Walter R. Johnson

WALTER R. JOHNSON.

WALTER ROGERS JOHNSON was born in Leominster, Mass., in 1794. His father, Luke Johnson, was a farmer of strong mind and decided character, and though but a youth at the breaking out of the Revolution, bore an active part in the struggle. His mother was only daughter of Rev. John Rodgers, first minister of Leominster, whose descent is traced in a direct line from Rev. John Rogers, the martyr of Smithfield.

Of these parents Walter was the only son, and the youngest of their three children. His mother died soon after his birth. He derived from his parents a robust physical constitution, intellectual vigor, and excellent moral endowments; and enjoyed through life, by hereditary right, the inestimable blessing of good health.

He early manifested a fondness for learning and a taste for books; and soon aspired to acquirements beyond the routine of the New England schools of the day. Of these, his assiduity soon enabled him to master the studies, and his local reputation for scholarship and manliness of character, procured him, while yet quite young, an invitation to teach a neighboring district school. While he fulfilled with punctuality the duties of his station, he lost no opportunity of making progress in his own studies, being stimulated by the prospect of securing by his own exertions the means of preparing for and pursuing the collegiate course which his father could not afford him. In 1814 he entered Groton Academy, completed his fitting for college within a year, and in 1815 entered Harvard University, as a freshman.

Here he maintained an unblemished character and a high position in his class. Continuing his earnest pursuit after knowledge, he applied himself to several studies not in the college course, including botany, chemistry, and some foreign languages. Under the necessity of supporting himself, and determined not to incur any avoidable pecuniary obligations, he spent his vacations in teaching in district schools. He graduated in Harvard in 1819, and, could he have followed his own inclination, would have remained in Cambridge to study law. He was however obliged to resolve to teach during two or three years, and accepted an

offer to become preceptor, as it was then called, of Framingham Academy.

Here he remained a year, laboring energetically in his vocation, and devoting his leisure hours to the sedulous study of law and belles lettres, at the end of which period he accepted a proposal to take charge of a small classical school in Salem, intended to prepare gentlemen's sons for college or business.

Mr. Johnson deeply appreciated and enjoyed the excellent society and rare literary advantages of his position at Salem, and he made good use of the improved opportunities which he found there for advancement in his knowledge of law, as also in science and general literature. He always considered intercourse with great minds a most powerful stimulus to his intellectual progress, and took great pleasure in his acquaintance with several eminent scientific men of Salem, including the venerable Nathaniel Bowditch. Under such influences, his predilections for the study of natural science received a new impulse, and he made large advances into its vast domains, subsequently the chief field of his labors and source of his reputation.

He was a ready writer, and a frequent contributor to the journals of the day, whose columns were always open to him. He occasionally wrote a sonnet or song, but most of his articles were of a grave and solid character. He excelled also in epistolary composition, and his letters were much valued by their recipients. His taste in literature was correct, and cultivated by study; and having a clear, sonorous, and flexible voice, and an excellent elocution, he loved oratory, and was successful in it. He was often desired to speak in public, and the anniversary of the Fourth of July especially, seldom failed to call forth from him either an oration or a poem.

Mr. Johnson had before this time become deeply interested in the cause of education, at large. It afforded, as he believed, the only sure foundation of a safe and prosperous republic; the only guarantee against poverty, crime, and anarchy. As this interest increased, he relaxed his attention to law, and bestowed more time upon an extended course of reading bearing upon the subject of education; undertaking to gather from the best works relating to it, from the time of Bacon to his own, whatever might with advantage be applied to the studies of American youth. The benefits derived from these investigations appeared in all the educational efforts of his after years, as teacher, essayist, lecturer, experimenter, and in preparation of text-books.

He remained in Salem but little more than a year, having been requested by the trustees of Germantown Academy, Penn., to become principal of that Institution, one of the most prominent in the state, originally endowed by it, and further enriched by private liberality. His acceptance of this offer was in part determined by a desire of more extended knowledge of the world; for hitherto he had never been outside of his native state.

The site of Germantown Academy was near the main street of Germantown, upon a lane leading away from it. The locality was salubrious and agreeable, and the buildings were surrounded by play-grounds and gardens, were substantial and respectable in appearance, sufficiently capacious, and included a library, philosophical and chemical apparatus, and comfortable dwellings for the principal and boarding scholars. Evidently nothing more was needed to make the institution equal to any in the middle or northern states in excellence or celebrity, except the appreciation of a liberal and vigorous system of instruction and discipline. A short time, however, sufficed to show Mr. Johnson, just come from the comparatively strict and thorough training of New England schools, that the public mind in Pennsylvania was far behind the age in the conception of what constituted a good education, and in appreciation of its value; and that, at least in the interior, far greater importance was attached to the development of soil and of animals, than of the minds of the young

Mr. Johnson was not long in perceiving that his principal field of labor here would be outside the walls of the Academy; and that to accomplish anything creditable to himself, or largely beneficial to his pupils or the cause of education at large, it would be indispensable to arouse the attention, convince the reason, and secure the co-operation of the trustees of the institution, and also of parents and guardians. A prevailing laxity of parental discipline and apathy on the subject of education, were among the discouraging obstacles to be surmounted, requiring long and patient effort, and for striving with which he had little taste or inclination. But he also discovered that he could count upon the sympathy and intelligent co-operation of many liberal and cultivated persons, both in attempts to introduce special improvements and in an endeavor to establish a common school system which should be commensurate with the wealth and influence of Pennsylvania.

In view of the wide field of effort which thus opened before

him, and of the manifest increase of the influence of his own wishes respecting the management of the seminary, he yielded, after some hesitation, to the wishes of the trustees, and continued at the head of the Academy after the expiration of the year for which he at first engaged. Under his management, the reputation and prosperity of the institution increased, and its classes were well filled. His own position became at the same time more pleasant, as he became better and more extensively known. His genial disposition found much to enjoy in the refined society to which he had access in Germantown and Philadelphia; he was invited to the well known "Wistar parties;" and his fondness for literature and science found much gratification from intercourse with the many men of eminence in those departments whom he thus met. He also greatly enjoyed the privileges offered by the Academy of Natural Sciences, and the Philosophical Society.

Giving up, at least for the present, and not without reluctance, his plan of returning to his native state and studying law at Cambridge, Mr. Johnson now turned his attention to the enterprise of educational reform in Pennsylvania, in co-operation with the company of benevolent and energetic men who at that period set themselves to awaken the state from her indifference to the mental and moral condition and prospects of her youth. Devoting to this purpose whatever time could be spared from the duties of the Academy, he traveled through the state in various directions, acquainting himself with the character, condition, and wants of the inhabitants, and gathering information and statistics; and visited Harrisburg to become personally familiar with the legislators and rulers of the state. The results of these investigations he used at home, in elaborating those writings in the theory and practice of education and instruction, which he published monthly in the newspapers of that day, which attracted much notice and were widely read and widely influential. Their publication was commenced in 'The Commonwealth," at Harrisburg, in 1822; with a series of thirteen essays on education, which embodied his general opinions on common schools, and on the establishment of a system in Pennsylvania. Another series of six essays on the same subject appeared in the Journal of the Franklin Institute, in 1823.

Among the pamphlets issued by him in 1825, embracing the views which he had published originally in the columns of a newspaper, was that entitled "*Observations on the Improvement of Seminaries of Learning in the United States, &c.,*" in which he advo-

cated the immediate establishment of "*Schools for Teachers;*" in this particular coinciding with the views put forth at the same time by Rev. Thomas H. Gallaudet in Connecticut, James G. Carter in Massachusetts, and President Lindsley in Tennessee.

These inquiries and efforts Mr. Johnson continued for a number of years, and had the satisfaction of believing that he had been an influential assistant in procuring the passage of the law of 1834, which gave Pennsylvania a general system of public schools, and virtually proved the winning of the long contest with ignorance and prejudice. During the long series of years while this law may be said to have been maturing, not less than two hundred and twenty public acts on education had been passed by the legislature, but none of them, until this, was upon a basis broad and liberal enough to be satisfactory to the friends of education, or practical in its results. Much time and money had been spent in procuring this course of legislation, various isolated colleges, academies, &c., had been benefited, and a number of acts had been passed to establish public schools exclusively for the poor; a species of benefaction which that class, to its credit, was too independent to accept.

In the autumn of 1823, feeling that his position and prospects justified the step, Mr. Johnson united himself in marriage with the eldest daughter of Dr. Loth. Donaldson, of Medfield, Mass., with whom he lived until his death, in unbroken happiness and affection. Upon bringing home his wife, he resumed his academical duties with undiminished ardor, and was now enabled to offer much greater advantages than before to such pupils as were placed in his family and under his entire supervision.

Although faithful and successful in the labors of the position he had assumed, its numerous and often vexatious duties, and the unvarying routine of school duties, were not in harmony with Mr. Johnson's tastes, nor with his mental activity and love of positive progress in knowledge; and accordingly, when after a time an opportunity was presented him to enter upon a course of labor requiring his favorite investigations and discussions in natural science, he gladly embraced it. This opportunity was offered by the Franklin Institute, then a young but vigorous and efficient organization, and about establishing a High School, with an especial design of affording the industrial classes cheap instruction in sciences and arts. The committee appointed to carry this design into execution, requested Mr. Johnson to lay out a system of instruction for the institution, which he did; and being further

invited to carry his own plans into operation under the auspices of the Institute, he resigned his place at Germantown and removed with his family to Philadelphia in 1826. The High School was soon organized, and went into operation with a large class of pupils, with a comprehensive course of instruction, designed to prepare either for a collegiate course, professional studies, or business life.

The monitorial system was introduced into the school, as economical and also as pre-eminently available, under the circumstances, both for teachers and pupils. The third annual report, in describing the number of pupils and their studies, says, "The High School is in complete operation with its full complement of three hundred and four. Of these three hundred study the English language, one hundred and fifty-three the French, one hundred and five the Latin, fifty-five Greek, forty-five Spanish, twenty German, two hundred and forty geography, three hundred elocution, two hundred and thirty-one linear drawing, and all arithmetic or some branch of mathematics." The system of Dr. Marsais was adopted in the study of foreign languages; and manuals were prepared for Greek by Mr. Johnson, for Latin by Mr. Walker, and for French by Mr. Bolman, which were used with success. Having given much attention to Greek, Mr. Johnson believed it an error to teach it as a dead language, but that modern Greek was substantially the same as the Greek of the days of Homer, and a living language, and as such he taught it. In these views he was sustained by means of some of the most distinguished Greek scholars of our own country, and by some of the most intelligent native Greeks who have written on the subject. Mr. Johnson found that his system gave his pupils a taste and fondness for a language generally esteemed a most difficult and discouraging one; and in the short period during which they were under his instruction, many of them became able to read with ease, intelligence and propriety, the poetry of Sophocles and of Homer.

The school fully answered the design of its founders, affording at the low price of twenty-eight dollars a year, instruction in all studies which it could ordinarily be desired to follow, and enabling those of narrow means to acquire an education of a grade before attainable only by the wealthy. Encouraged by this success, the Institute proceeded to enlarge their means of diffusing knowledge by establishing professorships in several branches of science and art, the incumbents of which were to prepare and deliver an

annual course of lectures before the members of the Institute and their families. Mr. Johnson was appointed to the chair of mechanics and natural philosophy—a department for which he was peculiarly fitted, and which had always been a favorite with him. It was therefore with the zeal both of duty and pleasure that he entered upon investigations in which he took the utmost delight, but which he had never before been able to pursue far without infringing upon the time and strength due to his regular employments. With the purpose both of increasing the interest and usefulness of his lectures, and of providing for himself the means of experiment, he provided an extensive mechanical and philosophical apparatus. The classes included both sexes, and many adults, and were numerous and uniformly interested and attentive during the many succeeding seasons when his lectures were given.

Although actively engaged in the educational department of the Franklin Institute, Mr. Johnson was always ready to co-operate in promoting its general objects through other channels. He contributed to their Journal, took part in their deliberative and conversational meetings, engaged in its discussions of questions of practical science, and prosecuted with reference to it, either alone or with others, in elaborate researches on subjects of great importance to the arts and to mankind. Nor were his labors limited to the objects of the Institute. The Academy of Natural Sciences of Philadelphia had elected him a member soon after his removal to the city, and he took a place among its working men of science, and was in the habit of contributing to its collection, especially such minerals and fossils as he could gather during his journeys or geological explorations in the state. He was a constant attendant at their weekly meetings, and frequently presided at them, and was for some time corresponding secretary. Papers by him are also numerously scattered through their published proceedings, for the many years of his residence in Philadelphia. It is scarcely necessary to add that his personal and social relations to his contemporaries of the Institute and the Academy were invariably most pleasant.

Mr. Johnson's official connection with the Franklin Institute continued for more than ten years. At the end of that time the High School, rendered superfluous by the adoption of a general school system, was given up, though the lectures were continued. During the whole period, besides discharging his official duties, Mr. Johnson was actively engaged in researches in physical science, often with a direct bearing on the arts and practical busi-

ness; and, it is believed, with no small result in contributions to the advancement of human knowledge. Many of his most important scientific papers, and several on education, were during the same period published in the scientific journals of the day.

Mr. Johnson was not content with merely mastering all already known of any department to which his attention was turned, but was accustomed to devote uncommon powers of patient investigation, careful analysis, and logical deduction, to the endeavor to discover new facts or to establish new principles. He possessed great quickness in comprehending even the most complicated mechanical devices, and suffered no new machine which came under his observation to escape the thorough understanding of its operations and uses. This aptitude was of singular advantage to him in the many elaborate investigations in physics which he afterwards pursued, in devising new apparatus or combinations of machinery.

Among the earliest and most important of these investigations was a series of experiments to determine the strength of materials, and the best construction of steam boilers. These were set on foot by the Franklin Institute, about the year 1830, and originated in a benevolent desire to prevent the misery arising from the frequency of steamboat explosions. The Institute appointed a committee of seventeen to carry out a systematic examination of the whole subject, whose operations resulted in a wide course of investigation, occupying many of the best scientific minds of the country for several years. A sub-committee of three, Mr. Johnson, Mr. Reeves, and Prof. Bache, was entrusted with that branch of the inquiry relating to the strength of materials. They sent circulars throughout the United States and abroad, requesting facts on the subject, and materials used in the manufacture of steam-boilers, to be submitted to scientific tests. The answers received showed a deep and general interest in the subject; and in a few months the committee were in possession of abundant facts for the further prosecution of their inquiries. The Secretary of the Navy, appreciating the importance of these researches, recommended their extension, and furnished the funds necessary for incidental expenses.

This branch of the inquiry was regarded as of paramount importance, and the committee applied themselves to it with corresponding zeal, devoting to it all the time which they could save from their ordinary occupations, for three or four years. Their report appeared in 1837, in 280 octavo pages, and included a

minute detail of all their experiments, verified and illustrated by tables and plates.

While conducting these experiments, and others on steam, heat, electricity, magnetism, &c., Mr. Johnson observed many phenomena suggestive of new physical laws; which, after verification, if of practical utility, he was accustomed to publish in some intelligible form. Of these discoveries, one of the most important was, that iron increases in strength, after being subjected to a powerful tension at an increased temperature, in the proportion of from 18 to 20 *per cent.*, with a gain in length of from 6 to 8 *per cent.*; a law verified by numerous experiments.

The importance of this discovery was regarded as great, especially with reference to marine equipments, where, as in cables, &c., the utmost possible strength is required with the least weight. Having devised a mode for the practical application of his discovery, Mr. Johnson submitted his scheme to Judge Upshur, then Secretary of the Navy, always of liberal sentiments in relation to scientific improvements, and who appreciated the value of this, so far as to direct a proving machine then about being furnished for the navy yard at Washington, to be constructed under Mr. Johnson's directions, in such a manner as to admit the application of his improvement to chain cables and to examine its feasibility. The result justified all that had been claimed for thermo-tension, but it was found that some modifications in the usual form of the links of chain cables would be necessary in order to admit its successful application to them. In a letter written about this time Mr. Johnson says, "The experiments on chains and bars of iron, hot and cold, are continued daily. I am making efforts to introduce some improvements in the mode of fashioning the links of chains and their studs. The prejudice in regard to old habits has to be met by persevering efforts to prove incontestably the superiority of the forms which I have proposed to substitute. Every step which I take batters down some obstinate prejudice and opens an easier and easier path to the success of my proposals. In the form of the studs and cross-stays of links, I have already effected a change, and as I have four or five times in succession proved that the new form of link is itself stronger and more enduring than the old one, I have little doubt that it will also gain the ascendency."

These experiments were never completed. They were at first discontinued in obedience to an order from the department to suspend all operations under the head of general increase, and subse-

quent imperative duties elsewhere, and changes of administration, prevented them from being resumed.

In the summer of 1836, Mr. Johnson quitted for a time the arduous occupations of the laboratory, the lecture room, and the study, for a more genial and healthful sphere of inquiry among the minerals and fossils of the coal formations of the Alleghany mountains, and of the region of the west branch of the Susquehanna.

In geology, comparatively a new science, and in its related pursuits, Mr. Johnson's attainments had hitherto been bounded by what was already known. He now, however, proposed to himself the pleasant task of independent investigation, with the hope of himself adding something to the extent of human knowledge. Having already made many investigations on the special department of the properties of iron and coal, he felt peculiar interest in studying their features in their native forms and localities. On this and subsequent occasions, indeed, he visited most of the coal fields of any note, of our own country, of Nova Scotia, and of Wales and some other parts of Europe. He also examined extensively the iron districts, studying the different ores and their localities, and collecting samples for future analysis. Some of these explorations were professional, for the benefit of mining companies, or to determine the value of lands; but an ultimate motive in all of them was the attainment of knowledge and the advancement of science; and their results were not only published in official reports to the companies interested, but were also the basis of many scientific papers which were afterwards published from time to time as occasion served. During these same explorations, no opportunity was neglected of collecting minerals, fossils, and curious or interesting relics and materials of whatever kind, relating to the natural history of the regions traversed. On one occasion, while ascending the Sinnemahoning in a skiff, he observed, high up an overhanging sandstone cliff, some rude attempts at engraving. With much labor and difficulty he had them detached, and upon examination found them to constitute a rude map of the course of that river and the country near it, and the animals found in the valley. He had it cut down to a manageable size and sent to the Academy of Natural Sciences at Philadelphia. The Pennsylvania Historical Society afterwards published a *fac simile* and description of this curious specimen of aboriginal topography.

In 1837, Mr. Johnson was appointed to take charge of the

department of magnetism, electricity, and astronomy, in the United States Exploring Expedition, as originally organized; a post which his love of knowledge and his desire of investigating a new field, induced him to accept, notwithstanding the long prospective absence from his home and family. He entered upon preparatory duties sometime before the departure of the expedition, and occupied some months in verifying and testing the instruments to be under his care, in a temporary building erected for the purpose on Rittenhouse square, in Philadelphia, and with the aid of several naval officers, and of Profs. Walker and Kendall.

Relying on the faith of the government, Mr. Johnson resigned his professorship in the Franklin Institute, for these preliminary labors, and was also obliged to make other sacrifices and preparations. But after many months of active preparation, and many more of vexatious delay, these justifiable expectations were disappointed by the abandonment of the original plan, and the reduction of the fleet, outfit, and scientific corps, to an extent and grade every way inferior. The dignity and efficiency of the scientific corps, in particular, was so much curtailed that it was with disappointed hopes and lowered expectations that those who were retained, embarked on the voyage; and it was with satisfaction rather than regret, that Mr. Johnson finally received notice from the Secretary of the Navy that his services would not be required; and the satisfaction of his family, whose scientific ardor was naturally less vivid than his own, was still greater at his announcement that he would again resume his favorite home avocations.

As the sphere of labor, and the demand for it, in the department of applied science was now constantly widening, from the wants of the increasing development of the mineral, agricultural, and industrial resources, and the general intelligence of the country, Mr. Johnson experienced no lack of employment. Besides extensive geological explorations in various parts of the country, analyses of minerals, and writing the requisite reports, he had occasion to enter, as by a natural gradation, into a new field, that of organic chemistry. The Pennsylvania College at Gettysburg, having in 1839 organized a medical department in Philadelphia, Mr. Johnson received and accepted the appointment in it of Professor of Chemistry and Natural Philosophy. In preparing for the duties of this chair, he was required to investigate the important and interesting relations between physiology, pathology, and

animal chemistry, and to prepare them for lucid explanation to his class. This required laborious study and profound thought; but the pursuit was one of fascinating interest to him, and his lectures were among the most popular of the whole course, eliciting the applause of the students and the approbation of the faculty. He retained this position for four years, at the end of which time he resigned it, to devote his undivided attention to scientific investigations requiring his presence elsewhere.

The practical knowledge which long experience had given him in relation to coal and iron, had led him to the opinion that they were the two most important productions of the country, both politically and economically; and that the extensive and rapidly increasing use of coal, especially in commerce, navigation, and manufacturing, demanded a thorough scientific investigation of the properties of all its varieties, for the ascertainment of their absolute and relative values, in generating steam, producing heat, and for other purposes. Under the conviction that such knowledge was attainable, and that it was a desideratum of especial value to the navy, Prof. Johnson addressed Secretary Upshur, with the view of obtaining the authority of Congress to institute the requisite experiments. The Secretary accordingly recommended the measure; in 1841 a bill was passed authorizing him to appropriate the necessary funds, and Prof. Johnson was authorized to commence the work. The preliminary steps were at once taken, and the navy department invited coal dealers to furnish specimens of varieties of coal for experiment.

The preparation of the necessary apparatus delayed the commencement of actual operations until the fall of 1842. The work was still for some reason suspended until 1843, when it was recommenced and industriously continued to a close in November. Forty-one samples were tested, and sixty tons of coal consumed in the experiments. A preliminary report was soon issued, giving a general account of the proceedings, for the satisfaction of the numerous inquirers on the subject. A final report however remained to be prepared, to embody in a systematised form the great mass of notes, observation, and analyses which had been accumulated, and to make it available for practical purposes. This was completed and issued by Congress in 1844, and constituted an octavo volume of 600 pages.

This report commanded universal approbation for profound and laborious research, accuracy, and extent of information. Prof. Johnson, however, considered it only the beginning of the much

greater work which he contemplated; namely, the continuance of his investigations until they should include all the varieties of coals from the principal coal fields of the United States, and from such others as in the progress of steam navigation we might have occasion to use, and thus to form a complete work worthy of our government, and commensurate with its deep interest in the development of our physical resources. But among the innumerable objects of personal and political interest, and the changes of our officers of government, many objects of great public importance are often overlooked, and left to be neglected, or promoted by the care of private enterprise. Among others, the researches among American coals, so creditably begun, yet remain to be finished, although its plan and execution as far as completed, commanded universal approbation, and although petitions often repeated and from various sources were presented, urging Congress to continue the experiments until their advocates desisted, hopelessly discouraged.

Meanwhile, the work, as far as it goes, has become a standard authority. The British Admiralty, in the similar course of experiments shortly afterwards instituted by them, adopted Prof. Johnson's plan as the basis of their operations; and those in charge of the corresponding series of experiments in fuel under the Prussian government, not only adopted his plan of proceeding, but bore an honorable testimony to their obligations to its author, in the preface to their published report, and also in a private communication to him.

About this period, Prof. Johnson was employed in various scientific researches connected with the Navy Department. He was member of a commission to investigate the subject of floating docks, and was engaged in examining various contrivances for preventing steamboat explosions, the causes and prevention of the corrosion of sheathing copper, and several subjects of minor importance, demanding much laborious research, and the drafting of various reports, published by government on their respective occasions.

In 1845, Prof. Johnson accepted from the city of Boston, an appointment, in connection with Mr. J. Jervis, the well known civil engineer, to examine and report on the sources from which a supply of pure water might be brought into that city; this important question having been surrounded with great difficulties during several years, from the numerous and conflicting opinions and interests combined to influence or prevent a decision; and it

having been determined to employ two gentlemen of acknowledged competency in scientific attainments, and free from local or personal interest or prepossession. The summer of 1845 was employed in this undertaking, and Prof. Johnson's share of the task was fulfilled with much satisfaction both to himself and to the public immediately interested.

From some years after this time, Prof. Johnson was employed in labors of a more literary character. He prepared for Philadelphia publishers, editions of some of the works of Moffat, Knapp, and Weisbach, adapting them to the wants of our own schools and students by emendations and notes of his own. During the same time, his pen, always actively employed, was engaged in various other writings, always having some relation to the advancement of science or to intellectual progress.

About this period, also, he entered with zeal into the study of agricultural chemistry, and was among the first to awaken the minds of the farming population of this country to the importance and profit of the judicious practical application of the principles of chemistry to the processes of their occupation. He prepared a course of lectures on the subject, which were delivered in Philadelphia and the neighboring cities to good audiences, attracting much attention from the novelty of the subject and the ability with which it was discussed.

Always taking a deep interest in chemistry, geology, and their kindred studies, he was one of the first twenty who organized the American Association of Geologists at Philadelphia in 1840. After the enlargement of the sphere of effort of this body, by embracing all the natural sciences, and their re-organization as the American Association for the Advancement of Science, in 1848, he served as their first Secretary.

Although for the greater part of his life devoted to pursuits of a scientific character, Prof. Johnson was interested in all organizations and enterprises for general improvement, whether political, philanthropical, or educational. While at college, he joined such societies as aimed at personal improvement or the laudable exercise of the social affections. He was a zealous and efficient mason, and rose through many grades of office in their organization. He was an early and active member of the Peace Society, and of the Temperance organization. Indeed, he never allowed himself to fall under the dominion of any animal appetites; and finding himself becoming gradually more addicted to the use of tobacco, which he had learned to use at college, he discontinued its

use entirely, and never resumed it. He maintained a strict temperance in all things, through life; believing it essential both to bodily health and mental vigor.

For mere party politics he had little taste, and never mingled in its contests, but thought and acted decidedly and vigorously on all subjects affecting the public welfare. His efforts in the course of the movement for educational reform in Pennsylvania have already been adverted to. His opinions relative to education made him a willing member of organizations for promoting it, and a participant in their counsels and efforts, so far as his occupations and location permitted. He was a member of the National Institute at Washington from its first organization, and while a resident there was an active member and constant attendant. With his fellow members, his social relations were most agreeable, to the end of his life; and his last meeting with his friends around his own board was with them. He was honorary member of the Maryland Institute for the Promotion of the Mechanic Arts, and delivered courses of lectures before them for several successive years; the first in 1849, and the last, which was also the last he ever delivered, in 1852. No similar effort, perhaps, ever called forth more universal approbation from its audience than did this. Its subject was "The Social and Industrial Relations of Man in Europe and America."

He was always attentive to the calls of humanity, and a friend and helper to the poor and the oppressed, whether from Europe, or his fellow-countrymen, with voice, pen, and purse. An ardent lover of liberty, both civil and religious, while he held firmly and boldly to his own opinions, which approximated most nearly to those of the Unitarian denomination, he recognized the like freedom in all others, while abhorring all bigotry, cant, and hypocrisy.

Finding his chief occupations centering in Washington, he removed thither with his family in 1848, still hoping that Congress would authorize the resumption and completion of his researches in American coals; continuing his own scientific researches, and transacting some business connected with mining, civil engineering, and the procuring of patents.

At the organization of the London Exhibition of the Industry of all nations in 1850, Prof. Johnson took a lively interest in the enterprise, and was among the first in this country to move in the promotion of it. He was appointed secretary of the central

committee for the United States, and performed the duties of the office zealously and faithfully.

He had for some time contemplated a visit to Europe; and as no occasion seemed likely to occur more attractive than that of the opening of the World's Exhibition in 1851, he embarked for England with part of his family, and spent some eight months in visiting England, Wales, Germany, Switzerland, Italy, and France, crowding every day and hour with a multitude of acquirements and observations treasured up for use in after years, had such been allowed him. He returned, gratified to the full extent of his expectations, both with the knowledge acquired and with the courtesy and kindness enjoyed in his brief intercourse with such men of science and learning as he met, and in the facilities given him for examining all objects of general or special interest.

In January, 1852, he was summoned to give evidence before the House of Representatives, upon the stability of the work in progress on the capitol extension; a task which made it necessary for him to examine elaborately the qualities of the materials used and the mode of their arrangement. This occupied him several weeks, and was performed to the satisfaction of all parties.

He had scarcely completed this work, and indeed was actually engaged in his laboratory in carrying out some further researches in relation to it, when he was suddenly attacked by the fatal malady which terminated his life in the brief period of six days, on the 26th of April, 1852.

Although he had never labored with the primary purpose of accumulating wealth, he had usually been liberally paid for his professional exertions; and his rule of moderate expenditure enabled him to live in respectable independence and generous hospitality, and to gather a comfortable provision against future contingencies.

The example of Prof. Johnson's life should encourage self-reliance. Almost from his infancy he had earned his own living. He left no debt uncanceled, and never sought for patronage from the rich or the powerful. In reliance upon divine protection and aid, he put his own hands vigorously to the work he desired to do, and steady prosperity was the result.