CHAPTER 19

BROWNSVILLE CLOSE-UP:
JOHN A. BRASHEAR

"A prophet is not without honour, save in his own country, and in his own house."
Matthew 13:57

On April 11, 1920, every American flag in the city of Pittsburgh was flying at half staff. At eleven o'clock that morning, church bells pealed and school bells tolled for a full five minutes as an entire city mourned the loss of one of its most beloved citizens.

It was truly a sad day, wrote Larry Schweiger, president of the Western Pennsylvania Conservancy, describing Pittsburgh's reaction to the death of a genuine superstar − John A. Brashear.

Eighty-two years after Brashear's death, Pittsburgh teenagers still attend a high school that is named for him. For some years, the school district which encompassed Brownsville Borough schools was also named for him. When a new high school was constructed in nearby Luzerne Township, it was erected on a street that, coincidentally, also bears the name Brashear.

John A. Brashear

John A. Brashear was world renowned for his skill in fashioning reflecting mirrors for telescopes and prisms for spectroscopes. Instruments he produced were of such matchless precision that they are still in use at leading astronomical observatories and physical laboratories all over the world. Brashear also invented an

improved method for silvering a reflecting mirror, and Brashear-developed optical technology is still used on the modern battlefield in range finders, gun sights, and meridian instruments.

In 1855, this amazing scientist ended his formal schooling in the Brownsville "common school" at the age of fifteen. Even though he never attended college, he was named later in life to the position of Acting Chancellor of the University of Pittsburgh. Much of his knowledge came from countless hours spent devouring scientific books and literature. John Brashear was a living testimonial to the power of reading.

He was also unusual in that he was respected and trusted by everyone, including some of our nation's industrial giants. When Andrew Carnegie needed help planning and creating the Carnegie Institute of Technology, he turned for help to Brashear, a man who had never attended college. Likewise, when Henry Clay Frick sought someone to whom he could entrust half a million dollars for the advancement of education in Pittsburgh, he chose Brashear to handle the fund. Both men placed these enormous responsibilities in the hands of John Brashear because he was a man of unquestioned integrity.

But most notably, John Brashear was loved for his kindness and generosity. The children at the Western Pennsylvania School for the Blind called him "Uncle John." The gentle bearded man visited them frequently and always played with them enthusiastically, earning their love and respect. He genuinely enjoyed being with them and making them happy.

Even the convicts at the Western Penitentiary, men who are not easily won over, held John Brashear in high esteem. The disarmingly unpretentious scientist visited the prison several times a year, enthusiastically explaining to the prisoners the wonders of the stars and helping them construct fourteen rudimentary telescopes to expand their knowledge.

"Talk with anyone who knew him," wrote W. Lucien Scaife, editor of Brashear's autobiography, in 1925, "and you will hear, not what he did, but what he was. Crusty old scientists came to him first because his genius could aid them in their work; they returned because they loved him."

Yet there is a disturbing question to be asked. Was John A. Brashear, world-renowned in his field, a prophet without honor in his own land? How many present-day residents of Brownsville, where he was raised, could put together more than a sentence or two about the life and accomplishments of this remarkable man? The Market Street house in which he grew up is still standing, but the story of the boy who grew

up there has largely been forgotten by the citizens of his birthplace.

"The story of John Brashear," wrote W. Lucien Scaife, "is the story of a boy who loved the stars and who early determined that so far as he was able, the whole world should have an opportunity to know the inspiring beauty of the heavens."

He was an inspirational human being and a prophet who connected his fellow earthbound humans to the heavens. He richly deserves to be remembered and honored in his home town.

"I came into this 'old round world' on the twenty-fourth day of November, 1840," John Brashear wrote in 1912 in his autobiography, *The Man Who Loved The Stars*. "My birthplace was the old town of Brownsville, Pennsylvania, on the Monongahela River, about sixty miles south of Pittsburgh."

Brashear's ancestors had arrived in America from France in 1658, landing in Virginia and soon moving to Maryland. "The records," noted Brashear, "show that the original name of the family was Brasseuir." It was later changed to Brashier, then to Brashear.

The Brashear family's Brownsville connection was forged in 1775, when John Brashear's great-grandfather, Otho Brashear, left Maryland in the company of Thomas and Basil Brown and traveled westward to the Monongahela River.

"Thomas Brown purchased the land on which the town was laid out," explained John Brashear, "and my great-grandfather married his sister.

"My grandfather, Basil Brashear, owned a tavern or inn in Brownsville," Brashear wrote, describing the building where he was later raised. "It was on what is now called Market Street. Here he entertained Lafayette in 1825. Although my mother was only six years old at the time of his visit, she remembered – or it may be was told by older persons – that she was one of the children who strewed flowers on the sidewalk where Lafayette walked to the tavern."

That stone tavern, where John Brashear was born in 1840, still stands at the corner of Market Street and Sixth Avenue on Brownsville's North Side. In the autumn of 1999, a truck carrying a crane lost its brakes and rammed into the former tavern's wall. The two-century-old structure withstood the assault without collapsing, was later repaired, and today looks as sturdy as ever.

This very early image from a glass negative depicts upper Market Street in Brownsville. John A. Brashear's birthplace, the Brashear Tavern, is on the right.

Tavern-keeper Basil Brashear had a son named Basil Brown Brashear. Born in 1817, Basil became a saddler and married Julia Smith. Basil and Julia's first-born of seven children was named John, and it was Julia's father, Nathaniel, who guided John to the study of the stars.

"It was my Grandfather Smith who first told me about the stars," recalled John. "Up until the time he moved to the South Side of Pittsburgh in 1855 [when John was 15], his humble cottage on Albany Road, just at the edge of the town of Brownsville, was a favorite haunt of mine."

During those visits to the Smith farm, John was enthralled by his grandfather's bewitching tales of the heavens. "It is no wonder," wrote Brashear, "that I imbibed a love of astronomy very early in life. Many were the stories told me by my grandfather of the great comet of 1843, one of the finest comets of the nineteenth century, and he and my mother often regaled me with accounts of the great meteoric display of 1833. I can well remember that he taught me the constellations when I was about eight years of age, and later presented me with his prized volumes of Dr. Dick's 'Works' from which I obtained so much inspiration."

All of John's formal schooling took place in a two-room "common

school" on Front Street in Brownsville. "The schoolhouse," he wrote, "was a small brick building on the Jeffrey's Common [opposite Nemacolin Castle], as I believe it is called to this day, occupying the ground where recently has been erected a model union school of which the town of Brownsville may be justly proud [Front Street School, opened in 1910]. My desk companion was Richard Knox, brother of our honored Attorney-General [Philander C. Knox] under President Roosevelt and Secretary of State under President Taft."

Near the little brick schoolhouse was the original town cemetery, located next to a house that later served as a funeral home in the twentieth century.

"I can remember fully sixty years ago," John wrote in 1912, "visiting quite frequently the old burying-ground on the Commons, where were buried many of the early settlers of Brownsville. I never could find the grave of my great-grandfather [Otho], but that of Thomas Brown, who died March 18, 1797, always held a fascination for me.

"I must add with considerable shame for the place of my birth," lamented Brashear, "that when I visited the graveyard (we never called it a cemetery) in later years, I found some of the old tombstones used as a pavement in front of a stable." Brown's tombstone and others were later relocated to the Christ Episcopal churchyard on Church Street, where they are located today.

At the age of nine, John had an experience that affected him profoundly. "I never afterwards lost my interest in the stars," he declared. "Squire Wampler of McKeesport, then a small town some forty miles from Brownsville, brought a little telescope of his own make to our town and offered a view of celestial objects at a nominal charge which I do not now recall.

"My grandfather learned of his coming, and I was taken to have a view of the moon and of the planet Saturn, that beautiful ringed planet being in good position for observing, although the rings were only about half open. Young as I was, the scenery on the moon and the rings of Saturn impressed me deeply. Although I have since seen more than four phases of Saturn's ring system through several of the finest telescopes in the world, the entrancing beauty of that first sight has never been forgotten."

It was John's first close-up look at the heavens. The visual feast permanently snared his soul. On that memorable night in 1849, as he stared in awe at the rings of Saturn, nine-year-old John A. Brashear's course was set for the stars.

JOHN AND PHOEBE BRASHEAR WERE A DYNAMIC TEAM

In 1855, fifteen-year-old John Brashear left the Brownsville common school on Front Street for the last time. The oldest of seven children, he felt a responsibility to help with his family's finances, particularly because of his father's poor health. After graduating from Duff's Mercantile College in Pittsburgh in four months, John returned to Brownsville, where within one year he worked in a grocery store, as a "printer's devil" at the Brownsville *Clipper*, and at an auction store.

Then he got his break. John's father got his sixteen-year-old son an apprenticeship at the engine works of John Snowdon and Sons in Brownsville. The business was located near the Monongahela River on old Water Street, just north of the Flatiron Building. There John learned to make patterns for steamboat engines that were built at the Snowdon works, and he also learned to work with metal.

"Every one of the master mechanics was kind to me," John said in his autobiography, *The Man Who Loved The Stars*. "I had every opportunity given me to do high-class work. Often I was taken into the drawing room to assist in making drawings."

John completed his apprenticeship at the Snowdon works in three years, then went to work in Louisville, Kentucky, in 1859, building engines for the city's waterworks. When the Civil War disrupted business in 1861, John lost his job and returned to Brownsville. Finding his father jobless, John sought work in Pittsburgh. He was hired as a mechanic in the rolling mill of Zug and Painter, and soon the intelligent twenty-year-old was in charge of the machinery in the mill.

John was a religious man, and while attending church on Pittsburgh's South Side, he met a young Sunday School teacher named Phoebe Stewart, who was originally from Fairchance. In 1862, John and the intellectually inquisitive Phoebe were wed, launching a forty-eight-year marriage and a great scientific team.

They set up housekeeping in Pittsburgh with no savings, because John had continued to send his earnings to his parents in Brownsville. Each Sunday, Grandfather Nathaniel Smith, who was working in Pittsburgh at that time, would visit them. John reveled in the opportunity to discuss astronomy with the mentor who had first taught him about the heavens.

Even though John worked long hours at the mill, he would come home each evening and continue his studies of astronomy. "I made studies of the constellations," he wrote, "particularly on Saturday nights, after the fires and smoke of the mills had ceased to darken the sky."

At age thirty, John secured a better paying position as a millwright at another Pittsburgh firm. He and Phoebe decided to build a new house on a steep hillside on the city's South Side. John's friends from the mill helped him erect the heavy framing and siding, then John and Phoebe labored for months laying the floors and completing the interior of their new home. When the house was finished, they immediately began planning a workshop for the back yard, because Phoebe shared John's dream. They were going to build a telescope.

"I had never lost the interest in astronomy which Grandfather Smith had aroused in my early boyhood," John revealed, "and I had determined that at some time I would have a telescope of my own."

Anxious to begin making a lens, John ordered special optical glass from New York. While awaiting its arrival, he purchased his neighbor's small eight-by-ten-foot coal house for use as a shop, and he added a small shed to its side. He placed an engine in the shed, installed a small boiler in the shop, and built a bench to hold a second-hand lathe he had bought.

"We had a pretty fair amateur outfit," he said.

It was an exciting time for the couple. They were finally beginning their dream project, the crafting of a telescope with a five-inch refractive lens that could capture and focus light from the night sky.

"My good wife and I went to work at it with all the zeal and interest of children with a new toy," John wrote years later. "Our work was done in the evenings. I would not get home until about six o'clock, often much later if there had been any kind of a breakdown in the mill. When I arrived, I would always find steam raised, the shop immaculately clean, everything in order, and a good supper on the table. After the dishes were washed, Ma would always come out to help me; and we often worked until twelve, one, and sometimes as late as two o'clock in the morning."

What did John and Phoebe know about how to make a lens for a refractive telescope?

"I was absolutely ignorant of the various processes used in lens-making," John confessed, "but I managed to cut the square disks [of glass] to circular form. Many, many trials did we have in those years of grinding and polishing."

John made the tools they used for grinding and polishing the glass, employing the skills he had learned in the mills. For seven hundred nights they worked in their backyard shop, patiently shaping and polishing the five-inch lens.

"Just as we would approach a time when we thought we could polish the surface, we would get a scratch on it, and it would have to be

done over again," John recalled.

Much of the polishing was done by Phoebe. "Phoebe developed a rare skill for finish polishing called 'fining,'" observed author Larry Schweiger. "Her skill of fining and patience finally brought the lens to completion."

The moment of truth finally arrived.

"Removing the lens from the lathe, John raised it to the light. Examining what appeared to be a finished product, his hands moist in excitement, John allowed the crown glass to slip."

It hit the floor.

"It broke in two pieces," lamented John Brashear, describing that horrible moment when two-and-a-half years of work was ruined. "It broke my heart, as well as my wife's, in a good many hundred pieces!"

But John and Phoebe Brashear did not give up on their dream so easily. This is as much a tale of human determination as it is a story of a remarkable scientific accomplishment. A sympathetic friend offered to order replacement optical quality glass from England, and it arrived in two months. The Brashears set to work again, beginning a new three-year-long labor of love – the construction of a refractive telescope.

"The work of getting the glass into circular form and grinding it to the correct curves all had to be done again," wrote John. When the five-inch lens was finished, John fashioned a tube nine feet long to hold the five-inch lens. He designed the patterns for the brass parts, had the parts cast, turned them on his lathe, and with Phoebe's help, assembled the lens, tube, and parts. Then they stepped back and quietly contemplated the instrument that lay before them.

They had built a telescope.

"I shall never forget the night," John wrote, describing that magical evening, "that we mounted this tube temporarily in our room that looked to the south, stuck the telescope out of the open window, and pointed it to the planet Saturn."

When John placed his eye to the end of the tube, he became nine years old again. "The view I had of the planet that night is pictured vividly in my mind today," he wrote forty years later, "as is that first view that I had of the same planet in the little telescope belonging to Squire Wampler, through which I had my first view of the heavens in old Brownsville.

"After my wife and I had enjoyed the sight, we could not rest until we had called in some of the neighbors," John declared. He believed it was his responsibility as a scientist to make the instrument accessible to anyone who wished to observe the heavens through it.

John fabricated a mounting for the telescope. "The equatorial parts

were made by my own hands," explained John, "and a large opening was cut in the roof of our cottage so that we could command a fairly good portion of the heavens."

Up to this point, this entire enterprise had been the hobby, perhaps obsession, of a millwright whose wife shared his fascination with astronomy. But was this homemade telescope, even though lovingly fashioned, merely a sophisticated toy? What was the true scientific quality of the instrument?

There was only one way to find out. It was time to show their five-inch lens to an expert.

"I plucked up the courage," wrote John, "to write to Professor Samuel Pierpont Langley, who had charge of the Allegheny Observatory, asking permission to bring the object glass to the Observatory that he might inspect it and perhaps give me advice about further improving it."

On the appointed evening, Brashear carefully wrapped the five-inch lens, placed it in his pocket, walked from Perrysville Avenue to the Observatory, and rang the bell. He was ushered into the presence of Professor Langley.

"As he took the lens in his hands and scrutinized its polish and general make-up," recalled John, "I stood trembling before him. At last (and to me, at least, it was a long time coming) he said, 'Mr. 'Brazier,' you have done very well!'"

Professor Langley was impressed with the workmanship. He offered to lend John a prized book, *Construction of a Silvered-Glass Telescope and Its Use in Celestial Photography*. The book explained how a telescope might be constructed in a different way, using a silvered reflecting mirror to capture the sky's light.

John jubilantly returned home and described the professor's favorable reaction to Phoebe. They had done the unthinkable! This thirty-six-year-old millwright and his devoted wife, using homemade instruments in a converted coal shed, had fabricated a precision instrument that met the high standards of one of the world's leading astronomical authorities.

For some, such success would be the climax of a life's mission. But Professor Langley's encouragement had re-stoked the fires of scientific ambition in John and Phoebe Brashear. John informed Phoebe that they would not attempt to further correct the five-inch refractive lens that he had shown to Langley.

Instead, taking Langley's suggestion, the Brashears would apply their rapidly improving skills to a new and different challenge. Still working in their backyard shop, they would attempt to build a large *reflective* telescope, one able to capture the light from the night sky using

a curved silvered mirror. Like the task they had just completed, crafting that mirror would be a challenge that would sorely try their patience and their skill.

JOHN BRASHEAR'S CAREER WAS DEVOTED TO EXPLORING THE SKIES

"It resembled an enormous bird, soaring in the air with extreme regularity in large curves, sweeping steadily upward in a spiral path . . ."

Professor Alexander Graham Bell, writing in *The World* on May 17, 1896, was describing the flight of a steam-powered airplane circling above the Potomac River, a flight he had witnessed. The aircraft was designed by Samuel Pierpont Langley, astronomer and director of the Smithsonian Institution in Washington, D.C. At the time, the historic twelve-second-long manned flight of the Wright brothers' airplane was still seven years into the future.

"It seemed to me," wrote Bell, "that the experiment was of such historical importance that it should be made public. The aerodrome or flying machine in question was of steel, driven by a steam engine."

Bell compared its flight to that of a huge bird spiraling upward, "the spirals with a diameter of, perhaps, one hundred yards, until it reached a height of about one hundred feet in the air, at the end of a course of about half a mile, when the steam gave out, the propellers which had moved it stopped, and then to my further surprise, the whole instead of tumbling down, settled as slowly and gracefully as it is possible for any bird to do, touching the water without any damage and was immediately picked out and was ready to be tried again."

The twenty-five pound, fifteen-foot-long unmanned "aerodrome" could have flown further, but its one-horsepower steam engine ran out of fuel. Langley's experimental plane was such a success that when he turned his efforts to designing an airplane that could carry a man, Congress allotted $50,000 to the project.

Langley asked his long-time friend from Pittsburgh, Brownsville native John A. Brashear, to build the airplane that Langley would design. Seven years later in October 1903, a crowd of reporters gathered on the banks of the Potomac River for the first public demonstration of Langley's "Aerodrome."

Unfortunately, Langley's devotion to creating a small but powerful steam engine to propel his aerodrome came at the expense of refinement of the plane's flight controls, and the piloted aircraft fell into the Potomac. On December 8, 1903, a second test had similar results. News

reports ridiculed the unsuccessful demonstrations, and Congress withdrew its financial support.

". . .just as he [Langley] had reached the point of success with his man-carrying flying machine, the failure of one part of the mechanism wrecked it," revealed John Brashear. "It wrecked my dear friend's hopes, too, and the unkindly comments of the press overwhelmed him."

Nine days after Langley's second failed demonstration, Orville Wright piloted an airplane forty-five feet into the air, flying it a distance of one hundred twenty feet at Kittyhawk, North Carolina. It was the first sustained powered flight of a heavier-than-air manned aircraft in history.

The flight immortalized the Wright brothers. For the sixty-three-year-old Brashear, the near miss at being the builder of the world's first manned powered aircraft was merely a disappointment. But for Samuel Langley, the public failures crushed his spirit.

This was the same Professor Langley who, twenty-seven years earlier at Pittsburgh's Allegheny Observatory, had examined a trembling John Brashear's 5-inch telescope lens and told him, "You have done very well, Mr. Brazier!" Langley had then encouraged the ambitious millwright to build a reflecting telescope, a project that had resulted in the greatest discovery of Brashear's career.

John and his wife Phoebe had decided to attempt to make a twelve-inch reflector, the largest diameter they could handle in their little backyard shop. They purchased glass disks from a New York firm, and as John had always done, he worked each evening in his backyard shop after a long day's work at the mill.

"Our evenings were frequently interrupted by visitors who wanted to see the heavens in the five-inch telescope which was mounted in what was then the garret of our home," wrote John in his autobiography, "but I do not and did not regret the delay, so great was the pleasure of our visitors at seeing the moon, planets, star clusters, nebulae and occasionally a comet, in our telescope. But it required many months of labor before we had carried the work far enough along on the reflecting telescope mirror to do the polishing and testing. After many nights of polishing, figuring, and testing, I concluded that the glass was as good as I could make it."

It was time to silver the glass.

"There were several known methods for silvering front surfaces of glass," explained Brashear, but his limited knowledge of chemistry prevented him from applying them. He tried modifying a method that had been used for silvering the inside of mirrors, but the results were unsatisfactory. Then a friend showed him an article that explained how to silver a glass by applying heat. He and Phoebe decided to try it.

Phoebe readied the shop. When John came home from work, they excitedly ate supper, then went to the shop to silver the disk they had been so carefully grinding and polishing.

"We had poured the silver solution with its reducer," wrote John, "to change it to the metallic form; and you can imagine our delight and joy when we saw a beautiful deposit of silver covering the surface."

Then, once again, came heartbreak.

"But, alas, alas, our joy was soon turned to sorrow, to grief, to keen disappointment that never could be described in words, when we saw and heard our disk crack from edge to center! Not to this day have I determined the real cause of the disaster.

"I do not like to write about this second disappointment in our optical work when we appeared to be just at the climax of success; for this last failure seemed to affect me more than the first one. Failure after all these months, and just when we had reached the goal!

"I slept little or none that night, though my dear wife tried her best to cheer me by saying we could finish another glass, as we had both [another] disk and the experience. I went to the mill the following morning; I walked around like a crazy man; I could not collect my thoughts or concentrate them upon anything.

"About four o'clock in the afternoon, I stopped and pondered for a moment, and this expression came from me, and could almost have been heard, I am sure, had there been anyone near me: 'What a fool you are, to worry this way; this worry will never mend that broken glass.'

"I am not certain that I was a believer in telepathy then, or that I am now, but somehow I felt in my innermost soul that something was going on at home. I started home as early as possible that evening, and as I climbed the hill it was not with the same heavy heart that I had as I walked down it that morning. As I opened the door I was met with a smile and a kiss, and then dear Ma asked me to go out to the little shop before we sat down to supper. I thought possibly something unfortunate had happened out there.

"But instead, what did I see? The little shop in prime order, a fire burning under the boiler, engine oiled ready to start, and the extra disk in the lathe ready to have its edge turned with the diamond tool, and its surface roughed out to the approximate curve. Could any one have done more? The memory of that moment, filled with the love and confidence of the one who was more than life to me, I can never forget.

"To make a long story short, in about two months from that evening, in the early spring of 1878, the new twelve-inch mirror was ready to be silvered."

In the interim, John had experimented with various methods of

silvering and modified a technique previously used only for silvering the back surfaces of mirrors and looking glasses.

Using this modified method, "I succeeded in obtaining most admirable results in silvering mirrors on the front surface," John explained. Of his new discovery he wrote, "So simple, so certain was this method, that I at once sent a communication to the 'English Mechanic and World Of Science,' describing it in full for the benefit of my amateur friends.

"Little did I think at the time that this method would become THE method, and be universally used for front-surface mirrors. The formula has been published in perhaps every chemical journal in the world; and although I am writing this note more than forty years after I had the pleasure of giving it to the world, without money and without price, I often have pleasant reminders of the value of my first humble contribution to the makers of reflecting telescopes."

The silvering technique John Brashear discovered was his greatest contribution to the science of crafting reflecting telescopes. Despite his method's immeasurable intellectual and monetary value, Brashear refused to patent the process he had discovered. Instead he allowed it to be used freely by anyone.

"Almost forty years later," he wrote in 1912, "I stood in the laboratory of the Mount Wilson Observatory, admiring the beautiful silvered surface of the great one-hundred-inch reflecting telescope mirror, made by my old-time friend Professor Ritchey. Expressing my pleasure to him, he replied, 'Well, it was silvered by Brashear's process.'"

After silvering the twelve-inch lens that he and Phoebe had made in his backyard shop, then using the technique successfully several more times, John placed an ad in *Scientific American* offering his lens making services to amateurs. The response to the 1878 ad was overwhelming. Too overwhelming.

"He and Phoebe were soon flooded with requests," wrote author Larry Schweiger, "not only from amateurs but professional scientists as well. Working the mill by day and his workshop by night, in 1881 John collapsed from complete exhaustion and required three full weeks of bed rest to recover.

"He had to give up something. He just could not physically keep up the pace. He knew he could not make enough [money] as an instrument maker to survive, but that's where his heart was."

John Brashear faced the agonizing prospect of abandoning his life's work in order to continue supporting his family on a mill worker's salary. It appeared that his greatest triumph, the development of a world-

acclaimed silvering process, was to be cruelly followed by his farewell to the scientific world. His health and family obligations would no longer permit him to be both scientist and breadwinner.

And then it happened – an almost miraculous turn of events that allowed John Brashear to leave the mill forever and devote his life to the crafting of astronomical instruments. To this gentle man who, as a child, devotedly attended Brownsville's First Methodist Church, the remarkable offer that would save his scientific career seemed nothing less than Divine intervention.

GOOD SAMARITAN RESCUED THE CAREER OF JOHN BRASHEAR

In 1881, John Brashear became a victim of his own scientific success. Following the successful 1878 experiment in which John produced a superior method of silvering mirrors for reflective telescopes, he had placed the following advertisement in the *Scientific American*:

Silvered-glass specular, diagonals and eye-pieces made for amateurs desiring to construct their own telescopes. Address: John A. Brashear, No. 3 Holt Street, South Side, Pittsburgh, Pa.

"Alas for me!" wrote John in his autobiography. "Hundreds of inquiries came to me from that advertisement. I had no clerk, and I was still hard at work in the rolling mill – up early in the morning, home after six. How was I to answer those scores of letters? And how to make specula for the fellows that wanted them?"

In order to meet the avalanche of orders that poured into the little hillside in Pittsburgh, John and his wife Phoebe worked in the backyard shop every night after he returned home from working at the mill. Three years of this brutal day-night work schedule, taking only Saturday nights off, finally took its toll on John's health.

"One evening," John wrote, "Dr. Herron on one of his visits found me laid up in bed, a pretty sick man who did not know what was the matter with him. The doctor at once pronounced it a nervous breakdown from overwork." Dr. Herron warned the forty-year-old Brashear that he must "let up with caring for the machinery of the rolling mill and making optical instruments besides."

After a long talk with Phoebe, John decided to quit his job at the rolling mill, team up with his son-in-law, James B. McDowell, and try to make a go of the business of making astronomical telescope lenses and mirrors. McDowell was married to the Brashears' daughter Effie. He was employed at Bryce Glass Works and took a keen interest in John's

scientific work. The young couple lived with the Brashears.

The decision that John would quit his job was a gamble. The Brashears' debts exceeded their meager savings, and they were not yet making a profit selling optical instruments. Could they hold out financially until the new enterprise became a money-maker?

"Fortune never helps the fainthearted," wrote Greek tragedian Sophocles. John and Phoebe Brashear were anything but fainthearted. So perhaps it was divine justice that after years of unflagging dedication to their scientific work, a benefactor providentially appeared at this most critical juncture of John and Phoebe Brashears' lives.

On an evening in July 1881, shortly after giving up his job at the rolling mill, John walked to the Allegheny Observatory to deliver a telescope mirror that he had silvered for Professor Samuel Langley. John could not have known that on that night, he would meet his "Good Samaritan" for the first time.

"It was quite light when I reached the top of the hill," wrote John of his hike to the Observatory. "I saw a gentleman sitting on the Observatory steps talking with Professor Langley, so I kept myself in the background until Professor Langley saw me and called me to him."

Langley eagerly unwrapped the silvered mirror, expressed great satisfaction with it, and showed it to his friend, who was also eager to examine it. Langley then introduced his friend as William Thaw, a vice president of the Pennsylvania Railroad, well-known philanthropist and great supporter of the Observatory.

"Young man," said Thaw to Brashear, after marveling at the beauty of his work, "I want to know you better. Come over to my house tomorrow night and let us have a talk together."

The following evening, John visited Thaw at his home. "I found him awaiting me in the modest parlor of his house," remembered John. "He asked me to be seated, and with his pointed queries, learned the general outline of my life-history from my birth to the day I met him. Then he bade me good night, saying, 'Tomorrow night I am coming over to see you.'"

The next night Thaw arrived at the Brashears' home after dark. He waited patiently as John showed some unexpected visitors the binary star Albireo through the twelve-inch reflector telescope. When the visitors departed, Thaw expressed the desire to see the object as well.

"He climbed the ladder to the eye-piece," said John, "and I well remember his expression, 'I have never seen anything so beautiful in all my life!'"

After John showed Thaw the backyard shop, the men joined Phoebe in the house and chatted for a while. As Thaw was leaving, he turned to

them, took both John and Phoebe by the hands, and spoke the words that changed their lives.

"I see you have the boat, the captain and the pilot," he said, "and now what you want is some water to float the vessel in. You must have a better and larger workshop, better machinery, better equipment. Study out your plans, then come to see me as soon as you can. Good night."

After he had left, John and Phoebe attempted to decipher Thaw's cryptic statement. Was he proposing to lend them the money to improve their shop? If so, would they ever be able to repay it? John followed Thaw's instructions and designed a modest plan that included a twelve-by-twenty-foot building containing all of the necessary machinery. Then he visited Thaw to deliver the plan.

"He expressed himself as well satisfied with my plans," John wrote, "and at once wrote me a check for three thousand dollars to pay for the materials."

John was stunned. He and Pheobe's life savings amounted to $300. This stranger was handing him a check for ten times that amount!

"I asked him when and how he expected me to pay the money back again," said John, "telling him I feared debt, and was much concerned over the uncertainty of paying it back. He told me it was his privilege to do this for me in the interest of a science we both loved so well; and since I was loath to accept the money as a gift, he let me down easy by saying if I ever became wealthy, I could either return it to him or pass it on to the other fellow! Moreover, he at once proposed to take another burden off my mind by paying all the indebtedness on our home, which was done."

By December, the new shop was built and fully equipped, and John and Phoebe were ready to "put full-time work on the orders we had secured both through Professor Langley and the single advertisement in the *Scientific American*."

One year earlier on Christmas Eve 1880, John had written the following entry in his diary:

Shipped the three mirrors I had made by Adams Express today. One to Hunt, C.O.D. $59.50; one to Hesse, $23.50; one to Bishop, $35. These are my first actual shipments and I do hope they will turn out good.

"It had been my ideal in all my work," wrote John, "to make it turn out good, as good as my ability and efforts could make it, and regardless of the time it took. It was this desire for perfection that made my work valuable to scientists, but coupled with a lack of interest in what it cost

me in time and money to do my work, it led me from this time on into frequent financial worries. Without Mr. Thaw's aid, I fear it would have been impossible for me to keep on."

In the years that followed William Thaw's remarkable gift, "orders began to come in that I found impossible to fill all by myself," John wrote. John's son-in-law, James, resigned his job at the glass works to work full-time in the Brashears' new shop, and a third man was hired to help with the instruments.

John and James became so skilled at the crafting of another type of instrument, the spectroscope, that the Brashear Company (as the business was now called) supplied them to major universities all over the world. This advance was followed by another, the highest quality precision work available in the manufacture of rock-salt prisms used in optical experiments.

Brashear's scientific ingenuity and expertise were now acknowledged the world over. He was asked to present a paper before the American Association for the Advancement of Science in Philadelphia. The presentation was a success, and a technique that John developed for correcting optical surfaces was soon adopted by the world's best opticians.

Through the dizzying years of the Brashear Company's growth and amid the increasing international acclaim for John's expertise, William Thaw continued to generously support John financially, even to the point of providing him with railroad passes to attend scientific meetings. In 1886, Thaw constructed a much larger, fully equipped shop near the Observatory, built to plans drawn up by John, then gave him rent-free use of the entire facility. It was better than anything John could ever have imagined.

"I had never dreamed of having anything so nice," he wrote. "All this Mr. Thaw did for me, not, he said, for charity, but to help push outward the boundary line of human knowledge. How I prayed for the ability to give a good account of my stewardship!"

The years that followed brought worldwide recognition of John Brashear's contributions to science. Several tours of Europe saw him welcomed with admiration by astronomical societies and leading scientists all over the continent. For the boy who had first glimpsed Saturn's rings at his grandfather's knee in Brownsville, a lifetime of hard work and unerring dedication to his science had finally brought well-earned acclaim.

But there was one group of young admirers whom fate had decreed would never see the rings of Saturn. To these children, the somewhat elderly bearded man who rolled with them on the lawn or rode them

piggy-backed as he laughed and played with them was "Uncle John," their favorite visitor. Next as our series concludes, we will follow John Brashear to a special place where he was often found playing, in his words, with "the little ones who would never see the stars."

JOHN BRASHEAR'S LEGACY LIVES ON TODAY

In December 1881, forty-one-year-old John A. Brashear's marvelous new shop near the old Allegheny Observatory opened for business. It had been constructed and provided to John rent-free by philanthropist William Thaw, and within its walls John happily proclaimed the official creation of the John Brashear Company. Thanks to Thaw's generosity, John was able to give up his job at the mill. For the first time in his life, he could devote all of his time and energy to crafting precision optical instruments, a skill for which he had gained a sterling reputation.

John's son-in-law, James McDowell, was also working full time at the company. In fact, James had become so expert at the meticulous optical work that John soon felt confident leaving him in charge of the shop. This freed John to travel by ship to Europe and Asia to share his knowledge with scientists throughout the world.

As the nineteenth century flowed into the twentieth and John Brashear's reputation continued to grow, leaders of industry and education began turning to him when they needed a man of unquestioned integrity to take on an important task. From 1898 to 1900, John Brashear served as Acting Director of the original Allegheny Observatory. He was the driving force in raising the funds that built the three-dome Observatory building which exists today.

In 1900, when Dr. W. J. Holland, Chancellor of the Western University of Pennsylvania (now the University of Pittsburgh), resigned to become Director of the Carnegie Museum, John was asked to serve as Acting Chancellor of the university. He remained in the position from 1901 to 1904 while he helped the search committee locate a permanent chancellor. He was also one of three men hand-picked by industrialist and philanthropist Andrew Carnegie to establish the Carnegie Institute of Technology (now Carnegie-Mellon University), breaking ground for that school's first building in 1905.

Yet it is a testament to the greatness of heart of this gentle man, a man whose companionship was sought by wealthy and powerful men, that he could often be found frolicking in the grass with 'the kiddies,' as

he called them, children who shared an affliction that denied them the opportunity to gaze at the same stars that fascinated Brashear.

Larry J. Schweiger of the Western Pennsylvania Conservancy, writing in 1998, explained that "during the years he headed the Western University, John was often found down the street in a business suit, piggy-backing blind children on the Western Pennsylvania School for the Blind's front lawn. He would roll in the grass with ten or fifteen frolicking children all about him acting like a litter of playful pups." It was this love of people, particularly children, that led many Pittsburghers to fondly refer to John Brashear as "Uncle John."

John Brashear left his mark on society in many ways. His scientific legacy has not faded with the passage of years. It lives on today in the business which bears his name, Brashear L.P., a highly specialized producer of optical instruments. The John Brashear Company, which was founded in 1881, operated independently for nearly a century until 1974, when it was purchased by a Swiss corporation called Contraves A. G. and renamed Contraves Brashear Systems L.P. In November 1999, the company's name was changed to Brashear L.P.

Brashear L.P. is located in O'Hara Township near Pittsburgh. The firm specializes in telescope systems and military applications that utilize the company's expertise in optics. Among Brashear L.P.'s specialties are the development and manufacture of tracking systems, optical components, test range instrumentation, laser beam directors, and small arms fire control systems.

In addition to the continued existence of his optical instruments business, there is another part of John A. Brashear's mission that has lived on to the present day. That is his oft-stated desire that knowledge of the stars should be shared with ordinary citizens. For example, what if you were offered the chance to look through one of the largest telescopes ever built by Brashear, one that is still in use today? If you are interested, you can have that unique experience.

Each year, the University of Pittsburgh, where Brashear was Acting Chancellor exactly one century ago, announces that the Allegheny Observatory is accepting reservations for its annual open house. The observatory is in Riverview Park, four miles north of downtown Pittsburgh.

According to the university, "The open house is the only time visitors are allowed to use the observatory's 30-inch Thaw Refractor [made by Brashear], the primary instrument of the Allegheny Observatory and the third-largest refractor in the United States. Visitors also will be able to use the 13-inch Fitz-Clark telescope, as well as a dozen smaller telescopes set up on the lawn by the Amateur Astronomers Association of Pittsburgh. The open house also includes a slide

presentation and a self-guided tour of the observatory, which is a noted example of 19th-century architecture."

And so we see that John Brashear's twin aspirations, to develop better instruments with which to view the stars and to share the knowledge of the heavens with all who showed an interest, continue to be achieved in the twenty-first century.

The last decade of John Brashear's life was filled with honors, tributes, and some sadness. In the summer of 1910, the seventy-year-old Brashear's aged mother Julia passed away. Then on September 23, 1910, came the hardest blow for him to bear. His beloved wife Phoebe, whose health had been failing for years, died. His partner in life, without whose encouragement he might have given up his lens-making experiments in the backyard coal shed during those difficult but exciting early years, was gone from his life.

"Like the sinking of a summer sun," he wrote sadly, "that sweet spirit left me."

In 1912, at the urging of his friends, John began to write down "reminiscences of my long life." He hoped that by his example, others might be encouraged to follow their dreams. "My one big hope," he wrote on the final page of his autobiography, "is that my humble effort in jotting down these items from life's memorandum book may help some struggling soul to master some of the problems of life . . .

"For aside from all knowledge, all science," he wrote, "I have long ago learned that 'it is worth while to do even the smallest kindness, as we go along the way. Nothing is lost, no dewdrop perishes; but, sinking into the flower, makes it all the sweeter.'

"The happiest days of my life," he concluded, reflecting on days happily spent explaining the heavens to fellow mill workers, friends, neighbors, and blind children, "have been spent in endeavoring to lend a helping hand to the other fellow; whether he was a prince or a pauper, a savant, or a poor chap seeking for some little knowledge of things good and beautiful, a teacher of men, or a lover of kiddies; and while my love of the beauties of the skies has not abated one jot or tittle from the time I had my first view in my old home town to the day I write this paragraph, my chief joy has been to hand these beautiful things over to the other fellow, that he, too, might share in them."

In April of 1920, John A. Brashear died at the age of seventy-nine. His ashes and those of his beloved wife Phoebe lie in a special crypt below the base of the Keeler Memorial Reflecting Telescope at the Allegheny Observatory, a telescope produced by the John Brashear Company. His legacy and his charge to make the stars accessible to every man, woman, and child live on today in the charter of the Amateur Astronomers Association of Pittsburgh, an organization which sponsors tours of the Allegheny Observatory for all who wish to view the stars.

A plaque marks the crypt of John and Phoebe Brashear. On it are

engraved the closing lines of a poem by Sarah Williams, one that John and his wife both loved, entitled "The Old Astronomer To His Pupil." For those who knew and loved this remarkable pair, man and wife, fellow lovers of the stars, the poem's final words were a mirror of their lives.

Though my soul may set in darkness,
it will rise in perfect light;
I have loved the stars too fondly
to be fearful of the night.