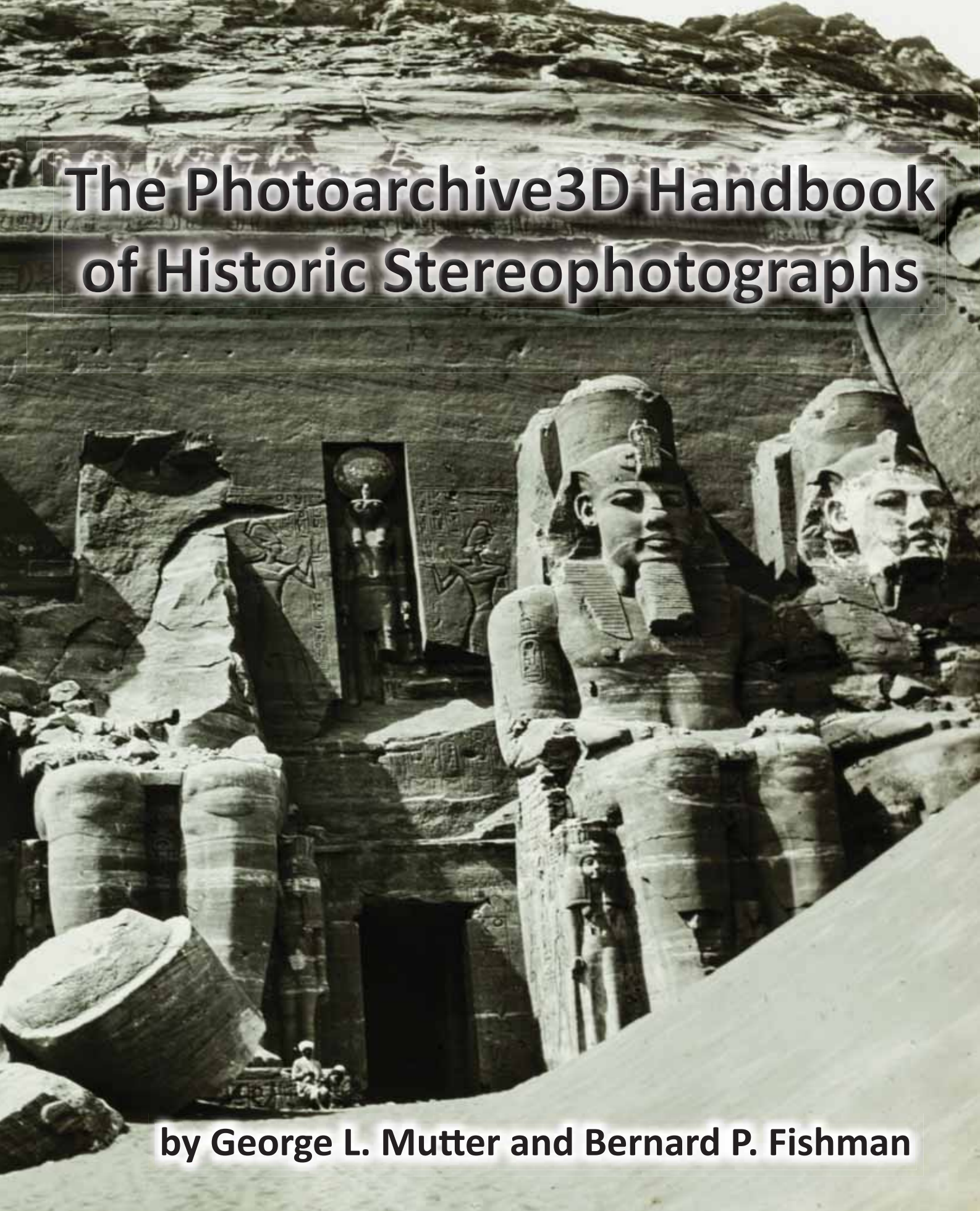

The Photoarchive3D Handbook of Historic Stereophotographs

by George L. Mutter and Bernard P. Fishman

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Cover: Colossi of Ramses II at Abu Simbel, Egypt. Glass Positive by Ferrier and Soulier, Paris, c. 1857.

Preface

The present work is an overview of historic stereophotographs and how to deliver them in three dimensions (3D) to contemporary audiences through digital technology. Illustrated with a selection of vintage photographic images from the Photoarchive3D Collection, it reflects years of experience by the authors, who have amassed 33,000 vintage images over a period of decades. The prospect of bringing these to a broad audience through digitization launched what has become a fruitful collaboration under the banner of Photoarchive3D. We digitized all the images at high resolution to produce durable, separate left-right aligned pairs of high resolution source files easily reformatted for any of a large number of current and future display technologies. Since 2011 we have walked into many rooms outfitted with a standard digital projector, handed out silly-looking cheap paper glasses suited to a 1950s horror movie (our inaugural 3D projection format was red-cyan anaglyph), and heard gasps from an intensely engaged audience shown images that had not been seen for over a century. We were "in the game," sharing our passion for history, great images, and the immediacy of three-dimensional immersion that had previously been constrained to our personal armchairs.

The digital world, and possibilities of virtual reality, has re-energized interest in historic material created originally in 3D up to 150 years ago. Our initial goal of archival digital documentation was quickly expanded to include another purpose: optimizing the image content for display in contemporary settings. The manner in which we have efficiently achieved both of these goals is detailed in the Technical Appendices. We scrapped our own first digital archive of jpg files shot with a 10 megapixel camera. Two cameras later, and with better insight regarding file format characteristics, we relaunched the entire project with what at the time was an optimistic vision: get the highest resolution quality camera we could afford (21MP), and use the latest flexible file storage format that promised to have some prospective durability (DNG). Now, all objects in the Photoarchive3D collection can be zoomed to a resolution that exceeds what was visible from legacy optical systems. With a few clicks any can be calibrated to a real world color standard, or restored for viewers who are more interested in knowing what Dresden looked like in 1870, rather than how the image has aged since.

Our purpose in this book is practical, and several fold. First, we will present the history of stereophotography as seen through its material remains, including the context of production and reissue of single negatives as variants. Second, digital strategies compatible with the dual perspectives of preservation and content revitalization are detailed. Third, as curious acquisitors incorporating all topical and geographical boundaries, our collections are broadly representative of what has been available in the marketplace between 1980 and today. Excluding the extremes of costly formats (only a few daguerreotypes are represented) and shabby photomechanical prints, the Photoarchive3D collection is representative of what has been preserved. Thus we include a statistical overview of the 33,000 images by region and subject (Appendix B). Lastly, it is another step forward in conveying these treasures to future generations.

George L. Mutter, Boston, Massachusetts
Bernard P. Fishman, Augusta, Maine
September 2018

Overview of Stereophotography

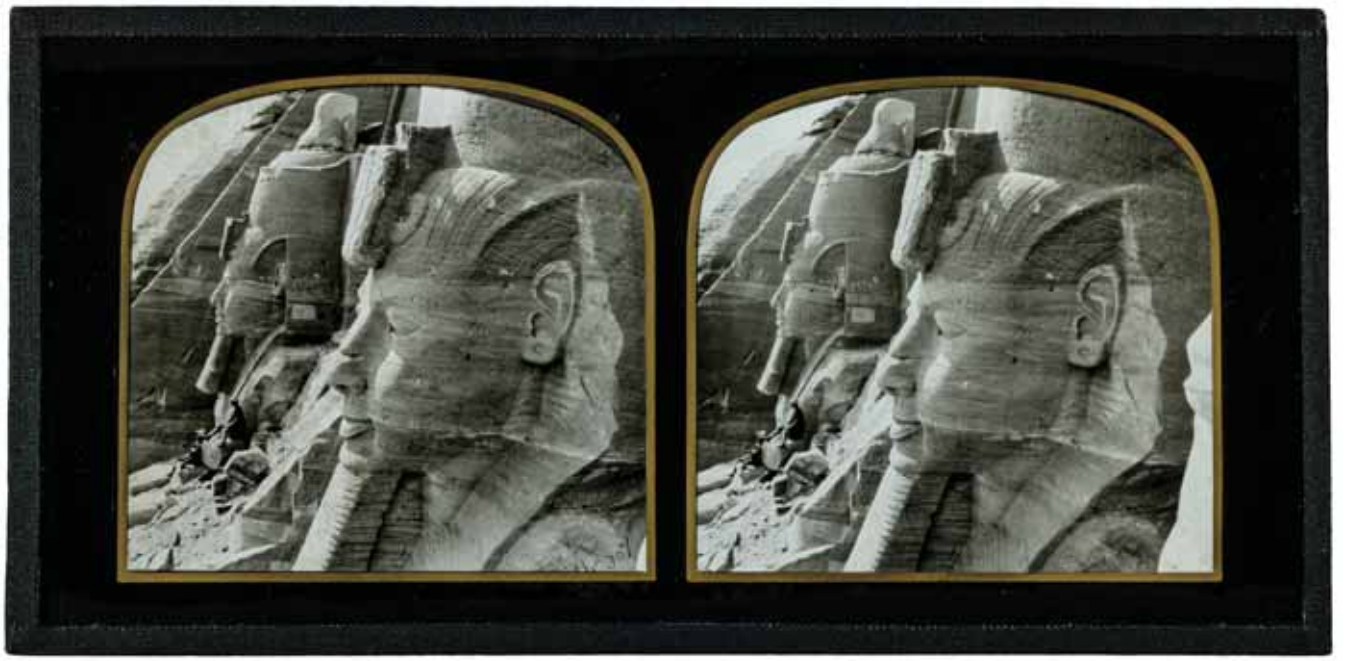
Through the miracle of stereophotography the mid Victorian world was able to enjoy the eye-popping sensation of viewing the farthest corners of the globe from the comfort of a parlor armchair. Not only could the actual images of historic events and distant or exotic places be brought directly into the home and provide delight to all members of the family, but the pictures themselves had the extraordinary quality of virtual, immersive 3D. You could see the monuments of ancient Egypt or climb to the summit of Mt. Blanc and have the sensation of actually being there, seeing the view as though you were the camera itself. That was made possible by photographic image pairs created by dual lens cameras or by simply shifting a single lens camera a sufficient distance between shots to mimic the space between the human eyes. The resulting images, as adjusted, printed and mounted on cards or glass to be seen through a handheld or tabletop viewer became a passport to a universe of new visual phenomena.

Between the early 1850s and the mid 1930s hundreds of thousands of images were produced in this format and distributed on millions of cards or glass slides. Over the past century these photographs were mostly lost or destroyed, but a precious remnant remains to provide the most comprehensive and thrilling visual record of those distant times to survive. Today, public awareness of this extraordinary record and the technology on which it is based has been renewed through elegant software renderings of virtual environments, and new display technologies that can deliver these original 3D images to the individual at the desktop or mobile device, or to groups in public settings. With an ease and fidelity never before possible, this vanished world can be restored to modern life.

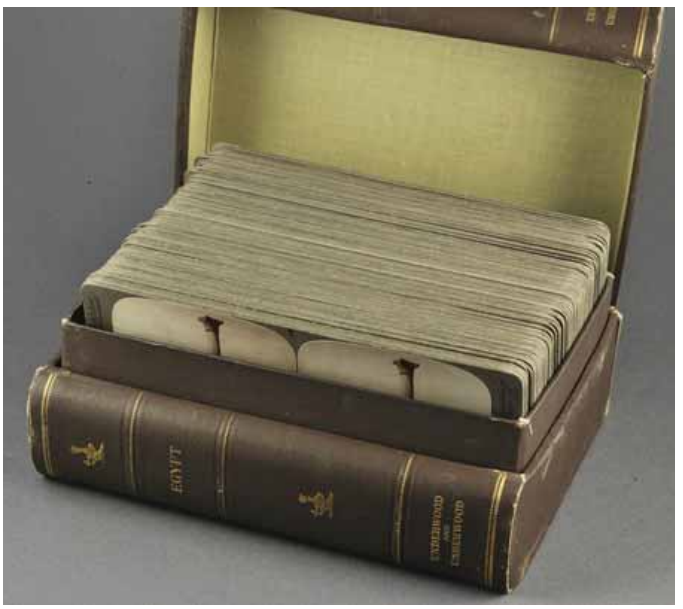
An example of how the stereoview phenomenon seized public attention is the acclaim that greeted the first 3D photographs of Egypt. Egypt of course figured prominently in the Bible and initial visual excitement about it had been launched by Napoleon in 1798 when his conquest of that country ignited the European scramble to acquire Egyptian antiquities, introduced Egyptology as a scholarly discipline, and fueled widespread 'Egyptomania' amongst the public. By the mid 1850s visitors to the rebuilt Crystal Palace outside London could gaze directly upon life-sized (65 feet tall) reconstructions of two of the colossi at Abu Simbel, alongside photographs of the actual monuments in their native context. Museums and popular sideshows swelled with mummies and artifacts, Egypt-themed designs began to creep into the repertoire of decorative art, and adventurers published popular accounts of their travels to the fabled land of the Nile.

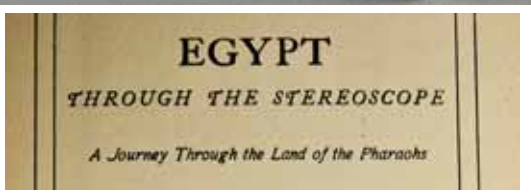
But it was the remarkable 1850s stereophotographs of Egypt by the Englishman Francis Frith that did more than anything else to make the stereoview

Pharaoh under glass in London. Towering over visitors to the Crystal Palace were life-sized (65 feet tall) recreations of the figures of Ramses II at Abu Simbel. Glass stereoview, anonymous photographer and publisher, but possibly by Philip Henry Delamotte, London, c. 1857.



Four seated colossi of Ramses II cut into the living rock at Abu Simbel, Egypt. Photographed by Francis Frith, published on glass by Negretti and Zambra or London Stereoscopic Company, London, c.1859.





100-image boxed set tour of Egypt issued by Underwood and Underwood with accompanying book written by the American Egyptologist Henry Breasted, 1901.

a resoundingly popular part of the Victorian imagination. Compelling visually, comprehensive in scope, and affordable to the emerging middle classes, nothing like them had ever existed before. They were comparable to the telegraph in their ability to shrink distances and instill a sense of immediacy, and to the television in their ability to bring the distant world within the perception of every observer. Frith went on to publish some 400 stereoviews of Egypt and of Palestine, bringing the direct reality of the biblical landscape into innumerable homes. When in 1862 Joseph Bonomi published a narrative to accompany 100 of Frith's stereophotos a new form of distance learning was born, one that made the stereoview set and accompanying text one of the educational engines of the age.

Image series issued as topical sets provide "virtual" tours of specific locations or events which reconstruct the experience of a traveler or participant. Sometimes an interpretive narrative is provided, and such sets are especially valuable records of historic events (wars, fairs) and changing conditions. After 1897 the publishing house of Underwood and Underwood took up the idea

Amongst the latest material in the Photoarchive3D collection are about 1500 Third Reich German views from the Raumbild Verlag company (Otto Schonstein), including political, World War II combat, cultural, and travel subjects. A form of state-supported propaganda, sets were issued as books with thick covers containing a viewer and pockets for the silver emulsion images. 100-image set Fliegen und Siegen ("Flight and Might") covering all aspects of the Nazi Luftwaffe, issued in 1942.

afresh and issued numerous thematic boxed sets illustrating the major countries and regions of the world through 50-100 carefully selected stereoviews accompanied by specialty guidebooks with relevant maps and descriptions. Bert Underwood took the photographs for his company's Egypt set himself. With the addition of a learned text from world-famous Egyptologist Henry Breasted, this set, in various versions, remained popular for some 30 years, and elements of it were still being sold when the stereoview phenomenon began its final glide into obsolescence in the 1930s.

In Europe stereoviews in a special small format were produced for another 20 years, but in the United States the commercial card stereophotograph was moribund by the 1940s. Public consciousness of the stereoview phenomenon, which had engaged the world for nearly a century, faded away, and the stereoviews themselves were thrown away by the millions. A few lingered in closets and attics, to be brought out from time to time as childrens' playthings, and some of those children, adults today, remember with sentimental fondness their random encounters with another world through a cache of 'grandma's old pictures.' Baskets of the views piled up in bookstores and antique shops where they might be sold for ten cents or a nickel each. Some huge private collections were amassed by scholarly pioneers before and after World War II, but these were ultimately broken up and sold in the 1970s and '80s, when public interest in the history of photography began finally to grow. But no institu-

tion took an interest in building a comprehensive historical collection of stereoviews when that was still possible to do so at a modest cost.

Now the educated, scholarly, and media oriented communities scramble to assemble collections of stereoviews, or at least access to them. Surviving antique stereoviews are avidly sought by collectors and institutions, and the rarity of good examples relentlessly drives up prices and reduces availability. In a climate buzzing with the new possibilities of Virtual Reality, the potential of these fascinating views to provide extraordinary content available nowhere else is increasingly recognized. Yet the full realizable possibilities of these images can be unlocked only with careful and exacting digitization, a time and labor intensive process that is expensive and demanding, all the more so when the intent is to ensure that the stereoviews can not only be reproduced as non-stereo images, but also as three-dimensional views, as they were originally intended.

See the world in stereophotographs!

***1859 advertisement by A. Gaudin in the French journal* Lumiere.**

The Photoarchive3D Collection

Origins

Over 65 years of combined collecting enabled George Mutter and Bernard Fishman to assemble an unparalleled gallery of over 33,000 historic photographic 3D images. Starting long before they knew each other, informed by comprehensive educations, aesthetic judgement, and eager curiosity, they travelled over the United States and the world in search of images. They found them in bookstores, flea markets, antique stores, collectors' conventions, auctions, yard sales, and in the hands of other collectors. They found them in Berlin and Paris, and in Oklahoma and Utah. No travel or professional engagement was complete without a trip to local stores, markets, or private contacts where a few more examples might, with luck, be found. What engaged both in searching for views was a love of the world's history, a respect for the aesthetic values of early photography, the extraordinary visual sensation of being "there" such as only stereoviews could provide, and the excitement of the hunt. Their knowledge deepened and their tastes became more demanding. They met, perhaps predictably, as collecting competitors at a Boston historic photography convention, and became allies and friends in the great task of turning the results of their private hobby into a public good. They understood that it was becoming increasingly difficult to newly assemble a great, comprehensive stereoview collection, and that what they had accomplished deserved to be preserved, intact. Photoarchive3D was established by the authors for modern entertainment and education, and for the benefit of a posterity that would be fascinated and enlightened by what had been saved from the storms of history. Each one of these tens of thousands of images has been carefully digitized so that it can be presented in any modern 3D visualization application.

Content and Meaning

The collection is comprehensive, in that it represents all significant aspects of the stereoview phenomenon from the 1850s through the 1950s, and there is almost no part of the world that is not covered by examples. In that sense the collection is essentially historically complete, as well as providing almost endless content for innumerable applications.

The collection starts at the beginning, with stereo daguerreotypes from the earliest days of stereophotography. The principles of stereo imagery were discovered in the 1830s and made practicable on a large scale with the advent of photography: concurrent with the world-famous London Exposition of 1851, the first commercial photographic applications of the process appeared with the daguerreotype. With the daguerreotype each image was a unique and non-mechanically reproducible picture on silvered copper that had no practical possibilities for use as a mass market product. The widespread development of glass negative based photography using collodion to secure the image, better cameras and lenses, and handy salted or albumenized printing-out papers brought the recognition that stereoviews could be mass produced for widespread public enjoyment. By the mid 1850s major publishers such as the London Stereoscopic Company were producing thousands of card stereoviews every day, and smaller numbers of exquisite stereoviews on glass, unmatched in their image resolution and sheer visual beauty, were being produced by French specialists in particular. By the early 1860s, American firms were publishing stereoviews that exceeded in numbers and equaled in quality what the Europeans were producing. By the 1870s, and especially after 1900, the Americans dominated the whole enterprise and led the world

Stereophotographer on the streets of Paris. Glass positive stereophotogaph, c. 1890-1915

in the quantity, quality, and variety of stereoviews being made and sold.

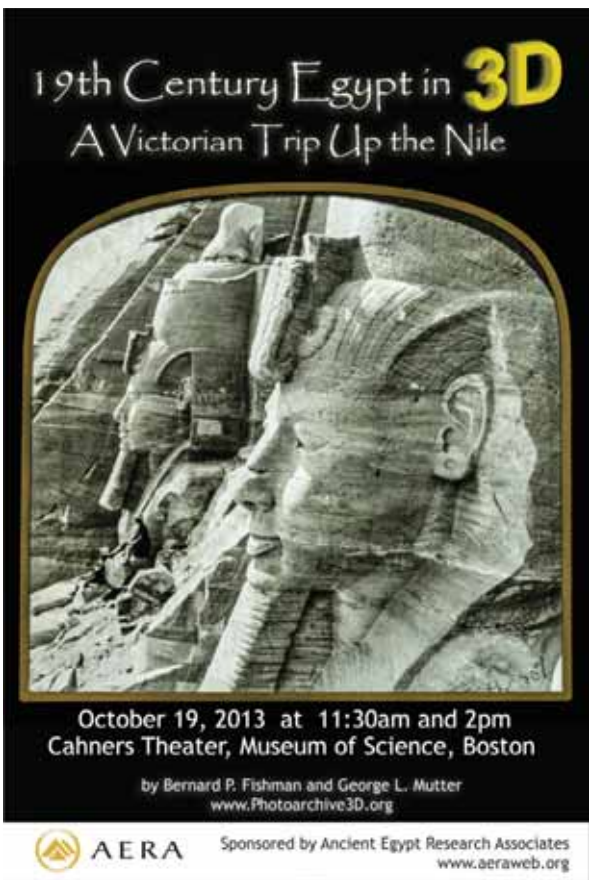
Every stage and advance of stereoview production is represented in the Photoarchive3D collection. Of yet greater significance are the countless and diverse subjects of the views. The collection has the social and domestic scenes, many presented as almost mini theatrical studio sets, which dominated part of the photography market before the Civil War. The family disputes, the humorous romances, the trials of servants, the frustrations of female dress, happy children playing, a visit to the barber or dentist or doctor, a visit to the market or church, all the minutiae of daily life are faithfully depicted, including the typical virtues and vices of the age. Drunkenness, poverty, prostitution, infidelity, gluttony share the visual stage with charity, self-sacrifice, prayer, sobriety, and bravery, a veritable human pageant in 3D. These glimpses of ordinary humanity and snippets from real and imagined lives share the viewer's attention with portraits of royalty and officers of state, celebrity events, and scenes of wars, cities, towns, and landscapes. The horrors of slavery and Indian removal are documented as well as the settlement of the West, the industrialization of the world, and the unparalleled use of the world's natural resources, whether lumber, water power, mined minerals and metals, whales, oil, or ivory. The American views of the post Civil War period, especially, show life on the farm and in the factories, the growth of the main cities and ports as well as of innumerable small towns, the advent of tourism and the growth of the great resorts, the fires, floods, earthquakes and tornadoes that afflicted so many, and the sweet rhythms of work and play that dominated the largely prosperous and community oriented lives most Americans led in the peaceful half century between the Civil War and World War I.

The global views of the time show similar subjects but with added exoticism and diversity: the peasants and royalty of Russia; the massive cultural changes in China and India; the modernization of Japan; the decline of the Ottoman and Austrian empires and the growth of Germany; the cultural blossoming of France; the mercantile fervor of England; the ancient ruins of Egypt, Greece and Rome; the extraordinary landscapes of the Alps and of Canada, and the romance of the boundless oceans; the transformation of the Middle East; the rich tribal cultures, Arab markets, and the jungles and deserts of Africa. From a baby in a New Hampshire cradle to the Queen of England on her throne, the vast tapestry of the peoples and places of a world gone,

but by no means vanished, await rediscovery.

Existing stereoview collections in public institutions are few, and differ in their strengths. Several excellent holdings (US Library of Congress, New York Public Library) have deep representation of American subjects. The Israel National Museum's fine assemblage is related almost exclusively to the Middle East. The collection at Historic New England, before 1940 one of the world's best, has been much diminished since, and is, of course, concerned solely with New England. Collections of academic institutions, such as Harvard, tend to be limited in subject and scattered amongst various departments. Collections residing within art museums (e.g the Getty Museum) reflect acquisition policies that value rare or artistically superior images. Public European collections are less well known, sometimes having been dispersed by war (Berlin), or still awaiting the cataloguing and digitization necessary to reach a contemporary audience.

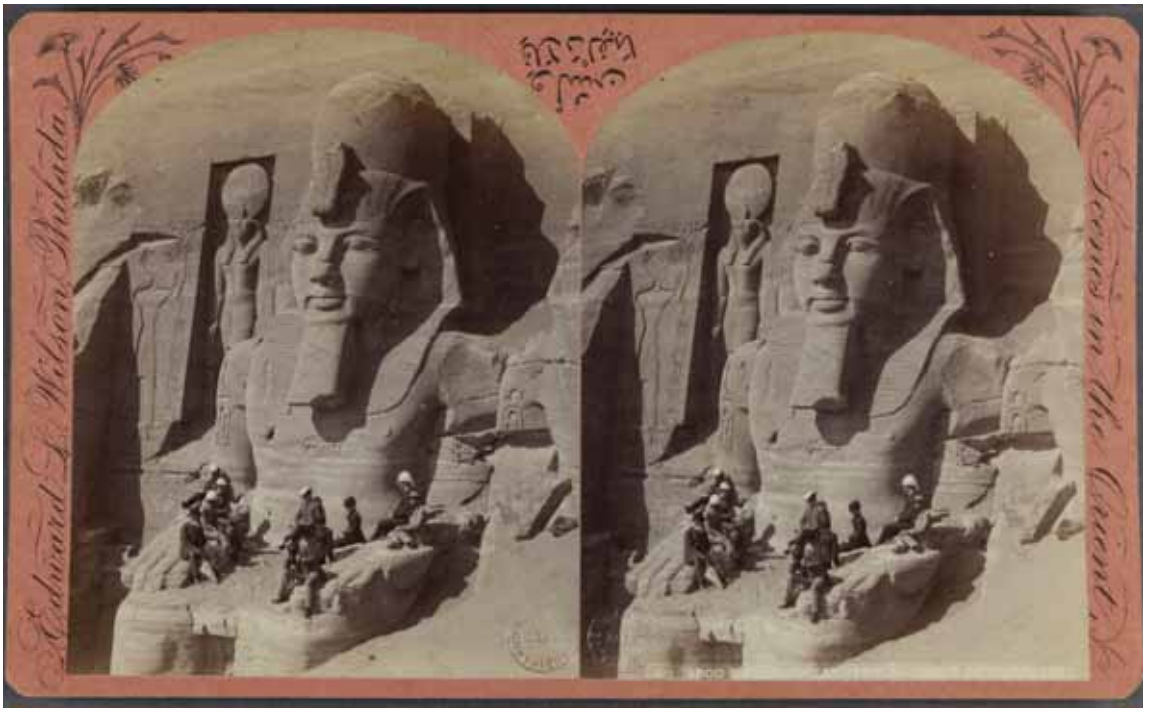
If history is of importance, then the Photoarchive3D collection is of superlative significance. The change in people and places, over nearly a century, is dramatically recorded in its holdings. Is environmental change in landscapes and wildlife of significance? Stereoviews can paint those pictures. What did the ancient site of Philae in Egypt look like before it was moved? What did Dresden look like before it was destroyed in war? What was it like to roll cigars in Cuba or weave sombreros in Mexico or fish for salmon in Oregon, or build the Transcontinental Railroad? Would you like to look into Queen Victoria's face, or Napoleon III's, or Tolstoy's, or Lincoln's, or Hitler's? What did an Irish peasant's hut look like inside, or a Greek's, or a Russian's? There is no end of the questions and curiosities. These incomparable views, already digitized and ready for visualization, support endless historical inquiry and limitless exploration into the human condition and what has shaped our world.



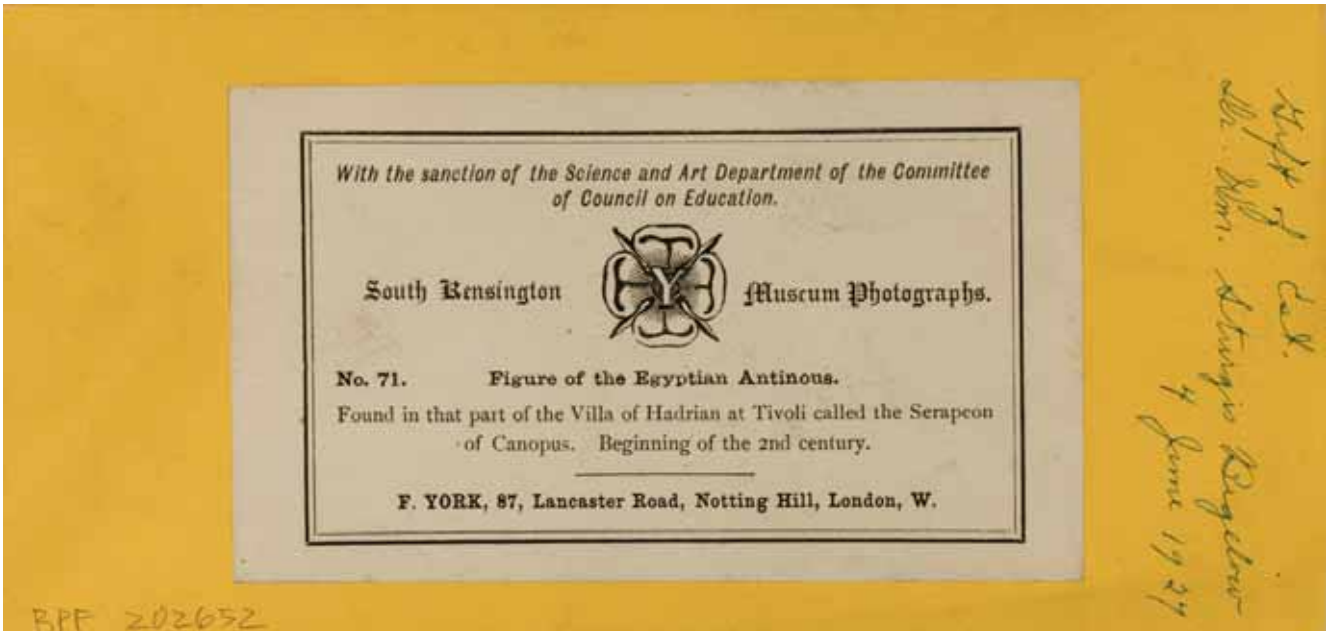
Physical Formats

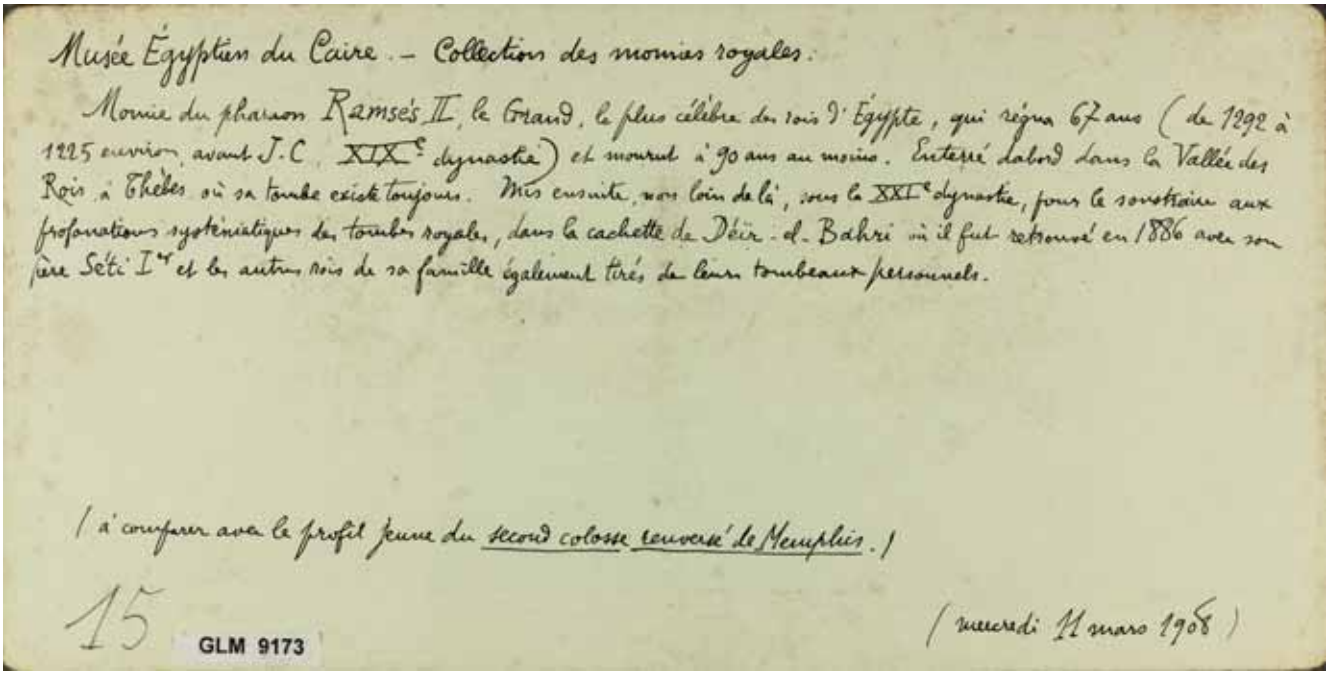
19th century stereophotographs were created as paired right and left photographs taken from a position separated approximately by the distance between a typical pair of human eyes.

For 3D viewing it was necessary for each eye to be able to simultaneously see only one image. Most commonly images were produced on photographic paper and mounted cardboard stock approximately



Front side of card mounts with decorative borders.





Annotations on the reverse side of paper mounts.
Borders of the mount, and the reverse side, often carry identifications of the subject and photographer. This allows retrieval of specific information despite the scattering and disassembly of individual images from their original series or context.

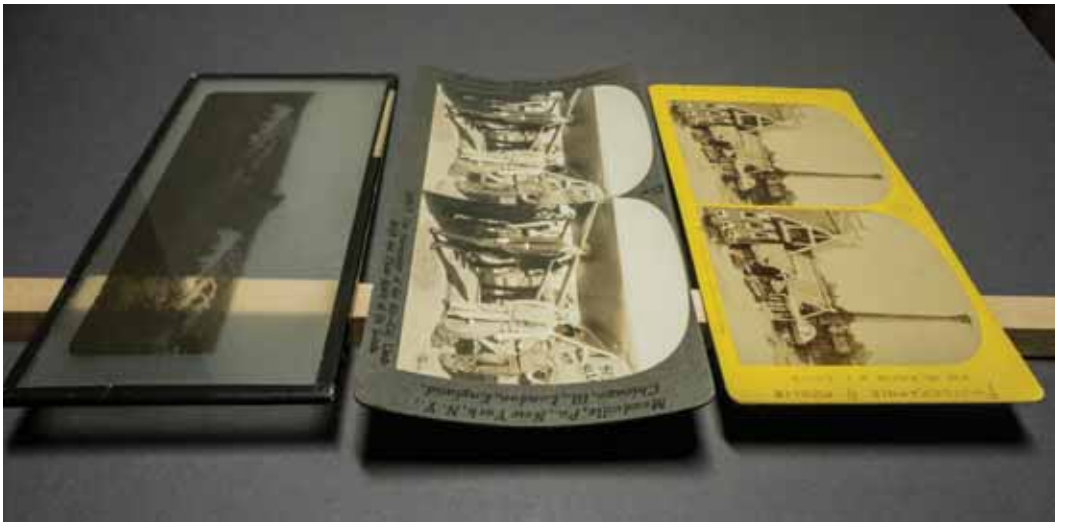
3.5 inches high by 7 inches wide. Hooded viewers with prismatic lenses were the most common type of stereoscopic apparatus. Handheld, photographic cards were placed in the sliding mount of a hooded viewer that permitted focusing by moving the image forward and backwards. Viewer lenses generated some distortion on the edges of images, partially corrected by an intentional curve in the cardboard backing of views produced after about 1890.

More expensive, and finer in reproduced detail, are positive photographic images developed on glass of the same size as the cardboard mounts. The images were held to a light source which illuminated the image by transmitted, rather than reflected, light. The detail created by non-enlarged contact prints on silver emulsion was of almost microscopic fidelity. Glass allowed even greater detail, being unaffected by texture or brightness of the paper itself.

Any of these images could be hand tinted to produce dramatic color effects. Beginning in approximately 1904 the first true color photographs, Autochromes, became commercially viable. Individually unique, the color of Autochromes was created by shining a light through the glass substrate where tiny dyed starch grains were lit up in areas that had failed to deposit silver grains during development. Autochromes can be recognized by the "pointillist," painterly, quality conferred by individual starch grains, each of a different color.

Glass Stereo Autochrome. Detail showing "pointillistic" color. France, near Burgundy, 1913

Stereophotographs printed on translucent tissue paper, "tissue views," combined transmitted and reflected light for a unique viewing experience. In reflected light they are comparable to regular cards. But when partially lit from behind a second backing layer of tinted tissue paper contributes a gentle color, sometimes enhanced by pinpricks that produce brilliant lighting effects. Many original tissue views have become torn, or even burned from being held up to a candle. Intact examples can be spectacular, with the fairytale brilliance or surprise elements that appear only when lit from behind.



Physical formats of stereoviews. Left-Right. Translucent glass positive, curved paper mount, flat paper mount.

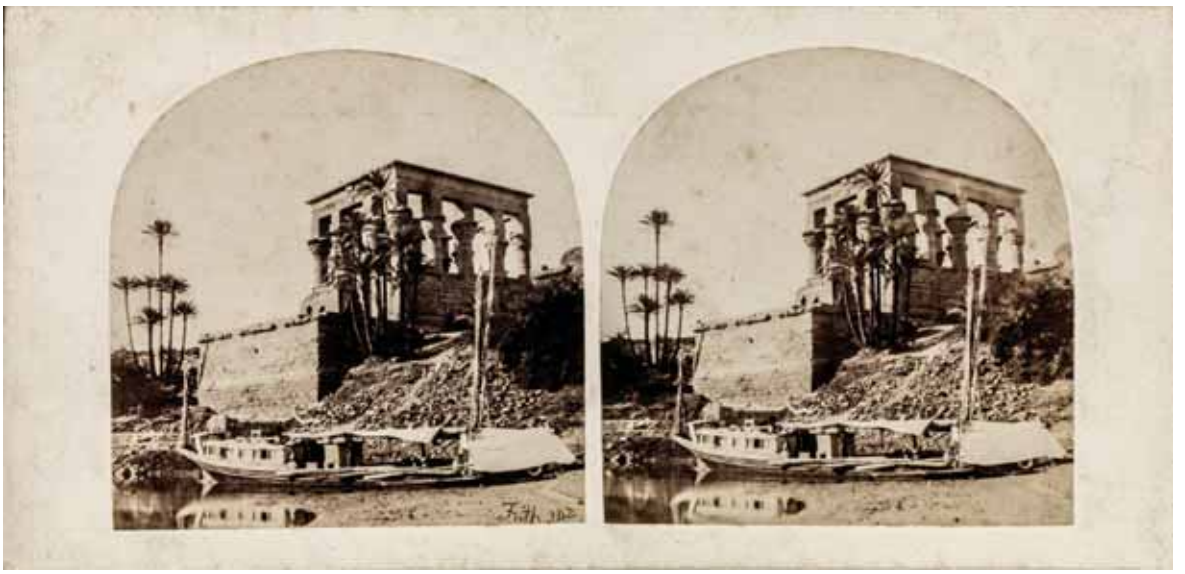
Image Variants

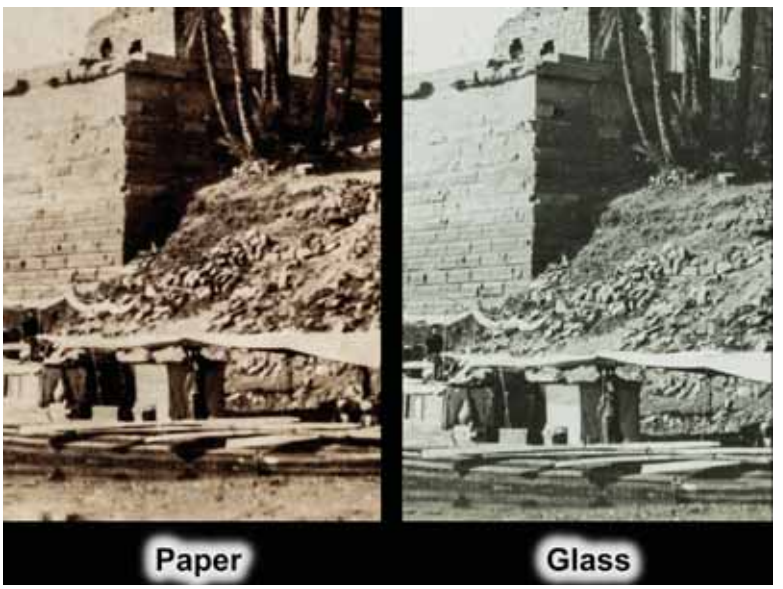
Prior to 1900, technical and cost factors made amateur private photography impractical. Rather, stereoview production was an expensive and highly skilled endeavor, the cost of which needed to be recovered by commercial sale to an interested public. The photographer was only one component of a successful business model. Also required was an investor funded commission to generate original negatives that were then handed over for print production, marketing, and sales. Glass and paper prints of an identical image are common format variants. The finest quality images, printed as positives on glass, were luxury goods only the wealthy could afford. Less expensive paper photographic silver emulsion prints, often made from the same negatives used for glass positives, were mounted on cardboard and sold at greatly reduced cost to an expanding middle class. Starting in the 1890s cheap photomechanical printing using the halftone method further lowered costs. These low resolution images, often poorly tinted, were printed directly on cardboard in huge numbers.

Pioneer stereophotographers in the 1850s and '60s had variable control over the way in which their images reached the public. Some, like the Englishman Francis Frith, were personalities and explorers in their own right, signing their work in the original negative and choosing a publisher who would make multiple prints under their direction for sale. More commonly, photographers were considered employees, or technicians, with the business backers not only taking credit for the work, but issuing prints according to their own agenda, in a manner that would maximize sales. Negatives were passed down to successors, and bought and sold between publishing houses. It is not uncommon for one negative to be issued over decades in different formats by different publishers. As public interests and expectations changed, captions themselves might change to reflect reissue as part of a series. Thus, a picture of the Sea of Galilee might be included in a Holy Land Tour series, as well as a Life of Christ series.

Signed negative. Francis Frith made several expeditions to Egypt, and was careful to sign the negatives and maintain control over their publication. This view shows the temple of Erment, Egypt built by Cleopatra VII (the famous one) but destroyed to make room for a sugar factory within a few years of this photo. Photographed by Francis Frith, London, published as a glass stereoview by Negretti and Zambra or the London Stereoscopic Company, c.1859.

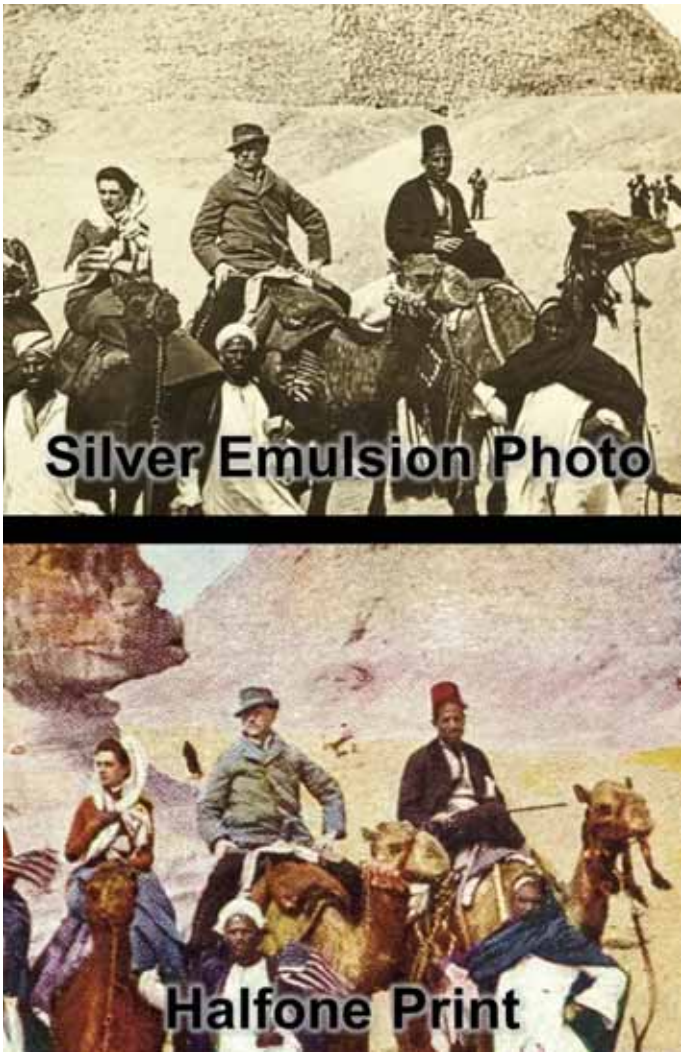
It is often difficult to know with certainty which surviving version of an image is the "original" issue. The variable image quality and preservation across formats and issues can provide a perplexing series of possibilities for reproduction, restoration and interpretation of an image.





Paper and glass versions from a common negative, printed within a few years of each other. Inexpensive paper and costly glass versions were made for different markets. Although more fragile, the glass versions had superior resolution and lack yellow deterioration caused by interaction between emulsion and paper, or degradation of the underlying paper over the years. Dahibeyah (Nile river boat) at Island of Philae, Egypt. Francis Frith, c. 1859.

Original and production versions. This picture of an Egyptian mummy was taken as a rectangular glass negative, shown as a first generation contact print made for the production catalogue. Cropping for mounting on card stock was done in rectangular (sepia) and arched (grayscale) window versions mounted on card. Original photo Underwood and Underwood, later re-issues by Keystone view company. Mummy of Seti I, original negative c. 1900.



Photolithographic halftone print from a series previously issued as a silver emulsion photo-graphic print. Note the hatched dots in the halftone.

Digital Fidelity

The intended uses of an image determine the type of digital processing required. Generally, the goal is to achieve fidelity between the original and digital images. But not all "fidelity," or adherence to facts, is the same.

1.**Object Fidelity.** Pure documentary intent maintains fidelity to the physical object exactly as it is, complete with damage, and changes in color or contrast brought about over time. This is essential for museum, academic, and auction house work.

2.**Content Fidelity.** Fidelity to content is a different standard, whereby the image is optimized for viewers more interested in the image content than the physical photographic object. Image changes introduced by damage or deterioration since creation can in many cases be partially or completely reversed through digital restoration. High resolution digital zooming can display fine detail that was never accessible from the physically small original using legacy optics. Reversal of acquired damage from scratches, yellowing or loss of contrast, can achieve greater fidelity to the artifact-free originals while at the same time improving the viewing experience.

3.**Fidelity to the Photographer's vision**. The most difficult goal of all is achieving fidelity to the photographer's intended vision. If the images were commissioned for sale, the photographer himself may be interpreting the extrinsic values of a commercial market. Often the surviving physical prints have been cropped, and image tones modified at the time of production without direct involvement of the original photographer. Captions are rewritten by an editor. Achieving fidelity to the original photographer's intent is thus an elusive endpoint.

Digital resolution of a 3-inch glass original digitized at 21 megapixels. The enlargement shows detail available on zoom, which is readily accessible to a viewer using contemporary digital displays.

Glass production negative and printed paper positive, 1876. Glass negatives could be used to print a positive image on paper glass. Retouching of the negative, such as reworking the sky in this Philadelphia Centennial exposition image, was common. Reversal of the digitized negative provides crisp detail, full borders, and rich tones. The vintage paper print is now yellowed and cropped.

"Fidelity" in image versions. Three different image processing goals are represented here.
<u>Left: Object fidelity</u> to a vintage paper print has no digital restoration, and a color balance matching a color standard included at the time digitization.
<u>Center: Content fidelity</u> of the same paper print is improved through digital restoration that includes enrichment of tone, restoration of contrast, conservative removal of yellowing, and smoothing of noise contributed by paper texture.
<u>Right: The photographer's intent</u> is perhaps best approximated in the (reversed) original negative.

Digital Display Methods

Display modalities are ever expanding, both in concept and detail. All can be implemented from the starting point of a pair of separate right and left aligned images such as those pulled from historic stereophotographs. Left-right pairs are thus the most flexible archive format of source files intended to be used across multiple display platforms.

In its least processed form, a photograph of the physical stereocard can be reprinted on physical paper and viewed with an old style lenticular viewer. New versions of these dual lens viewers are available as lorgnettes (handheld), and dual lenses aligned to a fixed image window that can be placed against the print (Holmes style). An excellent new issue of a modified Holmes style viewer for standard sized cards (7") is the Owl Viewer from the London Stereoscopic Company (http://www.londonstereo.com/). These are sold separately, or to accompany any of the company's excellent stereoscopic hardcopy publications. An updated fully digital approach is exemplified by virtual reality headsets (Oculus, Google cardboard) which project left and right images that are viewed by the special lenses much like a fancy Holmes scope. Field distortions conferred by the close physical distance between screen and lens are compensated by preadjustment of the image displayed on the screen.

Printed or projected anaglyph images can be viewed with special colored glasses in which the tints of the left and right lenses are matched to the tinting of the anaglyph itself. This is a very old approach, having been known in the 19th century, and repopularized in the 1950s and 1960s by Hollywood 3D movies projected in standard theaters. A distinct advantage of anaglyphs images is that aside from the tinted glasses, no special projection equipment is required. Starting with our first public presentations in 2011, Photoarchive3D has used

Digital anaglyph of tourists at the Colisseum, Rome, c.1865-70. Digital anaglyph overlay of red-cyan layers, for respective viewing by the right and left eyes. Paper glasses have red filter on left so only cyan signal gets through, and cyan filter on right so only red signal gets through. There are several software packages that can align, crop, and color code layers. Anaglyph created by Masuji Suto and David Sykes freeware software "Stereo Photomaker" which is available online at : [http://stereo.jpn.org/eng/stphmkr/]

red-cyan anaglyph in its projections. It can be as simple as loading images onto a local computer and projection system as you would for a standard lecture. When projected in a dark room, the audience will see the images in three dimensions by viewing

them through disposable glasses with colored gel filters. A disadvantage of anaglyphs is ghosting, caused by incomplete shielding of the opposite side. Although excellent image quality can be obtained from black and white images, color filters within the glasses distort colors present in the original.

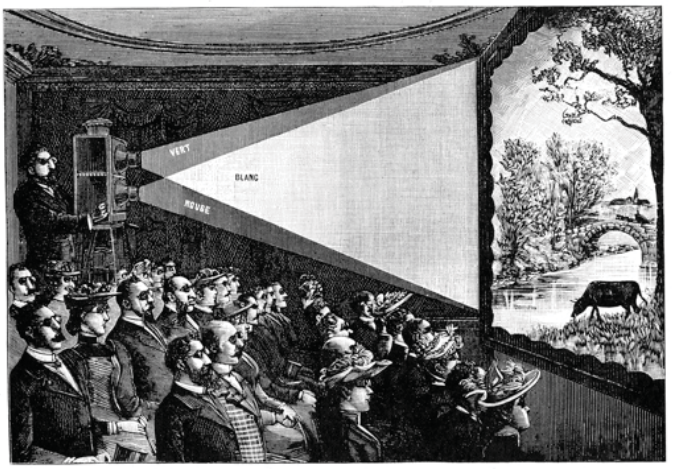
A variation of the anaglyphic method which avoids color distortion is polarized projection. Left and right pairs are polarized to different angles by passing the light output through differently rotated polarization filters. The viewer then puts on polarized glasses in which the rotation of right and left sides complements the intended source. The glasses are passive, in that they require no dynamic adjustment during use. A drawback is the need for specialized projection equipment, and substantial dimming of the image viewed through what are essentially sunglasses.

Dynamic shutter lenses have emerged onto the consumer market of televisions and small theaters. This method displays left and right images alternatively on a single screen at a very high frequency. The trick is to don a pair of glasses in which the left and right lenses can separately and rapidly be blackened by an electronic mechanism synchronized with the projection signal. When the left image is on the screen the right lens is blackened, and inversely for the opposite side. Color rendition and image quality can be quite good. Expense of the glasses tends to limit this method to private or small group use.

Audiences

Contemporary audiences for historic stereophotographs are varied, extensive, and essentially inexhaustible. The educational possibilities alone are vast. Views can be prepared for age level and the particular subject concentration involved, and accompanied by a programmed narration or teacher's instruction. Since virtually every kind of activity and element of history, art, lifeways, geography, natural history and science from the early 1850s onwards is covered, the potential scope is immense. Modern technology can revive and greatly improve what was in fact a major educational component of classroom instruction from about 1870 through 1940, when stereoview sets could be found in every American school system and many libraries. One reason the production of stereoviews lasted so long was because they were so widely used in schools, and the last American publishers of stereoviews derived most of their income from educational applications. Providing modern packaged educational programs using the views would seem a logical and profitable enterprise and would be of special value to the growing home schooled population of students.

There will always be a substantial audience for stereoview images among scholars, researchers, academics, research and teaching institutions, and older students. The potential here is only limited by the knowledge that such views exist, and digitization of images that makes them much easier to study. Photoarchive3D has been involved in several topically focused research and media development efforts, including with a virtual Paris history supported by Dassault Systemes, presentations and publications for the Ancient Egypt Research Associates, and for the Maine State Museum. In the case of the Maine State Museum, which has recently published a book of collection highlights, some five percent of all the photos in the book derive from stereoviews, and stereoview images are being



c.1890 image of dual projection, with color filter glasses for an audience to see in 3D. This was more of a theoretical possibility and was little used (if ever) because of its technical complexity, and low light intensity of projectors at the time.

supplied for it from three different sources. As an adjunct to this kind of usage the Photoarchive3D collection would lend itself well to any kind of suitable multimedia presentation, from the Ken Burns historical type to more jaunty Steampunk or mixed graphics kinds of expressions. Once the visual riches of stereoviews are publicized and known, the potential for their use expands endlessly.

Photoarchive3D has not yet undertaken the marketing and distribution that would make its archive the major commercial or educational entity it has the capacity to become. The founders have given many presentations in 3D related to countries (Egypt, Russia, etc.), and themes (historic preservation, hunting, past lives, etc.). The audiences for these public topical talks have been very enthusiastic and are always thrilled to see the past presented in three dimensions, something they hardly imagined possible. One of the best received of these presentations was given at the annual conference of the New England Museum Association in Boston in

2014, which combined a stereoview survey of New England with the technical information to introduce the audience to the existence of stereoviews and to provide help for collecting institutions and private collectors considering how best to digitize or otherwise document their own images. That presentation was the basis of the technical essays presented in this booklet. We have also given presentations in the USA, Germany, United Kingdom, and Brazil. Specialized audiences have included photo collectors, historians, art collectors, and 3D fans.

Thirty-Three Examples
The Best of 33,000

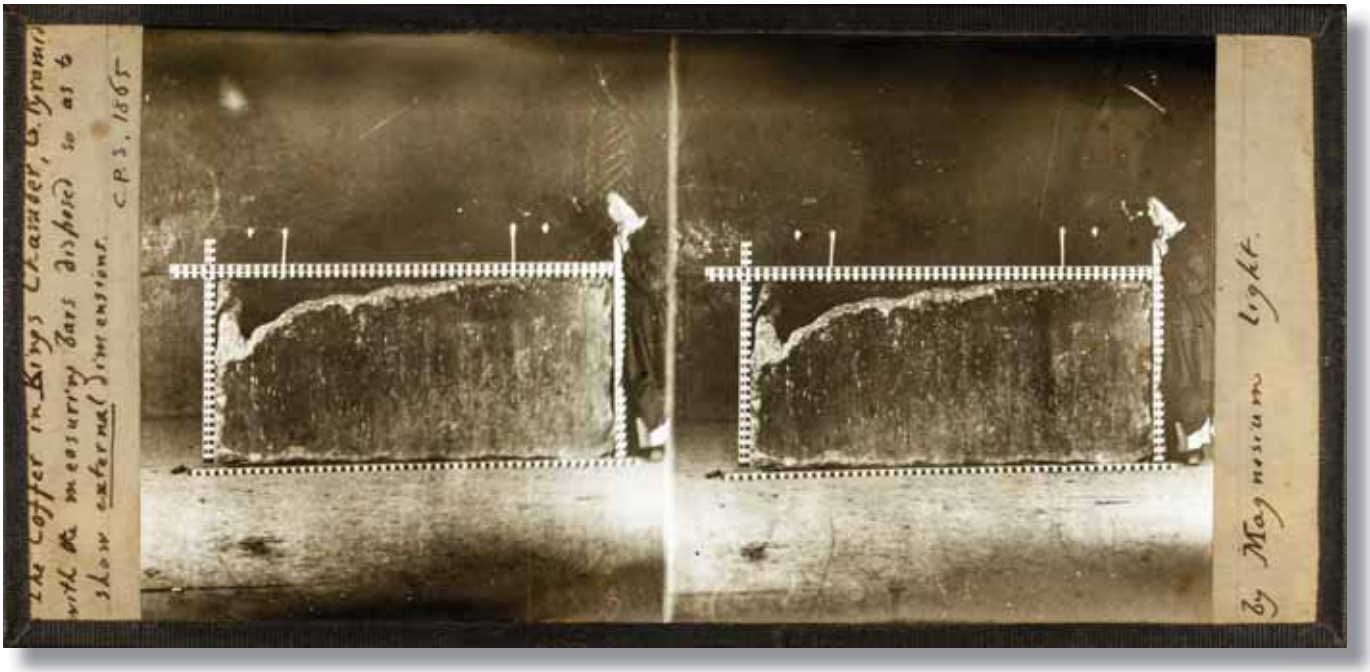
"One in a Thousand"

Thirty-three examplar images are reproduced here in full, from a total of over 33,000 in the Photoarchive3D collection. These represent the variety of formats seen, range of locations and subjects encountered, and some rarities. Most were "published" as multiple identical copies for sale, of which only a few have survived. Others are unique: daguerreotypes, ambrotypes, autochromes, and tintypes were all direct exposures in the camera developed as single originals. Hand finishing of others, such as tinted tissue or paper views rendered each example different from another in its fine details.

The physical stereocard images shown here can be viewed right from the page with an old style lenticular viewer. New versions of these dual lens viewers are available as handheld lorgnettes and dual lenses aligned to a fixed image window that can be placed against the print (Holmes style). An excellent new issue of a modified Holmes style viewer for standard sized cards (7") is the Owl Viewer from the London Stereoscopic Company (http://www.londonstereo.com/).

Object numbers (ObjNr-xxxxxx) are Photoarchive3D accession numbers.

Early stereoview manufacture. Recreated in studio setting. c.1856, France ***ObjNr-201707***



First picture inside Great Pyramid, first flash picture series outside a studio. ObjNr-008513
Charles Piazzi Smyth manuscript labels on glass positive.
1864, Egypt (printed 1865)

St. Basil's Cathedral, Moscow. Salt Print. Zuccalmaglio, ObjNr-010645
1855-60, Moscow, Russia

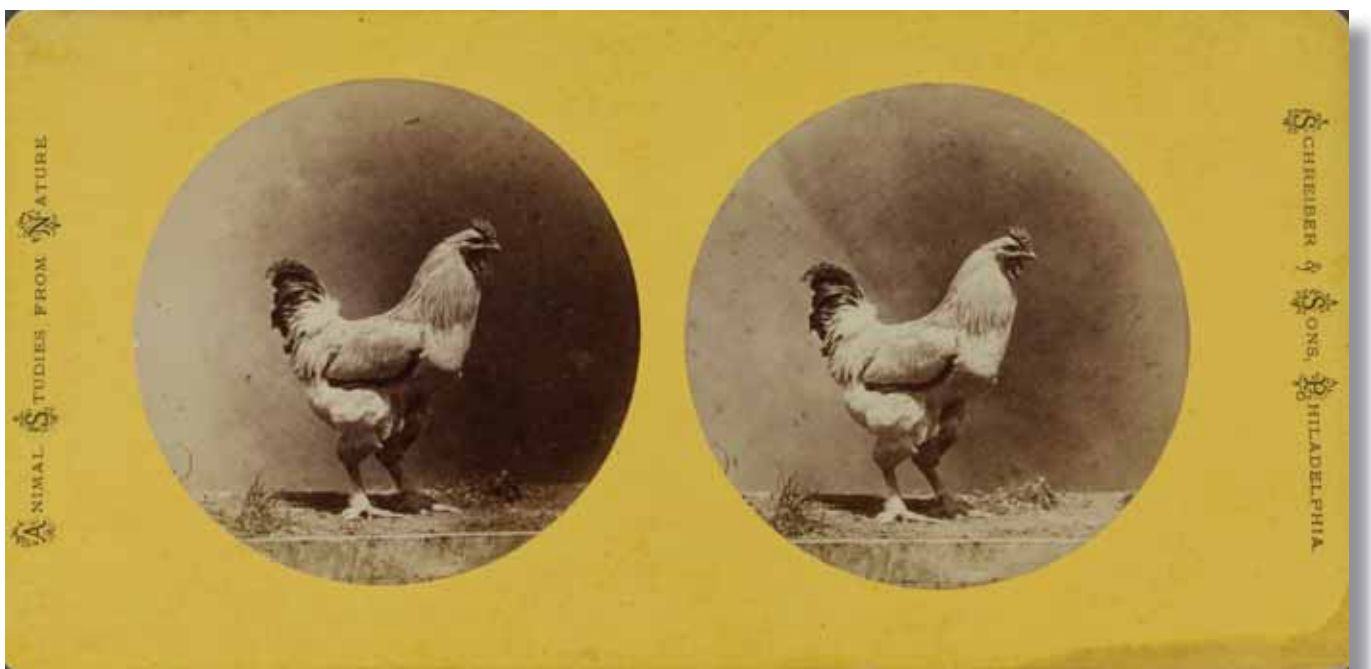
Venice (glass) ***ObjNr-209437***
c.1858, Venice, Italy

Inauguration of Suez Canal (glass) ***ObjNr-200015***
1869, Egypt

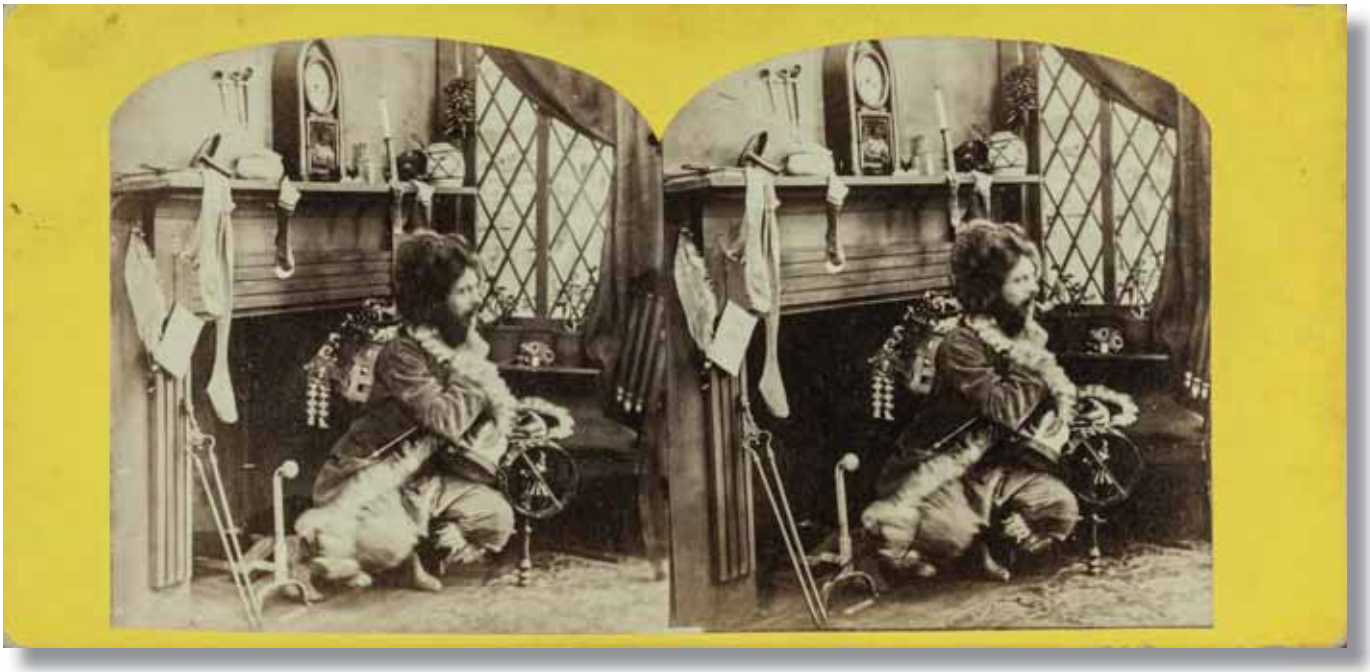
Daguerreotype portrait, tinted. Antoine Claudet, 1852-60, London, England ***ObjNr-010502***

Ambrotype portrait of 3 women and a girl, with stereoviewer c.1855-7, United Kingdom ***ObjNr-010147***

First published photo of moon (on glass). De LaRue 1859, United Kingdom *ObjNr-005695*



Study of a chicken, Schreiber c.1875, Philadelphia, United States *ObjNr-003612*

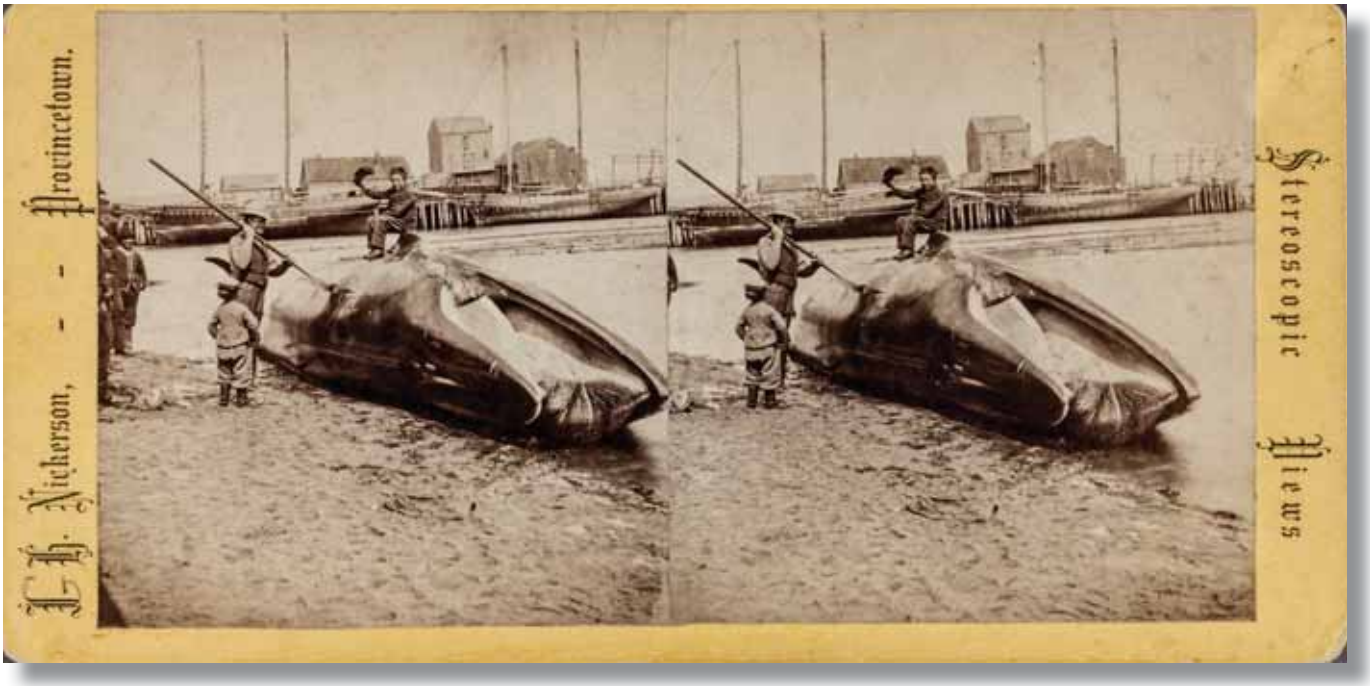


Earliest known photograph of modern Santa Claus ***ObjNr-002345***
1857, New York, United States

Autochrome, Child at Beach (glass) ***ObjNr-005779***
1910, Scarborough, United Kingdom

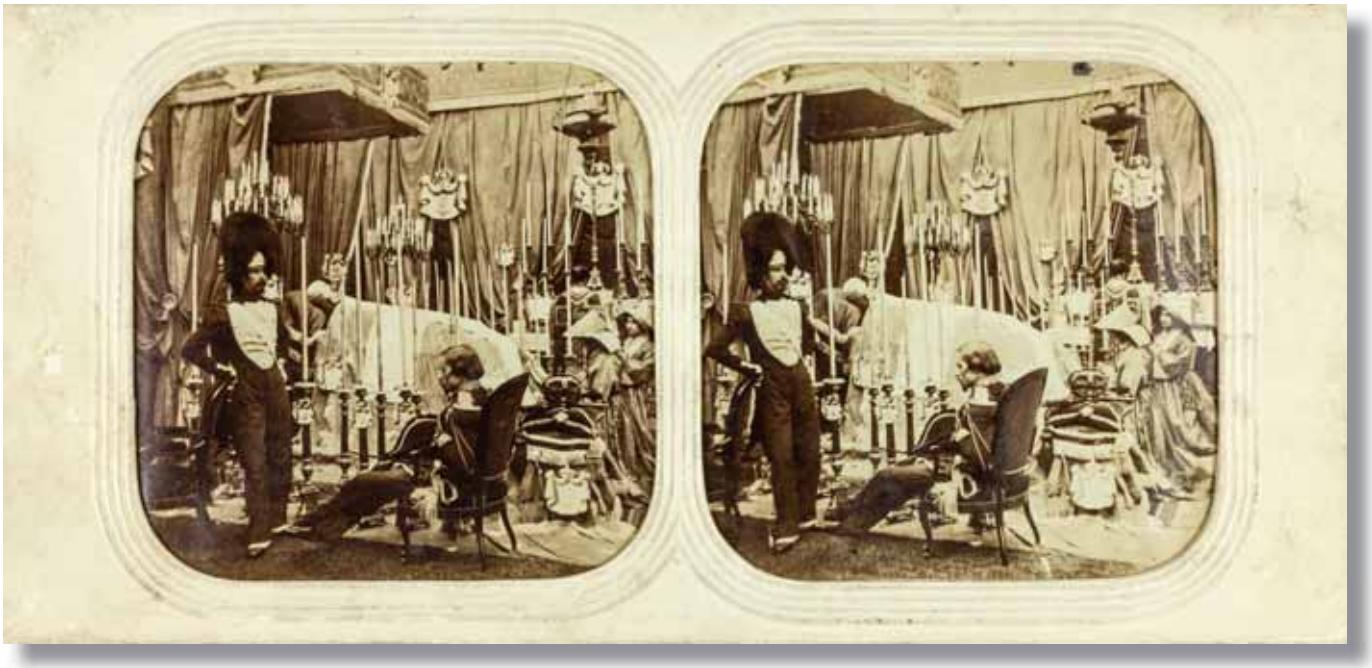
English ambulance, Franco-Prussian War 1870, Paris, France ***ObjNr-002565***

Imprint of Captain Werner Peterson, fallen from the L32 zeppelin 1916, Billericay, United Kingdom ***ObjNr-002594***

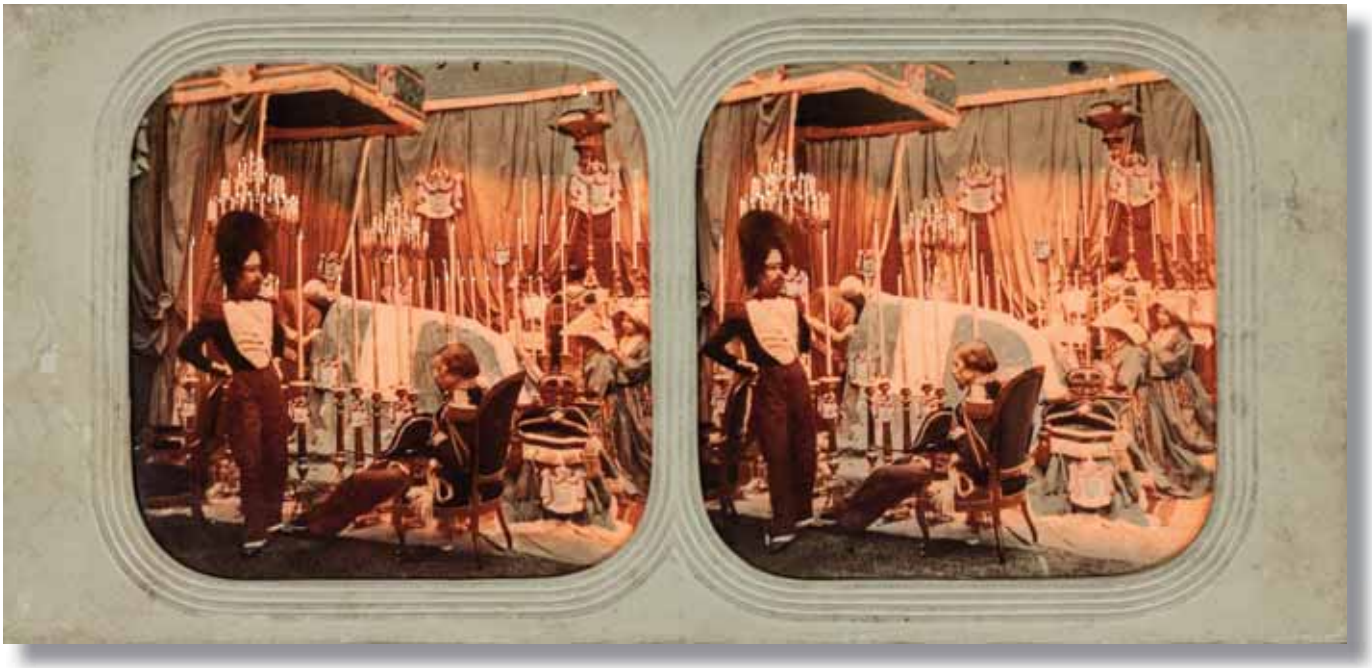


Beached whale. ***ObjNr-207222***
c.1875, Provincetown, Mass, United States

Allied material abandoned on the beach, with lounging German soldiers ***ObjNr-007429***
1940, Dunkirk, France



Jerome, youngest brother of Napoleon, lying in state. Staged recreation. *ObjNr-004499*
Reflected-light tissue view.
1860, France



Jerome, youngest brother of Napoleon, lying in state. Staged recreation *ObjNr-004499*
Transmitted light tissue view.
1860, France

American section at Paris 1889 Exposition (glass) *ObjNr-209823*
1889, Paris, France

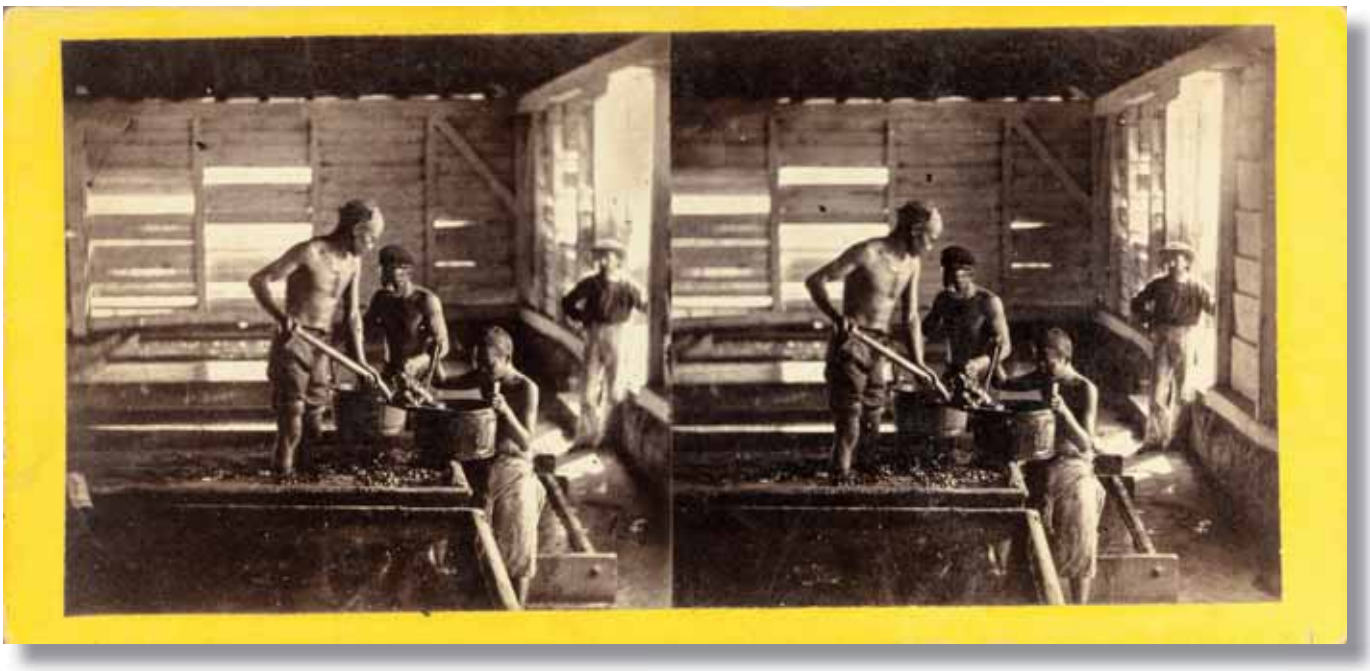
Paris 1937 Exposition, stereo autochrome (glass) *ObjNr-010299*
1937, Paris, France

Head of Liberty statue at 1878 Paris Exposition ***ObjNr-209795***
1878, Paris, France

Mississippi riverboat ***ObjNr-219899***
c.1870, Saint Paul, Minnesota, United States

Early Canton, China
c.1860, China

ObjNr-204922



Slaves in sugar house
1860, Cuba

ObjNr-202132

Street puppet show with crowd
c.1875, London, England

ObjNr-202802

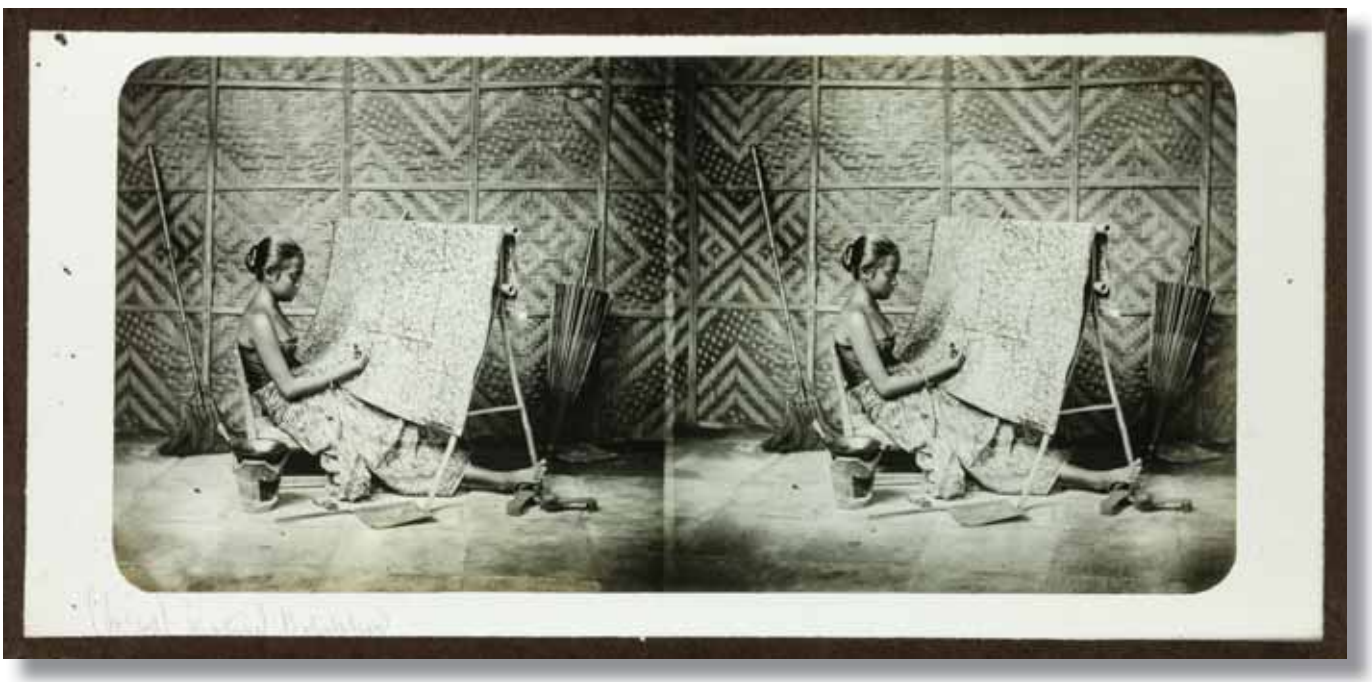
Building the Thames embankment
c.1864, London, England

ObjNr-203514

Moscovite peasant and child ***ObjNr-203962***
c.1855-60, Moscow, Russia

Nevski Prospekt, St Petersburg (glass) ***ObjNr-209827***
c.1875, St. Petersburg, Russia

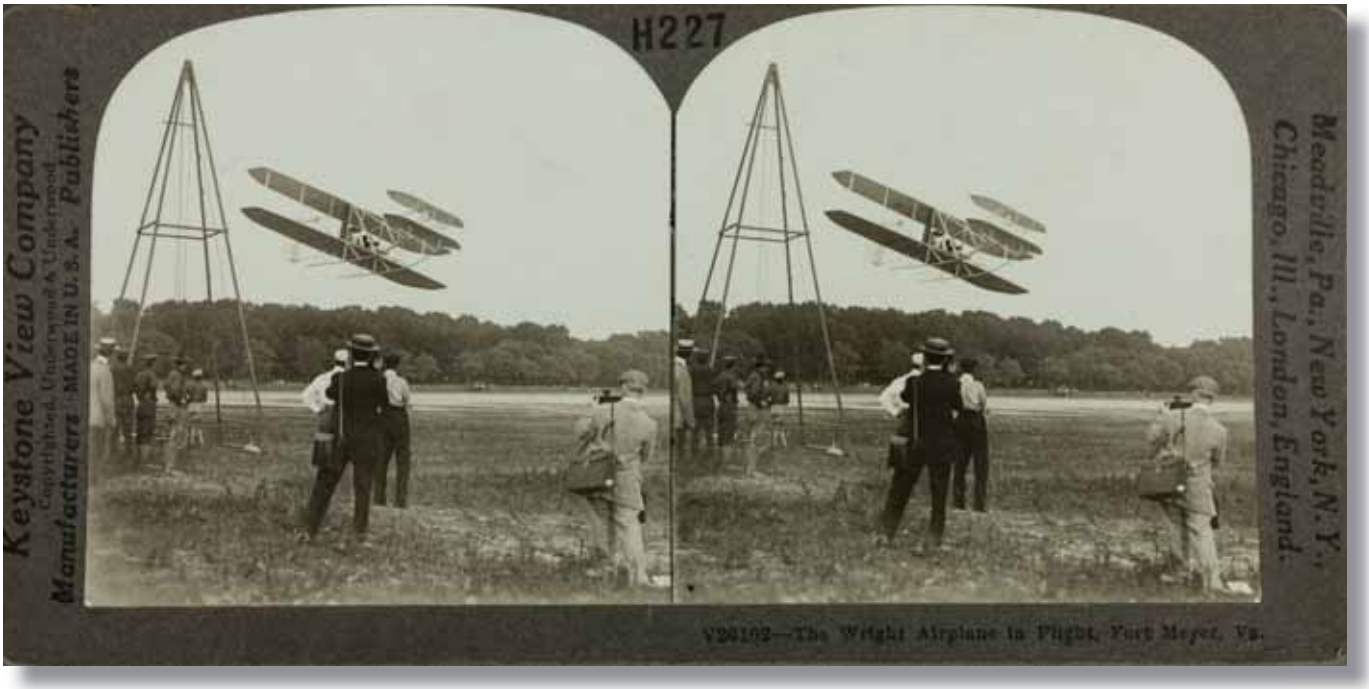
Nude in paradise (glass) ***ObjNr-008699***
c.1890-1900, France



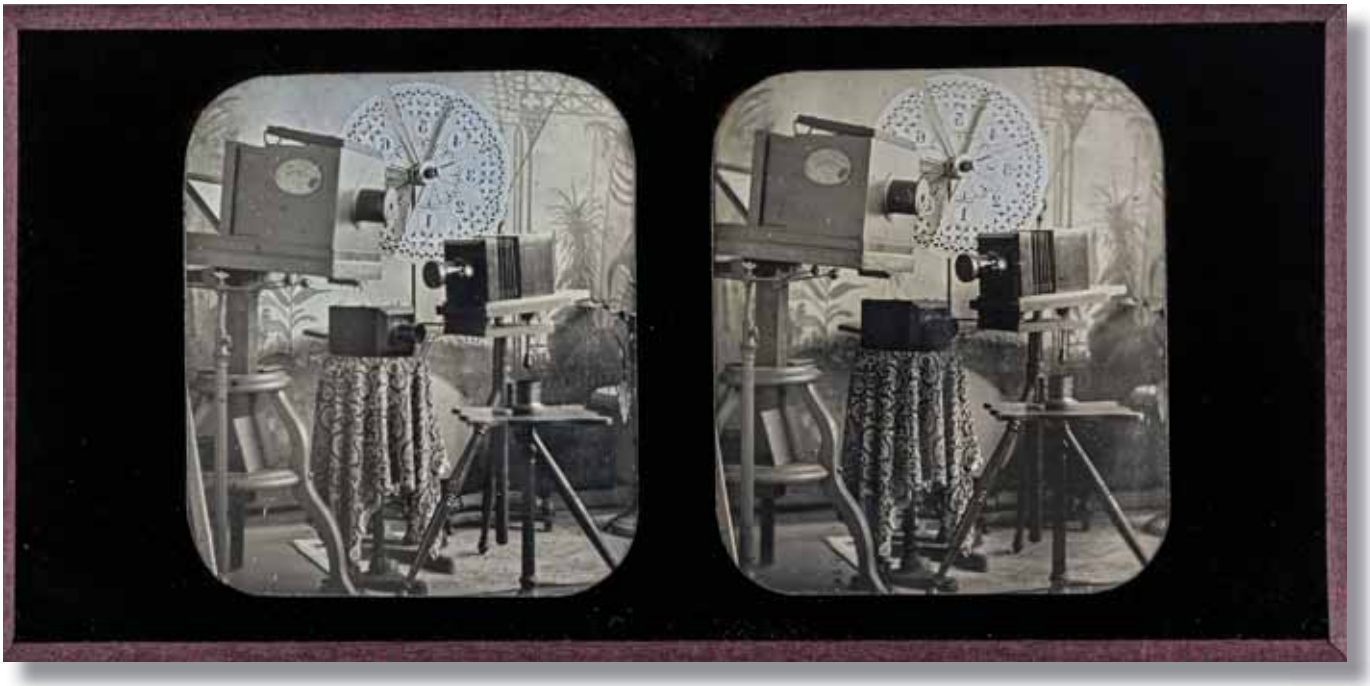
Javanese girl with batik (glass) ***ObjNr-209796***
c.1870, Java

Sioux Indians ***ObjNr-212647***
c.1870, United States

Tintype stereo portrait of Rev. John Robinson ***ObjNr-010511***
1870, United States



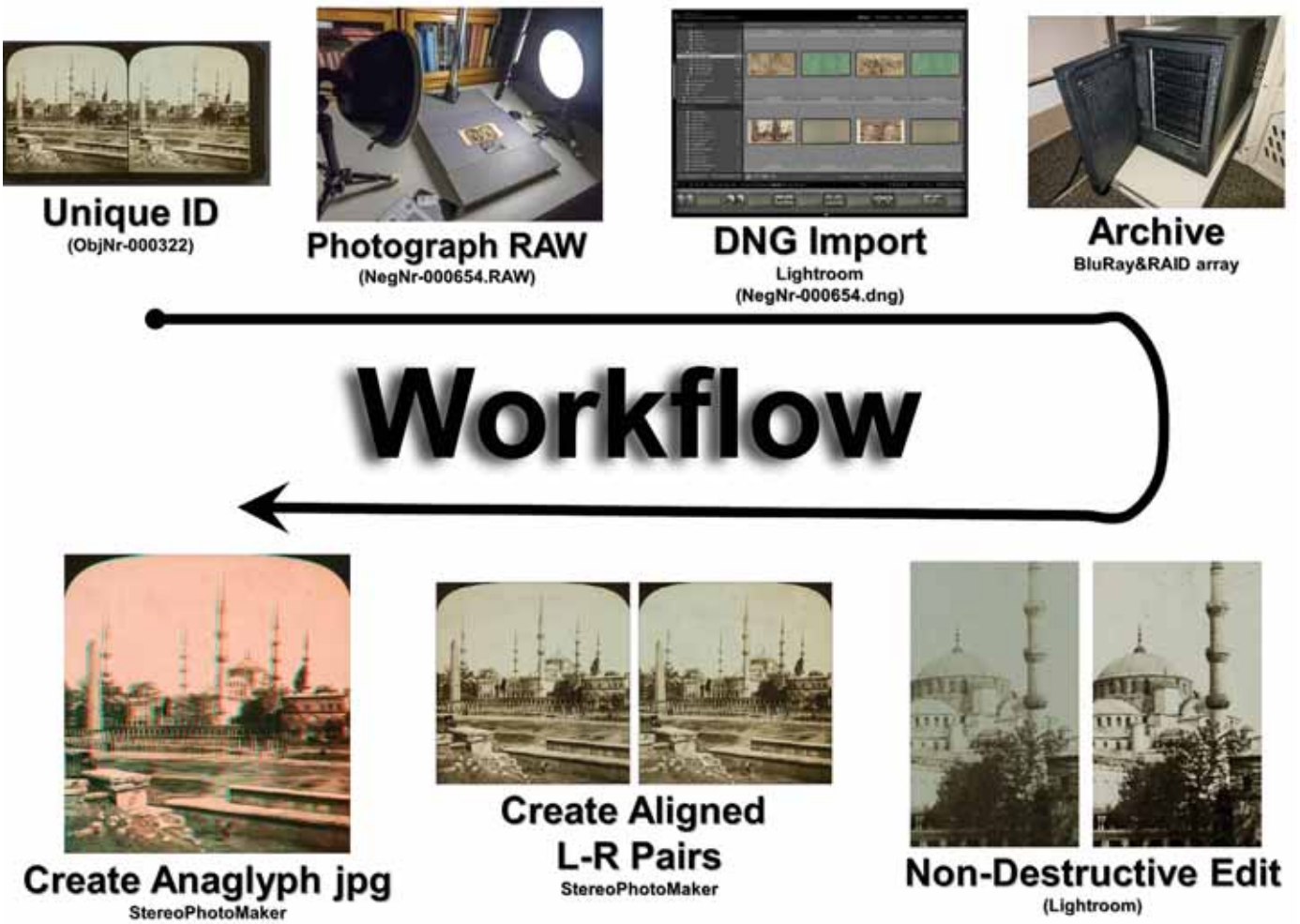
Wright brothers in flight ***ObjNr-001835***
1906, United States



Century Darkroom photography equipment, daguerreotype ***ObjNr-010503***
2016, Mike Robinson, Toronto, Canada

Appendix A: Digitization Workflow

The various physical forms of stereophotographs, flat or curved, and the diversity of materials, glass or paper, present challenges for digitization. Paper requires a diffuse reflected white light, whereas glass must be backlit. All of these formats can be readily accommodated in a standard photographic light stand, illuminated either by a lightbox behind the image or by tabletop lamps. High resolution capture previously required special flatbed scanners, but these have difficulty in imaging warped or curved cards, and special accessories are required for backlighting.

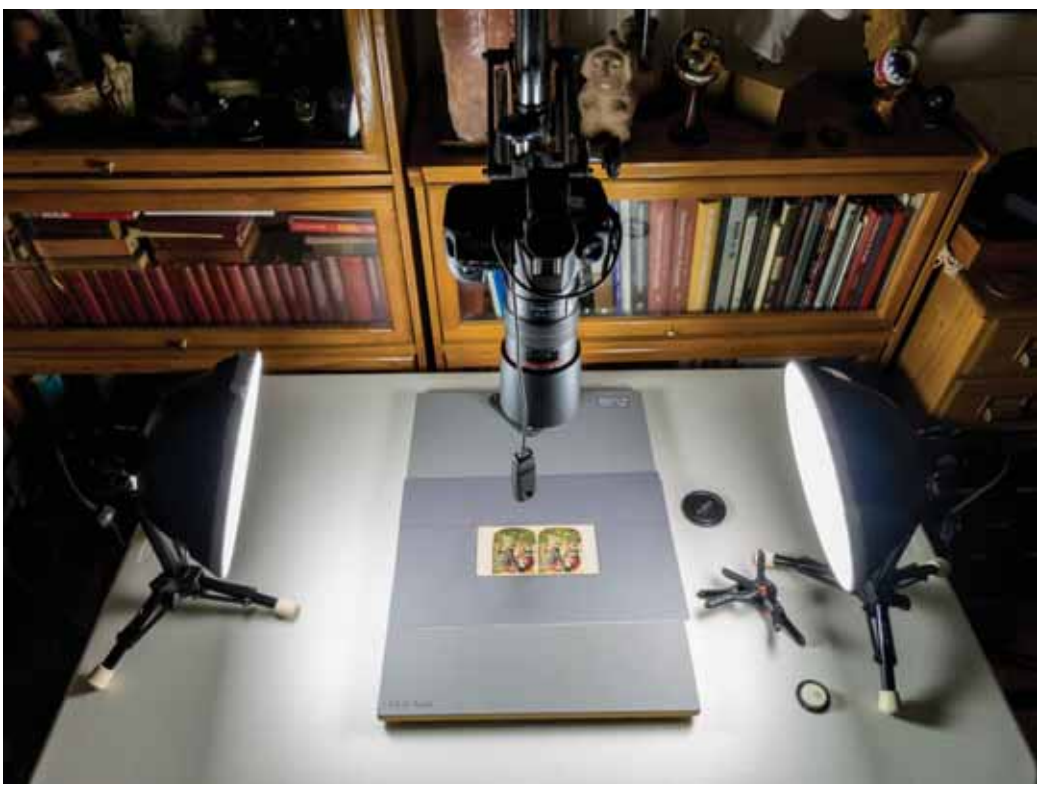


Digital workflow. Camera raw digital images were converted to open source standardized Adobe Digital negative (DNG) format, and imported into Adobe Lightroom for cataloguing and manipulation.

We here document our specific digitization protocol, as an example implementation. It is by no means required for success, as there are many workable alternatives. For example, scanning on a flatbed color scanner or drum scanner provides excellent color rendition and avoids perspective distortion of a misaligned or optically aberrant camera. Flatbed scanning can, however, be slow and yields very large tiff files designed more to preserve actual color fidelity than dynamic range during adjustment. Use of high quality apochromatic lenses and software removal of lens aberration artifact minimizes distortion when using a camera rather than scanner.

Original objects in the Photoarchive3D Collection were photographed on an aligned copy stand mounted 21 megapixel Canon eos 5D Mark two digital camera with 4400K daylight lighting. This produces a 5616 by 3744 pixel digital raw file at approximately 750 pixels per inch. Proprietary Canon raw files were converted to Adobe digital negative, DNG, format in Adobe Lightroom. Lens corrections were applied during import into Lightroom. The

Object storage must balance preservation with access. Special archival boxes designed to flip through stereoviews allow rapid screening and retrieval. Fragile surfaces can be protected by enclosure in clear archival (mylar or polypropolyene) sleeves.

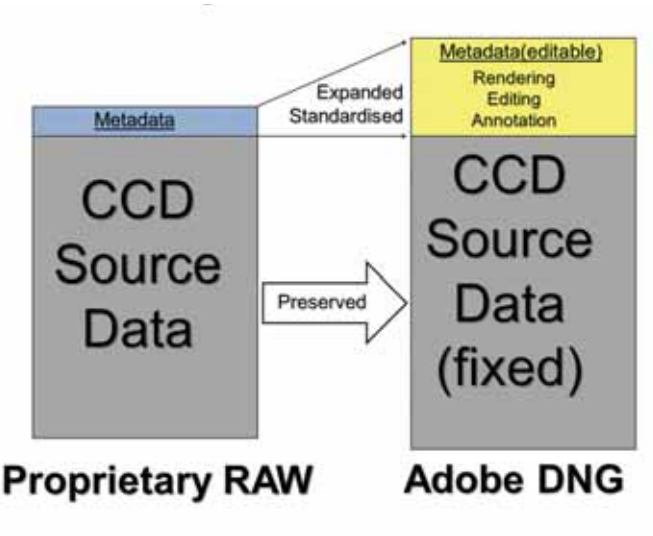


Copystand alignment of the camera leveled to the object platform is critical to avoid distortion. Multiple, diffused, daylight light sources in a dark room are provided by angled reflecters outfitted with diffuser screens.

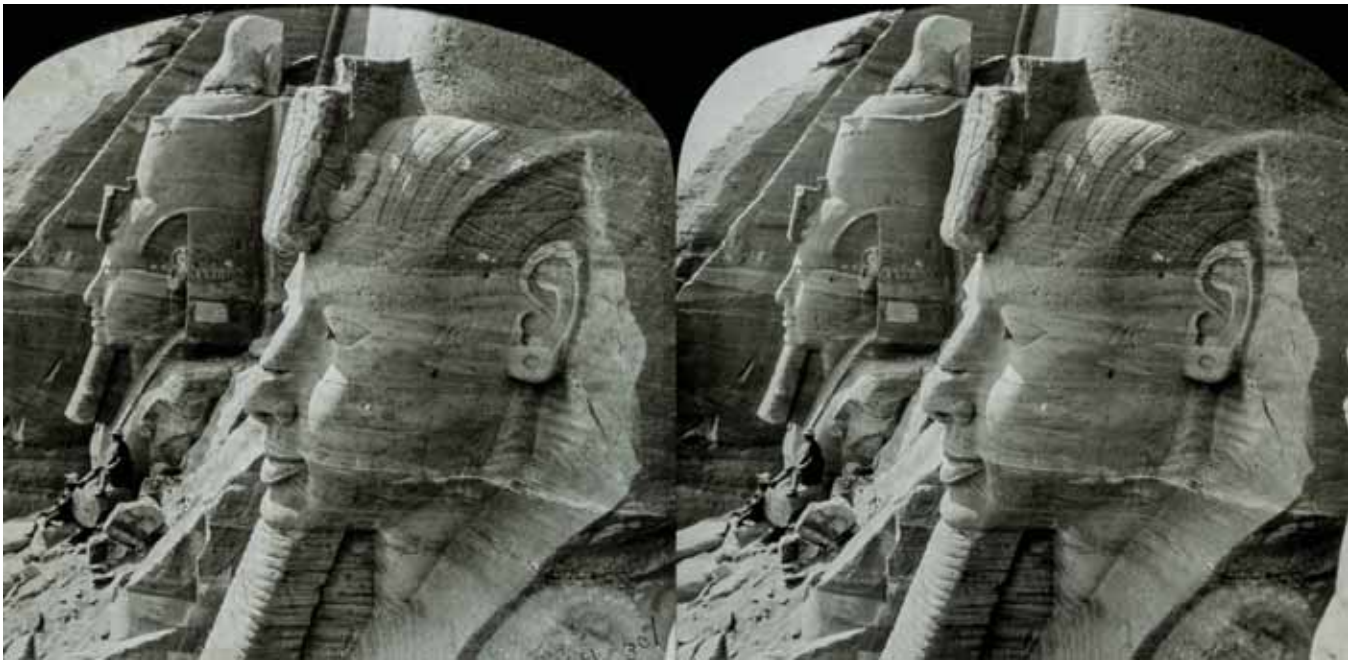
Image placement along a jig aligned to the camera field for primary photographic capture. Neutral photographic gray background and color standards facilitate high fidelity object documentation.

DNG format preserves original source data from sensors in the camera capture device (CCD) while standardizing access to an open source common standard. An additional advantage of the DNG format is embedding of metadata and image editing instructions in a file header which does not alter the lossless source image capture. Thus, a DNG master file can be edited or restored at will with complete reversal to the original state at any time. DNG files are easily exported as any common format including JPEG, tiff, gif, png, etc.

Image processing for public presentation typically includes digital restoration, export in lossless tiff format, and re-separation of left and right components into separate files cropped to proportions of actual image. The separate left and right half files can then be recompiled using software into 3D viewable format such as red cyan anaglyph (projection with red-cyan glasses), or multiple picture objects (mpo, for shutter glasses). We use Masuji Suto and David Sykes freeware software "Stereo Photomaker" which is available online at: [http://stereo.jpn.org/eng/stphmkr/].



The Digital Negative (DNG) file format created by Adobe in 2004 is a standardised container that preserves the source RAW data from the capture device (CCD) of many brands of camera. Image editing and annotation is nondestructive to the RAW data, but rather writes editing history to the file metadata. DNG files can be edited, resized, and converted to many other file types. Retention of editing history allows immediate redisplay and export of any state. Common states might include color card corrected unrestored images (fidelity to original), digitally restored images (fidelity to content), and various resized and cropped versions for specific applications.



Aligned, cropped, and color intensity normalized image pairs from vignetted glass stereoview. Left and right sides are saved as different files that can be combined into a single frame in any display platform. Options include streaming separate sides to respective eyes (virtual reality headsets), dynamic swapping of sides on one display (shutter glasses), or overlay of differently tinted sides viewed through colored lenses (anaglyph).

Red-cyan anaglyph of glass stereoview shown above. Right and left images are superimposed as independant color layers, to be viewed in 3 dimensions with red-cyan glasses.

Appendix B: Photoarchive3D Collection Statistics

32,744 physical stereophotographs (Objects, ObjNr) have been digitized as high resolution (21MP, 5616 by 3744 pixels, average DNG filesize is 20.6MB) digital negatives in Adobe DNG format. Average number of digital images per object is 2.2 (usually front and back). Including a small queue of new acquisitions that have not yet been processed, the collection includes about 33,000 stereos. Of these 1,694 (5%) are glass positive views, and 317 (1%) are tissue views. The balance is mostly paper. Collection statistics as of September, 2018 are shown in two tables below.

Geographic Location of Images

Geographic locations where images were shot are tallied in the following table. Unidentified locations are unknown, hard to classify (the moon, for example), or not yet fully researched. Distribution favors that of targeted commercial markets (Europe, North America, 71%), and their exotic heritage locations (Levant, Middle East, Northern Africa, 11%).

Sets and Series

The experience of viewing stereoviews is enhanced when groups of images sharing a common theme or geographical location are examined together. Multiple locations at a destination can be sequenced as a virtual tour, or a series compiled to explain something. The Victorian parlor was a social stage, where friends and family could entertain each other by passing views amongst themselves while discussing the subjects illustrated.

The commercial objectives of publishers were also well served by sales of bundled images, rather than single views. Although common practice since the 1850s, the mass production of stereoviews for home and educational audiences evolved by the 1870s to often include an explanatory, sequential, narrative on the backs of numbered views, or an accompanying book. “Boxed sets” were encased in cloth covered boxes resembling the spines of real books, and an educated household might have an extensive “library” of places and subjects available for browsing on demand.

The table shown lists some of the series and sets represented in the Photoarchive3D collection, along with a tally of the number of cards from each. These holdings are biased heavily towards later issues, which continued to be produced for quite specific purposes and audiences through the 1940s. For example, the German publisher Otto Schonstein of Raumbild Verlag issued political and propaganda sets during the Third Reich. The contents, and manner of presentation, of stereoview sets are thus a rich resource for understanding the political and social agendas, aesthetic values, and the latest fads. In many cases they record lost industries, ephemeral events (fairs and wars), and places that have since been destroyed.

Table 1: Summary Of Regions Covered. Part1

Region (Number, %)	Subregion	Number	%
Arctic (28, 0.1%)	Arctic	28	0.1
Caribbean (457, 1.7%)	Cuba	186	0.7
	Martinique	161	0.6
	Caribbean, Other	110	0.4
Central America (597, 2.2%)	Mexico	313	1.2
	Panama	204	0.8
	Central America, Other	80	0.3
Central Asia (551, 2.1%)	Ceylon	49	0.2
	India	502	1.9
East Asia (1025, 3.8%)	China	581	2.2
	Japan	373	1.4
	Korea	71	0.3
Eastern Europe (1183, 4.4%)	Austria	439	1.6
	Czechoslovakia	203	0.8
	Poland	104	0.4
	Turkey	421	1.6
	Eastern Europe, Other	16	0.1
Middle East (1002, 3.8%)	Iraq	138	0.5
	Palestine-Syria	797	3.0
	Middle East, Other	67	0.3
North America (7357, 27.6%)	Canada	425	1.6
	United States	6932	26.0
Northern Africa (2040, 7.7%)	Egypt	1808	6.8
	Northern Africa, Other	232	0.9
Russia (547, 2.1%)	Russia	547	2.1
Scandinavia (876, 3.3%)	Denmark	117	0.4
	Finland	30	0.1
	Norway	278	1.0
	Sweden	300	1.1
	Scandanavia, Other	151	0.6

Table 1: Summary Of Regions Covered. Part 2

Region (Number, %)	Subregion	Number	%
South America (162, 0.6%)	South America	162	0.6
South Pacific (344, 1.3%)	Australia	166	0.6
	South Pacific Islands	178	0.7
Southeast Asia (375, 1.4%)	Burma	108	0.4
	Philippines	183	0.7
	Southeast Asia, Other	84	0.3
Sub Saharan Africa (567, 2.1%)	Congo	64	0.2
	South Africa	358	1.3
	Sub Saharan Africa, Other	145	0.5
United Kingdom (1815, 6.8%)	United Kingdom	1815	6.8
Continental Europe (7722, 29.0%)	Belgium	71	0.3
	France	2226	8.4
	Germany	2243	8.4
	Greece	225	0.8
	Italy	1962	7.4
	Portugal	74	0.3
	Spain	261	1.0
	Switzerland	540	2.0
	Western Europe, Other	120	0.5
Total Region Known Above		**26,648**	**100.0**
Total Region Unknown		**6126**	
Grand Total		**32,774**	

Table 2: Sets and Series. Part 1

Set Name, Location, Publisher*, Year	Total
Africa, Keystone (reissue of UU), c.1920	100
Africa, North: (Tunisia) Unruhiges Paradies am Mittelmeer, c.1950	30
Africa, North: Tunis, Raumbild-Verlag Otto Schonstein, c.1950	30
Amateur: Algeria, Glass Set, c.1900	18
Amateur: Congo, Amateur Glass, c.1910-19	55
Amateur: Personal Grand Tour of Europe, 500 cards c.1906	496
Amateur: Personal, Europe Tour, collated various phot, 1866	56
Amateur: Tunisia, c.1900	34
America, Central, Keystone, 1908-10	51
America, South (East) Boxed Set, Keystone, c.1930-35	30
Arctic, UU, c.1910	14
Australia Boxed Set, UU, c.1895-1900	100
Austria Boxed Set, UU, 1898	83
Austria: Wein- Die Perle des Reiches, Raumbild-Verlag Otto Schonstein K.G., 1941	100
Austria-Turkey, HC White, 1903	100
Aviation: Air Travel, Keystone Jr., 1933	24
Aviation: Aviators Unit DC31 to DC 53, Keystone Diagnostic Series, Spectrometric Section. c.1945-50	11
Burma, 100 card set, Stereo Travel, 1908	100
Canada, HC White, 1908	100
Canada, UU Boxed set, 1902	72
Canada: Niagara UU Boxed Set, 1902	18
China, UU, 1901	100
Comic: French Cook, UU, 1900	10
Comic: French Maid, HC White, 1902	12
Comic: Marriage Boxed Set, UU, 1897	20
Comic: Marriage, UU/Keystone, 1901	30
Cruise Set: SS Cleveland, (Asia, India, Cairo) 1900-10	62
Cruise Set: SS Arabic (Spain. Mediterranean, Holy Land)1911	63
Cruise Set: SS Bleucher, (South America) c.1900-1910	16
Cruise Set: SS Cleveland, (Mediterranean, India,SE Asia, China, Japan, Hawaii) UU, 1900-05	211
Cruise Set: SS Cleveland, UU, (Egypt, India, Malaysia, Asia), c.1900-05	104
Cruise Set: SS Laconia, (Mediterranean, Egypt) 1900-10	13
Cruise Set: SS Oceana, (Scandanavia, N. Europe) UU, c.1900-10	58
Cruise Set: UU, (Turkey and Mediterranean) c.1905	14
Cuba and Puerto Rico, UU, 1903	98
Czechoslovakia: Das Hundertturmige Prag, Raumbild-Verlag Otto Schonstein K.G., 1943	100
Denmark, 100 card set, Stereo Travel, 1914	100
Diorama: After the Opera, Universal View Co, 1900	12
Diorama: Les Huguenots Diorama, France, 1865-1870	12

Table 2: Sets and Series. Part 2

Set Name, Location, Publisher*, Year	Total
Disaster: Martinique (St Pierre/Mt Pelee) ,Keystone, 1902	83
Disaster: Michigan, Calumet Set Italian Hall Disaster, 1913	27
Disaster: New York, 9/11 in 3D, by Dan Shelley, 2001	21
Disaster: San Francisco 1906 Earthquake, 1906	30
Disaster: San Francisco Earthquake Lithos, 1906	95
Disaster: St Pierre Volcano, 1902	18
Ecuador, UU, c.1910	43
Education: History Set, Keystone, c. 1920-40	300
Education: Homes, Keystone, c.1940	33
Education: Keystone Primary Set Part 1, c.1920-40	87
Education: Keystone Primary Set Part 2. c. 1920-40	63
Education: Public Helpers (USA), Keystone, c.1920-40	25
Education: Sunday School Lessons, UU, 1914	51
Egypt 100 set, UU, 1897	96
Egypt Amateur Glass, c.1920	25
Egypt Boxed Set, UU, 1897-1900	92
Egypt, Sinai, UU, c.1897-1905	49
Egypt, UU, 1897-1900	100
Egypt: Pictures of the East. A series of 48 real stereoscopic photographs, tobacco card pairs, c.1920-30.	47
Egypt: Upper and Lower Egypt, Sunbeam, 1923-28	24
England Boxed Set, UU, c.1907	100
Fair: A day at the county fair Brockton, MA. Unk. Pub. 1902-06	12
Fair: B&O Railroad Exhibition, Keystone, 1927	101
Fair: St Louis World's Fair, UU&HC White, 1904	126
Finland: XV. Olympia 1952 – Helsinki, Raumbild-Verlag Otto Schonstein, 1952	30
France, Stereo Travel, 1908	100
France, UU Set, 1907-08	96
France: Paris Expo, Series 1, 1925	22
France: Paris, UU, 1901	39
Germany Boxed Set, UU, 1905.	100
Germany Set, HC White, 1901	101
Germany, Stereo Travel, 100 cards, 1910	94
Germany: Bavaria, Raumbild-Werkstatte Munchen, c.1946	18
Germany: Berlin-Potsdam, Raumbild-Verlag Otto Schonstein, c.1945-50	15
Germany: Der Este Grossdeutsche Reichkriegertag, Raumbild-Verlag Otto Schonstein K.G., 1939	100
Germany: Der Stadt Nurnberg Ursprung und Werdegang, Raumbild-Verlag Otto Schonstein, 1949	59
Germany: Deutsch Heimat, Raumbild-Vertrieb Johannes Schonfeld, c.1950	138
Germany: Deutsches Gau, Raumbild-Verlag Otto Schonstein K.G., 1938	200
Germany: Deutsches Heimat Series 1, Raumbild-Verlag Otto Schonstein, c1950	30
Germany: Deutsches Heimat Series 2, Raumbild-Verlag Otto Schonstein c1950	30

Table 2: Sets and Series. Part 3

Set Name, Location, Publisher*, Year	Total
Germany: Historisch Bauten Deutschlands vor und nach der Zerstorung, Raumbild-Vertrieb Johannes Schonfeldc. 1945-50	60
Germany: Nurnberg, Raumbild-Verlag Otto Schonstein, 1945-48	20
Germany: Reichsparteitag der Ehre, Raumbild-Verlag Otto Schonstein, Diessen a. Ammersee, 1936	99
Germany: Southern Bavaria, Kreuz und quer durch Oberbayern, Raumbild-Verlag Otto Schonstein, 1945-48	30
Germany: Traditionsgau Munchen-Oberbayern, Raumbild-Verlag in Diessen am Ammersee, c,1938	100
Greece, UU, 1907	100
Holland Boxed Set, UU, 1905	26
India, Stereo Travel, 100 card set, 1908	100
India, UU, 1903, copy 1	100
India, UU, 1903, copy 2	100
India: Delhi Durbar Set UU, 1903	55
India: Tiger Hunt, Bengal, Keystone, reissue of 1909 UU	11
India: Tiger Hunt, UU, 1909	13
Ireland, UU, 1903-8, copy 1	100
Ireland, UU, 1903-8, copy 2	100
Italy, UU, 1904	100
Italy,HC White, 1901-1908	94
Italy: Sicily, 100 card set, Stereo Travel, 1908	100
Italy: Sicily, UU, 1904	54
Japan Through the Stereoscope, UU, 1904	100
Japan, Stereo Travel, 1910	30
Japan, UU, 1904	100
Java, UU, 1907	36
Korea, UU, 1904	58
Medical: Kroll's Steroskop Bilder, Verlag Von Leopold Voss, Leipzig, 1929	30
Medical: Zur Lehre vom Abort. by Prof. Dr. Lesser, Verlag Von Johann Ambrosius Barth, 1898	12
Mesopotamia, UU, 1912	84
Mexico, Stereo Travel, 1906	100
Mexico, UU, 1901	82
Natural History: Aquarium of Monaco, Aime Bruguiere a Mazamet (Tarn), 1900-15	12
Natural History: Skeletons, Raumbild-Verlag Otto Schonstein, Oberaudorf am Inn, 1951	18
Natural History: Zoo: Tiere im Zoo, Raumbild-Verlag Otto Schonstein, c.1950	10
Netherlands, Stereo Travel 100-card set, 1910	100
Norway, Stereo Travel, 100 card set, 1914	100
Norway, UU, 1905	100
Norway,Keystone, 1906	49
Occupational: Beekeeping, CorteScope, 1921	24
Occupational: Cotton, UU, 1908	18

Table 2: Sets and Series. Part 4

Set Name, Location, Publisher*, Year	Total
Occupational: Ice Harvesting, UU, c. 1900-1910	13
Occupational: Iron Manufacturing, UU, c.1907	94
Occupational: Salesman Set, UU, 1900	50
Occupational: Steelmaking, Keystone, 1905	13
Orient Express, HC White, 1902	52
Orient Express, UU & Keystone, 1906-1912	31
Palestine 72 card set, UU, 1897	72
Palestine Boxed Set, UU, c.1900-1903	100
Palestine, UU, 100 card set, 1900	100
Palestine: Jerusalem Cyclorama (Philadelphia), Newell,R, c.1870-80	11
Palestine: Jerusalem, UU, 1896-1904	27
Palestine: Tell Fara (Beth Pelet), Flinders Petrie Excavations, Camerascope, c. 1923-1928	25
Panama, Stereo Travel, 1913 large set	91
Panama, Stereo Travel, 1913 small set	31
Panama, UU, 1906	36
Personality: McKinley Boxed Set, UU, 1901	13
Phillipines, UU, 1900	51
Portugal UU, 1902	60
Queen Victoria 60th year on throne. , UU, 1897	35
Religious: Holy Sacrifice of the Mass, Keystone, c.1920	100
Russia HC White, 1901	95
Russia, UU, 1897	100
Scotland, Stereo Travel, 100 card set 1910.	100
Scotland, UU set, 1896	21
Scotland, UU, 1905	82
South Seas Set, Keystone, c1910-30	100
Spain Boxed Set, UU, 1902	100
Spain: Bullfight, Keystone, 1902	13
Sweden Boxed Set, UU, 1905	100
Sweden, 100 card set, Stereo Travel, 1914	100
Sweden, UU, c.1903	97
Switzerland, UU, 1903	100
Turkey, Keystone 50, 1910	50
Turkey, UU c.1900	48
United States and Washington DC, UU, 1897-1903	100
United States of America Set, UU, 1904	98
United States of America: Colorado UU Set, c.1900-1910	50
United States of America: Hawaii, Keystone, c.1920-30	25
United States of America: Indians: Forsyth, 1908	30
United States of America: New York City, Stereo Travel, 1909-14	100
United States of America: New York City, UU, 1904	34
United States, Stereo Travel, 1908-10	52

Table 2: Sets and Series. Part 5

Set Name, Location, Publisher*, Year	Total
United States: Yellowstone Boxed Set, UU, 1904	30
War: Boer War, UU, 1900	211
War: Die Soldaten des Fuhrers im Felde, Raumbild-Verlag Otto Schonstein K.G., 1939	100
War: Russo-Japanese War, UU & HC White, 1904-5	177
War: Russo-Japanese War, UU, 1904	100
War: Spanish Am War, 1899, UU	24
War: Spanish American War, 1899, UU, Copy 2	40
War: Turko-Italo-Libyan War 1912	22
War: US Occupied Zone (Germany), Raumbild-Werkstatte Munchen, 1946	33
War: World War I, 100 card series, Keystone, 1923	100
War: World War I, Keystone 300 set, 1923	302
War: World War I, Realistic 200 set, 1916-1918	200
War: World War I, Realistic Travels & Keystone, 1916-1923	41
War: World War I, The Battlefield Series, Stereoscopic Views, Blackwell, Reflex Studios, Parkstone. c.1919-20	43
War: World War II, Der Kampf im Westen,Raumbild-Verlag Otto Schonstein A.G., 1940	100
War: World War II,Fliegen un Siegen, Raumbild-Verlag Otto Schonstein K.G., 1942	100
War: World War II,Grossdeutschlands Wiedergeburt, Otto Schonstein, Raumbild-Verlag, Diessen a. Ammersee, 1938	100
War: WWII (Germany), 7th Army Area, Raumbild-Werkstatte Munchen, c.1946	18
World: Costumes Boxed Set, Keystone, c.1920-30	92
World: Keystone 1200, (worldwide) c.1935-40	1202
World: World Tour, Keystone, 600 card set, 1932	601
TOTAL IMAGES IN SETS	**14138**

*UU = Underwood and Underwood

Appendix C: Photoarchive3D Activities

Website

- www.Photoarchive3D.org

Published Works

- Mutter GL, Fishman BP. “Lost” photographs of Edward L. Wilson: The American who documented the discovery of the Royal Mummies cache. KMT A Modern Journal of Ancient Egypt 2009; 20:60-68.
- Mutter GL, Fishman B. First photos taken from the great pyramid. AERAgram 2013; 14(1):16-21.
- Mutter GL, Fishman BP. Kafr, Village of the Pyramid Sheikhs at Giza. AERAgram 2017; 18(2):10-15.

Topical Presentations:

2011

o Victorian virtual reality: 19th century education in 3D. Immersive Education (iED) Summit, Boston, MA

o Egypt in the Victorian Parlor: E.L. Wilson’s virtual tour. Association for Study of Travel in Egypt and the Near East, Oxford, UK.

o The Ottoman World in 19th Century 3D Photographs. 16th Annual Boston Turkish Arts and Cultural Festival, Museum of Fine Arts, Boston, MA

2012

o Life in 4D, and A Trip Up the Nile. Photographic Historic Society of New England (PHSNE), Wakefield, MA

o Egypt in 3D. Am. Research Center in Egypt (ARCE) Annual Meeting Providence, Rhode Island.

o Up the Nile in 1856-1870. Dept. of History, Wm. and Mary College, Williamsburg, Virginia.

2013

o 19th Century Preservation in Historic Stereophotographs. Dept. of Anthropology and Archaeology, Boston University, Boston, MA.

o 19th Century Egypt in 3D: A Victorian Trip Up the Nile". Museum of Science, Boston, MA

2014

o Cuba in 19th Century Stereophotographs. Dept. of History, University of Maine at Augusta, Augusta, Maine.

o Latin America in 3D. Maine State Prison, Warren, Maine.

o Life in 4D: The Human Experience Across Space and Time. Multiple venues, including: Magic Lantern Society, Boston Massachusetts; Faculdade de Ciencias Medicas da Santa Casa de Sao Paulo, Brazil; College of Wm. and Mary, History Honors Society, Williamsburg, VA.

o A 19th Century 3D Trip Up the Nile to Nubia. Dept. of History, College of Wm. and Mary, Williamsburg, VA

o Digitization, Documentation and 3D Presentation of Historic New England Stereoviews. New England Museum Association (NEMA) Annual Conference, Cambridge, Mass.

o 19th Century Istanbul in 3D: Center of Empire. Howard Thurman Center for Common Ground, Boston University, Boston, MA

2015

o Hidden World of the Czars: The Russian Empire in 3D Photographs. Museum of Russian Icons, Clinton, MA

o Historic New England Stereoviews. Penobscot Marine Museum, Searsport, Maine

o From Martha's Vineyard to the Shore in 19th Century Stereoviews. Martha's Vineyard Museum, Vineyard Haven, Martha's Vineyard Island, Massachusetts

o 19th Century Egypt in 3D: A Victorian Trip up the Nile. Neues Museum, Berlin, Germany

o Photoarchive3D: The Collection and Its Digitization. Museum fur Fotographie, Berlin, Germany

o Life in 4D : A Stereoscopic Journey Through Space and Time. Museum fur Fotographie, Berlin, Germany

o Historic Japan in Early 3D Photography. Museum fur Fotographie, Berlin, Germany

2016

o The Jewish World Awakes. Historic 3D Photographs of Jewish Communities in Europe and the Ottoman Empire Before WWI. Jewish Genealogy Society of Greater Boston, Newton, MA, and at subsequent venues.

o Hidden World of the Czars: The Russian Empire in 3D Photographs. 100th Annual Warner Free Lecture, Harvard, Massachusetts

o The 19th century Greek World in Historic 3D Photographs. Hellenic Arts Society, Worcester, MA

o World War I in Stereophotography. Maine State Museum, Augusta Maine

2017

o Longfellow's World in 19th Century Stereoviews. "Longfellow Days" Festival, Brunswick, Maine

o Maine Sporting Camps and Hunting in 19th Century Stereoviews. Multiple venues, including: Sportsman's Alliance of Maine, Augusta, Maine; Rangeley Outdoor Sporting Heritage Museum, Rangeley, Maine, and elsewhere

o Up the Nile, c. 1855-1905, Maine State Museum, Augusta, Maine

2018

o Delivering 19th Century Stereophotography to Today's Audiences, with a live projection of special rarities. Companion session to the conference "Stereo Photography: Images, Inventions and Advancements," St. Andrews, Scotland, UK

o Historic 3D Stereophotography: Demonstration, Documentation, and Research. Maine Archives and Museums Conference, University of Maine at Farmington, Farmington, Maine.

2019

o Historic Maine in 3D. Maine Statehood and Bicentennial Conference. Repeated on other occasions as Maine celebrates the bicentennial of its statehood in 2020, University of Maine at Orono, Orono, Maine.

o Immigration. Given at the Maine State Museum for the Holocaust and Human Rights Center, University of Maine at Augusta, Augusta, Maine.

www.Photoarchive3D.org

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George Mutter (Left) and Bernard Fishman(right) have over six decades of combined experience searching for, and studying, historic stereophotographs. The prospect of bringing these to a broad audience through digitization launched what has become a fruitful collaboration, Photoarchive3D. The result is a freshly digitized archive of approximately 33,000 original photographic stereo images covering many subjects, most of which has not been seen by the public in the last century.

George Mutter trained in medicine at Harvard and Columbia, is currently a Professor of Pathology at Harvard Medical School. He is a prolific scientist and educator, having authored over 100 scientific papers, and delivered numerous invited lectures internationally. Bernard Fishman is an Egyptologist trained at Columbia U. and U. of Pennsylvania. He worked in Egypt with the Oriental Institute of the University of Chicago before becoming a nonprofit institution administrator. He is presently the Director of the Maine State Museum in Augusta, Maine.

Tintype wetplate photo by Mark Bingham, Portsmouth, New Hampshire, 2011.

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