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OF

JOSEPH SWEETMAN AMES

1864–1943

BY

HENRY CREW

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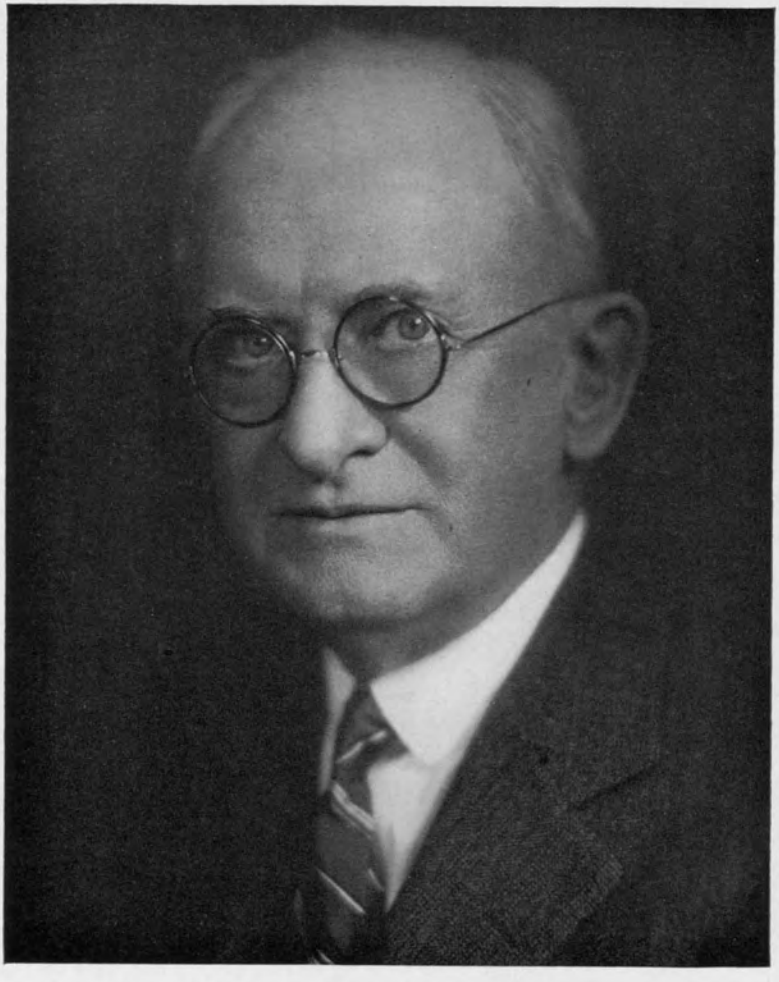

Joseph S. Amos

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There are times when a single act characterizes the entire life of a man. Such an occasion was the publication of his first scientific paper by Joseph S. Ames. He had just taken his bachelor's degree at Johns Hopkins University; was an assistant in the laboratory and was, at the same time, working toward a doctor's degree. On his way to those experimental results which later formed his doctor's dissertation, he had met for the first time the then recently invented concave grating. This remarkable instrument he mastered, in theory and in practice, so completely that he was invited by its inventor to describe, for the leading journal of physics, its construction, adjustment and use. This he did with such accuracy, clarity and completeness that this first paper soon became and remained, on both sides of the Atlantic, the standard guide for the Rowland mounting.

The outstanding features of this paper (*Phil. Mag. 27,* 369, 1889) are simplicity, logical sequence, accuracy, fine perspective; and these are also the outstanding features of Ames' life.

Two great English poets have taught us that the child is father to the man; a dictum which every man who has lived through two generations has verified for himself. It is therefore well worthwhile to follow the rather meagre record of this man's ancestry in order to discover, if possible, among his forebears and friends—for these latter are often one's most important ancestors—the origin of some of those qualities so highly cherished by men who knew him.

From the rather scanty data which Dr. Ames deposited with this Academy in 1926, one learns that both of his paternal grandparents were born in Vermont, while the maternal pair

came from the neighboring state of New York. The genealogy of the family is briefly set forth in following table:

Benjamin Ames of East Dorset, Vt. b. 1798—d. 1866 } married { Lydia Griffith of Danby, Vt. b. 1804—d. 1866

and had a son,
George L. Ames,
who lived in Manchester, Vt.
b. 1832—d. 1869.

Nathaniel Bacon of Ballston Spa, N. Y. b. 1802—d. 1869 } married { Jane S. Sweetman of Charlton, N. Y. b. 1801—d. 1841

and had a daughter,
Elizabeth L. Bacon,
who lived in Manchester, Vt.
later in Niles, Mich. and in
Faribault, Minn.
b. 1836—d. 1921.

In 1859, George L. Ames married Elizabeth L. Bacon. Their only child, Joseph Sweetman Ames, was born in Manchester, Vermont, on July 3, 1864.

The fact that his grandfather Ames was known "for his fair-mindedness," that he possessed an excellent library, and was a man of scholarly tastes, allows us no reason for surprise at the scholarly instincts of the grandson.

Still less are we surprised when we learn that his grandfather Bacon, a graduate of Union College, was a lawyer, judge and farmer, "devoted to travel and legal studies." Ames' mastery of clear and forcible English may not be unrelated to his grandmother Bacon's "marked literary ability." The father, Dr. George L. Ames, found his favorite study along the lines of botany and entomology: but was "a great reader, especially in history and biography and had an exceptionally good library." Having completed the course at the Louisville Medical School he began the practice of medicine at Niles, Michigan. His death in 1869 brought an irreparable loss to his young son. The lad, however, was fortunate in having an able mother, a woman who had inherited from her own mother definite literary tastes and was devoted to poetry; so that the boy was brought

up, as he says, "in an environment of books and among well educated people."

As indicating the manner in which the twig was bent, witness the following from his autobiographical memoranda:

"My father died when I was four years old and my only recollections of the period before I went to boarding school are those of ordinary boyish games. I remember, however, that when I was about twelve years old I was asked by a cousin what I was going to be when I grew up, and I replied 'A teacher of Mathematics!' This subject always appealed to me, and when I was eight years old, I could do such operations as square roots."

In 1872, the eight-year-old boy was sent to the Shattuck School in Faribault, Minn., because his mother was very favorably impressed with the personality of Bishop Whipple, who lived in Faribault and who was an outstanding pioneer in the Episcopal Church as well as one of the founders of the Shattuck School.

Two years later, in 1874, Mrs. Ames married the Rector of the school, Dr. James Dobbin, a graduate of Union College. A result was that here, in the invigorating atmosphere of southern Minnesota, and among its glacial hills, the young Ames spent the next nine years of his life. Here also he had all the social advantages (and disadvantages) of being at once in school and at home. Here too he had the privilege of training in a school which still respected the fundamentals. Here by a thorough study of the two basic languages of western civilization—the languages of Homer and Virgil—he acquired a rare mastery of clear and accurate English. The Shattuck Catalogue for 1866-7 shows that "The course of study covers six years, with Latin and Mathematics in each year, Greek and English in each year but one, and French and German each for two years." A footnote explains that "Declamations and compositions are required throughout the course." The present headmaster of the Shattuck School, Mr. Nuba A. Pletcher, writes me that on the walls of the building is a record of "the scholastic leaders of the school through all the years." "In that list," he says, "Joseph Ames stands as first boy of the school in 1879, '80, '81, '82, '83."

His friends of that period report him as "very reserved," "very smart," "knew all that was going on," was good company and possessed of a fine sense of humor. "In school," says Ames, "I was especially interested in Mathematics, Latin and Greek." It is easy to believe that these studies are to some extent responsible for the logical acumen and the fine sequence of thought so constantly exhibited during all his later life.

Just how the attention of this young man was first directed to Johns Hopkins University is not entirely clear; but there is good reason to believe that the initial incentive came from the following paragraph in a magazine article which fell under his eye in 1880. The writer of this article, in describing Johns Hopkins University and emphasizing its devotion to pure research, said: "It possesses no history, claims no distinguished sons, has, indeed, hardly reached the dignity of *alma mater*." In any event, Ames tells us very distinctly how, when once there, he entered upon the pursuit of physics. Following is one of the few paragraphs in his brief autobiographical memorandum:

"My reason for starting in with Physics when I came to the Johns Hopkins University was because I realized that here was an entirely new field of investigation and study, to which I had had no approach in school. I determined, therefore, to simply look at Physics as a part of a general education, but I soon became so interested in it and in the mathematical side of it that I determined to pursue it definitely."

As an undergraduate at Baltimore, he maintained the same reserve, the same quiet dignity, the same military bearing which had characterized his school life at Faribault. No student who sat in the same class with him ever failed to acquire a high respect for his native ability and quick wit. In conversation he was direct and incisive; candid with every one; confidential with none; an excellent listener withal. The dignified manner in which he wrestled with and conquered an impediment of speech heightened the regard of all his fellow students and, later, of his colleagues. A large part of all his undergraduate work—such, for example, as chemistry, hydrodynamics and

differential equations—was done in courses where the majority of the students were graduates of other institutions.

Along in the seventies and eighties of the last century, the custom of study in a foreign university had become so popular among graduate students in America that it was a veritable

J. S. AMES, STUDENT AT THE UNIVERSITY OF BERLIN, 1887.

craze. The fashion had been initiated by men such as B. A. Gould, Harvard '44, and Basil Gildersleeve, Princeton '49, who, at Göttingen and at Bonn, had left an honorable and long-lived tradition of American scholarship. At the time when Ames matriculated, there was, indeed, a "Johns Hopkins University Club" to which the sole requirement for admission was that the applicant had previously studied in some foreign university.

One evening in the spring of 1885 Ames, as a guest of the present writer, attended a *Kneipe* of this club, a highly amusing affair, where the program included the reading of a *Bier-zeitung,* the drinking of a *Bier-duell* and various songs from the *Kommers-buch.* The prestige of the German university was already beginning to decline; but the dominant fashion had affected Ames much in the same manner as the rest of us. He wanted his foreign experience to be first hand. Accordingly, in the following summer, immediately after his graduation, he and the writer of this sketch took passage on the steamship *Anchoria,* a twelve-day boat of the Anchor Line. The ship was not more than two days out of New York when Ames knew all the more interesting men and women on the passenger list. Passionately fond of society, he was never a mere recipient; but always a contributor to any group in which he found himself. As a traveling companion, he was remarkable. Stepping off the train at Glasgow, Edinburgh, London or Paris, he had already mastered his Baedeker in such a thorough and characteristic fashion that he was instantly at home. This geographic familiarity never ceased to amaze his fellow traveler, who on a previous trip had acquired it only at considerable expense of time and energy. A short while in Paris was spent on French conversation.

At the end of the summer, Ames went, *via* Switzerland, to the University of Berlin where he spent the remainder of the academic year. Working in Helmholtz's laboratory, he there met those two kindred spirits, Arthur Gordon Webster and Michael I. Pupin. No three men ever possessed more distinct personalities than these; and yet they had in common a versatility, a largeness of heart, a breadth of view, and a respect for the unglossed facts which made them fast friends as long as they lived. The tradition of this trio lingered in Berlin much as that of Gould and Gildersleeve in Göttingen and Bonn. As one can imagine, Ames was, during this winter in Berlin, exactly in his element. For, in this well policed and orderly city, there were approximately five hundred American girls; some traveling with their families, some there for music, others for art, and all

learning the German language. His correspondence during this period shows how thoroughly Ames enjoyed swapping conversation with these young people.

Never fascinated by German methods, Ames returned to Baltimore in the summer of 1887; proceeded to do three excellent pieces of work in spectroscopy; and took his doctor's degree in 1890. From 1888 to 1891, he held an assistantship in Rowland's laboratory; and in 1891, he was invited to occupy the associate-professorship left vacant by the migration of Professor A. L. Kimball to Amherst College. Ames thus became the second man in the department and one upon whom Rowland relied and trusted absolutely, his *alter ego,* in fact. Promotion to a full professorship came in 1899. This chair he held for twenty-seven years, yielding it only to accept the provostship of the University in 1926.

Following the early and lamented death of Professor Rowland in 1901, Ames was, with the widest approval, chosen to succeed him as Director of the Physical Laboratory. These first eleven years after taking his doctor's degree were full of work; and by the turn of the century he had established his reputation as an inspiring teacher and as an expositor of the first order. During this same period, while Rowland was creating the modern science of spectroscopy, Ames was giving an elementary course in general physics [represented by his *Theory of Physics,* Harpers, 1897] and also a more advanced one, known as the Major Course, besides handling much of the administrative work of the department. It was in this same period that, on invitation of Dr. George E. Hale, he joined the editorial staff of *Astrophysical Journal.*

His interest in the history of physics awakened about this time, and led him to undertake the supervision of *Harpers Scientific Memoirs,* a series of twelve volumes in which are reprinted, with expository and biographical notes, a large number of fundamental researches in modern (not recent) physics. Four of these volumes were edited by Ames himself. Along this same historical and critical line is a paper on "The Mechanical Equivalent of Heat" which he presented to the *Congrès International*

de Physique (Paris: 1900.) Here, within some thirty pages, he gives an admirable appraisal of the methods employed and the results obtained by the best experimentalists up to the date of the congress. While not a skilful manipulator himself, Ames had surprising familiarity with the best that had been done and said in the laboratory. Accordingly he joined with his late colleague, Professor W. J. A. Bliss, in the production of *A Manual of Experiments in Physics* (American Book Co. 1896), an authoritative and widely used guide to sound laboratory practice.

As one might well expect, Ames was, along with Webster and Pupin, one of the prime movers, charter-members and, later president of the American Physical Society which was launched in New York City in the spring of 1899.

To this last decade of the nineteenth century belongs also one of the happiest events of Dr. Ames' entire life. For it was in the early nineties that he had the good fortune to meet, in a purely social way, Mrs. Mary B. Harrison, *née* Williams, at the home of Colonel David G. McIntosh in Towson, Maryland. She was the mother of three children; had been a widow for several years; was an excellent *raconteuse* and strikingly handsome. In her were combined all those fine qualities which we associate with good ancestry, with the old South, and with a keen sense of responsibility. They were married in St. Marks Church at Pikesville in 1899. The home which they built in Guilford, a mile or two north of the University, soon came to be, and ever remained, a happy spot for the entire family. One of his closest friends, Dr. J. B. Whitehead, a former student and a long-time colleague of Dr. Ames, writes: "I think that his married life and home atmosphere were to him the greatest things in his career; and that he fled to them for refuge often in a life which seems to me to have been even more of a struggle for him than for most of us." The desolation and loneliness which came with the death of Mrs. Ames in 1931, he bore with characteristic courage.

As indicated above, the first period of Dr. Ames' work covers the last decade of the nineteenth century. The second

period extends over the first quarter of the twentieth century and covers his teaching career. Following the death of Professor Rowland in 1901, the departmental strength was gradually increased by the appointment of such productive scholars as Dr. R. W. Wood, Dr. J. B. Whitehead, Dr. A. H. Pfund, Dr. J. C. Hubbard, Dr. K. F. Herzfeld and others.

Superposed upon teaching duties were numerous public addresses. Notably one on Relativity. Others were the course of Harris Lectures given at Northwestern University in February of 1913. These six popular addresses upon *The Constitution of Matter* (Houghton, Mifflin & Co.; 1913) were based largely upon the ideas of Sir J. J. Thomson concerning atomic structure and those of H. A. Lorentz concerning electrons. Delivered, as they were, upon the eve of Bohr's great work, they represent the utmost reach of human effort in solving the mysterious structure of matter *without the idea of the quantum and without the nucleus of Rutherford.* Eleven years later, from the same platform and upon the same topic, he gave a lecture—fascinating in its clarity—dealing with the enormous strides recently made in atomic structure.

The fairest appraisal of a teacher is probably that given by the top men in his classes. The following accurate pen-portrait of Ames, the teacher, was kindly written for this sketch by Dr. Richard T. Cox, one of his ablest students.

"Among Dr. Ames' qualities as a teacher probably the first to impress a student was the great respect in which he held science, especially his own science of physics. This respect combined with his native dignity to give his lecture room an air of some austerity. In his experimental demonstrations he avoided the spectacular; for students, he said, remember only the spectacle and forget the principle. To some young students who laughed at the odd gyrations of a piece of apparatus he said gravely, 'I may be deficient in humor, but I have never seen anything laughable in the laws of nature.' In the same way, in his expositions he avoided every show of cleverness and paradox. The laws of nature were to be understood not by being clever but by using Common Sense, words which he always pronounced as though he were at the same time writing them in capitals. Perhaps it was also a gesture of his respect

for physics that he kept to the old-fashioned custom of lecturing in a cutaway coat, even though he might have only a single student in a class.

"If this trait impressed itself first upon a student mainly by such singularities as these, and if perhaps some noticed these gestures and nothing more, to those who were his students for several years the impression became clearer and deeper and probably remained as their most lasting recollection of Dr. Ames. For it became plain to them that his respect for science was an attitude of spirit far transcending any outward sign. It was evident in his custom of never referring to himself as a physicist but, even when he was eminent in the profession, calling himself still a student of physics. It was clear also in the disdain in which he held the commercialization of science, though in its use for real human welfare he was always interested.

"He prepared his lectures with the greatest care and, although he gave the same cycle of courses for many years, he rewrote his notes in detail each time. But he never looked at a note while lecturing, and he discouraged his students from taking notes in the lecture room, for he wanted them to think rather than take dictation. Although he was himself a man of incisive mind and strong character, he did not expect his students to conform to any pattern of his own or any other. He kept himself free from narrowness, recognized the various talents and handicaps of others, and tried to help each to make the best of what abilities he had. When he talked with his students outside the lecture room, he dropped the greater part of his gravity, encouraged those who were depressed, and listened with good nature to those who were cocksure.

"He had a very wide and accurate knowledge of the literature of physics, and the number of researches of which he remembered the author and the year and place of publication was always a matter of wonder. The contribution he made to research in sharing this knowledge can not be calculated, but they deserve to be remembered. At length, however, the changes in physics were so many and came so fast that he decided he could no longer keep up with them. To others he seemed to be keeping up very well, but he acted on his own judgment. When he gave up his professorship, he called in all of his students and former students and distributed his whole physical library among them. So, generously and without complaint, he ended in his own way his years as a teacher of physics."

In the midst of the second period of Ames' career came the First World War. American intervention brought with it a

two-fold demand upon American men of science. One was to learn of the work already done in various fields bearing upon the war; the other was to offer France and England all possible assistance from our laboratories and scientific workers. It was with these ends in mind that Dr. Ames was invited, by the National Research Council, to head its Scientific Mission to France and England in the spring of 1917. Other members of the commission were Dr. George A. Hulett of Princeton, Dr. George K. Burgess of the Bureau of Standards, Dr. Harry F. Reid of Johns Hopkins, Dr. Richard P. Strong of Harvard and Dr. Linsly R. Williams of New York. The story of the mission and its results are charmingly told, by the leader, in the *Johns Hopkins Alumni Magazine* for November, 1917. A close friend and colleague, who lived and worked with Ames for forty years, Dr. J. B. Whitehead, writes that

". . . the background materials for his programme [in aeronautics] were acquired by his visits to England and France in World War I. He had intimate conferences with authoritative bodies and individuals in both countries, and I have been told that his report upon his return dwelt particularly upon those features of fighting planes which needed study and correction."

The appointment of Dr. Ames to be Provost of the University brought to a close this second period of his work in 1926. But this shift of emphasis was not allowed to interfere with an important joint undertaking with Professor F. D. Murnaghan. The volume on *Theoretical Mechanics* (Ginn & Co.) which these two gentlemen published in 1929 deals with the oldest branch of physics and with one which is fundamental to all the experimental sciences. Yet they treat it with such novelty, clarity and logical consistency as to give it place among the already classical works of Lagrange, Poisson, Thomson and Tait, Kirchhoff and Webster.

It was in this same year, 1929, that Ames had thrust upon him the difficult and uninviting presidency of an impecunious university, at the very moment when the nation was entering upon its deepest financial depression. Fortunately loyalty to his *alma mater* and to his own ideals gave him courage which knew

no limits. He was as ardent as was President Gilman in his advocacy of the early ideals of the university when men counted most, when methods and technique were secondary. The following paragraph is from a letter of congratulation which he received in June of 1929 from a fellow professor in another university:

"You are strong enough not to become drunken (as a smaller man might do) with the great power placed in your hands. Your sense of fairness and justice is so keen that you will always have the loyalty of your faculty. Your judgment is so sound that the trustees will not attempt to steer the ship from some point behind your back."

How well this prediction was fulfilled and how well his administrative duties were performed may be judged, perhaps, from an address presented him by his colleagues in 1933 when he completed his 50th year at the university. The last paragraph of their brief message reads as follows:

"In your progress from freshman to fellow, from professor to president—an office which it has been your lot to fill in most trying times—you have won and held from your colleagues in all departments, that respect and affectionate regard that prompts them now to wish you many more years of health and happiness and the continued enjoyment of the interests with which these past fifty years have been enriched."

Close friends and colleagues will recognize the following sentences from Professor George Boas as an accurate and penetrating appraisal of Ames as a university president:

"Among his outstanding qualities was a *great intuitive sense of human character.* He would sweep away all rules and regulations for the benefit of a man whose character he trusted. Bibliographies, national reputation, etc., were nil if the man in question was narrow-minded, uncultivated or ungentlemanly. He had no use for pedants, for people with bad manners or for bigots.

"His office door was always open to the youngest and newest member of the faculty as well as to the most famous and oldest. He had a healthy but imprudent contempt for his trustees and the alumni, which was of no help in raising money. In extenuation, it must be admitted that he received from his

trustees utterly inadequate support, (moral as well as financial). One outstanding reform was his abolition of professional athletics."

One who wishes to see the other side of the shield can find it in the perfectly frank after-dinner address which Dr. Ames gave before the American Association of University Professors at Duke University in December of 1929. He was speaking on the functions of trustees, president and faculty, and said:

"As to the trustees it is their absolute duty to accept any recommendation that comes to them from the faculty when proposed by the president. I don't see how any university can exist if this policy is not adhered to. . . . As for the president, his primary duty without any exception is to uphold the faculty. . . . I refer to tenure of office, freedom of speech, morale, all that goes to make up a faculty. This is his primary duty. . . . The primary purpose in life of a professor is to conduct his own investigations and lead his own scholarly life, and the more attention he can pay to that, the better it is for an institution."

If one recalls that evening in the spring of 1875, when Mr. Gilman, the newly chosen president of Johns Hopkins University, had just met the young Rowland of Troy and was strolling with him along the edge of the cliff at West Point, and presently offering him a professorship in the university about-to-be at Baltimore; if one recalls this event, I say, he will be interested in remembering also that, at that moment, the eleven-year-old lad in Shattuck School, out in Minnesota, was in the next twenty-five years to succeed Rowland in his chair of physics and at the end of another twenty-five years to succeed Gilman in the presidency of the University. Even more remarkable is the fact that, in each case, Ames was the conservator of his predecessor's ideals.

The retirement of President Ames was the outstanding feature of the Commencement Exercises, held in the Lyric Theater on the afternoon of June 11, 1935. His address to the graduating class upon *Freedom of Thought* was followed by a congratulatory address from the Board of Trustees. In this manner came to an end the third period in the life of this unselfish, straightforward, friend of every honest scholar.

Never since the early experiments of Langley in aerodynamics and the actual flight of the Wright brothers in 1903 has there been any doubt, in the minds of intelligent men, concerning the important rôle of the airplane either in civil life or in warfare. It was on the 3rd of March 1915, that the Congress of the United States established, as a war measure, the National Advisory Committee for Aeronautics. Dr. Ames was one of the original members. The Committee has always included a distinguished group of scholars such as Admiral D. W. Taylor, Professor W. F. Durand, Dr. George K. Burgess, Admiral William A. Moffet, Mr. Orville Wright, Mr. Charles A. Lindbergh, Dr. S. W. Stratton, Dr. C. D. Walcott, Dr. George W. Lewis, Professor Michael I. Pupin, and Professor W. C. Sabine.

No more authoritative account of Dr. Ames' aeronautical work can probably be found than the following minute adopted by this eminent committee on January 26, 1943, and kindly furnished to the present writer by Dr. W. F. Durand:

"During the twenty-four years which he served on the National Advisory Committee for Aeronautics, Dr. Ames probably contributed more than any other man to the development of the science of aeronautics in this country. One of the original members of the NACA appointed in 1915 by President Wilson, Dr. Ames served as Chairman of the Executive Committee of the NACA from 1919 to 1936, as Chairman of the main committee from 1927 to 1939, and at different times on more than twenty of its subcommittees. The patriotic and generous public-minded spirit with which Dr. Ames made his numerous contributions to the Committee is brought out by the fact that he served all these years without pay.

"The fact that few people know of Dr. Ames' many achievements and contributions is attributable to the quiet and modest way in which he conducted both his own affairs and those of the NACA. The success of his 'All Work and No Talk' policy, however, has not escaped the attention of the outstanding leaders of aeronautical science. Few men before their death have been so deservedly honored as was Dr. Ames. Shortly after his resignation as Chairman of the NACA in 1939, because of failing health, Dr. Ames was informed that the new NACA $16,000,000 aeronautical research laboratory at Moffet Field, California, was to be named the 'Ames Aeronautical Laboratory' in his honor. This laboratory, the second aeronauti-

cal research station of the NACA, now plays a vital role in the world-wide struggle for qualitative supremacy in aircraft.

. . . "Members of the Air Commands of the Army and Navy placed great faith in Dr. Ames and followed his inspiring leadership in the prosecution of aeronautical research directed to keeping America ahead of other nations in the design of airplanes. Among the signers of a testimonial resolution adopted at the October 19, 1939, meeting of the NACA, recognizing the great work of Dr. Ames were the following responsible chiefs of military aeronautics: Lt. General Henry H. Arnold, now Commanding General of the Army Air Forces; Lt. General George H. Brett, formerly Chief of Air Operations in the Southwest Pacific under General MacArthur and now Army air commander in the Caribbean area; and Vice Admiral John H. Towers, formerly chief of the Navy Bureau of Aeronautics and now Chief of Air Operations in the Pacific. This resolution stated:

" 'For over twenty years Dr. Ames has served as chairman of the National Advisory Committee for Aeronautics or as Chairman of its Executive Committee. His long service leaves upon the organization the indelible imprint of his character. He is not only a great scientist, he is a great man, and we are proud to have been associated with him.

" 'When aeronautical science was struggling to discover its fundamentals, his was the vision that saw the need for novel research facilities and for organized and sustained prosecution of scientific laboratory research. His was the professional courage that led the Committee along new scientific paths to important discoveries and contributions to progress that have placed the United States in the forefront of progressive nations in the development of aeronautics. His was the executive ability and farsighted policy of public service that, without seeking credit for himself or for the Committee, developed a research organization that holds the confidence of the governmental and industrial agencies concerned and commands the respect of the world. Withal Dr. Ames was an inspiring leader of men and a man beloved by all his colleagues because of his rare personal qualities.'

"Dr. Ames' scientific knowledge and professional attainments are exemplified by the fact for many years he was an outstanding physicist on the faculty of Johns Hopkins University and for the latter part of his career served as president of that great educational institution.

"Other public honors have come to Dr. Ames in spite of his

unassuming and modest ways. In 1923 he was invited to present the Wilbur Wright Memorial Lecture before the Royal Aeronautical Society of Great Britain.

"In 1935 he was presented the Langley Gold Medal for Aerodromics by Mr. Chief Justice Charles Evans Hughes, then Chancellor of the Smithsonian Institution, in recognition of the 'surpassing improvement of the performance, efficiency, and safety of American aircraft resulting from fundamental scientific research by the National Advisory Committee for Aeronautics under the leadership of Dr. Ames.'

"Much credit for the many outstanding accomplishments of the NACA must also be given to Dr. Ames, for it was under his courageous leadership that the foundation for the progress in airplane design now being realized was laid. In 1930 the NACA was awarded, by President Hoover, the Collier Trophy for having made, during the previous year, 'the greatest achievement in aviation' in the development of the NACA cowling.

"A glance at a group of modern airplanes on almost any American airport would bring into view many features developed by the Committee under the guidance of Dr. Ames. The famous NACA cowling for radial air-cooled engines, the NACA low-drag wing, the proper location of engines and nacelles in the wing of an airplane, the size and location of the control surfaces, the tricycle landing gear, and the general streamlining and contour of the modern airplane represent results of work done in the laboratories of the Committee.

"With the nation now involved in a global war in which air power is a dominant factor, the work done by Dr. Ames in improving the efficiency and performance of our aircraft over a period of more than twenty years is of inestimable value to his country."

It was in 1939, four years after retiring from the presidency of the University, that Dr. Ames resigned the chairmanship of the NACA. Only two years earlier he had suffered a stroke of paralysis which confined him to his home for the remainder of his days. This disaster he met unflinchingly, as indeed he had every other crisis of his life.

"His courage and high spirit" says his close friend, Dr. J. B. Whitehead, "were never seen more clearly than during his last illness when he was nearly helpless for months. I saw him often and he was always cheerful; although his progress was steadily downward, he always reported his condition as 'fair'."

His death came on Thursday, June 24, 1943. The funeral services—full Requiem Mass—were held on the following Saturday at the Mt. Calvary Protestant Episcopal Church in Baltimore—the church of which he was a vestryman. The burial was in St. Thomas Churchyard in Garrison Forest, near Pikesville, Maryland.

Much more important than any single piece of work was the influence which Dr. Ames exerted, through his warm human spirit and his high aims, upon his students, his colleagues, and all who learned to know him.

KEY TO ABBREVIATIONS USED IN BIBLIOGRAPHY

Amer. Jour. Chem. = American Journal of Chemistry.
Astrophys. Jour. = Astrophysical Journal.
Astron. and Astrophys. = Astronomy and Astrophysics.
Conserv. Rev. = Conservative Review.
Johns Hopkins Alumni Mag. = Johns Hopkins Alumni Magazine.
Johns Hopkins Univ. Cir. = Johns Hopkins University Circular.
Jour. Franklin Inst. = Journal, Franklin Institute.
Jour. Roy. Aero. Soc. = Journal, Royal Aeronautical Society.
N. A. C. A. = National Advisory Committee for Aeronautics.
New Ped. = The New Pedagogue.
Phil. Mag. = Philosophical Magazine.
School Sci. and Math. = School Science and Mathematics.
Trans. Amer. Inst. Min. Met. Eng. = Transactions, American Institute of Mining and Metallurgical Engineers.

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