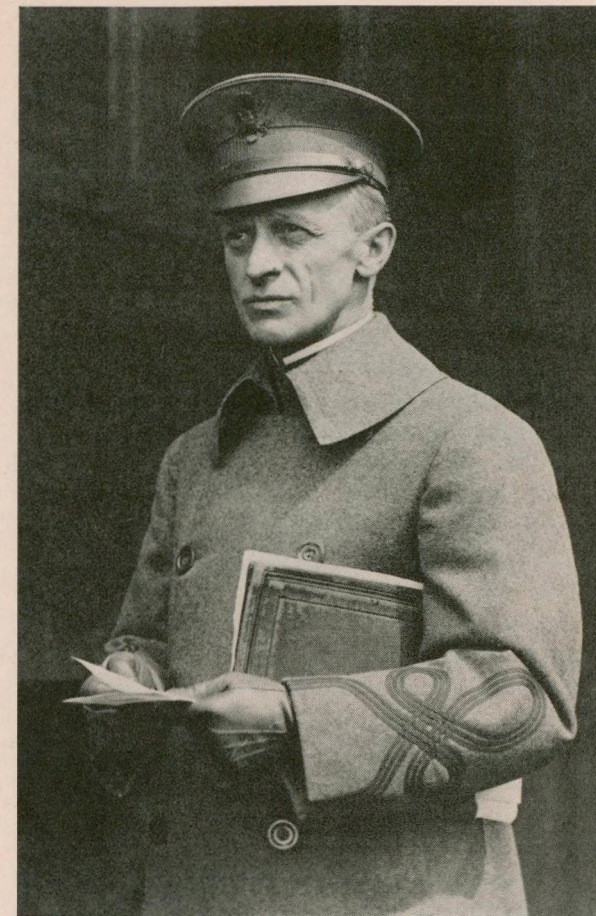
▪ Around the turn of the century the brain was a wilderness of tangled nerve fibers, a mysterious region just beginning to be explored. A few daring surgeons performed brain operations but most of their patients died. In 1901 the brilliant young Harvey Williams Cushing penetrated the neuron jungle and in some 30 years perfected the techniques of neurosurgery. ▪ He also won worldwide acclaim as a pioneer endocrinologist, an outstanding physician and teacher, a humanist of unusual literary gifts. Generally agreed

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Opposite, Yale University's class of 1891 freshman baseball team of which young Harvey Cushing (front row center) was a member. Below, he is seen during World War I. When war was declared he organized a unit of medical volunteers from Harvard to aid the British Expeditionary Corps in France early in 1915.



Extract from one of his case histories, with his sketch of the patient, a sailor with suspected Addison's disease, dropsy, aortic insufficiency, arteriosclerosis, rheumatism. A diligent recorder of his cases, Dr. Cushing originated the anesthesia records in common use today; he also sketched patients frequently on his own records.

is that he was one of the greatest medical figures the United States ever produced.

BEGINNINGS. The fourth in a direct line of a family of physicians, he was born in Cleveland a century ago on April 8, 1869, his forebears having moved west from Massachusetts in search of a less severe climate. His father, an aloof and reticent man, was devoted to medicine; he had an enormous general practice in mushrooming Cleveland that kept him busy night and day. His mother was well-educated, vivacious, sociable, goodhumoredly served as both father and mother to the brood of ten children; she gave loving companionship and advice, helped with homework, read bedtime stories, supervised prayers, used the back of the hairbrush when required.

Harvey, the youngest child, was an indifferent student with a reputation as the worst speller in school.* To his father's displeasure he excelled in sports and dancing; he also was mischievous, witty and extremely popular with boys and girls.

He occasionally accompanied his distinguished father to Cleveland's Case Library; the elder Cushing entered the section reserved for a select group of physicians and immediately buried himself in the latest copy of *Lancet*, while Harvey sat at the window staring at the activities in the public square outside.

An important influence was his high school phys-

ics instructor who launched a special course in manual training for a group of well-to-do youngsters who were bored in school; the boys eagerly threw themselves into carpentry, mechanical drawing, metalwork, learned the dignity of labor and an appreciation of work for its own sake. In the summer he took the same group on fishing trips on the Great Lakes, set up a camp on an island where they built their own cabin, surveyed and mapped the terrain, hunted, fished, cooked their own food. As the future Dr. Cushing put it later: "He taught us about being independent and made us so by the duties he inflicted upon us during those summer vacations."

Harvey graduated from high school as president of his class; but he disappointed his father by finishing eleventh in a class of 83, and this only after a Herculean cramming effort aided by his mother.

At 18 he entered Yale still far more fun-loving than studious: he confessed to having visited the Yale library only once in four years, but was troubled by his father's letters of stern disapproval of most of his activities.

Influenced by his teacher of physiologic chemistry, the great Russell H. Chittenden, he thought briefly of majoring in chemistry. But because of a gift for drawing, he gave more thought to studying architecture and then opening an office in New York with one of his classmates. Discussions with his family and meetings with prominent physicians

dispelled these ideas, and following the example of his elder brother, Edward, he entered Harvard Medical School in 1891 at 22.

AWAKENING. Intense interest in medicine began in the anatomy class; he was fascinated by the perfection of the human body and its intricate structure. His facility in using a scalpel and handling delicate tissues soon proved so extraordinary that classmates and teachers came in groups to watch him. Shortly thereafter he wrote a letter to his father that changed forever their strained relationship; he told him that thenceforth he would forgo social activities and concentrate entirely on his work, adding that he intended to lead the class.*

Now his father began to write him as man to man, and Harvey no longer feared to ask the senior Cushing for money; for the first time funds arrived

*He came in second, after Elliot Procter Joslin, later the authority on diabetes.

freely without an accompanying lecture on the virtues of thrift.

A profoundly affecting incident occurred when he was a third year student doing clinical work at the Massachusetts General Hospital. His later terse description tells as much about medicine in his day as it does about Cushing: "I was called down from the seats and sent into a little side room with a patient and an orderly and told to put the patient to sleep. . . . I knew nothing about the patient whatsoever. . . . I proceeded as best I could under the orderly's directions, and in view of the repeated urgent calls for the patient from the amphitheatre, it seemed to be an interminable time for the old man, who kept gagging, to go to sleep. . . . Just as the operation was started there was a sudden great gush of fluid from the patient's mouth, most of which was inhaled, and he died. . . . No one paid the slightest attention to me although I supposed that I had killed the patient. . . . To my perfect amazement I was told it was nothing at all, that I had nothing to do with the man's death, that he had a strangulated hernia and had been vomiting all night anyway, and that sort of thing happened frequently and I had better forget it and go on with the medical school. I went on with the medical school but I have never forgotten about it."

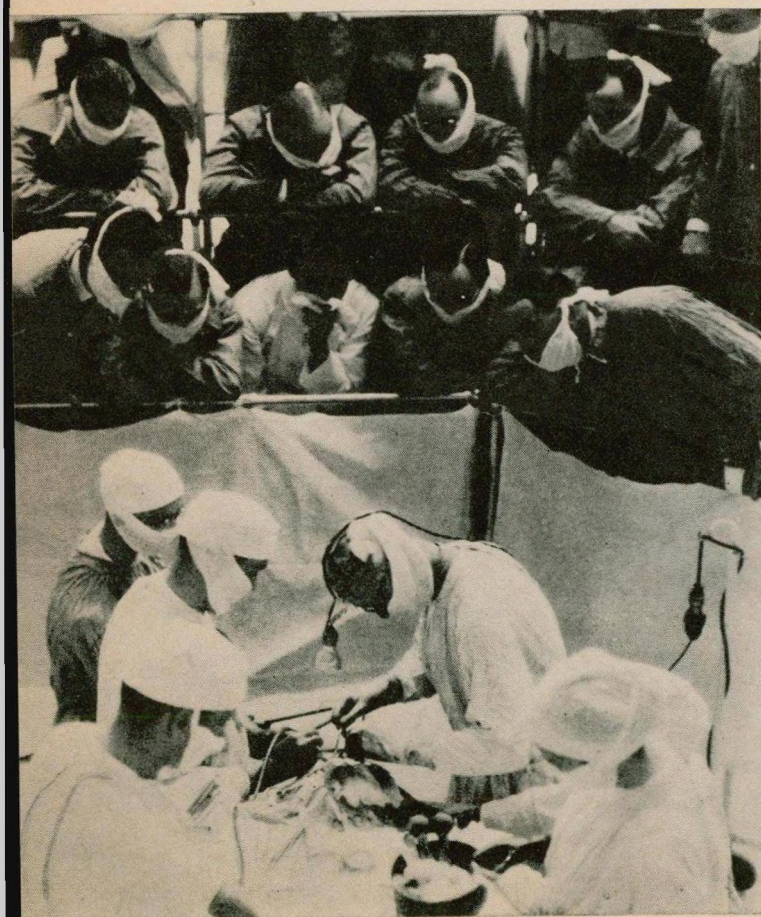
As an intern at Massachusetts General in 1895, he and his friend Amory Codman competed to see who could give the most efficient anesthetic, the ultimate

*As an adult he still wrote "privaledge" and "definate."

goal being one in which the patient was sufficiently conscious to respond when left in the ward with the nurse and did not subsequently vomit. They began making careful records of pulse rate, respiration, comments on drugs previously administered, and other vital data; thus originated "ether charts," the anesthetic records in common use today.

Cushing criticized the work of many of his superiors; one of the pungent comments in his diary for 1896 reads: "Not operating much. Considerable sepsis in the house. No wonder, these men operate about the way a commercial traveler grabs breakfast at a lunch counter." He also demanded perfection from his juniors, drove them as severely as he drove himself. Only his patients and old friends saw the charm and warmth which formerly had endeared him to everyone; he was launched in the life of scientific asceticism which was to become his hallmark.

OPPORTUNITY. In 1896 Cushing went to Johns Hopkins hospital as junior assistant to William S. Halsted, America's foremost surgeon. Still at the helm in the first decade of its existence were the brilliant creators of the medical school: William H. Welch, pathology; Howard Kelly, gynecology; William Osler, internal medicine; Halsted, surgery.



Accustomed to the hubbub at Massachusetts General and the rapid turnover of patients, Cushing at first was puzzled by the quiet humanistic atmosphere at Johns Hopkins. Trained to complete an operation in 20 minutes, he was shaken when his first patient had not come down from Halsted's operating room for more than four hours and prepared a hypodermic of a powerful stimulant; to his surprise, the patient was in better condition than any he had seen formerly. This was his introduction to the painstaking methods developed by Halsted: the careful ligation of each blood vessel, the meticulous effort to keep the tissues from drying, the matching of each wrinkle in the closure of the skin. Halsted also developed such refinements as the use of rubber gloves and fine silk, all of which Cushing later passed on to his own numerous pupils.

Although Cushing later came to appreciate fully Halsted's genius, during four years on his service he was impatient with his chief's vagueness and shy ways. Because of Halsted's chronic ill health and his recognition of Cushing's ability, he increasingly left the young surgeon in charge of the service, about which Cushing wrote this typical letter home: "We have had two very hard days—operations and operations, from ten in the morning till half past seven. . . . People don't know what it means. Here I am a youth doing surgical work that not one of my school confreres will hope to do for years. It frightens me sometimes. The Chief rarely operates. Today I did all his private cases. Everybody seems to do well, however. . . . I hardly dare speak of it lest some day may come a fall."

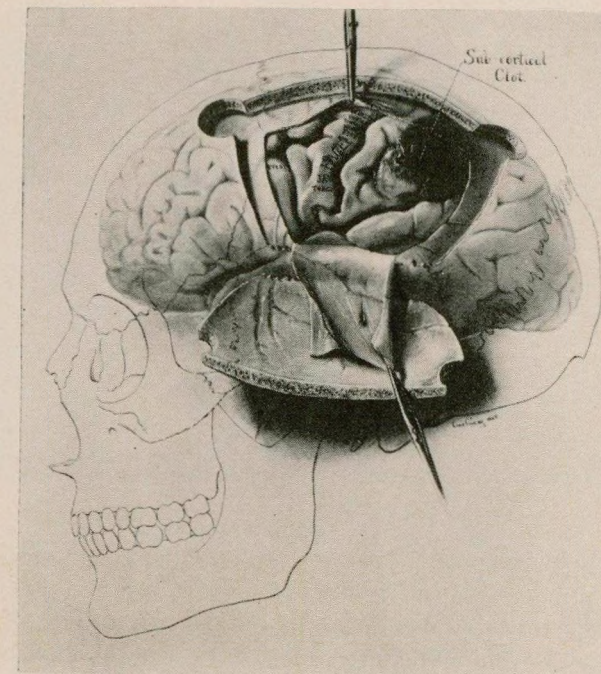
Cushing did not know at the time that what he called his Chief's unprofessional behavior was due to Halsted's agonized efforts, finally successful, to overcome an addiction to cocaine developed while perfecting the drug as a local anesthetic.

Cushing forged a lifelong bond with William Osler whose kindly openhearted nature was like a magnet to the tense, hard-driving young surgeon. When Cushing's temper had alienated him from most of his colleagues, only Osler was able to insist that he must learn to get on with his co-workers. Osler also inspired him to read and write medical history as relaxation from the rigors of his professional life; taught him how to polish his prose style through practice and wide reading; and made a

Dr. Cushing performing surgery. After World War I he resumed as professor of surgery at Harvard Medical School and as surgeon-in-chief at Peter Bent Brigham Hospital. Opposite, a drawing by him with his note: "Case II: sketch showing field of operation: wound in dura & brain with sub-cortical clot: excito-motor area."

passionate bibliophile out of him. With Osler's encouragement, he wrote lively essays on Haller, Vesalius, Sir Samuel Garth, the 17th century physician-poet.

The story of Vesalius, his precocious youth, his impetuous twenties, his death at 54, was to fascinate Cushing until the end of his days. It was to lead him into bookstores, libraries and museums for the



next 40 years. In later life, Cushing's library of editions of Vesalius became the largest individual collection in the world.

While working in general surgery, Cushing made noteworthy experimental studies of the production of gallstones, the bacteriology of the alimentary canal and in the Gasserian ganglion resection for the relief of trigeminal neuralgia.

Now fascinated by the field of the nervous system, he went abroad to study, first with the great surgeon Theodor Kocher in Bern, then with pioneer neurologist Charles Sherrington in Liverpool. In Bern, after working for about a year on the problem of physiologic relationships of intracranial tension, he concluded that the systemic blood pressure rises as the result of a dangerous increase in intracranial pressure; this and related studies led to his introduction of the use of blood pressure determination in the United States in 1901.

NEUROSURGEON. When he asked Halsted to create for him a post as neurosurgeon in the clinic, his former chief recommended instead that he take up the relatively new specialty of orthopedic surgery,

since so few neurosurgical cases were amenable to treatment. He reminded Cushing of the tragic record: for the decade before 1901, ante-mortem diagnosis of brain tumor had been made in only 32 cases of 36,000 admissions; of these only two had been operated on, both with fatal results. But Cushing persisted and Halsted finally gave in, although most of Cushing's work for some time was still in general surgery.

Not only were patients reluctant to submit to brain operations, but few physicians could recognize symptoms of neurologic disturbance. As soon as possible Cushing began the practice of publishing his results (although they usually were negative at first) and thus alerted physicians to watch for possible neurologic conditions.

Because his early efforts so often ended fatally, Halsted is supposed to have commented that he did not know whether to say "Poor Cushing's patients" or "Cushing's poor patients." But gradually more and more successes appeared: patients were saved who had been facing certain death, and others who had resigned themselves to a lifetime of constant pain were cured. His fame spread until, as he put it, "contrary to all expectations, neurologic cases began to accumulate in such numbers as to guarantee a living."

He worked under tremendous tension, allowed no conversation while he scrubbed up, insisted on absolute quiet in the operating room. One colleague said he felt that each operation was a fierce battle between Cushing and the forces of death, and was deeply moved by the experience. Others were moved to tears or curses by Cushing's caustic remarks and complete lack of tolerance of the slightest failing on the part of aides; once he rapped an assistant's knuckles to get them out of the way, another time he hissed to a new resident who tried to cut a thread with his left hand: "For God's sake use your right—you're clumsy enough with that."

After an operation, which usually took from four to eight hours, Cushing would not allow the patient to be moved from the recovery room for more than a day. When the intern and nurse finally took over, he called frequently from his home for detailed reports, even at midnight or in the early hours of morning. He was tireless in his personal attention and generosity to his patients and their families, and they idolized him, as did aides fortunate enough to escape his wrath. Many remarked on his human qualities which characterized his relations with patients, particularly the indigent.

A colleague of this period recollected: "Consider this man Cushing—thin, medium-sized, muscular, chiseled features, snapping eyes, quick thinking, quick acting, short-tempered, nervous, charming,

sarcastic, inconsiderate, lovable, selfish, domineering, demanding; he had a penetrating mind, stupendous ability and there was nothing he could not do and do well, once he decided to have a go at it."

He established an experimental surgery laboratory (named for John Hunter) and developed a celebrated teaching course in surgical anatomy, using animals as subjects. Although his teaching methods were as icily perfectionistic as his operative techniques (he never unbent, never spiced his lectures with humor) his course was the most popular in the medical school.

In 1902 he married his childhood sweetheart, Katharine Stone Crowell of Cleveland; they lived in the house next door to the Oslers, to which, with other intimate friends, they had their own keys for informal visiting. There Cushing melted into his old cheery self, to the point where another visitor once remarked: "I wonder if two adjacent houses, with a couple of boards knocked out of the intervening backyard fence... can ever, before or since, have sheltered such a pair of congenial geniuses, so useful, hard-working, stimulated, informative, Vesaliolatrious, exuberant and witty..."

Kate Cushing presided over her household with grace, charm and good humor, exactly as Harvey's mother had presided over hers; the two women were remarkably similar in temperament, and Harvey was now in most ways a duplicate of his father. Kate shielded her brilliant husband from domestic problems and social commitments, accepted the fact that medicine was his first love. She was counselor and confidante to their five children, explained as best she could their father's constant preoccupation. That she was not always successful is apparent in a typical letter to him from their youngest, Barbara (now Mrs. William Paley), written when she was about nine years old: "Dear papa stay home with me. and Don't go earning money. We'll just do Something funny. I'll give you my Pennies. and I'll give you my shiny Buckle. I'll arrange all for you."

Around 1908, after making many important contributions, including development of the subtemporal decompressive operation and new techniques for improving hemostasis, he became fascinated with the role of the pituitary, which was then a complete mystery. He studied the gland from every angle: physiology, pathology, clinical, surgical; in 1912 he incorporated the results into the epoch-making *The Pituitary Body and Its Disorders*, which revealed for the first time the part that hormones play in growth and in distortions of face and body.

Until his work appeared few surgeons dared to attempt a pituitary operation, but Cushing's detailed and honest accounts of surgery in 50 cases gave



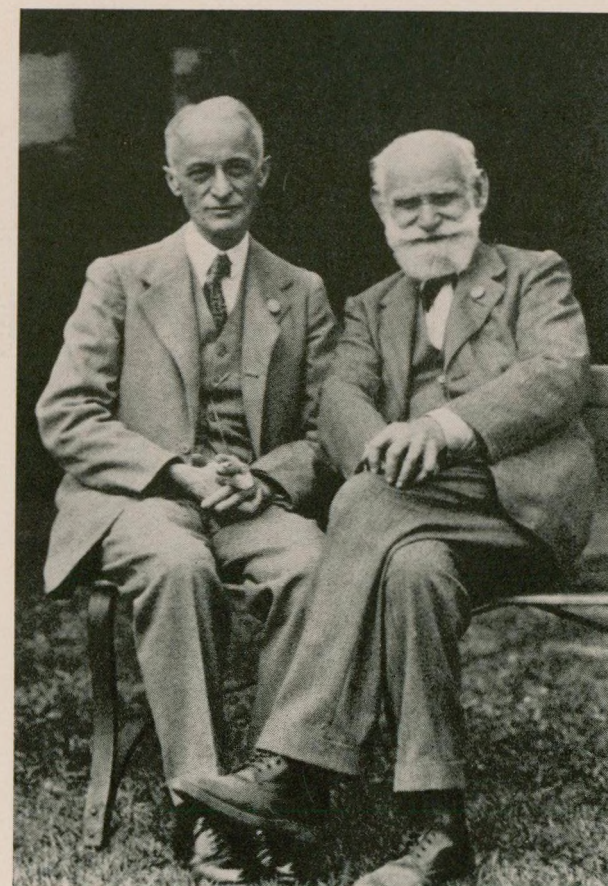
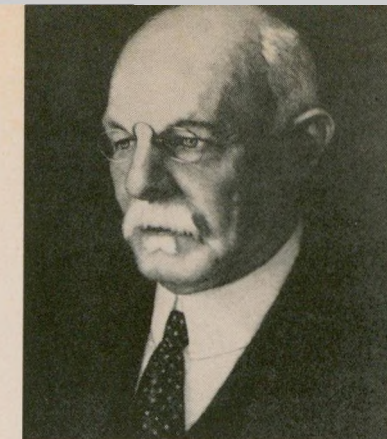
confidence to other surgeons throughout the world. In his first case he approached the pituitary through the frontal sinuses, but later found two disadvantages in this approach: one was that as the sinuses were often infected, opening the cranial cavity could lead to meningitis; the other was that it left a cyclopean scar, particularly revolting to women. He then developed the safer and invisible trans-sphenoidal approach, elevating the upper lip and approaching the sphenoidal bone by a submucous dissection of the nasal mucous membrane. He used a more formidable procedure for marked intercranial extension of the pituitary tumor, involving a large bone flap as in any other brain tumor.

He labeled the gland "the conductor of the endocrine orchestra"; in one of his last major contributions to clinical medicine in 1932 was a description of a new clinical entity, pituitary basophilism, now known eponymically as Cushing's disease.

THE WAR. Cushing had just been appointed professor of surgery at Harvard Medical School and surgeon-in-chief at the splendid new Peter Bent Brigham Hospital in Boston when World War I broke out. At once he organized a unit of medical volunteers from Harvard which became part of the British Expeditionary Corps. In 1917 he was appointed director of United States Base Hospital No. 5 in France, then became senior consultant in neurologic surgery for the American Expeditionary

Force. At war's end he held the rank of colonel in the Medical Corps.

Opposite: Dr. Cushing, in France in 1931, poses with Sir Charles Sherrington, at his right, co-winner of the 1932 Nobel Prize in physiology and medicine for discoveries regarding the function of the neuron, with whom he studied, and Dr. William Welch, at his left, great pathologist and a founder of the Johns Hopkins Medical School where Cushing taught from 1896 to 1912. Below, he visits in 1929 with Prof. Ivan Pavlov, Russian experimental psychologist. Dr. William Halsted, right, America's foremost surgeon of his time, trained Cushing in his own painstaking methods of surgery while he was his assistant.



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Despite bitter criticism, Cushing refused to rush cases through and continued his slow, painstaking approach to brain surgery. While some men died in his anteroom, he insisted that "one job well done was worth two half-alive;" he reduced the general mortality in serious wounds penetrating the brain by nearly half in the series of cases which came to him. Sometimes he operated from eight one morning until past two the next morning after which, as always, he made a complete record with drawings of the operative field. He also kept a million-word diary of the war, augmented by his own maps

and photographs. In the diary, parts of which were published in 1936 under the title *From a Surgeon's Journal*, Cushing wrote vividly of larks singing while the cannons roared; of bulls tearing down clotheslines; of battles, operations, the patience of men with horrible wounds.

Toward the end of a particularly harrowing day in August, 1917, word came to him that Osler's son Revere was seriously wounded in a nearby casualty clearing station. He rushed to him in an ambulance, found him riddled by shrapnel in chest, abdomen, thigh. Although the case seemed hopeless, Cushing felt there was a bare chance and an operation was performed. He and Revere spoke briefly, then he wired an encouraging message to Osler in London. But Revere died the next morning and was buried in Flanders Field. Approximately a decade later Cushing's own firstborn son William was killed in an automobile accident; Cushing was in the middle of a brain operation at the time and could not reach him.

In the summer of 1918, during the battles around Château-Thierry, Cushing collapsed with what he diagnosed as the grippe, but which turned out to be peripheral neuritis. Blinded periodically, unable to stand, barely able to use his hands, he spent the last months of the war in a hospital, where he recorded his own crippling symptoms with his usual detachment. Still suffering from severe pains in the legs and some cardiac irregularity, he returned to the Peter Bent Brigham Hospital in 1919 to resume his career.

ZENITH. During his last 15 years at Harvard (from 1919 to 1933) Dr. Cushing's name became a household word; he was internationally famous as the most skilled and nimble of surgeons in the most delicate of all operations. He probably did more than any other person to dispel the fear of neurosurgery.

He concentrated on attacking brain tumors, studied every case himself and described vividly in numerous papers the syndrome which accompanies the growth of various tumors in the cranium and in the sella turcica. Cushing's low mortality rate

attracted young surgeons from all over the world.

In 1919, after Sir William's death, Lady Osler asked Cushing to write her husband's biography. The book which he thought would take one year took nearly five because of his thoroughness in research and careful polishing of style. He worked on it in the early mornings, evenings, Sundays and during vacations. The two-volume *Life of Sir William Osler* appeared in 1925, and in the following year it won the Pulitzer Prize for biography.

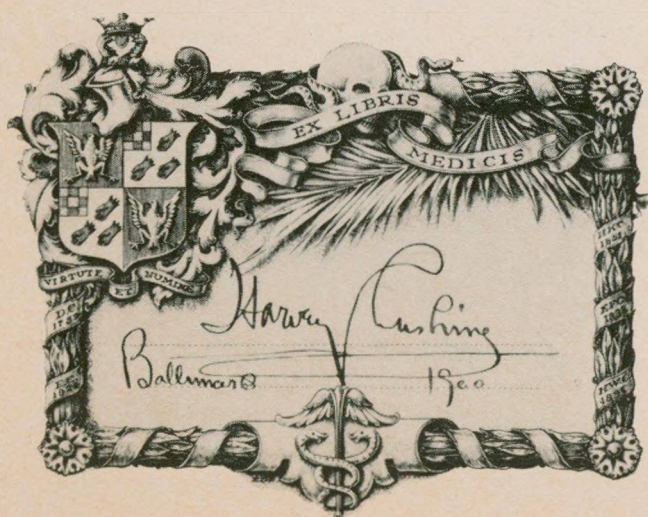
During this period of extreme pressure Cushing smoked about four packs of cigarettes a day, but varied his usual routine very little: he worked at home early in the morning and after a light breakfast arrived at the hospital about 8:30 full of energy, ready for his standard 11-hour day in hospital and clinic.

In charge of his research laboratory at this time was the brilliant young histologist named Percival Bailey, who had studied in Spain with Santiago Ramón y Cajal; his task was to make an orderly analysis of the hundreds of brain tumors that Cushing had amassed over the years. Cushing compiled Bailey's conclusions and his own into the famous monograph *Classification of the Gliomas*, that caused another international stir for its originality; he dedicated the work to "Professor S. Ramón y Cajal and to the disciples of his distinguished school of Spanish neurohistologists."

Other outstanding works included two more monographs with Bailey, *Tumors Arising from Blood-Vessels* (1928) and *Intracranial Tumors*, which surveyed the results in a series of 2000 patients with verified tumors; also *Meningiomas* (1938) with Dr. Louise Eisenhardt.

Altogether Cushing wrote 13 books and 330

Cushing's bookplate and signature. Inspired to take up bibliophilia by William Osler, his library of editions of Vesalius became world's largest individual collection.



scientific articles; he received 23 honorary doctorates in law, science, medicine, and was made an honorary member of 60 scientific societies. When he retired from Harvard at the mandatory age of 63, Dr. Welch called him the outstanding medical figure in the world. His operative results in that final year eclipsed all his previous achievements: mortality had dropped to five percent.

EVENING. Cushing once quipped to his wife: "We will spend our evening years on the back porch, ruminating on the past, knitting side by side." This was hardly the case: he became Sterling professor of neurology at Yale for five years, then director of studies in medical history. Mellowed at last, in his capacity as president of the Elizabethan Club of Yale (an undergraduate literary and social organization) he seldom missed taking tea at least twice a week with students.

He now had the time to prepare for publication the books, photographs, papers and other material on Vesalius that he had collected over some 30 years; in the winter of 1938-39 he worked out plans for a biobibliography of Vesalius which he outlined the following spring. For this work he drove his family out of the dining room and confiscated the large table, the sideboards and window ledges for his piles of data.

His pattern was to intersperse biographic material on Vesalius with detailed descriptions of his books in chronologic order. But illness plagued him: a gastric ulcer, poor circulation in the legs which required amputation of a gangrenous toe. The work was about two-thirds drafted when, on the evening of October 3, 1939, as he lifted a copy of the heavy second folio of Vesalius, he suffered a coronary occlusion and died four days later at the age of 70.

Services were held at the historic Center Congregational Church in New Haven where Cushing had received his A.B. degree 48 years earlier.

An autopsy showed no sign of atrophy in the brain, but perhaps in accord with an old medical superstition about physicians falling victim to their personalities, a small colloid cyst was found in the third ventricle. The coronary arteries were sclerosed and their lumina grossly reduced; a posterior branch was completely blocked. The apices of both lungs showed old scars, probably of tuberculous origin. Most remarkable finding was the complete occlusion of the femorals, in an old process which must have begun during his wartime service.

SUMMING UP. By Dr. Cushing himself (quoting from the Talmud): "The day is short and work is great. The reward is also great and the Master praises. It is not incumbent on thee to complete the work but thou must not therefore cease from it."

