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Joseph Brown, Scientist and Architect

by J. Walter Wilson*

Joseph Brown was the second of the four brothers who played such an important part in the affairs of Providence both during and after Revolutionary times. A testimonial [1] drawn up at the time of his death describes him thus:

He was descended from an ancient and respectable line of ancestors; to which his character adds no inconsiderable luster. He possessed a strong and manly genius calculated for business, as well as for the greatest improvements in the liberal and useful ARTS and SCIENCES. His skill and industry in the earlier part of life in the merchandise and manufacture, in which he was concerned, had rendered his circumstances easy if not affluent, and enabled him to indulge his natural taste for SCIENCE.

He became, in fact, a noteworthy amateur scientist and architect.

We are accustomed to think of the lives and thoughts of our colonial ancestors as dominated by religious controversy and political trials. But throughout the colonies and, indeed throughout European civilization, there was an intense interest in science. The important advance of science in the 17th century, which Professor Whitehead designated the Century of Genius, beginning with Galileo and culminating in Newton, made an enormous impression on popular thought. The development of scientific instruments, the telescope and the microscope, even the thermometer and the barometer, gave tools to the scientist and playthings to the less serious amateur, much as did radio a generation ago.

Unquestionably the most important men in New England were the ministers of the churches, referred to as "That influential body of men known as the New England or puritan clergy,--of great personal influence, they were a power in the land." [2] Many of the most conspicuous of these amateur scientists: Ezra Stiles of Newport, later president of Yale; Manasseh Cutler and John Prince of Salem; and Perez Fobes of Raynham, for a time Professor of Natural Philosophy, and Vice President of Brown, then Rhode Island College. Ezra Stiles' *Diary* has innumerable references to his scientific activities and the Reverend Manasseh Cutler's *Journal* tells of his own activities as well as those of the people he visited. For example, on April 10, 1766:

"Spent the morning I [with Mr. Thomas Adams at Medfield, Mass.] viewing objects in the microscope. We could see that a hair has a path in the middle, by which moisture is conveyed from the nutritive vessels to the extremity of the hair. Fur is full of joints, which occasions its softness."[3] In fact some young men apparently joined the clergy to get leisure for science. This was true, for example, of John Ewing, New Jersey College (Princeton) 1754, later Provost of the University of Pennsylvania and author of a System of Natural Experimental Philosophy. According to his biographer Robert Patterson, Ewing accepted an appointment as tutor following his graduation and "At this period he resolved to choose his profession; and feeling the study of theology congenial to his wishes, and calculated to permit him to mingle with it scientific researches, he adopted it with his usual promptitude and his usual zeal."[4]

Men in political life were also interested in science: Franklin, Jefferson, John Adams and Stephen Hopkins in Rhode Island. Far from being of minor importance, this interest in science was a significant factor in the life of the times. Charles W. Parsons quotes Professor Tyler, the well-known historian of American Literature, that "the bond of scientific communion ... helped to prepare the way for political communion,"[5] and the Bridenbaughs say much the same thing: "Interest in science . . . proved a strong force for Americanization, bringing together persons of all ranks in close and increasingly democratic association for the accomplishment of a common purpose."[6]

Joseph Brown was neither a clergyman nor a political leader but acquired the leisure for his studies from success in business. My own interest in him was aroused through investigating the activities of my predecessors in science teaching at Brown. This was started in part by the discovery of the remarkable fact that though founded by the Baptist denomination with the development of the clergy in mind, all of its professors for the first quarter century down to 1790—with the exception of President Manning himself—were science professors: David Howell, Joseph Brown, Benjamin Waterhouse, Benjamin West and Perez Fobes.

Furthermore, as many or more of its early graduates went into medicine—then as now an important scientific career—as went into the clergy. For example, of the five in the class of 1773, the class of Solomon Drowne, three went into medicine and only one became a clergyman. Joseph Brown, as a benefactor, a trustee and a professor obviously had much to do with this trend in the young college.

Joseph Brown was born Dec. 3, 1733. His father, James, was the great-grandson of Chad Brown, one of the first settlers, and first elder of the Baptist Church. James had become a merchant and laid the foundation for the prosperity of his family. He had married Hope Power, granddaughter of Pardon Tillinghast, another of the early pastors of the church. When Joseph was five years old his father died, leaving the bringing up of the family to the mother. Guild says "She was remarkably amiable in her temper, and brought up her boys well; a proof, says one, of strength of character and mind."[7] Joseph married Elizabeth, daughter of Nicholas Power and they had four

children but the line died out according to Guild with Mrs. Eliza Rogers, his granddaughter.[8]

Joseph played an important part in getting the college under way. He was a trustee, and from 1784 till his death, [and appointed its first-ed.] Professor of Experimental Philosophy. He received the honorary degree of A.M. in 1770 at the second commencement. He was elected a member of the American Academy of Arts and Sciences and was for several years a representative of Providence in the General Assembly. He had a stroke of apoplexy Nov. 24, 1784, and on March 4, 1785, President Manning in a letter said: "Mr. Joseph Brown's indisposition is indeed a very heavy stroke to us. Thr college and the church particularly feel it. There is little possibility of his ever being restored to his former usefulness, though he again goes a little abroad." [9] He died Dec. 3, 1785, at the age of 52.

Of his works, the best known and indeed the most noteworthy, were his participation in the observation of the transit of Venus in 1769, and the planning of five of the most important buildings architecturally in the Providence of Revolutionary times: the College Edifice, now University Hall, the First Baptist Meeting House, the Market Building, his own house on South Main Street, and the John Brown house, now the home of the Rhode Island Historical Society. Both these activities have been adequately treated, the astronomical by Mr. Lownes in a recent number of *Sky and Telescope*, [10] and the architectural by Mr. Isham, [11] Mrs. Downing, [12] and Prof. Hitchcock. [13] I include them here to make my story complete.

In the 18th century there seems to have been no profession comparable to that of our modern architect. The role of such men as Munday, Harrison, and Joseph Brown seems to have been to select a plan, more or less complete, and leave it to the master workmen to carry it out. At least this was Joseph Brown's role in each of his projects.

In connection with University Hall the first committee "to draught instructions and prepare a model of the house" included Stephen Hopkins, Joseph Brown, and the Rev. John Davis. After a preliminary report this committee was changed to replace Davis by President Manning. They reported Feb. 9, 1770, and it was voted "That the College edifice be built according to the following plan, viz.: That the house be one hundred and fifty feet long and forty-six feet wide, with a projection of ten feet on each side, (ten by thirty), and that it be four stories high." [15] The construction of the building was in the hands of another committee of which Joseph Brown was not a member, but his brother John was. I think there is no actual record of the part played by the various men in planning the building but one of the items of expense in the building is the sum of three pounds twelve shillings "for the passage of Joseph Brown, Jonathan Hamman, and Zeph. Andrews to Cambridge to view the colleges." [16] Hamman (Hammon or Hammond) was a carpenter and Zephaniah Andrews was a master mason. The model finally adopted by the building committee was Nassau Hall, Princeton, which according to Guild was regarded as one of the finest structures in the country. The fact that both

Manning and Professor Howell were Princeton men may have had something to do with the selection.

In the planning of the First Baptist Meeting House Joseph Brown seems to have played a more important role. He with Hammond (the same carpenter), and Comfort Wheaton, a 'housewright,' were appointed members of a committee "to make a draught of a house 90 by 70 feet together with a tower and steeple and make an invoice of the timber and other material, and ascertain the price of the same". Brown and Hammond again went to Boston "to view the different churches and meeting-houses there, and to make a memorandum of their several dimensions and forms of architecture."¹⁷

The final design of the meeting house was adapted from plans in a book by James Gibbs which Joseph Brown owned and which is now in the possession of the Providence Athenaeum. The main body of the church contains elements of two of Gibbs' churches. But Isham says that "the plan of the meeting house is pretty nearly a product of its own time and place." The steeple, however, follows closely one of the rejected plans for St. Martin's in the Fields in London. The story of the steeple illustrates the relation between the 'architect' and the master workman. The plan in Gibbs selected by Brown is a drawing to the scale of one-twelfth of an inch to the foot. It was the work of the master workman—in this case James Sumner of Boston—to make from this plan working drawings from which the structure could be made and devise a method of constructing it. How this was accomplished is instructively told in Isham's history of the building."

In 1773 Joseph collaborated with Stephen Hopkins in planning the Market House. This building Hitchcock characterizes as "Rather rudimentary and even archaic like the college edifice."

In 1774 Joseph built a house for himself on South Main Street which still stands between the Court House and the Old Stone Bank. Toward the end of his life he planned the house on Power Street for his brother John. At the time it was built it was one of the most magnificent dwelling houses in North America. How much of the detail he planned no one knows. The work was done by some of the same master workmen who had carried out his plans at University Hall and the Meeting House. At any rate, he did not live to see the building commenced.

Brown's taste in architecture was, according to Hitchcock, even in his own day old-fashioned. The buildings, in contrast to those of the Newport architects, Mundav and Harrison, though larger, and more expensive, were "neither so refined nor so up-to-date in style."^[19] Since Gibbs' *Book of Architecture* was published in 1728 and the plans in it were undoubtedly somewhat older, and since most of the buildings which Brown could have examined for models were of an older period, this may not be surprising. Whatever the academic criticism may be the fact remains that the buildings are, for most of us, the source of an aesthetic satisfaction which is timeless. They are

substantial and beautiful and constitute his most important contribution and claim to memory.

The idea of making observations of the transit of Venus apparently originated with Joseph Brown, as a result of his reading Winthrop's account of the transit of 1761. He ordered a telescope like Winthrop's, but seeing a list of apparatus requested by the American Philosophical Society for a similar observation, realized that his own would be inadequate. He took the matter up with Benjamin West and additional instruments were ordered. "Mr. Brown's expense in this laudable undertaking was little less than 100 pounds Sterling, besides near a month's time of himself and servants in making the necessary previous experiments and preparations." Among the apparatus was a micrometer which they did not know how to use. "Not having any author by us from which we could get the use of that curious instrument, we were obliged to have recourse to experiments" says West; further "in justice to him [Joseph Brown], I must acknowledge, our work could not have been done with equal accuracy had it not been for his skill and contrivance therein." [20] It must be admitted that in a letter to Stiles from the Rev. David Rowland, pastor of the First Congregationalist Church in Providence it is stated that these statements "which are designed to do so much honor to Mr. Brown were forced in by him, contrary to Mr. West's Inclination, and what was really just and right; and the advantage taken because Mr. West's circumstances were low and he was not aide to support the press." [21]

However, it must be remembered that there was high feeling between the Congregationalists and the Baptists and that West was a Congregationalist and Brown a Baptist. I haven't a doubt but that without West's astronomical and mathematical knowledge the observations could not have been made. Nor that without Joseph Brown's inspiration, financial backing, and also skill and contrivance in manipulating the apparatus, they would not have been undertaken nor completed. Like every other cooperative enterprise of this sort, it is very difficult even for the participants themselves to tell who deserves the greatest share of the credit. The observation turned out to be very important. Cook's voyage to Tahiti was planned to make similar observations of the same transit there. "The Providence account by West (says Lownes) was the first to be published, except for brief newspaper stories and the only one printed as a separate document.' Both Brown and West deserved plenty of credit for their work and were awarded it by their contemporaries. That Brown was capable of independent astronomical observation is indicated by a paper of his in the first volume of the *Memoirs* of the American Academy entitled "An Observation of a Solar Eclipse, October 27, 1780, at Providence," apparently his only published paper.

According to the Testimonial of December 10, 1785, "his favorite study was Mechanics: in this was the greatest strength of his genius discovered; honorary proofs of which are left behind him." I have two accounts of activities of this sort. In Solomon Drowne's diary there is the following account of a test of a fire engine made under his direction like one then in Providence.

April 15,. 1772 Town meeting day. Vote and choose representatives at the court house. The engines were carried up behind the court in order to try then. The new one throws water further than either of the other two which, perhaps, is owing to its being better manned, the over-the-river people having chose out a set of strong lusty Fellows before they brought the engine in ; even they could scarce get enough to our engine even such as they were, some boys. However, the new engine is an excellent one considering it is the first ever made in this town. It was made by Jackson founder under the direction of Joseph Brown A.M. exactly of the same dimensions as the down-town one. A dispute arose among the Learned in philosophy show the spraying of the water after it is emitted from the pipe. some attributing it to one thing and some us another, which I shall pass: over in silence."[23]

The first fire engine of Providence was purchased some time between 1754 and 1759 when the inhabitants of the compact part of the town petitioned to purchase a "large water engine." It was a so-called 'cheese wheel' engine imported from London. In December, 1760, Obadiah Brown and James Angell were authorized at a meeting of the compact part of the town to purchase another engine in Boston. In 1792 there were four engines here; No. 1 on North Main Street opposite the First Baptist Meeting house, No. 2 at the south end of Benefit Street. (I presume this was the one purchased in Boston and which was the 'Downtown' one referred to by Drowne as the model for Joseph Brown.) No. 3 at the north end of Benefit Street and No 4 near what is now the corner of Weybosset and Dorrance Streets which would be the one from 'over-the-river' that Brown made. According to White "these engines were nothing more or less than a box mounted on rollers and steered by a tail-like lever behind, and drawn by ropes hooked to the forward corners. They were supplied with water by buckets passed by men arranged in double rows, one for handling the full buckets and the other for returning them to be refilled. This was called 'forming a line' and was the primary duty of the fire wards."[24] Everyone was required by law to have two leather tire buckets with his name painted on them near his front door. The engine was pulled as near as possible to the fire and the water played from a nozzle mounted directly on the engine, for satisfactory fire hose was not invented till 1808. These four engines made up the fire apparatus of Providence until 1822 when a fine engine, the Hydraulion No. 1, with a thousand feet of hose was purchased from a firm in Philadelphia.

In Manasseh Cutler's Journal there is the following account of the steam engine at the ore beds at Hope furnace:

Wednesday. June 27. This morning I received a polite invitation from Governor Bowen, in the name of a large company. to join them in a Turtle frolic, six miles out of town. Mr. Hitchcock and the other clergymen of the town were of the party, but, much against my inclination, I was obliged to excuse myself. Spending my time in Turtle frolics would very illy comport with the long journey and public business I had undertaken. As I went out of town, Mr. Hitchcock and I waited on Governor Bowen. I informed him that it was my wish to visit the famous

steam engine at Cranston, of which he is one of the proprietors. He proposed excusing himself from going with the Turtle party, and riding out with me to the engine, eight miles from Providence; but it must have deprived him and the company of so much pleasure as they had then in prospect, I insisted on his not thinking of it, and went on myself to Cranston, To go to the furnace and engine was eight miles, nearly, out of my way, and a road I had never traveled; but my curiosity was so much excited by the description of so singular a machine, and the only one in America, that I could not deny myself the pleasure of viewing it.

I arrived at the ore-beds at 12 o'clock. The engine was at work, raising water from a well 80 feet deep. The iron flue is 2½ feet wide and 6 feet long, with a square hearth at the mouth, secured from fire by large, thick, iron plates. On the back part of the Hue is a winding funnel, which passes into a chimney on the back part of the building. A wooden boiler of 6 feet diameter is placed above the flue, which is constantly kept full of water when the engine is in motion. The boiler rises above the first story of the building, much in the form of the large cisterns in distilleries, where it receives at the top the condensing cylinder, 2 ½ feet in diameter, and made of plated iron. From this cylinder a large worm passes with many windings down the boiler. The valve that passes into this cylinder is more than 2 feet in diameter, and rises and depends by means of an iron rod made fast to one end of the large beam. Around the top of the boiler are numerous leaden pipes. some connected with the condenser and some not, furnished with stopcocks for admitting or excluding air or water, as necessary in working the machine; but they are too numerous and complicated to admit of any description front a mere view of the machine. A large reservoir of water is placed in the third loft of the house, constantly affording water to the works below, and as constantly supplied (with a pump for the purpose), by the working of the machine. The large beam is a massive piece of timber, nearly 4 feet in diameter and 20 feet lung, being two very large oak timbers nicely forged together. It moves on a large iron bolt in the center, like the beams of scales, and has two arching timbers at each end, forming the segments of a circle, along which two chains of a prodigious size play as the beam moves. One of these leads to the piston or valve of the condenser, and the other, at the opposite end, to the pumps in the well. There are four cold water pipes, one feeding pipe, and one venting pipe. By the same motion of the beam which raises the water out of the well, all these pipes open or close, by the means of stop-cocks and valves, as the design of them requires. There are two large pumps in the well, which is 80 feet deep and 23 feet wide. The sides of wells are supported by large timbers, laid horizontal, so as to make the form of the wells quintangular, and the ends of the timbers let into one another. The engine raises 7 hogsheads of water in a minute, and the flue consumes 2 cords of wood in twenty-four hours. The immense weight of the beam, the cast-iron wheels, large chains, and other weighty parts of the works, occasion a most tremendous noise and trembling of the large building in which it is erected, when the machine is in motion. By the

sides of the well front which the water is drawn are two other wells of the same form, 70 feet deep. These are sunk down in the bed of ore; and in these are the workmen. about ten or twelve in number, digging ore. The ore is raised in large buckets, which hold about one ton weight, let down and drawn up by large chains, carried from the well to a large capstan, which is constantly turned by an ox. As one bucket rises. another goes down. These wells are kept dry by the water continually drawing off into the well where the pumps are fixed, and the pumps keep the water below the height where the men work. This curious machine was made under the direction of Mr. Joseph Brown, of Providence, and is a standing proof of the abilities of that able philosopher. The invention was nor new, but he has made many valuable improvements in simplifying and making the working of it more convenient above what has yet been done in Europe. It cost upward of one thousand pounds sterling. Baited my horse: 8d.[25]

The steam engine here described was obviously a complicated contrivance. The problem of draining mines was an old one and it was for this purpose that the first successful steam engine had been built by Newcomen in England about 1712.[26] It was the only purpose to which the steam engine had been put when the one at Hope furnace was built, for it was only in the 1780's that Watt developed the rotative steam engine to drive machinery. 'Many improvements had been made meanwhile on the Newcomer pumping engine, and Joseph Brown's was, according to Zachariah Allen, of this type. He says "One of the earliest steam engines constructed in the United States was erected upon Newcomer's plan at the Hope Furnace in Rhode Island, where it was used for raising water from the shaft of a pit sunk for obtaining ore."[27] The fundamental principle was always the same; the huge beam supported in the middle had the pumps attached to one end and the piston to the other and as the cylinder tilled with steam the piston was raised and the pump arm lowered. Then a jet of cold water caused the steam to condense, producing a vacuum, which pulled the piston down and raised the pump end with the water from the well. The complicated system of levers, trips, cords, piping, and valves was necessary to time the entrance of the steam and the jet of water, and to keep the boiler full. It would be exceedingly interesting to know just what Brown's improvements were. Whatever they were, the mere building of the engine implies a thoroughgoing understanding of mechanical principles and their application. It must have been his masterpiece in this line, but the reputation given him by Cutler and the casual nature of the account of the tire engine suggest that there must have been many more such works that we have not been told about.

During the Revolution Joseph Brown played the part of a patriot, though not so spectacularly as his brother John, who is traditionally accredited with a leading part in the Gaspee affair. The danger of attack from the British fleet made it imperative to establish an alarm signal at once and to fortify the shores of the Bay. In both these activities he played a leading part as has been told by Field. In July, 1775, Joseph Brown, Joseph Bucklin, and Benjamin Thurber were appointed a committee to "erect a beacon on the hill to the eastward of the town to alarm the country in case of an

enemy's approach". The beacon was erected near the corner of Prospect and Meeting Streets. It consisted of a kettle suspended by an iron crane from an eighty-foot mast. Joseph Brown was appointed "Master of the Beacon" and had associated with him four wardens "to rig the kettle when orders are given to alarm the country." [28] On Aug. 17th a practice drill was held of which the people had been forewarned by printed handbills. The beacon was observed over a wide range of country from Newport, New London, Pomfret and well into Massachusetts. As far as I can learn it never was used as an alarm.

Early in January, 1776, Joseph Brown and General West were appointed "to lay out such fortifications upon the said [Warwick] Neck as they shall think necessary," for it was thought by some that this would be the logical place to land for an attack upon Providence. The arrival of the British fleet at Newport created great excitement in Providence, and in December, 1776, Joseph Brown with Stephen Hopkins and six others all military officers were appointed a committee "to examine the most suitable places for erecting and making proper batteries and entrenchments for the defense of the public against the enemy."

One of the greatest problems of the American armies was to obtain cannon. The British officers had expected them to find this insurmountable. Among the places that helped in its solution was the Furnace at Hope in which the Brown Brothers were interested. The whole story of this works has not I think been told. But here cannon for the forts in the Bay and for ships were cast and bored. Among the Brown Papers in the John Carter Brown Library are letters of Joseph Brown to his brother Nicholas from Grafton (where his family seems to have taken refuge) in which he discusses the cannon, and one in which he suggests how to get boards to roof the "bearing" mill. Since we know that he later directed the building of the steam engine there, it seems a not improbable conjecture that he helped in the general planning of the work which solved the problem of the cannon. If so his contribution to the winning of the war was of very great importance.

Most of his work discussed thus far has been of a practical nature. Even the transit of Venus was of importance primarily because of its bearing on navigation. He was, however, interested in pure science as well. The inventory of his estate lists his books, of which many are scientific, including astronomy, chemistry and electricity, along with the Gibb's *Architecture* already referred to and among many others *Pilgrims Progress* and *Tristram Shandy*. It also lists "The Electrical Machine and Apparatus with all the appurtenances thereunto belonging," valued at 30 pounds. [29] West says he had constructed and furnished himself "with as curious and complete an apparatus for electrical experiments as any, perhaps, in America, and of which he well knows the use." [30] Such machines which could produce large amounts of static electricity to be stored in Leyden jars had long been popular with amateur scientists. One had been made by William Claggett, a clockmaker in Newport, which Franklin saw when passing through New-port in 1746 and which according to Parsons aroused Franklin's interest in

electricity." The Bridenbaughs, however, quoting Franklin's autobiography, conclude that Franklin's interest in electricity was first aroused by Dr. Spencer of Edinburgh, who had lectured on electricity in Boston in 1743 and who also had encouraged William Claggett in Newport. In any case it is certain that Claggett knew Franklin "and quite probably communicated to him some of his 'great discoveries in electricity' during the latter's visit to Newport in 1746".[31] Joseph Brown could have obtained help from the Newport people and may have had his interest aroused by two lectures advertised in the *Providence Gazette* for Saturday, March 3, 1764, as follows:

"For the entertainment of the curious, will be exhibited at the Court House a course of experiments in that instructive and entertaining branch of Philosophy called Electricity. To be accompanied with lectures on the nature and properties of the electric fire; by William Johnson."

The course consisted of two lectures. They are outlined in some detail in the advertisement and completely in a pamphlet in the John Carter Brown Library." They ended with an experiment that consisted of "A battery of seven Guns, fired by a Spark, passing through cold water." If Joseph Brown's interest in electricity did not antedate these lectures it would surely have been aroused by them.

The inventory includes also "in the north parlour, one barometer out of order and one thermometer." In those days everyone did not have a thermometer outside his kitchen window. In Stiles' *Diary* for August 10, 1771, there is the following entry:

"Dr Evers told me he was at Providence last Wed. and viewed Mr. Brown's thermometer at 3:30 P. M. it stood at 95 in the house. Mr. Brown suspended it abroad on a post in the yard in the sun, where it rose to 107, and thence it was said the heat of that day was 107 at Providence."[34] They learned early how to use the thermometer effectively!

The most convincing evidence of his interest in pure science is that when the French soldiers left the college ruined and it was about to undertake resumption of its activities with no faculty but the President and was also without funds, Joseph Brown and another Trustee, Benjamin Waterhouse, volunteered to serve as professors without pay. Thus Joseph Brown became Professor of Experimental Philosophy. This was not Brown's first indication of interest in science in the college, however. Each of the four brothers had contributed 200 pounds toward the fund to build University Hall but Joseph gave only 100 in cash, the other hundred "to be paid in philosophical apparatus . . . as soon as a proper place is provided to put them in." He was probably instrumental when the college was recovering from revolution in his brother John's offer to pay "half the sum necessary to buy 'a complete Philosophical Apparatus and Library' if the Corporation would raise the other half," which they did and 700 pounds was spent on it." I have been unable to find any account of Joseph's activities as Professor, but it seems that he had something to do with the spending of his brother John's money. Manning in a letter dated March 18, 1784, says:

"A catalogue of the books, which are to compose our new library is made out with great care and attention. It has cost me a great deal of care and labor through the winter, and we are now busy in collecting the books subscribed here, in order to leave them out of the catalogue which Mr. John Brown is about to send to England this spring. The air pump with its apparatus is arrived. It cost fifty pounds sterling in London, and is perhaps the most complete in America, made on the new construction. Mr. Joseph Brown has not yet completed his list of the apparatus, for want of some information on that subject which he has not yet been able to obtain." [36]

In the college archives is a manuscript document with the label "Rough Draught of the remaining parts of an apparatus for the college, 1783." [37] It is a list of scientific equipment, each item followed by a price, and is apparently a list of Joseph Brown's desiderata. Some of the equipment must have been obtained, for it appears in later lists. Whether Joseph used it or not is doubtful because he was so soon taken sick.

In Solomon Drowne's diary there are two sets of entries that give us an idea what he would have done. Drowne entered college in 1770 at the age of seventeen, and graduated in the class of 1773. The diary covers his college years.

The first entries are as follows:

Oct. 4th 1771: Spend this week reading and working upon my wooden telescope.

April 18 1772: This day worked upon my wooden telescope.

April 25: This day I finish my prism for demonstrating the theory of light and colors. It is made of wood and glass, the glass being cut and fastened in with putty after the manner of windows.

April 26: Talk with Mr. Brown concerning the prism.

It is not difficult to reconstruct from this a picture of Joseph Brown fostering an interest in science in a lad of eighteen years.

The next set of entries are to me of great interest, for they give a picture of actual laboratory work in science in Brown in 1772.

Aug 3 1772 This morning at about 8 the senior and junior classes go down to Mr. Brown's apparatus at the works to attend electrical and Philosophical lectures. Mr. Howell present. In the forenoon and part of the afternoon try electrical experiments. Kill a pigeon, etc. Then darken the room to construct the *camera obscura* which affords very pretty diversion as some go out and ride, play, etc. and David stands upon his head. We then carry out the telescope and micrometer up on the hill and look at the sun as long as we could see him, then at the moon, then stars, and lastly the planet Jupiter, 3 of whose moons we see.

Aug. 4th This morning at 8 we go again to the apparatus. In the first place we fill a globe with water which is hung up in a darkened room with only a hole in

the window shutter to let a ray shine upon the globe, which after a refraction and reflection or two exhibits a rainbow; but our globe falls in the midst of the experiment, not being well suspended. Next we demonstrate the theory of light and colors with a very neat prism: Then we fix the *camera obscura* or solar microscope which magnifies objects amazingly. A louse is made to appear six feet long in which we could plainly discern the peristaltic motion. Lastly we see water ascend in capillary tubes which concludes the experiments.

Here we see the electrical apparatus as well as the equipment used in the observation of the transit of Venus in actual use in teaching. The use of the solar microscope is particularly interesting. This type of microscope had been invented by Lieberkuhn in 1738. "The vast magnifying power obtained by this instrument, the colossal grandeur with which it exhibited the 'minutiae of nature,' the pleasure which arose from being able to display the same object to a number of observers at the same time" did much to make the microscope a popular instrument.[38] I would like to know if the instrument used here was the same one which appears as the last item in the catalogue of the Providence Library for 1768. This library thus owned such an instrument as well as Baker's book on the microscope which was one of the most popular manuals of the time. In any case it seems very clear that a complete description of "Mr. Brown's apparatus at the works," would be an interesting thing to discover. It is also worthy of note that the members of the classes of 1773 and 1774 all had more laboratory work, though it was crowded into two days, than many of their followers in the classes of today. What Mr. Brown would have done with the new apparatus seems obvious.

This concludes the sketch of Joseph Brown's scientific activities as far as I have been able to discover them. In closing, it may be permissible to speculate on the question how such a man, a business man with no college education, came to be interested in such things in the Providence of the 18th century. In the first place we may emphasize again that an interest in science was much more generally widespread than it is usually thought to have been. Furthermore, as Bronson in his *History of Brown University* has emphasized, Rhode Island was no backwoods colony of primitive people. Newport was already wealthy and had received from Berkeley a "rich legacy of lofty thought and generous culture". Association between the leaders of Providence and Newport was very close. In the appendix to Stephen Hopkins biography there is a list of twelve college graduates resident in Providence before 1770 [39] which, though not a large number today, would be a significant focus in the population of between 4000 and 5000 of those days. Some of the population must have been interested in science for the Catalogue for 1768 of the Providence Library lists many scientific books, and the microscope we have mentioned.

In Brown's case, however, there is a more personal circumstance which I think may have influenced him. When he was a boy his sister Mary married Dr. David Vanderlight, a Dutch doctor who came to Providence after graduating from the

University of Leyden. According to the *Chad Brown Memorial* Dr. Vanderlight was the principal druggist in Providence and with the Brown brothers engaged in the manufacture of candles, having brought from Europe the knowledge of the Dutch process of separating spermaceti from its oils.[40] He died in 1755, leaving a surprisingly large personal estate, valued at over £4000. Included in the inventory are sundry books valued at 20 pounds, a parcel of Dutch books valued at £7, a case for an anatomy with bones, a violin and a flute and four double columned pages of drugs.[41]

He is said to have given instruction in anatomy at his house on South Main Street.[42] It can hardly be doubted that his interest in science went beyond medicine. The Leyden of his day was the scientific center of the world. It was the Leyden of Boerhaave. With such a brother-in-law it is easy to see how Joseph Brown, a boy of eighteen or nineteen, became interested in science.

No one would claim that Joseph Brown became a great scientist, and it would be a mistake to imply that he was of great importance in the history of science. His importance was not that of the spectacular discoverer of fact or theory but rather that of the many quiet men who by their intellectual activity and interest keep the fires of scholarship alive and pass them on to be fanned by the drafts of greater geniuses.

Notes:

* J. Walter Wilson, Ph.B. (Brown) 1918; Ph.D. 1921; Frank L. Day Professor of Biology.

1. *Testimonial to Joseph Brown, Esq., Providence, December 10, 1785, Ms.* John Hay Library, Brown University, Broadside in R.I.H.S.
2. W. P. and J. P. Cutler. *Life, Journals, & Correspondence of Reverend Manasseh Cutler, LL.D.* (Cincinnati, 1888), p. 119.
3. *Ibid.*, p. 14.
4. John, Ewing. *System of .Natural Experimental Philosophy* (Philadelphia 1809), p. xii.
5. Charles W. Parson. "Early Votaries of Natural Science in Rhode Island", *R.I.H.S.C.* vol. VII, p. 247.
6. Carl Arid Jessica Bridenbaugh. *Rebels and Gentlemen* (New York, 1942), p. 363.
7. Reuben A. Guild. *Life, Time and Correspondence of James Manning and the Early History of Brown University* (Boston, 1864), p. 155.
8. *Ibid.*, p. 164.
9. *Ibid.*, p. 350.
10. Albert E. Lownes,. "The 1769 Transit of Venus", *Sky and Telescope*, II, No 6. p. 3.

11. Norman M. Isham. *The Meeting House of the First Baptist Church in Providence* (Providence 1925).
12. Antoinette Downing. *Early Homes in Rhode Island* (Richmond 1937).
13. Henry Russell Hitchcock, Jr. *Rhode Island Architecture* (Providence 1939).
14. Reuben A. Guild. *History of Brown University with Illustrative Documents* (Providence 1867) p. 230.
15. *Ibid.*, p. 231
16. *Ibid.*, p. 236
17. Isham, *op. cit.* pp. 1-2.
18. *Ibid.*, p 15.
19. Hitchcock, *op. cit.*, p. 22.
20. Benjamin West. *An Account of the Observation of Venus upon the Sun, the Third Day of June, 1769, in Providence, in New England* (Providence 1769) pp. 10-12.
21. Franklin Bowditch Dexter. *Itineraries and Correspondence of Ezra Stiles* (New York 1916) p. 562.
22. Lawnes, p. 5.
23. *Solomon Drowne's Diary, 1770-1774. Ms.* John Hay Library, Brown University.
24. Charles E. White. *The Providence Fireman* (Providence 1886), p, 302. 26. Cutler, Vol 1, p. 2015.
25. Cutler, Vol 1, p 205.
26. A. Wolfe, *A History of Science, Technology and Philosophy in the Eighteenth Century.* (new York, 1939), p. 611.
27. Zachariah Allen. *Science of Mechanics* (Providence, 1829), p. 326.
28. Edward Field, *Revolutionary Defenses in Rhode Island* (Providence, 1896), pp. 43, 49, 54.
29. Inventory of the Estate of Joseph Brown, died December 3. 1785, *Providence Probate Records, Will Book N. 7*, pp. 7-26.
30. West, *op. cit.*, p. 11.
31. Parsons, *loc. cit.*, p. 245.
32. Bridenbaugh, p. 223.

33. William Johnson, *A Course of Experiments in that Curious, and Entertaining Branch of Natural Philosophy called Electricity* (New York, 1764).
34. *The Literary Diary of Ezra Stiles*, F. B. Dexter ed. (New York, 1901), vol. 1, p. 137.
35. Walter C. Bronson, *The History of Brown University, 1764-1914* (Providence, 1914), p. 81.
36. Reuben A. Guild, *Early History of Brown University including the Life, Times, and Correspondence of President Manning* (Providence, 1897), p. 385
37. Ms. No. A9411.
38. Jabez Hogg, *The Microscope: Its History, Construction and Application* (London 1856), p. 7.
39. *R. I. Historical Tracts*, No. 19, part 2, p. 251.
40. *Chad Brown Memorial* (Providence, 1888), p. 16.
41. Inventory of Estate of Dr. David Vanderlight, *Providence Probate Records, Will Book, No. 5*, p. 75.
42. Walter L. Munro, "Early Medical History in Rhode Island," *Rhode Island Medical Journal* (July, 1935), p. 12.