Oliver Wendell Holmes

—*His pioneer Stereoscope and the later Industry*

GEORGE E. HAMILTON

"Were American Newcomen to do naught else, our work is well done if we succeed in sharing with America a strengthened inspiration to continue the struggle towards a nobler Civilization—through wider knowledge and understanding of the hopes, ambitions, and deeds of leaders in the past who have upheld Civilization's material progress. As we look backward, let us look forward."

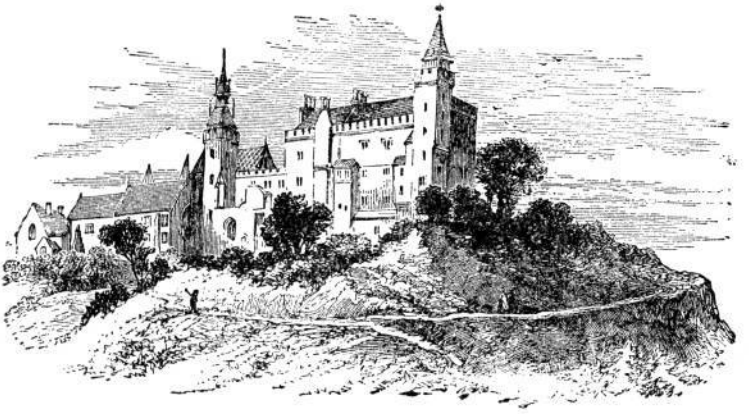
—CHARLES PENROSE
Senior Vice-President for North America
The Newcomen Society of England

This statement, crystallizing a broad purpose of the Society, was first read at the Newcomen Meeting at New York World's Fair on August 5, 1939, when American Newcomen were guests of The British Government

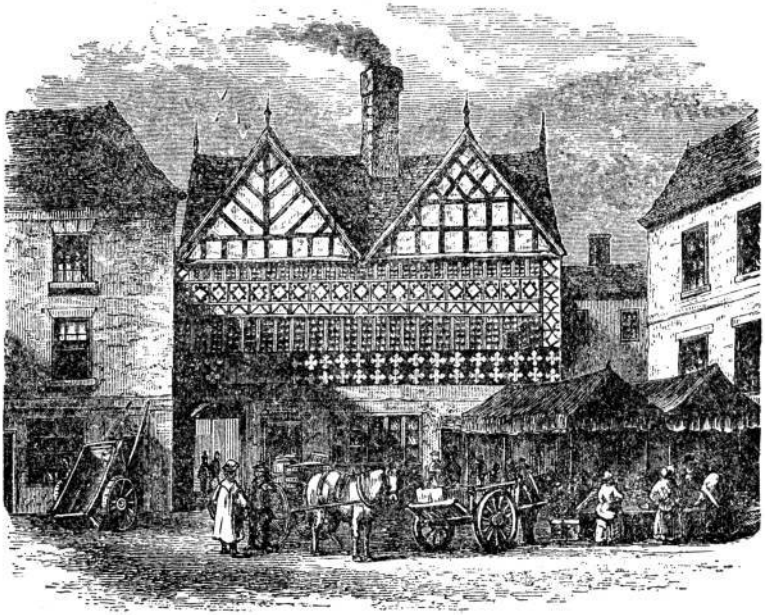
"Actorum Memores simul affectamus Agenda"

OLIVER WENDELL HOLMES—

His pioneer Stereoscope and the later Industry



AMERICAN NEWCOMEN, *through the years, has honored the memories of numerous pioneers within the broad fields of many enterprises and many industries. Invention and research and development have opened golden doors to discovery, whereby knowledge and educational teaching have made valuable contributions: so that men shall have wider understanding. Nature has been unfolded; Science has been explained; Travel has been brought close to home. Inspiration has been shared and intellectual curiosity aroused. This Newcomen manuscript deals with pioneers and an agency and an art valuable alike in the educational and entertainment fields. A development whose popularity flourished like the green bay tree, in the 1890's and the early part of the 20th Century; and, today, through greater precision, greater refinement, and the application of scientific principles, has attained new place among America's distinctive contributions to Education and Science.*



Isolated as America was during many generations, the American People responded quickly to the breadth of outlook which foreign travel provided for those to whom its lure was accessible. For those many others, the stereoscope was a veritable gateway, at home, to Foreign Land and Peoples. Oliver Wendell Holmes, scholar, philosopher, and man of letters, early grasped the vision of its wide possibilities!

Oliver Wendell Holmes

—*His pioneer Stereoscope and the later Industry*

GEORGE E. HAMILTON

MEMBER OF THE NEWCOMEN SOCIETY
PRESIDENT
KEYSTONE VIEW COMPANY
MEADVILLE
PENNSYLVANIA

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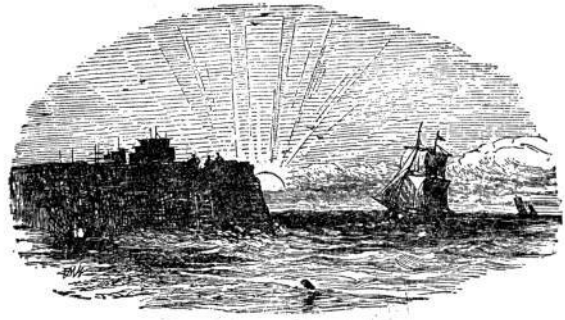

This Newcomen Address, dealing with the history of the Stereoscope in America, was delivered at the "1949 Lake Erie Dinner" of The Newcomen Society of England, at which Mr. Hamilton was the guest of honor, held at Erie Club, in Erie, Pennsylvania, U.S.A., on November 4, 1949

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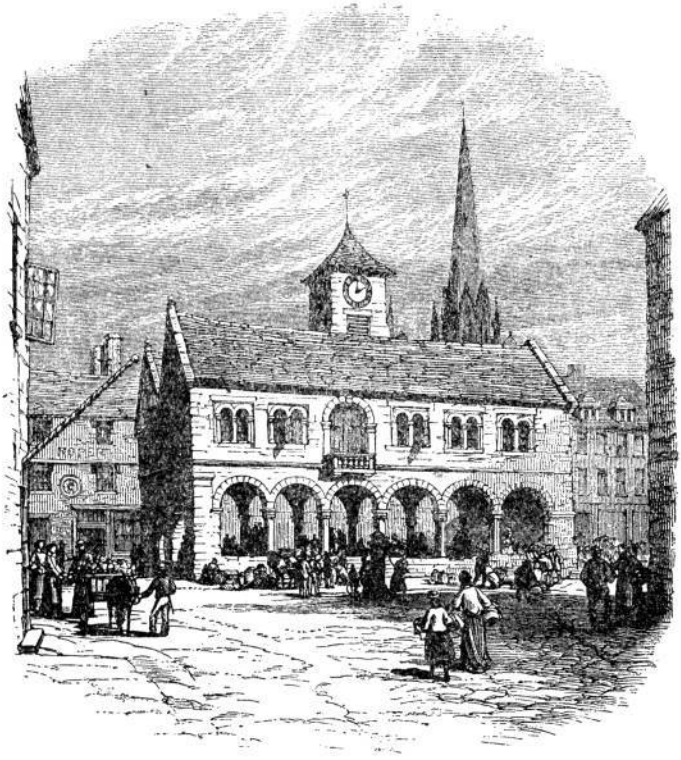

"Few Americans are aware of the scientific contributions made by Oliver Wendell Holmes (1809-1894) in the development of the Stereoscope. The famous author of *The Autocrat of the Breakfast Table* is known more for his essays, his poems, and his satires. The distinguished graduate of Harvard College, in the Class of 1829, had many accomplishments and many interests: man of letters, teacher of anatomy, master of verse, physician, and inventor. The Stereoscope was one of his most cherished ventures."

—George E. Hamilton

Biographical Sketch of The Author

OXFORD *and* PEMBROKE COLLEGE *form a prized British background of the American whose unique Newcomen manuscript is set out in these pages. Pembroke College in Oxford University dates back to the Year of Grace 1624, when founded by* JAMES I; *and when the Earl of Pembroke, then Chancellor of Oxford, "stood godfather." A colorful and magnificent ceremony was that of August 5, 1624, when the venerable Broadgates Hall became exalted into Pembroke College. Among benefactions were three fellowships for the Channel Islands, endowed by* CHARLES I. *Pembroke's history has been distinguished: her sons include Dr. Samuel Johnson, who matriculated in 1728; George Whitefield, in 1732; and Sir William Blackstone, the great lawyer, in 1738. Samuel Johnson's room, still preserved, is found over the Great Gateway. The best of Oxford's traditions are a golden heritage for Pembroke College. It was in residence there, that* GEORGE E. HAMILTON, *first Rhodes Scholar from the State of Indiana, spent three years: with every opportunity to absorb all that English culture and English learning had to offer. He profited abundantly. Born in Ohio, he earlier attended Manchester College in Indiana; subsequently graduating at Earlham College in Indiana, in the Class of 1905. Then he went to England, entering Oxford University. His entire life has been devoted to Education. Upon return from England, he taught Latin and athletics, in Indiana. During the earlier Summers of 1900 to 1903, he had worked his way through college by selling stereoscopes for James M. Davis of New York. This was the heyday of the stereoscope; Davis was a foremost pioneer; and, today, Keystone View Company owns all*

Biographical Sketch of The Author

of the Davis negatives. During just 30 years, Mr. Hamilton has been associated with Keystone View Company, at Meadville, Pennsylvania, U.S.A., of which he is President. His organization, internationally-known, centers its efforts in the educational and ophthalmic fields, whether for schools, colleges, industry, the ophthalmic professions, or government. It has the famous Brady negatives, taken during the Civil War, and made available by the Library of Congress. Its travel negatives cover all countries of the civilized world. The writer of this informal biographical sketch remembers distinctly the thrill, as a small boy in the late 1880's, provided by the stereoscopic views of foreign lands which his Grandmother highly prized at Philadelphia. Here then were spread out before him a glorious pageant of the countries of England, France, Germany, Belgium, Holland, Italy, Spain, and Northern Africa—countries which he was destined years later to visit and to recognize. The memory of that earliest stereoscopic experience has never dimmed. Therein lay inspiration and ambition—even for a small boy! Amazing strides have been made in the art during a succeeding 60 years! Today, the modern stereoscope is a valuable aid—and in then undreamed directions. Educator, author, lecturer, business executive, good citizen, student of history, Mr. Hamilton is a member of the Lake Erie Committee, in The Newcomen Society of England.

HIS MARK

My fellow members of Newcomen:

MORE THAN 2000 YEARS AGO, Euclid ventured the opinion that *each eye* saw *a different picture* of any given scene. Thus was born the beginnings of an idea that later became important in the appreciation of stereoscopic awareness of *depth*, which we now call stereopsis.

If the reader will draw two lines of equal length but differing slightly in direction off vertical (rings drawn over each line as in *Figure A* will help) and then, from the correct distance, squint at the left-hand line with his left eye and at the right-hand line with his right eye, he will note a strange phenomenon. The two lines will seem to fuse into a third line; but the fused line, instead of lying flat on the paper, will seem to occupy a slanting position in three-dimension space, one end appearing farther away from the looker than the other. If one has difficulty in fusing the two lines, a cardboard divider held between the lines will help. In some such

manner, *at some unknown date*, some unknown observer discovered *the beginnings* of the art of stereoscopy.

After this discovery, more complicated geometric drawings were made so that they might be fused into *third-dimension* space. It

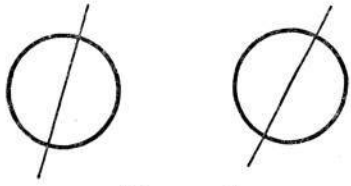

Figure A

was finally, in 1941, that Professor John T. Rule, of Massachusetts Institute of Technology, wrote a splendid article on "The Geometry of Stereoscopic Projection," which was published in *The Journal of the Optical Society of America.*

When Wheatstone of England invented the mirror stereoscope, in 1838, it was for the purpose of enabling the observer to *fuse* more readily such stereoscopic drawings. The invention of Photography came after Wheatstone's invention. A Frenchman named Daguerre invented the daguerreotype in 1839; and, a year or two later, the printing of a photograph on paper from a negative was accomplished. It was not until 1845 that Wheatstone was credited with the first successful experiment in viewing and fusing two photographs of the same scene, made from slightly different points of view. Thus, contemporaneously with the early development of modern photography, came the development of stereoscopic photography and the use of the stereoscope for viewing third-dimension photographs.

However, the *mirror* stereoscope was large and clumsy and very expensive to build. In 1849, Sir David Brewster, also of England, conceived the idea of securing separation of the two pictures of a

stereograph through the use of *prisms*. These prisms were set in the eyepiece with the bases out. Then a divider was extended forward in the box, between the prisms, so that each eye could see its own picture independent of the other, with the prisms seeming to superimpose the two views. This prism stereoscope was in principle identical with all popular and scientific stereoscopic viewers used since that time.

M. Duboscq, a noted French optician, began the extensive manufacture of stereoscopes in France during the same year in which Brewster announced his invention. The Brewster stereoscope, also, was clumsy and expensive to build, and it made no provision for changing the distance of the picture from the eye in order to adapt it to *the focusing power* of the observer. The versatile Oliver Wendell Holmes, American physician, scientist, and writer, became interested in the use of stereographs. He succeeded in designing a simple type of stereoscope, which dispensed with the boxing in of the picture, and provided, at first, for *three* positions at which the picture could be set, according to the focusing needs of different observers. Likewise, he placed a hood over the front of the instrument to exclude extraneous light from the eyes. A little later, he added a sliding cardholder. This feature made more flexible the adaptation to the observer's correct focusing position. The Holmes Stereoscope was identical with stereoscopes sold in America, and later in Europe and elsewhere throughout the World, for the next seventy-five years!

Dr. Holmes' first instrument was perfected in 1859. It is interesting to read, in his own words, Dr. Holmes' description of the difficulty he encountered in endeavoring to get someone interested in the manufacture of his new gadget. He was very enthusiastic over the possibilities of the stereoscope, and he wished to aid in promoting its general use through the production of a cheaper and more usable instrument. He was acting purely in the interests of the development of the new art; he had no desire for royalty or

for any other sort of personal reward. There always have been people like that in America!

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Possible manufacturers were reluctant, however, to venture the small capital required on this project. In the *Philadelphia Photographer* of January 1869, Dr. Holmes wrote in part:

"I felt sure this was decidedly better than the boxes commonly sold—that it was far easier to manage, especially with regard to light, and could be made much cheaper than the old-fashioned contrivances. I believed that it would add much to the comfort and pleasure of the lover of stereoscopic pictures. I believed, also, that money could be made out of it. But considering it as a quasi scientific improvement, I wished no pecuniary profit from it, and refused to make any arrangement by which I should be a gainer. All I asked was to give it to somebody who would manufacture it for sale to the public. There did not seem to be much chance of anybody's making a fortune by it, at first, certainly. I showed it to one or two dealers in Boston, offering them the right to make all they could by manufacturing the pattern, asking nothing—not even one for my own use. They looked at the homely mechanism as a bachelor looks on the basket left at his door, with an unendorsed infant crying in it.

"I had received many polite attentions from members of a great photographic house in Broadway, New York, and, as I was returning through that city, I thought it would only be fair to offer them a chance to repeople the world with my improved breed of stereoscope. Nothing could be more polite than the way in which they treated me, but I might as well have offered my stereoscope to an undertaker for a smile of welcome as to these great dealers, generous and excellent people as they are.

"Not far from their establishment, was another of some pretentions, at which I made one last trial. On entering the salesroom, I saw a young gentleman smoking a cigar with such evident enjoyment that I felt quite ashamed of myself for interrupting him on a mere matter of business. I bought a picture

or two of him, however, and then brought out my stereoscope and began, in a modest way, to explain its advantages and its commercial possibilities. It was to a young Briton, I found, that I was addressing myself and my answer was somewhat to this effect: 'Beg your pawdon?—Aw—Yes. Quite so. They send us out everything new FROM LONDON—last dodges—and all that sort of thing, you know.' Of course, I ought to have remembered that in London they know all that we wretched provincials know, and ever so much more. So I left him over his cigar and his last London importations, which had, of course, all the possible improvements which the wit of man can devise."

In a few years, the great War between the States was going on, and Brady, who contributed so much to the photographic record of those times and of that great struggle, was making stereographs of great personages and of great scenes of the war. Today, we may still see the immortal Lincoln, the imperturbable Grant, and the dashing Sheridan standing out in stereographs in such reality *that they seem ready to speak to us!*

What is this marvel of photographic representation that makes children and adults feel they are in the room, on the highway, or in the forest, where the stereoscopic photographer caught the scene? First, the photographer has a binocular camera and gets *two pictures* of the scene *at the same moment*—two pictures *from slightly different points of view.* Through the use of the stereoscope, then, it is possible to separate these two pictures so that the right eye sees the right picture only, and the left eye sees the left picture only. Consequently, the stereoscope as described above, puts the observer in almost the same position the photographer himself occupied when the picture was made. Objects, especially those at near point, stand out with striking reality because of the human ability to *coordinate* the vision of the two eyes on one object or scene. This ability is not shared by the lower animals; it is peculiarly a human trait. There are other clues to depth awareness, such as interpretation of size, overlapping of contours, geometric

perspective, and chiaroscuro—all available to the one-eyed person or in the single photograph, still or in motion, and often confused with stereopsis by promising inventors who talk about achieving third dimension on single pictures or photographs. They are talking about factors of depth awareness that do not include the most striking factor of all, which can come only from the *two-eyed picture* seen with *two eyes,* as provided for in the stereoscope.

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Dr. Holmes wrote two articles in *The Atlantic Monthly,* one in 1859 and the second in 1861, and discussed with his characteristic clarity of style, stereoscopic photography and the cultural contribution the stereoscope was destined to make to the new travel-hungry America that he knew. Following are highlights from these:

"The stereograph, as we have called the double picture designed for the stereoscope, is to be the card of introduction to make all mankind acquaintances. The first effect of looking at a good photograph through the stereoscope is a surprise such as no painting ever produced. The mind feels its way into the very depths of the picture. The scraggy branches of a tree in the foreground run out at us as if they would scratch our eyes out. The elbow of a figure stands forth so as to make us almost uncomfortable. Then there is such a frightful amount of detail, that we have the same sense of infinite complexity which Nature gives us. A painter shows us masses; the stereoscopic figure spares us nothing—all must be there, every stick, straw, scratch, as faithfully as the dome of St. Peter's, or the summit of Mont Blanc, or the ever-moving stillness of Niagara. The sun is no respecter of persons or of things. This is one infinite charm of the photographic delineation. Theoretically, a perfect stereograph is absolutely inexhaustible. In a painting you can find nothing which the artist has not seen before you; but in a perfect photograph there will be as many beauties lurking, unobserved, as there are flowers that blush unseen in forests and meadows. It is a mistake to suppose one knows a stereoscopic picture when he has studied it a hundred times by the aid of the best of our

common instruments. Do we know all that there is in a landscape by looking out at it from our parlor-windows? In one of the glass stereoscopic views of Table Rock, two figures, so minute as to be mere objects of comparison with the surrounding vastness, may be seen standing side by side. Look at the two faces with a strong magnifier, and you could identify their owners, if you met them in a court of law.

"Oh, infinite volumes of poems that I treasure in this small library of glass and pasteboard! I creep over the vast features of Rameses, on the face of his rockhewn Nubian temple; I scale the huge mountain-crystal that calls itself the Pyramid of Cheops. I pace the length of the three Titanic stones of the wall of Baalbec,—mightiest masses of quarried rock that man has lifted into the air; and then I dive into some mass of foliage with my microscope, and trace the veinings of a leaf so delicately wrought in the painting not made with hands, that I can almost see its down and the green aphis that sucks its juices. I look into the eyes of the caged tiger, and on the scaly train of the crocodile, stretched on the sands of the river that has mirrored a hundred dynasties. I stroll through Rhenish vineyards, I sit under Roman arches, I walk the streets of once buried cities, I look into the chasms of Alpine glaciers, and on the rush of wasteful cataracts. I pass, in a moment, from the banks of the Charles to the ford of the Jordan, and leave my outward frame in the armchair at my table, while in spirit I am looking down upon Jerusalem from the Mount of Olives.

"If a strange planet should happen to come within hail, and one of its philosophers were to ask us, as it passed, to hand him the most remarkable material product of human skill, we should offer him, without a moment's hesitation, a stereoscope containing an instantaneous double-view of some great thoroughfare.

"This is no toy, which thus carries us into the very presence of all that is most inspiring to the soul in the scenes which the world's heroes and martyrs, and more than heroes, more than martyrs, have hallowed and solemnized by looking upon. It is no toy; it is a divine gift, placed in our hands nominally by science, really by that inspiration which is revealing the Almighty through the lips of humble students of Nature."

In discussing stereographs of New York City, in the second article, Dr. Holmes mentions favorably a Mr. Anthony who apparently had developed great skill in making views of Broadway and of other sections of New York City. Holmes describes several of these views in detail. Anthony was one of the early American producers of stereoscopic views for sale to the public. Many photographers of the time tried stereoscopic photography, but only a few had the necessary patience and skill to make acceptable stereographs. Stereoscopic photography requires the production of two negatives that are perfectly matched, except for the slight stereoscopic differences; and the entire field in both negatives must be equally sharp and clear. Any *irregularity* in either picture results in a disturbing semblance of something hanging in the air in front of the scene. The slightest blur ruins the stereoscopic effect. The requirements go considerably beyond those of the news-style photographer and of the motion-picture photographer, who speak of "shooting pictures."

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One of the most successful of the early stereoscopists was Benjamin W. Kilburn of Littleton, New Hampshire. He began his experiments with stereophotography as early as 1865. Inspired and spurred on by the vitalizing touch of Dr. Holmes, soon after the close of the Civil War, he started to build his marvelous collection of stereoscopic negatives. The first of these were made of his surroundings and of the beautiful White Mountain region of his native State. Later, he visited all other scenic spots in the United States of America, and then the historical and cultural scenes of Europe and the rest of the World, making excellent stereoscopic negatives. Meanwhile his brother, Edward Kilburn, looked after the manufacture of stereographs from the negatives. Benjamin Kilburn played a leading role in the widespread popularity of the stereograph during the last decade of the 19th Century and the first decade of the present Century. Much of his extraordinary collection of negatives is still in use and is owned by the Keystone View Company of Meadville, Pennsylvania, with which I am privileged to be associated.

Meantime, the manufacture of stereoscopes was keeping pace with the production of stereographs for sale to the public and to meet a demand for stereoscopic viewers. Among other small manufacturers was Hawley C. White in New York City. In 1873, Mr. White moved to North Bennington, Vermont, where he knew there was ample water-power to operate lens-grinding equipment. At first, Mr. White and his partner, D. G. Surgam, operated a factory that produced nothing but lenses for small manufacturers of stereoscopes, several of which apparently operated in North Bennington. Later, White began the manufacture of stereoscopes; and, in 1900, organized The H. C. White Company. This company was so efficient in the manufacture of stereoscopes that it soon became almost the sole source of supply for all the large organizations selling stereographs. The H. C. White Company itself finally built up a library of stereoscopic negatives, and went into the production and sale of stereographs.

In the last decade of the 19th Century, there was great activity in the sale of stereoscopes and stereographs to homes. Large sales organizations were developed for this purpose. In 1882, two Underwood brothers of Ottawa, Kansas, one a subscription book salesman and the other a bookkeeper, decided to try selling the famous Kilburn line of stereographs. The venture was successful from the start; and stereoscopic photographs from other producers, notably J. F. Jarvis of Washington, D. C., and Charles Buerstadt of Niagara Falls, New York, were added to the list. The firm of Underwood & Underwood soon was incorporated; and, as the business grew, an office and a depository were opened in Baltimore. That firm very shortly began producing its own stereoscopic negatives, and either gave up buying from other producers or bought their collections of negatives. In 1891, Underwood & Underwood established headquarters in New York City; and, a little later, set up a very efficient manufacturing plant at Arlington, New Jersey.

Meanwhile, James M. Davis, who was an Underwood salesman, decided to set up his own sales organization to handle the Kilburn output and also that of other and minor producers. Very soon

thereafter, he made an exclusive contract for the sale of the Kilburn stereographs. Finally, *in 1892*, B. L. Singley, another former Underwood salesman and a salesman for James M. Davis, started out on his own, and organized the Keystone View Company of Meadville, Pennsylvania. These three companies, together with The H. C. White Company, were primarily responsible for one of the most spectacular and interesting developments in the history of American Industry. All four were very active, from about 1890 to 1915. This is the period usually referred to as the Gay Nineties! American Industry was in its infancy, and American Economy was to a large extent agricultural. Although, naturally, people of considerable wealth congregated in the cities and were the first purchasers of stereoscopes and stereographs, yet the farmers of that day were, as a rule, well-to-do; and it was a simple matter for the farm wife to appropriate small amounts of her income from eggs and butter to the purchase of stereographs. The workmen in the city were paid comparatively low wages, and the city housewife usually was in no position to purchase much beyond the necessities of life. It only was natural, therefore, that the stereoscopic-view companies found their most responsive market *in the rural areas.*

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Salesmen were recruited primarily from the colleges and universities. Most of these men worked only during the three months of the Summer vacation, and frequently were able to earn enough money within that time to pay their entire college expenses for the year. Underwood & Underwood claimed that their organization alone sent out as many as 3,000 college students in one Summer. With the other three big companies, each employing more than 1,000, it is easy to understand how the countrysides of the Nation literally *swarmed* with stereograph salesmen throughout the Summer months! The competition between companies for salesmen was intense during the college year. The competition between salesmen themselves was likewise aggressive, with no holds barred. Many successful business and professional men of today relate with considerable pride that they got their start on their careers in this practical and very effective school of salesmanship.

The salesman traveled usually on a bicycle, or with a horse and buggy. He invariably was invited to stay overnight at the home where dusk happened to catch him, usually making payment for his lodging with stereographs. The method of selling was unique and effective. On the first call, the salesman endeavored merely to book an order for a stereoscope and "some views" or, if the prospect had a stereoscope, an order would be booked, if possible, for only "*one* view." Approximately three weeks were spent in the booking of orders; which were followed by three weeks of deliveries. On the delivery, the salesman took with him a large collection of stereographs, sometimes covering thousands of subjects. With the prospect's head in a stereoscope, he would skillfully run for him a succession of views, by sliding one in behind the view in place and then lifting the front view to expose the one behind it. The prospect would say from time to time: "I'll take that one." The close of the sale meant bringing the prospect as close as possible to paying for *all* of the subjects he had laid out on the original showing. Although sales were not large, it was not an uncommon experience for a good stereograph salesman to deliver orders to more than half the "prospects" called on in the canvass. One readily can understand that the most successful stereoscopic-view salesmen were on the high-pressure order. Being aware of this fact, the management of the companies did not hesitate to promote high-pressure sales methods.

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On the other hand, the companies did not limit their competition to the promotion of sales. They recognized the importance of worth-while pictures. And so skilled stereoscopic photographers were sent to the four corners of the Earth to bring back high-class negatives of places, monuments, and shrines, famous in history and literature. Nor was Scenic America—from Bar Harbor, Maine, to the Golden Gate on the Pacific shores—neglected. Great expositions like the Centennial Exhibition in Philadelphia, the World's Columbian Exposition in Chicago, and the World's Fair in St. Louis were photographed—large sums of money being paid for

exclusive rights, which were not always honored by competing photographers. At any rate, culture was being provided for the farm homes of America.

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But all was not culture and education. The writer well remembers the enthusiasm with which he set forth, in the Summer of 1900, from Manchester College in Indiana, fired with zeal over an opportunity offered him to carry *travel information about the World* to the farms of Ohio and Indiana! But, alas, soon came disillusionment. The farmers and their wives *were* interested in travel, but usually they seemed much more interested in something else. They insisted constantly on showing a preference for *comic* situations, and those in which *sentiment* was predominant. Reluctantly, at first, such samples were brought out from mistaken concealment. Soon, it was so obvious that these subjects loomed large in the sales possibilities that they were the first picture shown, and became an essential aspect of the stereoscopic-view salesman's success.

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Typical of sentimental projects was the so-called *Wedding Set*, duplicated by all the major companies. The series, which consisted usually of twelve views, began with two or three scenes of courtship and then went on through the various steps, culminating in the wedding march and the wedding itself. Down the aisle of the Church marched the bride, in gorgeous dress and bridal veil, while the groom and best man, in full dress, waited at the altar. The Church, usually Episcopal, was filled with an elegant congregation, smartly groomed. Everything was of the best! Then followed the wedding breakfast, the going-away scene, and, finally, "*Alone at Last!*" This last picture was the most important one of the series; it was responsible for closing many a sale. Here they were in the bridal suite in a fine hotel. The groom had laid aside his dress coat, modestly, in a far corner of the room; and the bride—ah, a bit of the risqué here—standing out in the foreground, had removed her dress and was covered only by at least three petticoats and one of those corsets of the day with stays

that held rigid all the way up and down. What a wedding! Such as few of the purchasers ever experienced—but couldn't one *dream*?

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Typical of the stereographic comedy was the French Cook Series. The master comes home to find his wife away, but the attractive young French cook is in the kitchen—where he goes. Business of osculation follows, but a hurried break-away occurs when the wife is heard to enter the front door. Then follow scenes of the guilty husband confronted and confounded by his suspicious wife, who finally calls his attention to the hand prints in flour on the back of his frock coat. Ha! Ha! Ha! Similar series there were—"The Masher and the Pensive Maid," "The Pretty Secretary," "Reuben and Samantha on Their First Visit to New York," and many single scenes of the slapstick variety. Childhood scenes, too, were in great demand. Without doubt, these scenes of Gay Nineties comedy are largely responsible for the current and often-expressed derogatory idea that the stereoscope is as passé as the horse and buggy and the McGuffey Readers.

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But really, the story does not end here; and, from now on in this Newcomen Address, may we take the liberty of disillusionizing those who still may think that the stereoscope is passé. A narrow view of the situation might lead to the same assertion about the organ, which was found in every well-to-do farmhouse, in those same times. Organs of that type no longer are found in farmhouses, but one would be very wrong to assert that the organ business *ended* with the Gay Nineties.

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The major companies manufacturing and selling stereographs never really lost sight of the cultural and educational factors involved in their sale and use. Underwood & Underwood and the Keystone View Company, in particular, seemed to be aware of these *educational* possibilities. They instructed their photographers to look always for scenes of high educational significance. Indus-

tries were photographed, specimens from science laboratories received attention, and scenes of historic possibilities were not overlooked. Among the first photographers to make pictures of the early experimental airplane flights of the Wright brothers were stereoscopic photographers—leaving to history priceless studies of the details of the earliest airplanes in flight. Specialized salesmen were developed to serve the educated prospective buyer, to whom large collections of these travel stereographs frequently were sold.

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Underwood & Underwood seemingly was the first company to provide *printed information* for each stereograph. This text was printed upon the back of the card. The Keystone View Company soon followed suit. But James M. Davis demurred, defending his action on the grounds that such text "distracted attention from the picture." One gets a feeling here that he was trying to sidestep expense involved. It is significant to note that his was the first of the four big companies to quit the business.

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It seems, also, that Underwood & Underwood led in another development of importance. Series of stereographs on *travel* in countries or regions and on other subjects, were organized in sets. These were provided with so-called *guidebooks*, which were edited by some of the most eminent scholars of the day. Among these authors, one finds such names as: James Henry Breasted, noted historian and Egyptologist; Frank M. McMurray, author of many school textbooks in geography; John Burroughs, naturalist; and many others outstanding. The Keystone View Company, too, soon began to provide sets of stereographs for educational use, in homes and public libraries. The smaller companies, frightened by the investment that continuation in business seemed to involve and discouraged by what seemed to them to be a vanishing industry, sold out their collections of negatives to Underwood & Underwood and to the Keystone View Company. This left these two companies as practically the only competitors in the sale of stereoscopes and stereographs.

The sale of *home library sets* has continued to this day. Keystone salesmen are selling *a World Tour of* 1200 *stereographs* selected and described, in text printed upon the backs of the cards, by the famous world-traveler and lecturer, Burton Holmes. Salesmen work full time and call only on people who are able to purchase libraries of considerable size. Sales of travel stereographs to such buyers, since 1925, probably have exceeded in volume the total sales of stereographs during the entire previous history of the business. Be not surprised if some day a Keystone representative comes to your office or to your home on a reference from a friend, and shows you travel stereographs in a modern electric-lighted Televiewer, which is identical in principle with the Holmes Stereoscope, but entirely unlike it in appearance! Be not surprised, furthermore, if he books your order for stereographs to the amount of $1000 or $1500. Among such purchasers, during recent years, one finds names of many members of American Newcomen.

The Keystone View Company was first to sense the possibilities of selling stereographs to schools and colleges, for use in teaching. Early in the Century, educational psychologists became conscious of the over-emphasis educational procedures placed upon verbalism. Learning suffered because instruction was not made meaningful. Children read *words* and children were taught *words*—but their real understanding was limited to the facts of life that came under their observation *outside* the schoolroom. Educational psychologists said: "Why not bring the World into the schoolroom by means of the stereograph?" A group of noted psychologists, headed by Dr. James R. Angell then of the University of Chicago, signed a statement which read:

> "If a stereoscopic photograph *of a place* is used with certain accessories (as special maps which show one's location, direction, and field of vision, etc.) it is possible for a person to lose all consciousness of his immediate bodily surroundings and to gain, for a short time at least, a distinct state of consciousness or experience *of location* in the place represented. Taking into account certain obvious limitations, we can say that the experience a

person can get in this way is such as he would get if he were carried unconsciously to the place in question and permitted to look at it. In other words, while this state of consciousness lasts, it can be truly said that the person is in the place seen."

Through the stereoscope, *the World*, with all its far-flung places of interest, is brought to the pupil in the classroom. In the well-known law of learning formulated by the noted psychologist William James, vividness is one of the chief factors. The stereograph brings to the student unusual and impressive vividness of delineation of the scene, whether it is of a bee pollinating a flower, or of a ricksha on the Bund in Shanghai. Closed off from his *surrounding* world, he readily transports himself into the *space* world spreading out before him in the stereograph—*in three dimensions.* The psychologists did not overstate the case! Their promise has been confirmed by the modern educator.

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Both Keystone and Underwood & Underwood responded to educational needs of the times. Carefully selected and well-edited collections of educational stereographs were offered to schools. Both had so-called "600 *Sets*"; and Underwood's developed a "1000 *Set.*" Duplicate lantern-slide sets were furnished, in order to provide group discussion of the marvels of reality experienced by individual students through the stereoscope. The leading educational talent of the Nation was enlisted in supplying teachers with source material, in order to facilitate the best use of the stereographic knowledge presented.

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Competition between the two companies was intense. If a large city expressed particular interest, swarms of Keystone and Underwood salesmen arrived on the scene to promote their rival interests. It soon turned out to be a battle to the death. Underwood & Underwood finally *gave up the fight* and sold its magnificent library of stereoscopic negatives, with all educational rights, to the Keystone View Company.

This gave Keystone nearly *one million* selected stereoscopic negatives; and made it for a time the unchallenged leader in the stereoscopic educational business. Considerable investment in sales development seemed necessary, because educators and schools, although very much interested, with their usual conservativeness, *purchased* slowly. Keystone went ahead, nevertheless, making all possible improvements in the "600 *Set*," and promoting its purchase from Coast to Coast. At one time, it was estimated that 10,000 elementary schools had bought the complete Keystone "600 *Set*" of stereographs.

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More recently educational leaders have developed the project or unit idea, the "600 *Set*," which was a comprehensive library collection of pictures organized upon a library basis, was replaced by units of stereographs and accompanying lantern slides that conformed to the conventional teaching units of the current curriculum.

Although the more spectacular promotion of motion pictures in education, in the course of time, seemed to eclipse the practical values and uses of the stereographs in teaching, as well as to eclipse them in the amount of money involved, yet the stereograph has won a permanent place in American educational procedures that can be displaced by no other visual aid. An interesting fact is that Southern California, home of motion pictures, today provides the best educational market for stereographs. Dr. F. Dean McClusky, of the University of California in Los Angeles, says: "I regard the stereograph as one of the most valuable types of visual aids available for use in education. It is particularly adapted to individual study and analysis."

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In *A Measure for Audio-Visual Programs in Schools,* published by American Council on Education, in 1944, recommendations for standard audio-visual equipment are made. Among requirements suggested under the heading "A Minimum Goal in Supplying Equipment," along with a 16 mm sound motion-picture projector for every 200 students, a 2″ x 2″ projector for every 400 students,

and a 3¼″ x 4″ projector for every 400 students, we find as a prominent requirement *one set of 35 stereoscopes for every 400 students*. Many stereographs would be required to make these 35 stereoscopes useful. Miss Rita Hochheimer, Assistant Director in Charge of Visual Instruction, for The Board of Education in New York City, says: "With our increasing emphasis on individualized teaching in the elementary schools it is gratifying to observe a widespread return by our teachers to the classroom use of the stereograph with its magical third dimension."

About 1930, the Keystone View Company began the promotion of *another* very important technical use of the stereoscope and the stereograph. *Eye specialists* had felt, almost from the time the Wheatstone stereoscope was invented, that stereographs had therapeutic value in the correction of visual difficulties arising from lack of binocular *coordination*. A great many scientific writings upon the subject had been published in America and in Europe; and European oculists had designed special stereograms that were used in what were called *eye-training exercises*.

In 1912, David W. Wells, a Fellow of the American Academy of Ophthalmology and Otolaryngology, wrote a book entitled *The Stereoscope in Ophthalmology*. He says at one point in this publication:

> "A recent review of one thousand cases of eye strain shows that 25 per cent needed treatment because of some failure of the two eyes to work together properly. Since each person is obliged to learn the art of using the two eyes together as part of his own experience, and has no instruction whatever, some of us learn it well and some of us learn it quite imperfectly. Now it is quite possible that, if a child were given a stereoscope and set of views, many of those who now fail individually to pick up a good fusion faculty might very likely, with this early training, develop this capacity, and so be saved from much eye strain later in life. It is advisable to insist upon good photographs properly mounted."

Dr. Wells thus pays a deserved tribute to the many expert stereoscopic photographers of all the companies who were responsible for making the large collection of negatives that finally were assembled in the Keystone stereoscopic library. Dr. Wells, likewise, was one of those salesmen who worked their way through college, selling stereographs from house to house! Referring to this work in the light of his later professional use of the stereoscope in vision training, he said: "Little did I know the good I did *the eyes* of that generation."

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During the past twenty years, the Keystone View Company has developed stereoscopic *vision tests* that have received wide acceptance from ophthalmologists and from optometrists; and, likewise, from schools and industries who wish to give adequate vision tests, in order to make early discovery of pupils or workers who are in need of professional eye care—and also to assure correct placement of workers. These tests give not only information on the acuity of the subject, both at far point and at reading distance, but also information on the binocular functions of fusion, correct lateral and vertical balance, and depth perception. More than 3,000 schools and colleges, and more than 3,000 industrial plants, use these tests.

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At the same time, ophthalmologists and optometrists have aided in developing programs of stereoscopic vision training. Psychologists agree that *seeing* is a learned skill. Therefore, it follows that vision may often be trained *out* of poor binocular functioning and *into* higher degrees of efficiency. In some cases of mere visual discomfort, the patient is given a prescription for a stereoscope and a set of specially designed stereograms, with instructions for use in home training. Elaborate stereoscopic instruments with scientifically designed stereograms have been provided for what is known as *vision training*, in the office of the doctor or the eye clinic. Some of these stereograms are opaque and some are transparent; some are single stereographs and others are split so that movement of the two pictures laterally is possible. The *two* sides of the stereograph sometimes are projected on the screen: one through a *red*

filter and the other through a *green* filter; while the subject wears a red glass over *one* eye and a green glass over the *other* eye. This procedure results in achievement of stereoscopic separation and stereoscopic projection on the screen. The two pictures may be moved mechanically back and forth over each other, so that movements *in depth* appear to and fro on the screen, making unusual demands on the coordination of the two eyes, and providing excellent *training* possibilities. A similar procedure is achieved through use of Vectographs. Use of the stereoscope and the stereograph for vision training has gone far beyond first experimental stages; it is an accepted and widely practised procedure with the best-informed members of those professions responsible for the visual care of America. Success is achieved with almost every sort of binocular difficulty, even in the correction of squint in many cases without surgery.

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Stereoscopic *photography* was used in the First World War; and very, very extensively in the Second World War. A single photograph of a piece of terrain made from the air often leaves much to be desired in information as to details of military value. It often is difficult to determine relative height of hills and depth of depressions; or, in fact, whether there actually *are* hills or depressions, in a certain area. An exaggerated stereograph, however, taken from the air, the two pictures being taken rather widely apart, gives very clear and exact information concerning the lay of the land. For example, stereoscopic photographs were an immense help in discovering the launching sites of the deadly *V-1* bombs. And, literally, mile upon mile of stereoscopic photographs were made of the Normandy beachhead, before landing was attempted. Doubtless, many thousands of lives were saved and even the success of the venture itself assured, through this scientific use of stereoscopic photography.

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Since the War, several stereoscopic cameras and viewing devices utilizing 35 mm film have been developed. Although these miniature stereoscopic pictures are not comparable with the large, stand-

ard size in giving impressions of reality, nevertheless they are third-dimension pictures and offer a variety of subject matter with popular appeal. Each month, *American Photography*, leading periodical in the field of amateur photography, carries an article devoted to the scientific aspect of stereoscopic photography. In response to popular interest, this Company published, in 1948, an excellent book by Herbert C. McKay, entitled *Principles of Stereoscopy*. Stereoscopic photography appeals primarily to the amateur photographer well advanced in his hobby. There probably is more popular interest in the making of stereoscopic pictures today than there has been at any other time in the history of Stereoscopic Photography.

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No, the stereoscope did not pass away with the Gay Nineties! It had its beginnings with inventors and students of science; it achieved a unique role in bringing travel information and amusement into almost every well-to-do home in America; and, now, it has taken its place among standard and well-accepted practices of education and the healing arts. Truly did Oliver Wendell Holmes, scientist, physician, and "autocrat of the breakfast table," say many years ago: "This is no mere toy."

THE END

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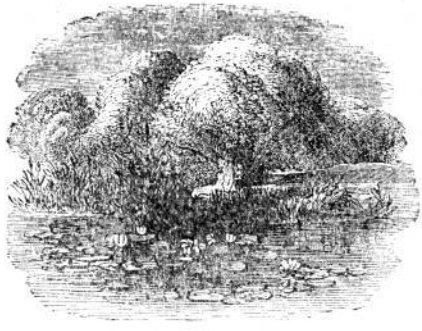
"Actorum Memores simul affectamus Agenda!"

THIS NEWCOMEN ADDRESS, *dealing with the beginnings and development of the stereoscope and its usefulness in Education in America, was delivered at the "1949 Lake Erie Dinner" of The Newcomen Society of England, held on November 4, 1949, at Erie Club, in Erie, Pennsylvania, U.S.A.* MR. HAMILTON, *the guest of honor, was introduced by the* SENIOR VICE-PRESIDENT FOR NORTH AMERICA, *in this British honorary Society whose headquarters are at London. The dinner was presided over by* NORMAN W. WILSON, *President, Hammermill Paper Company, Erie, the Chairman of the Lake Erie Committee, in The Newcomen Society of England.*



"The versatile Oliver Wendell Holmes, American physician, scientist, and writer, became interested in the use of stereographs. He succeeded in designing a simple type of stereoscope, which dispensed with the boxing in of the picture, and provided, at first, for *three* positions at which the picture could be set, according to the focusing needs of different observers. Likewise, he placed a hood over the front of the instrument to exclude extraneous light from the eyes. A little later, he added a sliding cardholder. This feature made more flexible the adaptation to the observer's correct focusing position. The Holmes Stereoscope was identical with stereoscopes sold in America, and later in Europe and elsewhere throughout the World, for the next seventy-five years!"

—George E. Hamilton

"No, the stereoscope did not pass away with the Gay Nineties! It had its beginnings with inventors and students of science; it achieved a unique role in bringing travel information and amusement into almost every well-to-do home in America; and, now, it has taken its place among standard and well-accepted practices of education and the healing arts. Truly did Oliver Wendell Holmes, scientist, physician, and 'autocrat of the breakfast table,' say many years ago: 'This is no mere toy.'"

—George E. Hamilton

AMERICAN NEWCOMEN *takes satisfaction in this Newcomen manuscript dealing with the beginnings in America and the growth of the Stereoscope—and its application to wide fields of educational usefulness. It is a colorful recital which links together those early days when the device, having then quite amazing novelty, was employed largely for home and classroom entertainment, to the present wide use in education, the professions, industry, and the arts. A pioneer in the manufacture of these equipments tells the story in his own words.*

THE NEWCOMEN SOCIETY OF ENGLAND

IN NORTH AMERICA

BROADLY, *this British Society has as its purposes: to increase an appreciation of American-British traditions and ideals in the Arts and Sciences, especially in that bond of sympathy for the cultural and spiritual forces which are common to the two countries; and, secondly, to serve as another link in the intimately friendly relations existing between Great Britain and the United States of America.*

The Newcomen Society centers its work in the history of Material Civilization, the history of: Industry, Invention, Engineering, Transportation, the Utilities, Communication, Mining, Agriculture, Finance, Banking, Economics, Education, and the Law—these and correlated historical fields. In short, the background of those factors which have contributed or are contributing to the progress of Mankind.

The best of British traditions, British scholarship, and British ideals stand back of this honorary society, whose headquarters are at London. Its name perpetuates the life and work of Thomas Newcomen (1663-1729), the British pioneer, whose valuable contributions in improvements to the newly invented Steam Engine brought him lasting fame in the field of the Mechanic Arts. The Newcomen Engines, whose period of use was from 1712 to 1775, paved a way for the Industrial Revolution. Newcomen's inventive genius preceded by more than 50 years the brilliant work in Steam by the world-famous James Watt.

"The roads you travel so briskly
lead out of dim antiquity,
and you study the past chiefly because
of its bearing on the living present
and its promise for the future."

—LIEUTENANT GENERAL JAMES G. HARBORD,
K.C.M.G., D.S.M., LL.D., U.S. ARMY (RET.)

(1866-1947)

Late American Member of Council at London
The Newcomen Society of England