Bild 19b Die photographische Kamera mit den beiden mit Glühlampen präparierten Handschuhen (Aufnahmen: W. Müller)
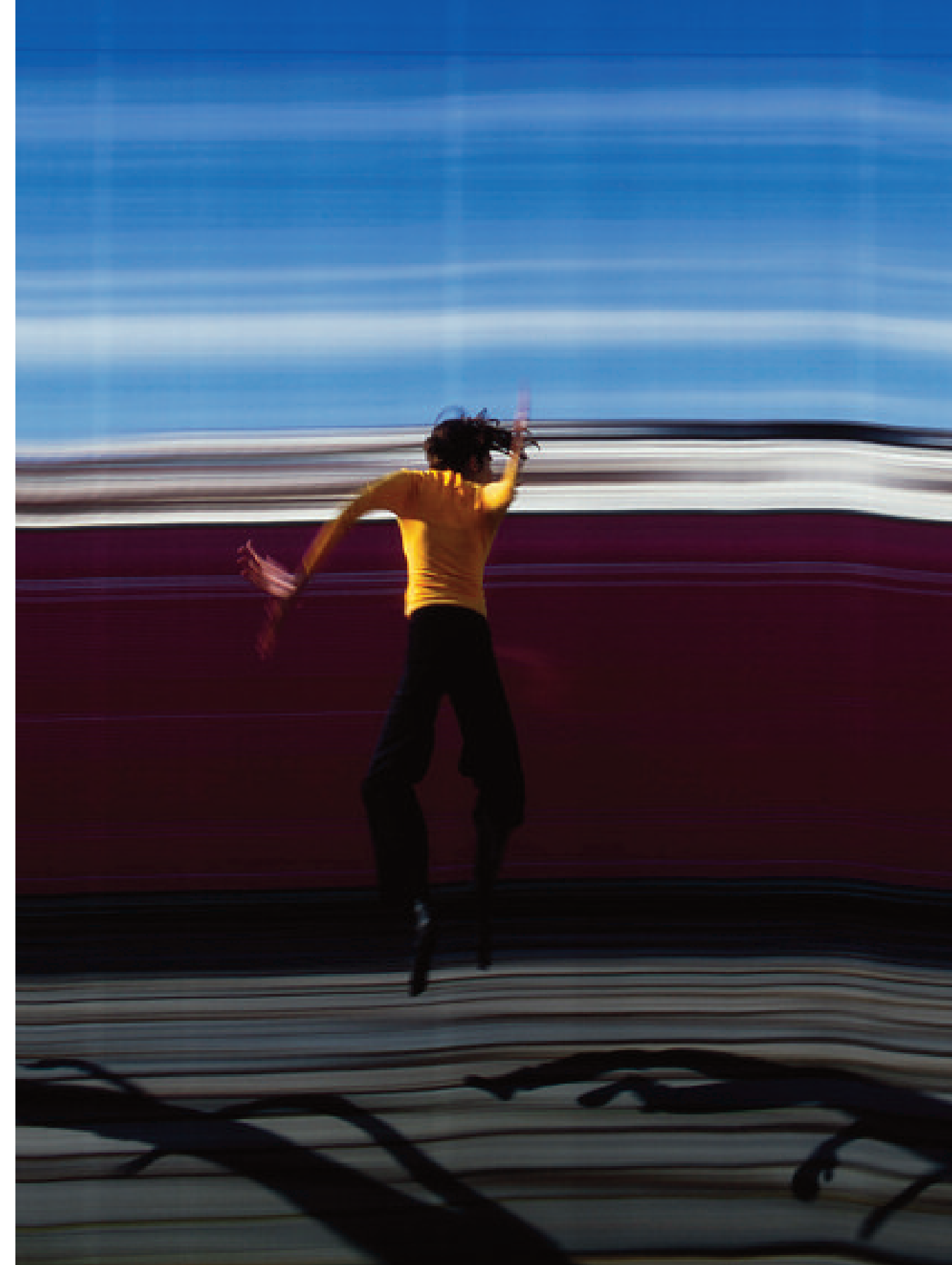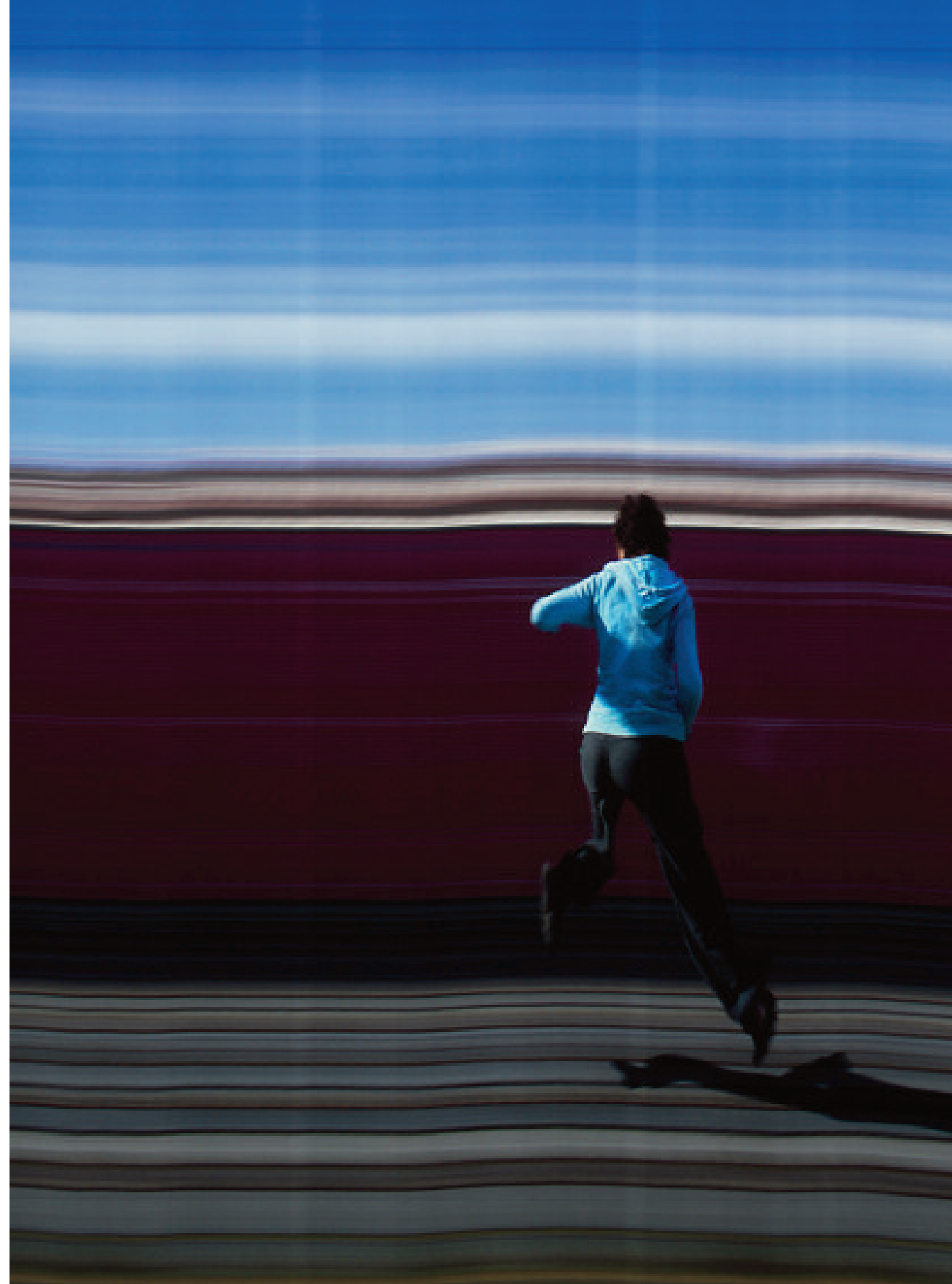
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IMAGES IN MOTION

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cahier

IMAGES IN MOTION

Edited by Ingrid Hoelzl and Friedrich Tietjen

In film theory, the history of photography is often read as the prehistory of cinema, the step from still to moving images appearing as a teleological consequence of a desire for the replication of the real world (Bazin) or as a culmination of the history of art (Benjamin). From this perspective, film came to be defined in terms of what it added to the photographic image: movement and projection, while photography was understood as both the predecessor (still image) and the material basis (film frame) of the filmic image. Film, then, is a dispositif of display: the spatial constellation of film projector, screen, and viewer, while photography is a dispositif of recording: the alignment of an object, a camera lens, and a photo-sensitive surface, generating a material image-object, which can be viewed as such, i.e. without viewing instruments such as the film projector needed for the display of the film image.

With digitalization, it becomes clear that this generic distinction between the printed still image (photography) and the projected moving image (film) no longer holds true. There had always been zones of media overlap and hybridity, such as the early cinematograph with its integrated functions of recording, copying and projecting, photographic slide projections (including movement effects) and stop-motion techniques in film. But with the advent of digital screen technologies photography and film now share the very same display surface: the screen. Retrieved from digital data the images appear as emanations of light on a screen or as projections of light via a video beamer; and post-production allows all sorts of convergences: whether an image is a photograph, a freeze frame, a film scene or the result of graphic engineering often can not be judged by the picture alone but only through the context it appears in.

This means that the trajectories of photography and film, which the precept of medium specificity had separated into printed still images and projected moving images, have become inextricably entangled with digitalization. But the technical transitions for both media are different. While film is undergoing only one technical transition, that from celluloid to pixel, photography is undergoing also a second transition from the printed to the digitally screened and thus, potentially

moving image: on screen, the still image is rarely displayed as such, but comes to be animated in various ways ranging from mere transition effects between "slides" to movement effects such as pans and zooms (Ken Burns effect).

While the presumed loss of authenticity through digital manipulation has been widely debated in photography studies, this "loss of stillness" has somewhat been ignored. While authenticity is based on a distinction between recorded and calculated images, a distinction that is questionable even before digital imaging, the concept of the still image is based on the exclusive distribution of the trans-medial categories of stillness and movement to the media of photography and film respectively. It remains to be seen whether the digital image induces a change of category, that is, of photography becoming a moving image, or whether digital image processing induces a loss of medium specificity in general where both stillness and movement cease to be attributed to a specific medium and become mere digital effects.

The aim of this *Cahier* is to bring together contributions that, induced by digitalization but not confined to digital images, explore historical and contemporary image practices that are situated beyond the habitual definitions of photography and film. The first part of the essays traces the pre-digital history of photography as a time-image in early photography (Starl), the implications of using photographic images for proto-cinematic optical toys (Tietjen) and Auguste Chevallier's translation of panoramic images into a circular image which upsets traditional notions of photographic temporality as much as notions of the frame (Müller-Helle). The second part explores the historical legacy of the digital "moving still" such as the freeze effect (Røssaak) employed in the blockbuster film *The Matrix* (1999) or the ubiquitous Ken Burns effect (Hoelzl) used as a display feature in Apple iPhoto and other photo-software. It is preluded by a visual essay by Maarten Vanvolsem and Jonathan Shaw. The essay assembles and discusses their respective artistic practice in relation to their chronophotographic predecessors such as Bragagila—in the unusual format of the photographic still.

We would like to thank Steven Humblet and Maarten Vanvolsem for giving us the opportunity to publish this special issue in a format that emphasizes both image and text—a rare combination within academia. We would also like to thank Karl Sierek for hosting our "Moving Stills – Images in Movement" conference at the Friedrich-Schiller-University Jena in 2009. The essays published in this *Cahier* issue derive from the papers and discussions initiated by this conference.

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After the Standstill

On the First Attempts to Bring Motion into the Photographic Image

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TIMM STARL

In 1997, Salzburg-based photographer Andrew Phelps shot views of the city from a window on one of the top floors of a high-rise hotel that was slated for demolition.[1] The prints were not fixed, so that the views gradually transitioned to enigmas, as one could observe upon multiple visits to the exhibition. Through this unfinished processing, which evokes a disappearance of the images, the artist articulates his protest against the building's demolition by preempting the destruction of the object. Through this omission in the photographic process, Phelps succeeds—along with others—in bringing movement into the affair, but also into the picture. In *one* single print he delivered a photographic view that failed to remain constant in that the images successively dissipated. Nonetheless, this occurred so slowly that the movement was imperceptible, and beholders inevitably got the impression of viewing a standstill.

What was built into this concept as a desirable effect has been considered a deficiency ever since the discovery of photography. Unique copies or prints that

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1   See Andrew Phelps, "Disfunction," unfixed black-and-white photos, barite paper, 51 x 61 cm each, in Thomas Gruber, Hermann Schnöll, *Architektur ist überall. Die ganze Stadt. Ein Salzburger Fotoprojekt* Salzburg: Anton Pustet, 1997, pp. 52–55.

have not been properly fixed fade from the effects of steady light. In contrast to film, in which slow fades are employed as an artistic method, for example, to allow the gradual ending of a plot line, a similar method is considered unacceptable for photographic images. In other words, depicting a situation in which something existed and presented itself to the camera in one way or another at the time a photo was taken, yet meanwhile no longer exists; displacing such a situation as picture, in that the contours and contrasts on the print gradually disappear, is not considered a form of depiction appropriate for photography. Rather than a change in a rendering of reality, the interest of those taking a picture has always been on the process of movement that takes place before the lens. This procedure is what is meant to be included in the picture. I would even go so far as to claim that for all of the innovations in the area of taking a photo—whether in the fields of apertures, photo material, or composition—at issue is always ultimately the pictorial mastery of movement, or put in another way: for every time, its photographic image.

When we look at the pioneer's first attempts and ask how they developed the terrain of the photographic image, we see that initially they all chose immobile objects. Just as Joseph Nicéphore Niépce continually used graphic sheets with various light-sensitive substances for his trials, in 1826 he employed a copper etching with the portrait of Cardinal d'Amboise in order to create a heliographic reproduction.[2] William Henry Fox Talbot, among other things, set plants on light-sensitive treated paper and exposed them to sunlight on 13 November 1939;[3] Hippolyte Bayard did the same with lace in spring of 1839.[4]

Similar trials with contact copies by Louis Jacques Mandé Daguerre are not known, instead, he experimented with still lifes in 1837.[5] Daguerre's photos are different in that during the recording process, movement took place. Since he worked with natural light, and the objects have volume, there was a minimal change in the shadows they cast, albeit imperceptible to the naked eye. Although this should be of no further importance here, it

Fig. 1: Joseph Nicéphore Niépce, *Point de vue pris de la fenêtre du Gras* (1826/27), heliography

must be considered that every registration in a light sensitive layer requires a certain amount of time, no matter how brief.

Niépce achieved an entirely fascinating depiction of the impression of the passing of time with one single photographic image that has remained preserved until today. The image shows the neighboring building of his country estate in Le Gras.[(fig. 1)] He produced the image in 1826 or 1827 by exposing for eight hours a tin plate coated with an asphalt derivative. Not only did the sun shine on both sides of the garden, allowing each of the towers' façades, left and right, to stand out brightly, but also the extent to which particular parts of the garden were in the shade during the eight hours was recorded precisely. The brighter triangle corresponds with the area that was in the sunlight during the entire procedure. In the image, light was able to emerge as a body that left its traces in time.

The contrasting of the image carried out for the reproduction allows the fuzziness of the direct positive to step back, so that the viewer is offered the amazing spectacle of a view from morning to afternoon in *one* picture. One can hereby easily forget the surreal moment involved in this stretching of time and for the artist Niépce,

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2   Nicéphore Niépce, "Le Cardinal d'Amboise," 1826, Heliography reproduced in: *Nouvelle Histoire de la Photographie*, Sous la direction de Michel Frizot, Paris: Adam Biro/Bordas, 1994, p. 20.

3   William Henry Fox Talbot, "Astrantia major," 13 November 1838, photogenic drawing reproduced in Larry J. Schaaf, *The Photographic Art of William Henry Fox Talbot*, Princeton and Oxford: Princeton University Press 2000, p. 45.

4   Hippolyte Bayard, "Dessin photogene," spring 1839, reproduced in André Jammes, *Hippolyte Bayard. Ein verkannter Erfinder und Meister der Photographie*, Lucerne, Frankfurt/M: Bucher 1975 (Bibliothek der Photographie, vol. 8), ill. 14.

5   Louis Jacques Mandé Daguerre: Still life, 1837, reproduced in *Le daguerréotype français. Un objet photographique*, Ouvrage collectif sous la responsabilité scientifique de Quentin Bajac et Dominique Planchon-de-

Font-Réaulx, exh. cat. Musée d'Orsay, Paris: Editions de la Réunions des musées nationaux 2003, p. 58.

Figs. 2, 3: Louis Jacques Mandé Daguerre, *Boulevard du Temple* (April/May1838), daguerreotypes

the photo was a complete success. In a letter to his brother, he writes the details that can be seen and does not mention the "wandering" shadows or the changing location of the sun. Niépce also did not express any critique with regard to other photos of a similar nature.[6]

A different type of surreal aspect marks the photos of Boulevard du Temple, which were created at the end of April or beginning of May 1838 in Paris.[figs. 2, 3] Daguerre set up his camera on a floor of his residence on rue des Marais, aimed it at the street through a window, and exposed it for ca. fifteen minutes. Different than for Niépce, the advance of time did not register in the photo sensitive layer, but instead, everything that did not stand still moved out of the picture, as it were.

Yet Daguerre was interested in the changes that take place during the course of a day. He photographed, namely, the same motif three times at regular intervals, probably on the same day, which photo history has overlooked with a passion, although Heinz Buddemeier pointed it out in 1970.[7] Two of the photos are known through reproductions; the original photos are, indeed, preserved, but entirely corroded. A horse is apparently visible in the third Daguerreotype, which is currently missing. The horse was tied to a carriage and only its

body was depicted as it kept moving its head, which the contemporary commentators at the time made a point of mentioning. The photos were taken in the morning, at midday, and in the evening. This procedure could most certainly have had the intention of examining the abilities and possibilities of the new procedure of recording pictures.

Likewise—and I suppose primarily—for the inventor it was about the question of the extent to which the fixed observations could prove advantageous to improving his dioramas, which he still operated at the time. It is possible to assume that he investigated how closely he could stage light effects with the Daguerrotype that were analogous to those in the staging within the diorama. For example, in some pictures, daylight seemed to be turning to dusk or even nighttime, until finally, morning dawned again.[figs. 4, 5] This was achieved by painting both sides of a screen with transparent colors and exposing it from the front and also from the back. The change from a negative to a positive view, which occurs when one's gaze first lands frontally on the Daguerreotype and then diagonally, and before a dark background, probably inspired the inventor to take his series of photos. The inventor of both processes wrote:

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6   Cf. Nicéphore Niépce, *Der Blick aus dem Fenster. Gesammelte Briefe*, ed. Kathrin Reichel, translated from French to German by Irene and Kathrin Reichel, Hamburg: material Verlag, 1998 (material 100).

7   Buddemeier assumes that Daguerre was "mainly [interested] in a more precise depiction of movement" which he could use, if need be, for his dioramas; Heinz Buddemeier, *Panorama, Diorama, Photographie. Entstehung und Wirkung neuer Medien im 19. Jahrhundert.* Munich, Wilhelm Fink, 1970, p. 83.

Figs. 4, 5: Louis Jacques Mandé Daguerre, *Alpine village* (ca. 1836), coloured lithographs, daylight and night scene

It will be understood from these principles of dioramic art, in which striking results are obtained by a simple decomposition of light, how important it is to observe the aspect of the sky when we would appreciate the tone of a picture, whose colouring matters are thus subject to decompositions so great. The best light for this purpose is that from a pale sky; for where the sky is blue, it is the blue tone of the picture also, and consequently its cold tone, which comes out most powerfully, while its warm tones remain inactive. Their media are not present, and they are cast comparatively back into neutral tints by the blue medium of the sky—so favourable to the cold tones of the picture. It happens on the contrary, when the sky is coloured, that the warm tones of the picture—its reds and yellows—come forth so vigorously, and, overpowering its colder tones, injure its harmony, or, it may be, give it quite a different character—a warm instead of a cold tone of colour.[8]

Fig. 6: William Henry Fox Talbot, *Gate of Christchurch* (1844/46), Talbotype

In my opinion, Daguerre was therefore primarily interested in those changes that could be arranged by *means* of the photos. Also indicative of this is that the photos were not taken shortly after one another. In addition, Daguerre also varied the exposure time for a further motif, as is evident from a text by Alexander von Humboldt from February 1839: "One thus rightly admires most of all views of the Palais des Tuileries at three different times of day, on a summer morning at 5 a.m., at 2 in the afternoon, and at sundown."[9]

In contrast to Niépce, for whom *one* photo was enough, Daguerre required three photos to allow the progression of time to appear—in differently cast shadows. But with each single photo that did not take into account the movement of the objects, he held a corresponding image up to reality—albeit without intending to do so, and only because of the exposure time of fifteen minutes. For reality knows no standstill within movement. Movement has no equivalence as image because the time in which it takes place is indivisible.

The moment—however long it may last—does not exist, it is a phantom invented by man to create a special measure for time: As Sören Kierkegaard said in 1855, the shortest conceivable fraction that we are still aware of, is "the first reflection of eternity in time, its first attempt, as it were, of stopping time."[10] Yet the mind, with its suddenness and sharpness, is just as incapable of grasping it as is language with its linear progression. For as soon as one wants to grasp it, the moment has always passed: wanting to establish a moment conceptually or linguistically, one is already in the next.

Talbot confronted time and the moment in a special way in that he took multiple photographs of, among other things, church towers with clocks. He included a photo of Christchurch College on the grounds of Oxford University as plate XVIII in *The Pencil of Nature* from 1844/46.[(fig. 6)] As he professed in a commentary, the photographer was impressed "by the peaceful calm that reigned at these venerable sites of erudition." He spoke of "a summer evening drawing to a close, so handsome and still, so peaceful and celebratory that the visitor

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8   Daguerre: A Historical and Descriptive Account of the various Processes of the Daguerréotype and the Diorama. London (McLean/Nutt) 1839.

9   Alexander von Humboldt, letter to Duchess Friederike von Anhalt-Dessau from 7 February 1839, in: *"In unnachahmlicher Treue". Photographie im 19. Jahrhundert – ihre Geschichte in den deutschsprachigen Ländern*, exh. cat. Josef-Haubrich-Kunsthalle Köln, Cologne: Museen der Stadt Cologne 1979, p. 30.

10   Sören Kierkegaard, *Journals and Papers*, notes, p. 821, quoted by Koral Ward in *Augenblick, The Concept of the Decisive Moment in 19th and 20th Century Western Philosophy*, Hampshire: Ashgate Publishing Ltd., 2008, p. 7.

could possibly believe himself to be viewing a city from a past era, which has died out, but remains undestroyed … protected from the ravages of time." With the additional remark that one sees "to the [r]ight in the picture … the building of Pembroke College in the shadows,"[11] the author opposes the past era with a now, which is increasingly more precisely identified: from the season to the height of the sun, through to the precise time, which can be read as five minutes past three.

Yet there are several discrepancies that cannot be overlooked: for early afternoon in summer, the shadows have an unusual length, and evening does not end shortly after 3 p.m., regardless of how accurate the tower clock rings or if it is even working. Howsoever, Talbot counters text with image. He opposes imprecision, which cannot be precisely demarcated, with one-dimensionality, i.e., a purported clarity of view. The moment that the camera outlines corresponds in no way with the present day in which the author lives, which knows only the steadiness of duration, i.e., which cannot be captured "as" or "in" a photo, but only in words, which likewise move forward in time. Talbot thus established, no more and no less: elements of the image do not procure time and movement, but rather, these are first projected into the image in its viewing.

In a different photo—nowadays, one would call it a snapshot—the photographer opened up the possibility of delivering manifestations to the viewer that can be viewed as "in motion." The scene with his children and the nurse in the garden of Lacock Abbey was created in 1842.[(fig. 7)] Also supporting this impression is that a paper with a relatively rough surface, which favored the blurring of contours, functioned as carrier for both the negative and the positive. The audience later agreed to accept fuzzy elements in a photographic recording as evidence that movement had occurred in the place in question. At first, this type of picture creation was seen as failed—a notion that continued into the Fin de Siècle era and the pictorial creations of arty amateurs—as can be read in instruction manuals for photographers that consistently emphasize the precision of the reproduction.

Moreover, the need for a new pictorial world that would make motion visible was apparently not present. Instead, the need existed for products in which time was indeed preserved, but nonetheless, does not appear. The pioneers of the medium searched for all possibilities to carry out photographic recording and apparently assumed that in a period of multiple changes, which affected all areas of life, only pictures in which movement was depicted as such would be considered modern. But the fast beat of the machines, the nearly timeless spread of news by means of telegraph, the speedy portage of people and objects by railway and steamship, the rapid rebuilding of major metropolises, and the increase in traffic—all of these achievements of the industrial revolution and capitalist commodity economy demanded hours of calm and tranquility, breathing time, visual rendering in which everything appeared immovable, drafts of the absurd that allowed for escape and favored projections; the impossible, which no one had ever caught sight of, and that which did not exist in the world: standstill. For no reality existed outside of time.

All movement is a matter of bodies and things, not, however, the pictures that are made of them. After the new process of the Daguerreotype with its short exposure time of roughly one second was able to produce only unclear and apparitional figures and shapes from moving objects,[12] another standpoint was taken, as it were: a change of sides occurred, images should effectively glance back and allow what is depicted to come alive as something moving when viewed.

Panorama photography, patented in 1843 by its inventor Johann Puchberger from Retz in Lower Austria[13] and handed down in only one single example in which the Dominikanerbastei in Vienna is photographed across 130 degrees,[(fig. 8)] succeeded in grasping with the lens, a perspective that a person could access only by a commensurate turning of the head. Whether an extreme wide angle that included elliptically formed recording material, a rotating negative plate, a rotating camera, or a movable lens, like in the later relevant inventions—movement had to take place *before* the picture so that the

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11   Quoted from *Die Wahrheit der Photographie. Klassische Bekenntnisse zu einer neuen Kunst*, ed. Wilfried Wiegand, Frankfurt am Main: S. Fischer, 1981, p. 80 (own translation).

12   Cf., for example, the "Sekundenbilder" by brothers Johann and Josef Natterer, which were created in 1841 on the occasion of an event in Wien, reproduced in Hans Frank, *Vom Zauber alter Licht-Bilder. Frühe Photographie in Österreich 1840–1860*, ed. Christian Brandstätter, Vienna, Munich, Zürich, New York: Molden Edition, 1981, pp. 14 and 15.

13   On invention, Cf. "(Daguerreotypie)", in *Allgemeine Theaterzeitung, Originalblatt für Kunst, Literatur, Musik, Mode und geselliges Leben*, vol. 35, no. 253, 22. Oct. 1842, p. 1124.
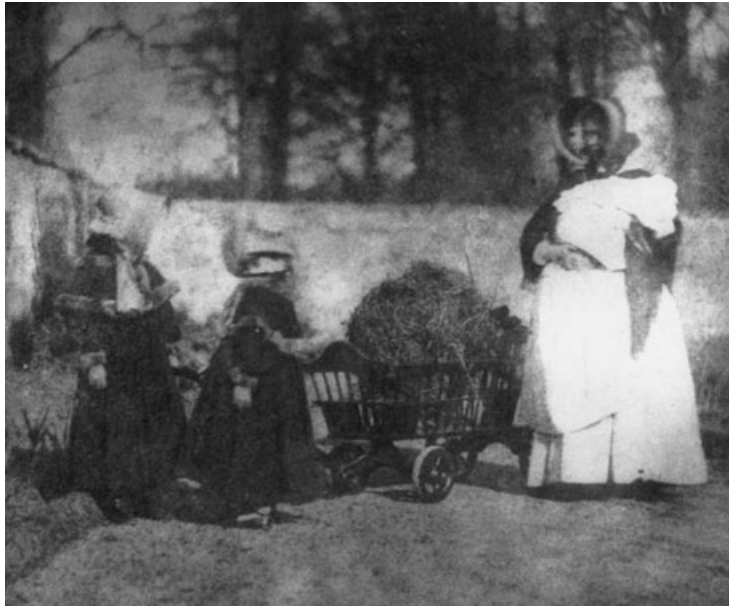
Fig. 7: William Henry Fox Talbot, *Eliza Frayland holding Charles Henry Talbot,* *with Ela and Rosamond Talbot* **(1842), salt paper print from calotype**
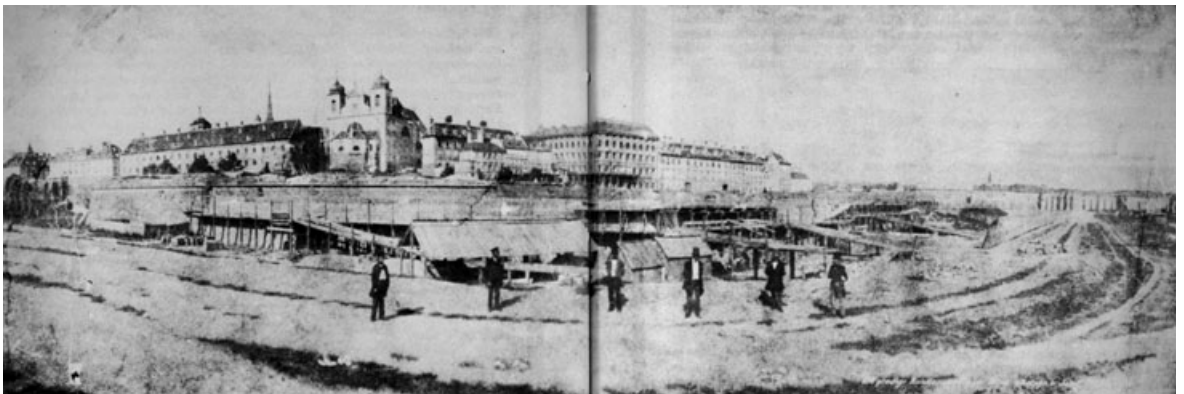

Fig. 8: Joseph Puchberger, *Die Dominikanerbastei in Wien* **(1843)** **calotype**

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Fig. 9: Adolph Schaefer, *Die oberen Reliefs der westlichen Außenwand der Tempelanlage Borobuddur, Java* (1845), daguerreotype

Figs. 10, 11: William Henry Fox Talbot, *Bust of Patroclus* (1842)

object could be seen as a whole.

If the subjects were too far apart, they had to be photographed individually before the camera, or it had to be brought to them. The result was a series, such as that of the fifty-eight Daguerreotypes of the Tempel of Borobuddur on Java, which were created by Adolph Schaefer from Dresden under commission by the government of The Netherlands in 1845. He positioned the camera in front of each relief and took a photo. The photos could be arranged in such a way that they could be peered at one after the other, as though one were passing by.(fig. 9) Serial methods made it possible to bring together objects that lay apart from one another, or a single motif could be followed in a sequence.

Just as the camera was able to follow reliefs, it could also document sculptures equally well. Talbot orbited a bust of Patroclus in 1842 and prepared several photos;[14] (figs. 10, 11) two decades later, the models turned before the camera so that they could be seen from all sides in the image.

Just as a temporal *after* one another and a spatial *next* to one another could be handled only with several photos, stereo-photographic images succeeded by means of

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14   In addition to the two photographs depicted here, Talbot also made further renderings of the busts of Patroclus from different perspectives.

Fig. 12: Louis-Jules Duboscq, *Vue intérieure de la nef du Crystal Palace de Londres pendant le montage de l'Exposition universelle* (1850)

two images in providing access to a *behind* one another in space. The two images appeared as one single picture when viewed through the proper equipment with two lenses—a stereoscope. Invented as a process by the English physicist David Brewster in 1849, the Parisian optician Louis-Jules Duboscq made daguerreotypes of the construction activity in Crystal Palace on the evening before the London World's Fair in 1851.[fig. 12] The spatial image satisfied the desire for simultaneity: not a simultaneity of moving and non-moving, which does not exist in reality or in the image, but rather—as substitute, as it were—simultaneity in viewing, which merges two pictures together as one: Apart from the fact that when focusing foreground and background, a movement is carried out in the eye, both before the original scene and when looking through the stereoscope.

Last but not least—one could say, to bring some real movement into the pictorial world—the unique image of the daguerreotype was left behind for the negative/positive process beginning in the 1840s and in the following decade, for good. Now the prints could circulate and be viewed simultaneously around the globe. That which was not possible to achieve between pre-picture and picture (or, rather, *in* the picture) was possible by the reproduction of the negative, because all phenomena were inverted. Movement can merely take place *as* picture—which has not changed until today.

Postscript: the history of the futile attempts and the renouncement of capturing movement in a single photographic image could also be told differently, and it might possibly have never even taken place. Even if Niépce never complained about the exposure time of eight hours, perhaps he was aiming for a much shorter one. And perhaps Daguerre took one photo after another of Boulevard du Temple until he had captured a single passerby and then stopped the experiment thereafter. And who is to say that Talbot did not see the snapshot as a failure, but like most private photographers saved the photo because it reminded him of a special shared occasion with his children? And so on and so forth. Moreover, the photos in the series by Andrew Phelps also never completely disappear, which the artist recently assured me of: faint contours can still be recognized. And the hotel in Salzburg was also not demolished in the end.

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Storing Time

The Imaginary Image Archives of Auguste Chevallier and Camille Flammarion

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KATJA MÜLLER-HELLE

On February 15th in 1918, during the last months of the First World War, the Technical Museum in Vienna received a letter from the k.u.k. technical military committee.(fig. 1) It refers to a photographic measuring table by Chevallier-Duboscq, which—as stated in the letter— was transferred from its field of potential application in the military service to the archive of the Technical Museum. Today, we could call this technical device one of many examples of the "dead media"[1] of the nineteenth century—that is, an apparatus that triggered the highest expectations possible before its full potential was realized and its practical limitations definitively determined.(fig. 2) The invention was one of the earliest examples of *photogrammetrie* in the 1860s. A photographic technique invented to deliver precise data by way of photographic artifacts, Auguste Chevallier's *planchette photographique* was patented in 1858 and bought from the French shortly after its invention by an elite troop of the Austrian k.u.k. military. Photogrammetrie revolutionized a number of disciplines by the end of the nineteenth century, including

1   The term "dead media" was introduced by Bruce Sterling, who collected materials on obsolete media technologies in "The Dead Media Handbook." The purpose was to include not only the successful inventions of the history of media, but also its failures. For the general idea of the project, which started in 1995 and ended in 2001, see "The Dead Media Manifesto": http://www.alamut.com/subj/artiface/deadMedia/dM_Manifesto.html (last visited 4.8.2011).
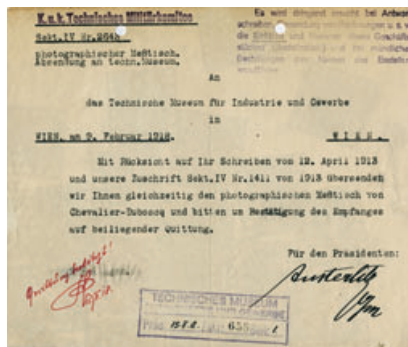
Fig. 1: Letter to the Technical Museum Vienna, 9.2.1918, Inventory number BPA-0114105

Fig. 2: Auguste Chevallier, Photogrammetric Measurement Table, Frühakten Mappe 44_X, Technical Museum Vienna

cartography, military practice, architectural recordings, and archaeology.[2] This paper considers the early phase of its development as a two-fold history of imagination and realisation, when only a vague idea of its ultimate practical application existed.

In November of 1866, Auguste Chevallier, a hitherto unknown French military medical practitioner, took a series of panoramic photographs and labeled them with the following captions: "Planchette Photographique. Tour d'horizon complet, mouvement continu".[(fig. 3)] The occurrence represented an unorthodox alliance of military surveying and the preservation of the Château de Pierrefonds, a historic monument near Paris, which the architectural historian Aron Vinegar has recently discussed in detail.[3] The question that is of interest in this paper is why Chevallier describes this series of panoramic photographs as time images, which have the ability to record continuous movement.

The *planchette photographique* consists of a circular protective case in which circular glass plate negatives are situated horizontally. During the recording process, a 360° view of the surrounding area can be registered on a plate by the rotation of a lens situated on top of the camera. The idea was to generate precise images for the fabrication of maps and architectural plans. In order to shoot the photographs, the camera was set up along a series of stations located around a specific object. In order to produce a precise architectural plan by means of the multiple stations, lines are traced from the centre of two photographs through the portion of an object that appears on both photographs until these lines meet.[(fig. 4)] One can see how this procedure was conducted in an architectural plan that shows the various stations around the château. The resulting diagram suggests that the considered object is not simply captured by a single photograph, but instead by a combination of shots from different angles. For this reason, the photographic procedure functions best with reference to three-dimensional objects and not non-specific topographical surroundings. Still, the technique of the *planchette photograpique* lacks the precision required for the recording exact data.

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2   For a general discussion on the history and epistemological implications of photogrammetry see Michael Ponstingl: *Der Soldat benötigt sowohl Pläne als auch Karten. Fotografische Einsätze im k. (u.) k. Militärgeographischen Institut zu Wien, Teil II*. In: *Fotogeschichte*, vol. 22, no. 83, 2002, pp. 53–82.; Herta Wolf: *Das Denkmälerarchiv Fotografie*. In: Herta Wolf (Ed.): *Diskurse der Fotografie*. Frankfurt/Main 2003, pp. 349–75.; Peter Geimer: *Bild und Maß. Zur Typologie fotografischer Bilder*.

In: Thomas Hensel and Andreas Köstler (Ed.): *Einführung in die Kunstwissenschaft*. Berlin 2005, pp. 157–78.
3   As Aron Vinegar points out, the art historian in charge of the project Violett-le-Duc used Chevallier's camera as an imaginary tool during the restoration of the building: Aron Vinegar: *Panoramic Photographs and the Restoration of the Château de Pierrefonds*, Online Publication, pp. 70–81: 76. See for a detailed discussion of the whole project Aron Vinegar: *Viollet-le-Duc, Pano-*

ramic Photography, and the Restoration of the Château de Pierrefonds. In: Werner Oechslin (Ed.): *Eugène Emmanuel Viollet-le-Duc*. Einsiedeln 2010 and Aron Vinegar: *Imaginative Variation and Photographic Frames of Reference at Pierrefonds*. In: Roy Ascott and Michael Punt (Ed.): *Consciousness Reframed 3*. Newport 2000.
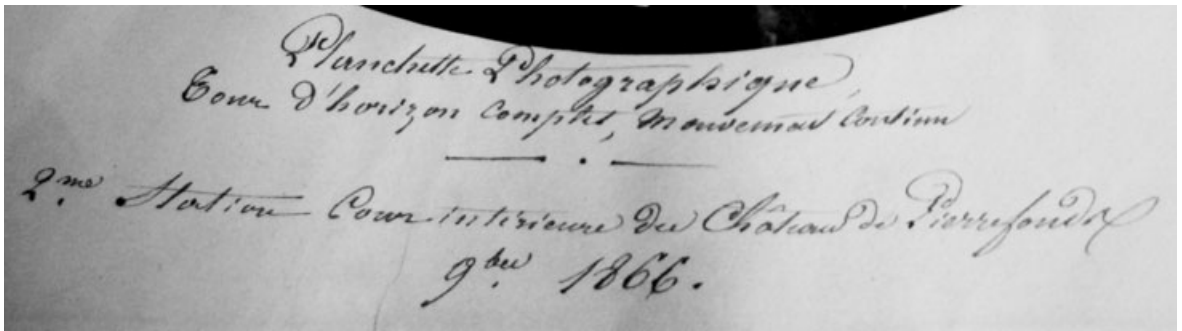
Fig. 3: Legend Auguste Chevallier, *Planchette Photographique* (1866), Technical Museum Vienna, Inventory number BPA-01147-5

Although the plan suggests how the transfer of single points of the photographs might generate a second system of representation, it is an *artificial mock-up* of the procedure: a ground plan of the château, which Viollet-le-Duc published in 1857, is superimposed with the photogrammetric results of Chevalliers panorama technique.

The recording of the photographs created highly distorted images as a result of the rotation of the camera. [(fig. 5)] This depiction of the inner courtyard, for example, spreads out the building in a 360° view. Because the caption fixes the circular band in a specific position, the only orientation a viewer has to actual space is the relationship between top and bottom. However, space within the picture is turned upside down: the *bottom* is located at its center and the *top* is on its outer edge. The anamorphic distortion of the depiction is a result of its continuous exposure. Due to the circular shape of the exposed areas, light covers more space in the outer areas of the image than the area closer to the center. Inscribing time, therefore, leads to an extremely distorted and non-mimetic representation of space.

The patent and supporting literature for the *planchette photographique* emphasized this temporal aspect of the new technique. It was the rotational movement around its own axis that one of the leading photographic journals touted as one of its most notable characteristics. With it, pictures could be inscribed on the plate successively. According to the "Note sur la Planchette Photographique" by M.C. Tranquoy of 1866, "un mouvement de rotation continu ou discontinu" describing a "tour d'horizont continu" was the primary achievement of Chevallier's invention.[4] Although the exact amount of time inscribed onto the plate cannot be exactly determined in the final photographs, their temporal nature can be deduced from a specific understanding of how the images were produced. In other words, time is accumulated within the pictures without *representing* it. This definition of a "time image" via the movement of the rotating camera is shaped in Chevallier's descriptions by a direct comparison with human sight.

THE TECHNICAL EYE

In Auguste Chevallier's conceptualization of reproductive vision, the camera serves as a model for sight that surpasses the capacities of the human eye. A number of optical instruments came into play in the history of vision, like the telescope,[5] the camera obscura,[6] and the stereoscope,[7] each which functioned as theoretical objects that shaped historically specific explanations of the human perception. For Chevallier, the *planchette photographique* was a device that exceeded the capa-

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4   M.C. Tronquoy: *Note sur la Planchette Photographique de M. Auguste Chevallier*. Paris 1866, p. 1. Also see Auguste Chevallier: *Note sur la Planchette Photographique*. In: *Le Moniteur de la Photographie. Revue Internationale des Progrès du Nouvel Art*, No 20, January 1865, p. 63. and *Description des Machines et procédés pour lesquels des brevets d'invention ont été pris sous le régime de la loi du 5 juillet 1844*, Ed. by Le Ministre de l'agriculture et du commerce, vol. 90, Paris 1878, p. 3.

5   See Joseph Vogl: *Medien-Werden: Galileis Fernrohr*. In: Lorenz Engell and Joseph Vogl (Ed.): *Mediale Historiographien, Archiv für Mediengeschichte*, Vol. 1, Weimar, Universitätsverlag 2001, pp. 115–123 and Hans Blumenberg: *Das Fernrohr und die Ohnmacht der Wahrheit*. In: Ders: *Legitimität der Neuzeit*. Frankfurt/Main, Suhrkamp 1975.

6   See Jonathan Crary: *Techniques of the Observer. On Vision and Modernity in the 19th Century*. Cambridge, MIT Press 1990.

7   See Bernd Stiegler: *Die Philologie des Auges. Die photographische Entdeckung der Welt im 19. Jahrhundert*, München, Fink 2001.
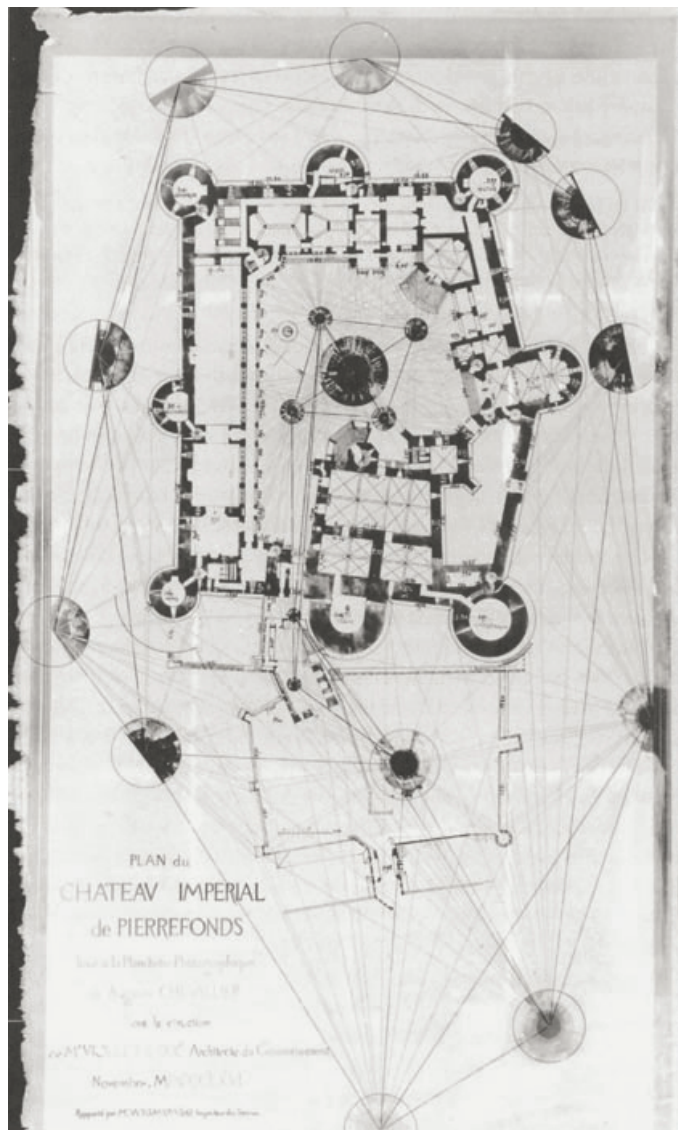
Fig. 4: Levé du Château Imperial de Pierrefonds levé à la Planchette Photographique d'Auguste Chevallier (1866), Archives Départementale de l'Oise, Beauvais, In: Aron Vinegar: *Panoramic Photography and the Restoration of the Château de Pierrefonds*, Online Publication, p. 74

bilities of human eyesight—it was a technical eye that would record pictures during the very process of seeing. He describes the functioning of the camera in the patent of 1858 by means of a metaphorical comparison with the human eye:

> This movement, like the whole operation, can be explained if one imagines that the sensitive plate is nothing but a circular mirror of which the circumference is divided into degrees, so as to take only a certain stretch of the horizon at a time, and that the exterior images will come to act successively on each of its parts, as they would do on the eye of an observer who turned around himself with a regular movement—albeit with this difference: that in the eye images succeed one another while successively occupying the same position, that is to say by losing the first so that one can see the second, while in the camera they remain successively fixed.[8]

Historically, the camera and eye were often compared with one another, and this coupling reflected the theoretical description of photographic practice.[9] The underlying distinction between natural and artificial vision is based on the assumption that the camera and eye were generally comparable,[10] even if the evaluation of the process of seeing in both cases changed over the course of the nineteenth century.[11] Chevallier's statements mark one of the crucial distinctions between the camera and the eye: photography afforded the fixation of images that would otherwise have been lost on the human retina. In an early description of the photographic process by Jules Janin, it was this quality of the automatic image production that characterized the new technique. In reference to a couple of daguerreotypes, Janin describes how Daguerre harnesses the sun—"the eye of the world"—onto the plate and how the earth and the sky, flowing water, cathedrals, as well as stones and little grains of sand are imprinted on a stable surface: "Now it is no more the uncertain look of man which discovers shadow or light in the distance. It is no more his trembling hand which reproduces the changing scene of this world on movable paper."[12] The changing scene of the world, which the human eye can only perceive by constantly refreshing its images, as Chevallier describes later, are fixed in the fraction of a second. As the historian of science Christoph Hoffmann has pointed out, the astronomer Jules Janssen emphasized this capacity of fixing ephemeral phenomena by creating the metaphor "the true retina of the scientist" in the context of science photography in the 1880s: "While our retina deletes every impression that lasts more than the tenth of a second, the photographic retina preserves those impressions for a nearly indefinite period."[13]

Chevallier's metaphorical concept of technically produced sight goes even further: what is fixed on the sensitive plate is a time interval, which can remain in its succession for an indefinite period of time. The idea that a precise image could provide exact data, as we have seen before, is pushed one step further: it should also function as a means of storing and accumulating time. This idea is related to the production process behind the pictures—the successive inscription on the circular glass plate negative is integral to the process Chevallier explains with an anthropomorphic approach: the camera moves around its own axis like "an observer who turned around himself with a regular movement."

MOVABLE OBJECTS

In 1918 it was finally clear that the apparatus could be stored in the Technical Museum in Vienna, but when the k.u.k. military bought it from the French military, the expectations were still at their height and based on the camera's presumed capability of fixing images of topographical surroundings, three-dimensional objects, and buildings. A report by Lieutenant Lucian Mikiewicz from 1876 testifies that attempts to use the *planchette* to generate precise visual data of topographical surroundings and objects carried on into the nineteenth century. Mikiewicz states that the photographs would deliver

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8   Auguste Chevallier: *Brevet d'Invention pour des perfectionnements dans les appareils photographiques*. Paris 18. February 1858, unpaginated.
9   See Herta Wolf: *Die Augenmetapher der Fotografie*. In: Winfried Nöth / Karin Wenz (Ed.): *Medientheorie und die digitalen Medien*. Kassel 1998, pp. 201–231.
10   In reference to Adrien Donnadieu, Peter Geimer points out that the analogy of camera and eye is two-fold: it is based on the assumption that they allude to the same process of seeing in which their differences emerge in an amplified way. See Peter Geimer: *Bilder aus Versehen. Eine Geschichte fotografischer Erscheinungen*. Hamburg, Philo Fine Arts 2010, p. 233.
11   See Bernd Stiegler: *Bilder der Photographie. Ein Album photographischer Metaphern*, Frankfurt / Main 2006, p. 34.
12   Jules Janin: *Le Daguereotype*. In: *Le Daguerréotype par Daguerre, Chevallier, Melloni, Hubert*, Paris, Jean Michel Place 1987, unpaginated.
13   Christoph Hoffmann: *Zwei Schichten. Netzhaut und Fotografie, 1860/1890*. In: *Fotogeschichte*, Vol. 21, 2001, pp. 21–38: 22. Also see Jimena Canales: *A Tenth of a Second. A History*. Chicago and London, The University of Chicago Press 2009.

exact images of animals, plants, and minerals and could provide the foundation of the work of geographers to produce their maps.[14] He imagines the application of this new tool for military surveys could facilitate the easy and rapid production of images out in the field, which could be evaluated in the office at a later date.[15]

The picture Mikiewicz draws of the prospective use of the camera imagines a chain of representation in which no information gets lost in the process: from the objects, to their photographs, to their final representation in maps. This idea echoes what Bruno Latour refers to as an "optical consistency" in his concept of "immutable mobiles"[16]; it presumes that the camera is able to record the ephemeral phenomena of the world and its objects through photographic means. Friedrich Kittler also emphasizes that it is this quality which represents the crucial means of differentiating the new technique from former optical media: "The only thing that did not exist before photography emerged, is a technique of fixation to send images through time and space and to see them at a different point in time and space again."[17]

Fixing representations of objects of the world that retroactively deliver information suggests that objects can easily be placed and replaced in space and time. Subject to a prospective reading, they stabilize precise information by way of their material basis. This situation establishes a specific relation of "presence and absence" of the represented objects—following Latour— "that allows translation without corruption." In the case of the *planchette photographique*, the translation not only points to the precise reproduction of photographed objects, but also to the inscribed interval of time on the plate; paradoxically, it is exactly that inscription of time— discernable as a blurred area of the image—which is what prevents the photographed objects from being sharp and exactly reproduced. Because of the circular rotation of the machine and the successive inscription on the glass plate negative, the camera produced out of focus images that were ultimately of little use in generating a precise architectural plan.[18] As early as 1862, one of Chevallier's supporters Paté confirmed that the im-

precision of the camera did not allow the pictures to provide exact data for further processing.[19] However, Mikiewicz's report on the practical application of Chevallier's camera in 1878 still testifies to an unwavering belief in the potentials of the new technique, although he must have observed similar results more than a decade later.

IMAGINARY ARCHIVES

The belief in the primacy of the new medium of photography was directly connected to the idea that its pictures not only represented the objects of the world, but could also function as substitutes for them. While the comments on the *planchette photographique* shortly after its invention by Paté, Tronquoy etc. mainly focus on the technical aspects of the picture generating process, Chevallier's thoughts also point the discussion into a slightly different direction. He imagines that the technique as a tool for registering every topographical surrounding in succession on the plate, which could provide exact information for future use in collections of image archives. Mikiewicz also states: "It is clear, that by means of this operation one can produce appropriate images, that serve for easy studying, as well as for collections and archives due to their preciseness and durability."[20] As genuine qualities of the collected pictures, *preciseness* and *durability* should guarantee that objects within photographic archives have a second life. A radicalisation of this idea was put forward in 1859 by Oliver Wendell Holmes, who imagined a stereographical library, where visitors could see "any object, natural or artificial." Holmes formulated a vision of destroying the objects once they were captured by photography: "Give us a few negatives of a thing worth seeing, taken from different points of view, and that is all we want of it. Pull it down or burn it up, if you please."[21] The idea of substituting the objects by photographic images was already formulated in 1839, but the *dispositif* of encyclopaedic photographic archives to "collect everything" took greater hold on the collective imagination in the second half of the nineteenth century.[22] The idea of developing an image

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14   „[…] sie [die Fotografie KMH] liefert dem Naturforscher getreue Abbildungen von Thieren, Pflanzen und Mineralien, dem Geographen Grundlagen zum Entwurfe seiner Karten; […]" Lucian Mikiewicz: *Anwendung der Photographie zu militärischen Zwecken. Mitteilungen über Gegenstände des Artillerie- und Geniewesens.* Wien 1876, pp. 621–637: 621.

15   „Ist nun eine Basis bekannt, so genügt bei Anwendung des erwähnten Instruments, um aus den Lichtbildern

den ganzen Plan-Entwurf später zu Hause zu machen, ohne dass man auf dem Felde ausser einzelnen Notizen etwas zu thun bemüssigt wäre." Ibid, p. 632.

16   Bruno Latour: *Drawing Things Together.* In: Michael Lynch/Steve Woolgar (Ed.): *Representation in Scientific Practice.* Cambridge/London 1990, pp. 19–68.

17   Friedrich Kittler: *Optische Medien.* Berlin 2002, p. 155. Also see Mary Ann Doane, who defines the time storing of photography and film as a model for thinking

fixation in modern theoretical frameworks such as psychoanalysis. Mary Ann Doane: *Zeitlichkeit, Speicherung, Lesbarkeit. Freud, Marey und der Film.* In: Henning Schmidgen (Ed.): *Lebendige Zeit. Wissenskulturen im Werden.* Berlin 2005, pp. 280–313.

18   See Aron Vinegar: *Panoramic Photography as Imagination Technology: Viollet-le-Duc and the Restoration of the Château de Pierrefonds.* In: Werner Oechslin (Ed.): *Eugène Emmanuel Viollet-le-Duc: Internationales*
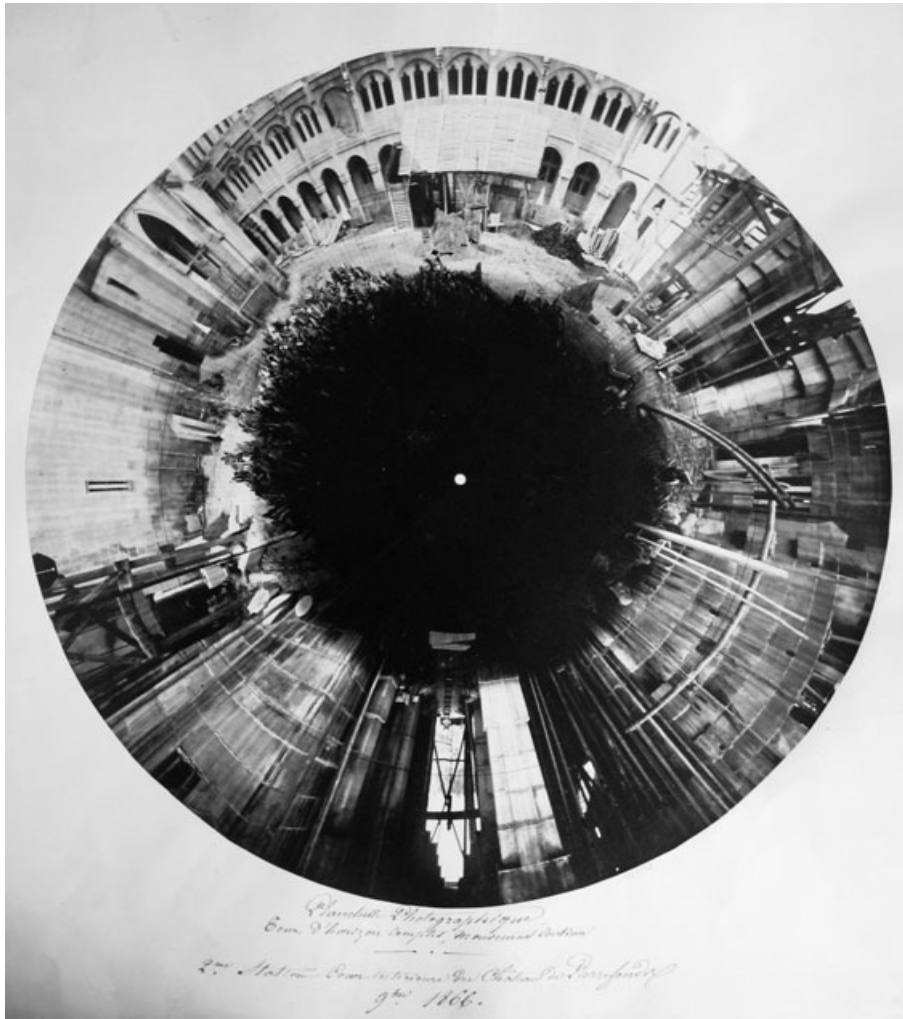
Fig. 5: Auguste Chevallier, *Planchette Photographique* **(1866),**
32,1 x 34 cm, Technical Museum Vienna, Inventory number BPA-01147-5

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Kolloquium. Einsiedeln 2010, pp. 90–109: 96.

19   M. Ed. Paté: *Notice sur la Planchette Photographique de M. A. Chevallier.* Paris, Librairie Militaire 1862.

20   „Es ist aus dem Ganzen ersichtlich, dass man mittelst dieses Verfahrens vollkommen zweckentsprechende Abbildungen erhalten kann, die sich sowohl zur Erleichterung des Studiums, als auch für Sammlungen und Archive ihrer Genauigkeit und Haltbarkeit halber vorzüglich eignen." Ibid, p. 624.

21   Oliver Wendell Holmes: *The Stereoscope and the Stereograph.* In: *Atlantic Monthly* 3, 20, 1859, pp. 738–48: 748.

22   See Kelly Wilder: *Photography and Science.* London 2009, pp. 79–101.

archive that stands in for landscapes and objects—as was claimed for *photogrammetrie*—perfectly dovetails with the idea of destroying objects of the world and preserving them in encyclopaedic archives. In this hegemony of photographs in the archive over and above the material world, Holmes saw the division of *form* and *matter*: objects of the world would be supplanted by their existence on two-dimensional paper.

Beyond the actual materialisation of those archives with their logics of fragmentation, decontextualization, and comparability, there is a history of imaginary archives in which the photographs are imagined as space-time-storage devices that can—by means of their "optical consistency"—travel through time and space. The French astronomer and spiritualist Camille Flammarion (1842–1925) formulated such an imaginary archive at the end of the nineteenth century. In his fiction book *Lumen*, Flammarion imagined an archive of the world, whereby all events of the history of humankind could be actualized through the observation of instantaneous photographs.[24] His protagonist "Lumen" is a ghostlike creature that travels through time and space using the speed of light for transportation. Lumen describes to a human character in the narrative that in the same amount of time a ray of light would need to travel through space, it would be possible to distance oneself as far away from the earth as necessary to see its history. From this particular viewpoint out in space, the past can be transformed into the present.[25] In this particular scenario, observing the sky does not mean seeing the present moment, but rather its history, because light needs time to travel. This reversal of historical orders in Flammarion's fictional vision, in which history can be transformed into the present and the present into history (the "transformation of the past into the present"[26]), is approachable in photographs. He describes the observation of the history of the world in photographic categories: "In more exact terms, the luminous ray would be a courier, who should bring us, not written despatches, but photographs, or more exactly still, the very aspect of the country, whence he comes."[27] That is, the photo-

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graph delivers more precise data than any kind of written message. The history of the world could be collected, therefore, in a photo album, whereby the observer of the present day reactivates it as a whole within a short period of time: "But this whole retrospective panorama was certainly displayed in less than a day, perhaps in a few hours."[28] This approach presupposes that photography can fix data of the historic past, stabilizing information that can be retrospectively reactivated over long periods of time.

Chevallier's photogrammetric archive would not have been *out of space* (in contrast to Flammarion), but had the potential to be a picture gallery of precise time images that preserved complete time intervals—had only the technique functioned properly. Auguste Chevallier's *planchette photographique* demonstrates that the invention of photographic techniques, the images they produce, and their collection in archives was pushed forwards by an unbroken belief in photography's ability to record the ephemeral phenomena of the world. The history of photography must be understood as a complex interaction between the potentials of the photographic image production and their actual results. It is one that is closely intertwined with the history of its imagination.

23   Ibid, p. 748.
24   The first french edition of Lumen was published in 1872 in a book with two other essays: Camille Flammarion: *Récits de l'Infini. Lumen. Histoire d'une comete. Dans l'infini*. Paris, Librairie Académique 1872. This first English edition was published shortly after the French: Camille Flammarion: *Stories of Infinity. Lumen – History of a Comet – In Infinity*. Boston: Roberts Brothers 1873.
25   Camille Flammarion: *Stories of Infinity. Lumen –*
History of a Comet – In Infinity. Boston, Roberts Brothers 1873, p. 35.
26   Ibid, p. 35.
27   Ibid, p. 34.
28   Ibid, p. 46.

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Loop and Life

A False Start into Protocinematic Photographic Representations of Movement

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FRIEDRICH TIETJEN

At the World's Columbian Exhibition in Chicago 1893, Eadweard Muybridge and Ottomar Anschütz showed their series of instantaneous photographs of moving humans and animals but failed to sell them. On the one hand, Muybridge had a building named the Zoo-praxigraphical Hall erected at the venue at his own expense, where he gave lectures illustrated by pro-jections and photographs as he had done for scien-tific and popular audiences since the late 1870s. But he also had series of photographs transformed into graphic images to be printed on cardboard disks and used with phenakistiscopes. With this, he made the series compatible with forms of entertainment that had been around in bourgeois homes for more than half a century. Visitors to the Chicago exhibition were, how-ever, apparently anything but enthusiastic about the Hall, the lectures and the disks; Muybridge's earnings were small, and when the show ended, he destroyed the lot of unsold paper disks.[1]

1   For Muybridge's lecture tours and the pictures used for them, see in particular *Eadweard Muybridge. The Kingston Museum Bequest*, exhibition catalogue, Kingston upon Thames, The Projection Box, 2004.

Anschütz, on the other hand, had developed a device named *Schnellseher* or tachyscope of which he had had different models built since 1886.[2] Most had series of chronophotographic images mounted on large disks or arranged on drums that were backlit by Geissler tubes, a predecessor of the neon lamp. In a hybrid form between projection and presentation, the audience could follow, for instance, a group of men playing skat or two elderly men snuffing tobacco. In Chicago and not far from Muybridge's Zoopraxigraphical Hall, Anschütz presented coin-operated tachyscope automats for single viewers. However, producing the machines must have cost more than was gained from the presentations there and elsewhere. After the Chicago fair, Anschütz tried his luck for some time with new constructions of his tachyscopes; although they seem to have been well received by paying audiences, it did not help cut his debt. When he finally stopped his involvement with moving images in 1895, he, too, destroyed the remaining tachyscopes in his possession along with the disks and for the years remaining until his death in 1907 refused to talk about his chronophotographs and earned his livelihood by supplying the needs of amateur photographers.

In April 1894, about half a year after the Columbian Exhibition had closed its gates, the first kinetoscope parlours were opened in New York, San Francisco and, again, Chicago. Edison's machines used film strips several dozen feet long, which initially lasted no longer than twenty to thirty seconds. Similar to Anschütz' tachyscopes exhibited in Chicago, the kinetoscopes were also aimed at viewers peeping through eyepieces into a machine. Contrary to Anschütz' and Muybridge's enterprises, however, they turned out to be quite successful—from April 1894 to February 1895, total profits amounted to more than US$ 85,000.[3] And when again a year later in November 1895 the brothers Lumière showed their cinematograph to a larger audience in Paris, their enterprise was also blessed with a success that would make their camera-projector combinations and films available all over Europe and the USA for the coming years.

Thus, within little more than two years a number of attempts to commodify series of instantaneous photographs of movements had taken place of which the earlier ones floundered and the later ones succeeded. Given this short period of time, Muybridge's and Anschütz' failure can hardly be written off as simply the bad luck of premature ideas. To understand some of the reasons for their misfortunes, though, it is instructive to analyse Anschütz' and Muybridge's modes of mobilising serial photographs with respect to those employed by Edison and the Lumières. As for the construction of the instruments for viewing, both Muybridge and Anschütz conceived of a variety of constructions—handheld and crank-driven, projections for multiple audiences and single-viewer, etc. But common to all these instruments was that the series of images were arranged on and seen by means of rotating objects such as drums or disks—loops of rarely more than two dozen single images. Edison's kinetoscopes and the Lumière's projector, in contrast, were operated with sequences of images on film strips. The way the images or their mounts were moved in the first case was thereby circular and in the latter, linear. Neither form of arranging serial pictures— may they be graphic or photographic—was entirely new in the 1890s: Phenakistiscopes had been in use since the 1830s, and patents for flip books were registered already in the 1850.[4] For the display of movement by means of serial pictures, however, circular modes such as those for optical toys like the phenakistiscope or the zoetrope apparently prevailed until the last decade of the 19th century.[5]

Reproduced by graphic means, such as lithography and engraving, the series had to satisfy certain demands as their mode of presentation is permanent repetition. The majority are conceived as having no first or last image. Hence, each single image is part of a line that leads back to itself, i.e. its repetition must be allowed for within a short period of time without a significant interruption. For this reason, the series often take as models movements that are repetitive in themselves and last for a while such as a running dog or a juggler throwing some balls; sometimes the scene is divided into two,

2   Anschütz constructed a number of models of the tachyscope differing in the arrangement of the pictures and thus the way in which a single or multiple audience was addressed. The models presented in Chicago were pay-per-view automats for single viewers For more details on the history and the construction of the tachyscope, see Deac Rossell, 'Breaking the Black Box: A Reassessment of Chronophotography as a Medium for Moving Pictures', in François Albéra, Marta Braun, André Gaudreault (Eds.), *Stop Motion. Fragmentation of Time*. Lausanne, Payot, 2002, pp. 121–150.

3   For the history and exploitation of the kinetoscope see Charles Musser, *Before the Nickelodeon. Edwin S. Porter and the Edison Manufacturing Company*. Berkeley/Los Angeles/Oxford, University of California Press 1991.

4   There were most likely flip books even before 1800 though none are preserved. For a short history and the uses of the flip book see *Daumenkino/The Flip Book Show*, exhibition catalogue Kunsthalle Düsseldorf, Snoeck Verlagsgesellschaft Cologne 2005.

5   I want to point out two minor details simply in passing: research on the opto-mechanical representation of movement has used rotating devices such as Faraday's wheel—probably one of the reasons that for a long time most toys followed that model, however with one notable exception: the thaumatrope as what is likely the oldest of

Fig. 1: Simon von Stampfer, *Waltzing Couple and a Fiddler*, stroboscopic disk, 1832. Observatory Kremsmünster, Austria

Fig. 2: Pellerin & Cie, *Two Fishermen Harpooning a Whale*, phenakistiscope disk, ca. 1890. Cinematheque Française, Paris

when, for instance, a fiddler plays to a waltzing couple. [fig. 1] With these series the inventory of the action depicted remains the same; should something move within the pictorial space it has either to re-enter as it happens with the dancers—because there are only nine seperate images of them but ten of the fiddler (and ten slits to peep through), he keeps sitting on his stool while the couple also moves laterally.[6] Alternatively the vanishing part of the picture has to be replaced as happens, for instance, on a zoetrope strip from ca. 1860: Here, red and black figures slide down a hillside, and for every figure disappearing at the bottom another appears at the top of a hill. Scenes depicting more irregular movements are rarely chosen. André Gaudreault and Nicolas Dulac found a few such disks for phenakistiscopes, for example a relatively late one from the 1890s showing two fishermen harpooning a whale.[fig. 2] But the introduction of such events or other narrative elements comes at a price in consistency: It is questionable whether rotation

could make the quite different single images of this disk appear as a moving one. Also, the narrative leans to the improbable when, after receiving the harpoon, the whale dives away and emerges again with no injury only to be harpooned again.[7]

Also the relative distance to and the perspective of what is happening is usually fixed. The moving models or objects remain at a distance and keep their position within the scene. Most series are surface images, allowing only horizontal and vertical development. Here, too, the whaling scene is one of the relatively few series exploiting the depth of the pictorial space: While the large sailing ship keeps its position in the background and the whalers' boat to the left hand side in the middle ground, the whale moves back and forth.

As long as the wheel is spun, the picture keeps moving. The couple will be lost in dancing, the dog will run incessantly, the juggler will never miss a thrown ball, and sure enough, the black and red figures will continue slid-

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these toys applies rotation, too, but the synthetic picture it generates is a still, not a moving one.

6   I owe this observation to Jens R. Nielsen from the Arbeitsstelle für Graphische Literatur, Hamburg.

7   Nicolas Dulac, André Gaudreault, 'Heads or tails: The Emergence of a New Cultural Series, from the Phenakistiscope to the Cinematograph' in *Invisible Culture. An Electronic Journal for Visual Culture*. Issue 8, fall 2004. http://www.rochester.edu/in_visible_culture/Issue_8/ dulac_gaudreault.html. My article owes to their observations and thoughts.

ing downhill just as the whalers will aim their harpoon again and again at the miraculously unharmed beast. The movement itself is, however, subject to external forces: the viewer operating the hand-held toys can spin them faster or slower, forward or backward, making the figures act accordingly. Instead of waltzing, the couple might seem to be spinning, and what had been a downhill slide could become a climb. Finally, all movement ceases when the viewer removes the toy from his or her eye and replaces the disk or strip with a new one; an interruption that can take place at any given moment, without leaving the action unclosed in limbo.[8]

When set in motion before the observer's eye at a suitable speed, the single images of these loops replace one another in rapid succession, giving the impression of a continuous moving picture. This continuity, however, knows neither past nor future: Through repetition its time is enclosed in itself, making the movements subject to a kinetic stasis, a present progressive in permanence. Everything changes while returning to what it has been before. And even these previous states of being become visible when peeping through the slits of a phenakistiscope or a zoetrope as there is not just one moving picture to be seen, but several, all at the same time, with their figures in different, yet recurrent positions. The structure of the loop does not allow for the irrevocable unfolding of an action, or for progress, but at most for change under the condition that it leads back to the previous state with only a few intermediate steps. As pastimes, these toys show movements as functions in time but disconnect the movements from the passing of time. Nevertheless, they are not pure continuity but contain one fundamental shock—that an inanimate object can become not only a moving one, but an animated one. The focus of attention is thus not primarily the spinning disk or drum as an object, but the moving pictures on it. Yet more important than what kind of scene these pictures actually show is that they show it as moving. Looking at or rather through the spinning images invites immersion into the visual spectacle which is amplified rather than disturbed by changes in speed or direction of

the rotation; but they hardly invite any empathy with what is happening as the viewer realises soon enough that it will happen again and again.

Under the technical conditions discussed earlier to conceive of series for such toys by graphical means was not problematic. Serving as motifs could be anything from mimetic drawings to abstract patterns as long as the single images were both different and similar enough to the preceding and subsequent ones to generate the impression of movement when viewed in rapid succession. When series of instantaneous photographs of animal or human models were employed, the choices became more limited. To fit into a loop, a series had to fulfil the same conditions as the graphic ones, above all that the sequence would allow for a seamless joining of the first and last image. This created a spatial and temporal problem: First, a perspective of the moving objects had to be chosen that excluded all elements that would betray a shift of viewpoint, and second, the movement had to be photographed within regular intervals: the time span between each single exposure had to be roughly the same in order to provide a smooth and evenly moving picture inside a fixed frame.

The first problem was dealt with according to what was photographed. If the objects were moving only in themselves, such as Anschütz' card-players were presumably doing, cameras that would take all pictures from about the same position would be used; this set-up could also be used for scenes such as leap-frogging, where one object remains in the picture while a second one is entering and leaving. If the object was moving steadily in one direction such as Muybridge's human and animal models, a battery of cameras with adjustable spacing to each other in a line parallel to the track was required to have all the images of the object taken from the same perspective and distance; the exposures taken by cameras lateral to the track were of little use as here both the perspective of and the distance to the object changes with every image, as can be seen in some of Muybridge's plates.[(fig. 3)]

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8   In their article, Dulac and Gaudreault quote from a Catalogue of the London Stereoscopic & Photographic Company from the 1870s suggesting that two strips could be combined in a zoetrope drum, thus creating a systematic alternation. I doubt that this was a common practice.
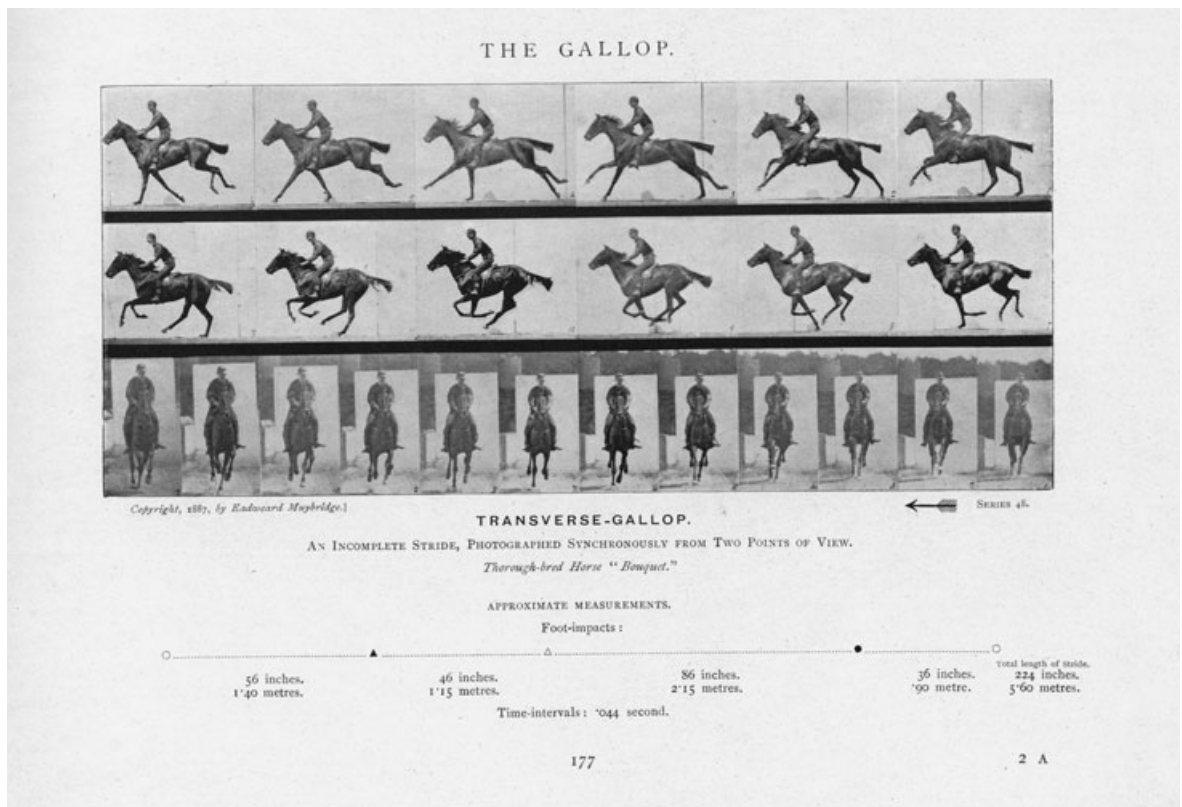
Fig. 3: Eadweard Muybridge, Transverse Gallop, *Animals in Motion*, London: Chapman / Hall, 1918, p. 177, 1918.
Collection of the author

As for the second problem, it was probably responsible for Muybridge's abandoning of thread-triggered cameras such as those used for serving Leland Stanford's famous commission in 1872: Here, in the beginning the goal had been not so much to analyse movement in its sequence, but rather, to find out whether there is a moment when a horse in full gallop has its four hoofs off the ground. To prove this assumption, of all the images taken only the one shot where the mare does exactly as it was wagered to do was of importance. To get that image it didn't matter whether the intervals between the single exposures were irregular. Regularity became important only when Muybridge's focus shifted towards the analysis—and later the synthesis—of movement in time. When Muybridge employed a motor-clock for operating the shutters with the help of electric circuits, he got a device that with a certain exactitude would allow various, yet regular intervals. Advance trial runs of the animals or persons ascertained the time it took to complete a full stride; the intervals between the exposures of the different movements then were calculated according to the number of shots taken and could last from fractions of a second to several seconds depending on what animal and what movement was to be photographed. While in Muybridge's early experiments it was the moving object itself that released the shutters, with the motor-clock, the operation of the cameras was caused by an auxiliary apparatus fed with average values gained from earlier runs.

These series of photographs did not simply record moments from a continuous course of movements but did so in relation to time. When viewed by means of a phenakistiscope or a zoetrope, the rate of images could be made to match that of the recording. According to Muybridge's measurements, a complete stride of a walking horse, for instance, could take about 12/10 of a second, so a series of twelve images would be taken in intervals of a tenth of a second. When reproduced at the same speed of the recording, ten images per second, the rate would hardly be sufficient to generate the impression of one moving image. On the other hand, a stride in full gallop is about four tenths of a second.[9] Now if both courses of movement were shot with the same number of images and then reproduced with the same rate of sixteen images per second, a fluent and continuous movement could be seen; but the walk of the horse would be sped up while the gallop would be in slow motion.

In short: the photographic series for looped animations not only had to match the formal criteria for this genre but also the temporal ones that depended, in part, on what actually happened in front of the lenses. The number of images taken per second had to adjust to the rate where they start merging into a continuously moving picture when set into rotation and looked at, and for different movements the disks or drums needed to be spun at appropriate speeds. But there was still one more problem that emerged when series of photographs were conceived of as a loop—caused not so much by formal demands but by the pictorial qualities of photography and their relation to time.

When emerging in the 1880s, instantaneous photography—a precondition to chronophotography of any sort—had changed the notion of truth attached to photography. Until then photographic images were generally understood to record what the human eye could see. And though this analogy was questionable due to distortions, selective sensibilities of emulsions etc., it was accurate in respect to the relation to time. Other than for experimental purposes, exposure times were usually measured in seconds rather than fractions: in order to obtain sharp pictures, the objects had to be immobile or immobilized, otherwise blurs or ghostly silhouettes appeared. With instantaneous photography, images could be taken in moments short enough to record what Walter Benjamin later would dub the optical unconscious—temporal details that escaped human perception because of their rapidity. Yet since instantaneous photography made it possible to ascertain the course of movements of a horse in gallop, it also revealed the contingency of all bodily movement, subject to parameters such as training, fatigue and chance, and since no single stride was

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9   See, for instance, Eadweard Muybridge, *Animals in Motion. An Electro-Photographic Investigation of Consecutive Phases of Muscular Action*, London, Chapman & Hall, 1918, p. 25 and p. 171.

ever the same, the repetition of the very same images became a problem

When series of instantaneous photographs are made into loops, a few things happen to them. Rotation adds what photography has subtracted—movement as a sign of life. At the same time though, the loop eliminates contingency as another essential sign of life: the movement of bodies here, too, is subject to an eternal present progressive—the galloping horse of a Muybridge series would run the same stride again and again and never give the impression of moving in or through a space. And while a running horse's movements are, to a certain degree, repetitive, with scenes like Anschütz' card players, the loss of contingency is even more dramatic: the probability that the same deck would be dealt to the same people and be played the very same way even once is next to nil.

Nevertheless, such series were praised for their truthfulness. In 1892, for instance, a reviewer wrote about one of Anschütz' loops: 'The horse's tail and mane wave. His bitted mouth opens. Even his muscular contractions are visible, and the straining of the neck, the distention of the eager nostrils, the drawung up, bending, and outstretching of the limbs. The huntsman's coat tails flap.'[10] The description is imbued with simultaneity: more or less everything happens at the same time as it does indeed when a horse runs. Yet the critic will have amassed the details from the waving mane to the flapping coat tails only by the constant repetition of the same movement seen from the same perspective over time. The description thus resembles those of a still image where a viewer dedicates his or her attention to its different parts—a common situation for Muybridge's and Anschütz' series and single shots as they were looked at mainly as printed pictures in books, magazines and papers.

Under these conditions the introduction of film does not appear as the logical further development of chronophotography—in more than one respect it instead breaks with forms of photographic representations of movement. It was a fundamental decision to cut the ties connecting the number of exposures in time to the speed of the movement to be recorded. Aimed at synthesising movement, the cinematic camera employed a universal frame rate no matter whether the movements in front of the camera were fast or slow, regular or irregular.

This ability to record more or less any movement is an indispensable precondition for what Tom Gunning has defined as the Cinema of Attraction. Essential is the simple ability of the cinema to *show* something[11]—and to a great extent, this 'something' is movement. Yet since this also applies to the optical toys and the animated series of chronophotographs, the difference might be found in *how* the Cinema of Attraction shows something. Whereas in loops every movement inevitably goes full cycle, the linearity of film holds a promise with which neither phenakistiscope nor tachyscope could compete: the potential of narration. Without a doubt this potential often remained unrealised as fictional and non-fictional narration was of secondary importance for film-makers and their audiences alike. But simply by virtue of being linear, these films already insist upon things happening one after the other, and the fact that looking at the same thing twice means just that and not a way back in time.

Whereas the introduction of film broke the circle, it was, at the same time, adapted as a formal element. When Max Skladanovsky showed his first films in the Berlin Wintergarten on November 1, 1895, they were strips with the ends glued together.[12] Cartoons for private use, in particular, were later distributed as endless film strips. But even more instructive is when films such as Lumières' *Workers Leaving a Factory* are thought of as loops: The doors that open to dismiss the workers finally close again so that the film ends with roughly the same scene as it started. Read as an initial equilibrium falling into disarray only to be reinstituted towards the end, this is a basic model of narration that remains widely applied in film until today.

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10   Quoted from Rossell, *Breaking the Black Box*, p. 135 f [spelling as quoted there].

11   Tom Gunning, 'The Cinema of Attractions: Early Film, its Spectator and the Avant-Garde', in Thomas Elsaesser (Ed.): *Early Cinema. Space, Frame, Narrative.* London, British Film Institute, 1994, pp. 56–62.

12   Josef Maria Eder, *History of Photography*, New York, Columbia University Press, 1945, p. 790. Ironically, Skladanovsky's main source of income since 1892 had been flip-books which he published as *Lebende Photographien* (Living Photographs).

Picturing Dialogues

Exploring Aesthetics, Pace and Rhythm

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JONATHAN SHAW & MAARTEN VANVOLSEM

In many of the reflections on the relationship of photographic images to the subject of time, it is actually not the images as an object that is addressed but their depiction of time. For example, a modern day viewer, who in an almost natural flow would seek to re-animate the image sequences of Eadweard Muybridge's *Motion Studies* volumes. However, it is not the form of the images that encourages the viewer to do so, but human perception of the movement of bodies and society's comprehension of, and relationship to, image technology, in this case of moving images.

This section presents an articulation of ideas, principles and notions on photography and how, as a field, it manages to deal with time and communicate that concept within itself. This sequence of images, which has been collaboratively authored, seeks to offer our understanding and reflection of the relationship between image, narrative and time.

> We are not interested in the precise reconstruction of movement, which has already been broken up and analysed. We are involved only in the area of movement which produces sensation, the memory of which still palpitates in our awareness.[a]

What is depicted on these pages is the consequence of a dialogue between two practitioners, Jonathan Shaw and Maarten Vanvolsem. We were familiar with each others work before we met for the first time on the occasion of a seminar in Brussels in 2007. At that point we did not have an opportunity to discuss the ideas and motivations behind our work. For this 'Picturing dialogues' section we have therefore attempted to collaboratively author, some of the reflections on, and understanding of, our practices that have resulted from our extended conversations and discussions, through words and images.

In 1913 Anton Giulio Bragaglia published the Futurist Photodynamism manifesto. This manifesto despised the fields of cinematography and chronophotography, pronouncing a new ideal instead, one shared by ourselves, where photography has the ability to express a certain feeling of movement, a flux. Therefore, you will find two strands of quotation across the following pages, some are from our recorded conversations, others coming from Bragaglia's text. The manifesto itself offered a central place, a conduit and focus for our dialogues, and as such we have sought to embed them within the flow of this piece. Their purpose and function is not to relive the manifesto but to reuse it, to help us further understand our use of 'technique' and our way of expressing time and motion within the still photographic image.
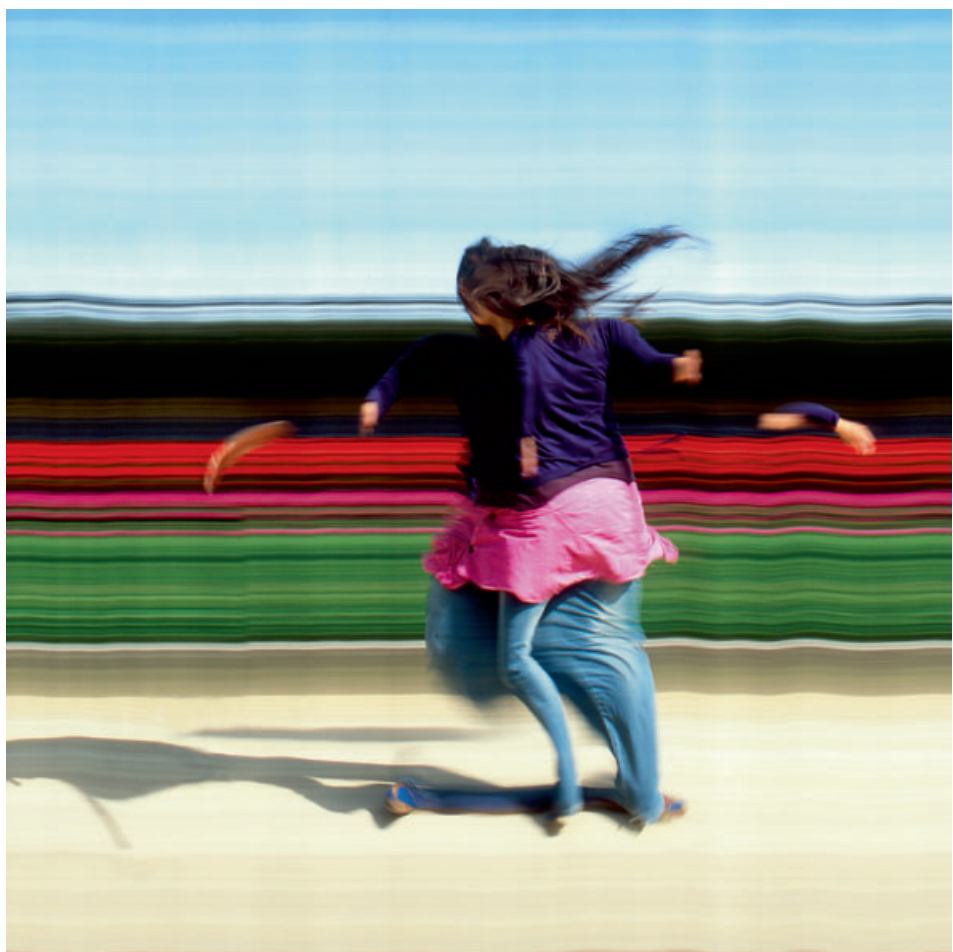
Our work as much as it produces images, is dealing with the action we as artists make and the trace of this action that is left behind in the image.[b]

As such there is an interplay between the machine, the mechanics of the camera, the artist and their surroundings. Within the image we are seeking for a harmony between these three elements. What is depicted is not focused upon the reality of that which can be seen. It is the result of a process that, by collecting data over time, works differently from the human eye. It is a reality that can be lived, a time-frame, a 'specious present'.[1]

The key feature of our work then, is not the ideal exposure—the attempt to capture an image that is a perfect depiction of what we want to present within the constraints of the frame of one specific camera. Our work is about an event, an encounter and its sensation. Importantly, it is also this event that determines the length of the image frame, not the camera or any other commercial standard.[b]

Chronophotography could be compared with a clock on the face of which only the quarter-hours are marked, cinematography to one on which the minutes too are indicated, and Photo-dynamism to a third on which are marked not only the seconds, but also the intermovemental fractions existing in the passages between seconds. This becomes an almost infinitesimal calculation of movement. In fact it is only through our researches that it is possible to obtain a vision that is proportionate, in terms of the strength of the images, to the very tempo of their existence, and to the speed with which they have lived in a space and in us.[a]

These images reflect this sensation of being in a place and they communicate the intensity of the relationship with the people surrounding us in that space: whether it is the claustrophobic reaction produced by navigating through the mass of bodies on the crowded dance floor in *Crash*;[2] or the feeling of discovering a space by moving through it and looking around it in the *Moving Body*-series.[3] Indeed, both are temporal sensations to be built up over time and felt over the course of a flow—we are not after instantaneous effects. You can only grasp this when you read the image and follow that flow.
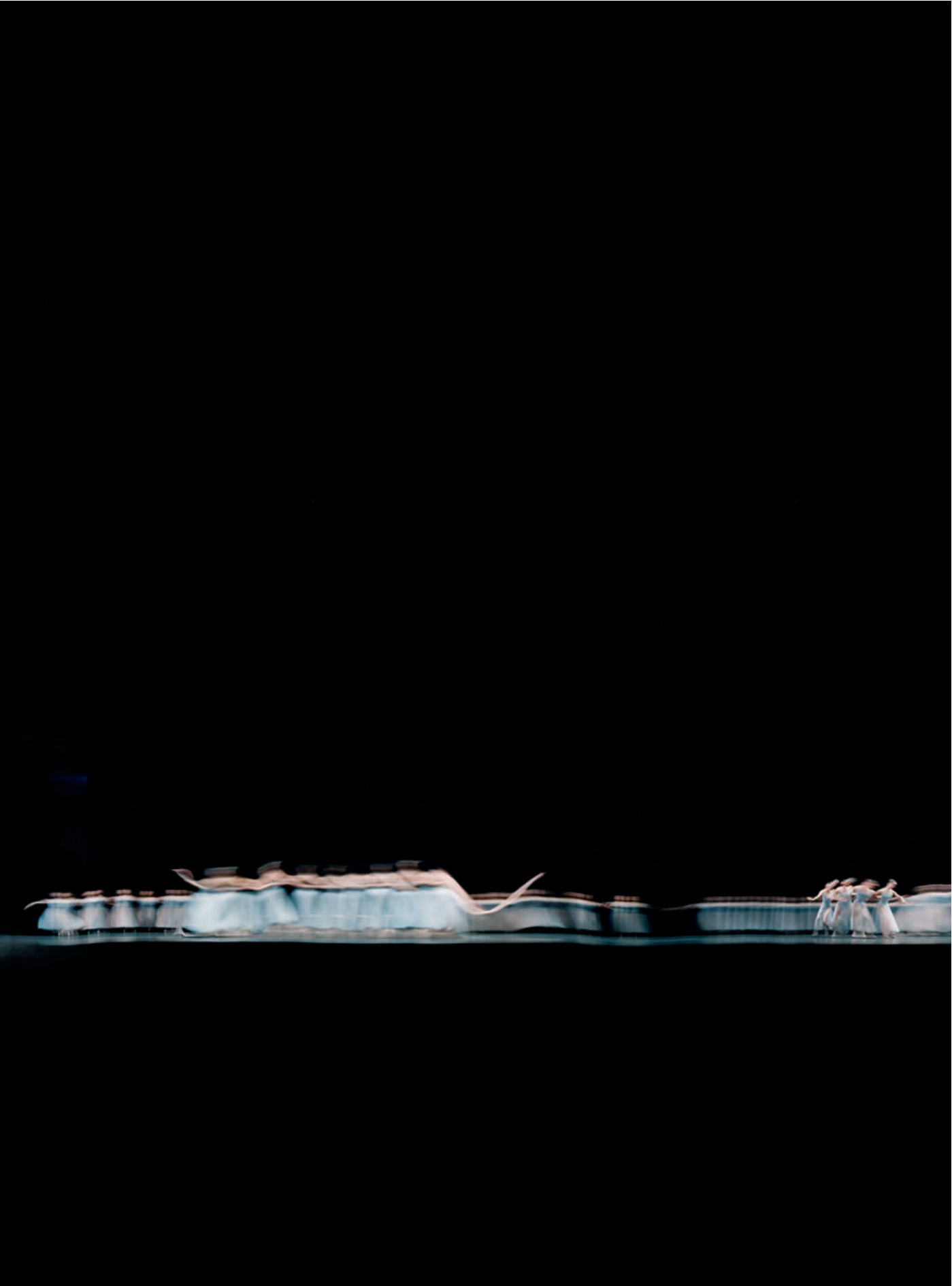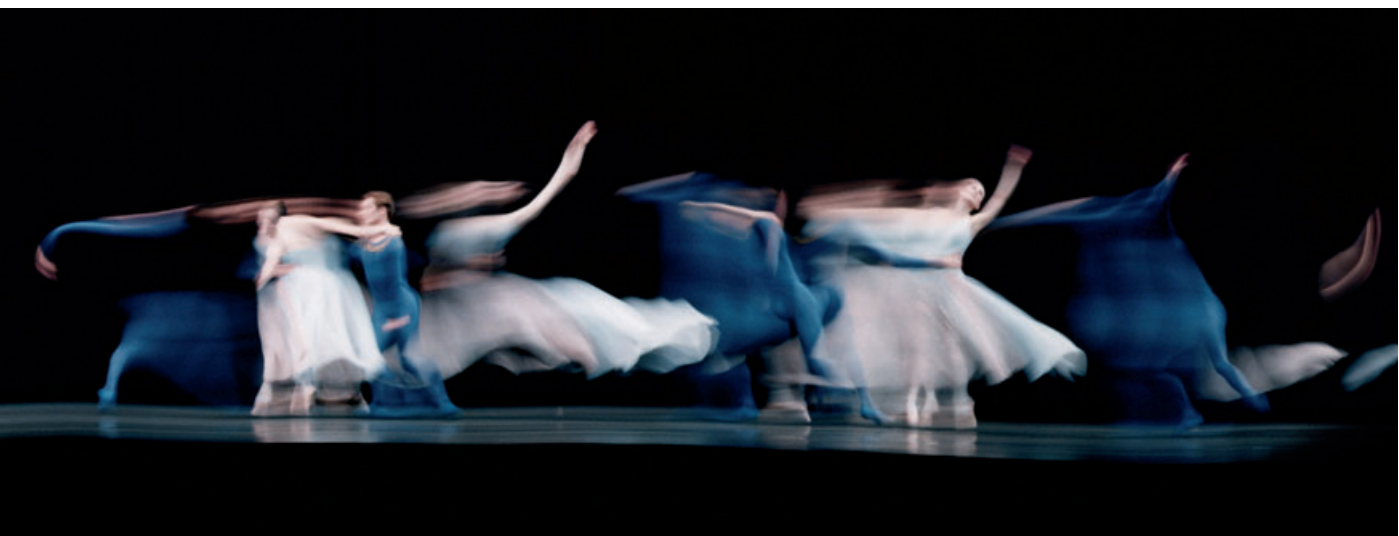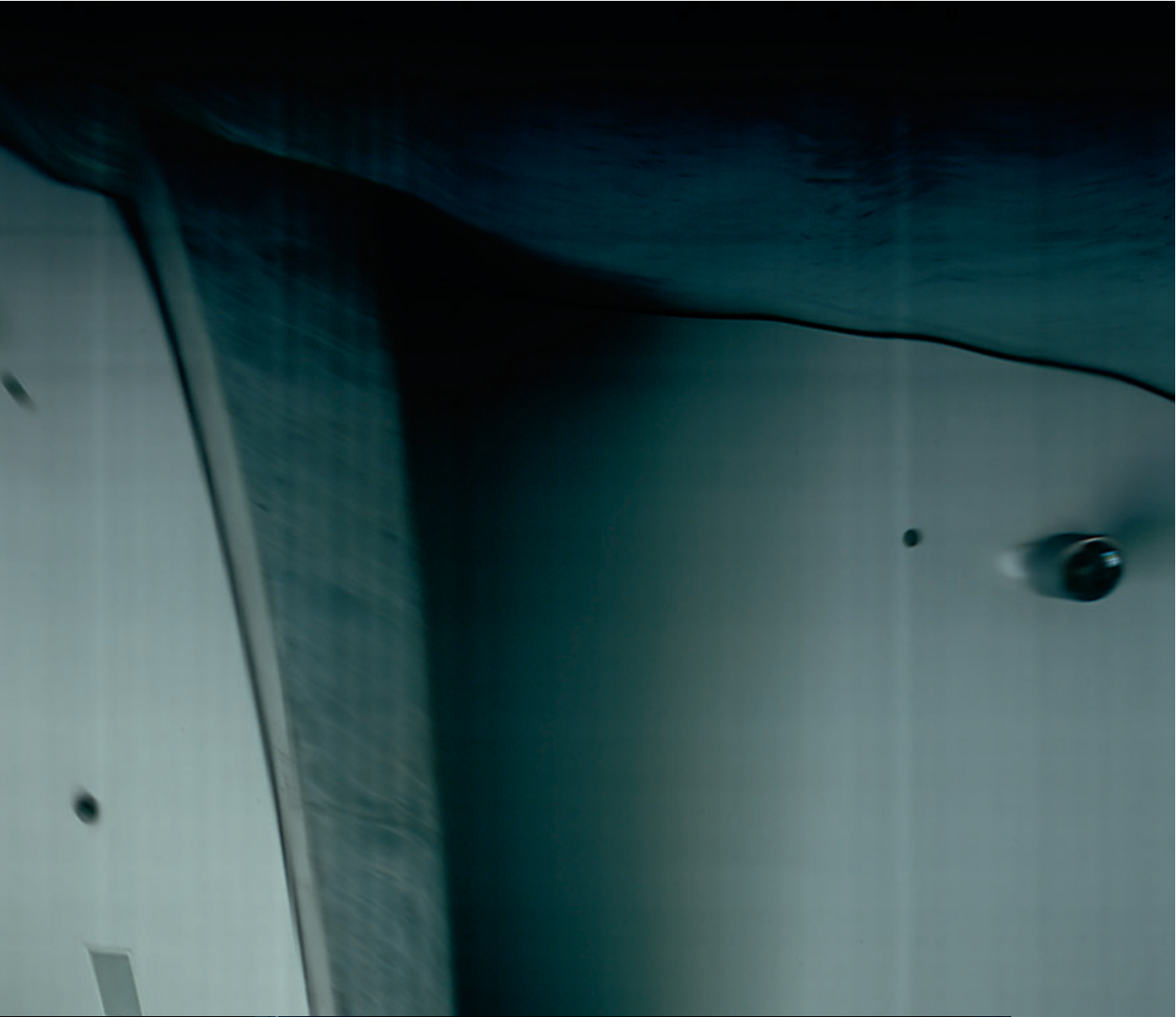
We despise the precise, mechanical, glacial reproduction of reality, and take the utmost care to avoid it. For us this is a harmful and negative element, whereas for cinematography and chronophotography it is the very essence. They in their turn overlook the trajectory, which for us is the essential value.[a]

In contrast to the photodynamic images of the Bragaglia brothers or any other photodynamic futurist photographer, we have adapted and explored a specific photo-mechanical technique associated with the birth of photography to expose our images.[4] This technique, which is best understood as a rudimentary form of scanning, enables us to turn the creation of the image into the subject of the image in its own right. So the 'act' or performance of moving the camera in space, rather than an object depicted in front of the camera, has the ability to be articulated within the resulting linear image. To appreciate this, you need to read across the expanse of our images from left to right (or right to left). Our linear images are mostly exhibited or presented in their entirety, revealing the full length of image capture. However, in the context of this piece we have sort to explore an alternative process of reading, one which seeks to provoke the feeling that something is progressing. There is a phasing of your reading, a developing rhythm, offering a temporal experience to you as a viewer. You feel that something is expanding, evolving, zooming in and out. In the representation of these images, as is encountered with forms such as the Bayeux tapestry or Chinese scroll paintings, the phasing attempts to highlight and bring to the fore, the physical activity of moving along the flow of the image sequence.

Images: a collaborative image-sequence by Jonathan Shaw and Maarten Vanvolsem

NOTES

a. Quotes: Anton Giulio Bragaglia, 1st july 1913, Futurist Photodynamism as published in Umbro Apollonio (ed.), Futurist Manifestos, ArtWorks, MFA Publications, Boston, 2001, pp. 38-45.
b. Quotes from recorded roundtable talk between Jonathan Shaw & Maarten Vanvolsem.

1. William James' (1843-1910) definition of specious-present dates from 1890. He writes, 'The short duration of which we are immediately and incessantly sensible." Nowadays it tends to be treated as 'The interval of time such that events occurring within that interval are experienced as present", Robin Le Poidevin, *The experience and perception of time*, in "The Stanford Encyclopaedia of Philosophy", (Fall 2000 edition), Edward N. Zalta (ed), 2000, (online: http://plato.Stanford.edu/archives/fall2000/enteries/time-experience/) (accessed 05/2010).
2. *Crash* by Jonathan Shaw – An immersive, site-specific installation at New Art Gallery Walsall, which drew the audience into the chaotic and claustrophobic world of club culture. The gallery walls were covered in their entirety by a large scale panoramic photograph that extended throughout the full length of the gallery. The exhibition and publication featured a single image shot at *Crash*, one of the most turbulent and decadent clubs in London. The resulting experience is one of effectively becoming a part of the sea of bodies, contorted by movement and flashing lights, as Shaw invites us to travel through the throngs, witnessing the melding of flesh and faces, only occasionally perhaps finding a moment of clarity within the chaotic mass.
3. Moving-body series by Maarten Vanvolsem was started as a commission of the Concertgebouw Brugge and consists of short choreographic movements done with the camera in an architectural space. First images were published in; Maarten Vanvolsem, *Move:in:time 01:15:DD07*, Concertgebouw Brugge vzw, December 2007, on the occasion of their dance festival *DecemberDance 07* (1 till 15 December 2007).
4. This technique is the trip or slit techniques. It is used for, among other things, 360° panorama photography and the photofinish (sports timing equipment), and can best be conceived as a scanning technique. Just one line (plane) of information is recorded. By moving this line (plane in front of the lens) one builds up an area, but at the same time one creates a time-line. In other words, the camera does not expose a single frame in a fraction of a second, but records movements through a narrow slit onto moving film. With regard to any vertical line in the image, the short or long strips of photographic images always show a small section before, during and after.

Moving Stills: The Ken Burns Effect

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INGRID HOELZL

ABSTRACT

While the early hybrid forms between moving and unmoving image have, with increasing historical distance, come to be considered worthy of study, the growing presence of digitally mobilized photographic images in the present visual culture has so far hardly been taken seriously as an object of research—not only on the basis of its currency and its suspicious proximity to popular culture, but also because its medial and thus academic classification is unclear. The matter-of-factness with which photo-, video- and computer-graphical recording and representation media are combined today, however, shows that the "expanded field of photography" (Baker) requires an expanded concept of "the photographic" between analog and digital, print and projection, still and moving. Taken the analog/digital debate for obsolete, I will directly attack the opposition of print and projection before exposing, with the Ken Burns Effect, a specific challenge to the still/moving divide.

BETWEEN HAND AND SPOON

A curious passage appears in Walter Benjamin's *Little History of Photography*:

> "While it is common that, for example, an individual is able to offer an account of the human gait (if only in general terms), that same individual has no knowledge at all of human posture during the fraction of a second when a person begins to take a step. Photography, with its devices of slow motion and enlargement, reveals this posture to him."[1]

Remarkable in this passage is the media-archeological slip that Benjamin makes: slow motion is generally considered part of the filmic process and not part of the photographic.[2] When Benjamin then goes on to define photography as making the optical-unconscious visible, he conceives of it implicitly as a dynamic, temporalized medium—an attitude apparently so emphatic that it makes its way into the French translation. Here, we find: "La photographie, avec ces auxiliaires que sont les ralentis, les agrandissements, montre ce qui se passe." In the phrase "montre ce qui se passe" the significance of the representation of movement in image is reinforced—photography doesn't only show what is, but rather what *happens*.[3]

A comparison with the essay "The Work of Art in the Age of Mechanical Reproduction," which was written a few years later and contains an altered version of this passage, makes clear the media-technical and media-historical indifference which generally permeates Benjamin's thinking: the object of reflection here is film, not photography, but the argument is quite the same (although he gives a more detailed list of the camera "resources" than in the "Little History of Photography" where he mentions only slow motion and enlargement):

> "Even if one has a general knowledge of the way people walk, one knows nothing of a person's posture during the fractional second of a stride. The act of reaching for a lighter or a spoon is familiar routine, yet we hardly know what really goes on between hand and metal, not to mention how this fluctuates with our moods. Here, the camera intervenes with the resources of its lowerings and liftings, its interruptions and isolations, its extensions and accelerations, its enlargements and reductions."[4]

In another passage in the essay on the work of art, Benjamin explicitly addresses medial hybrids and views them—media-technologically—as representatives of an intermediate phase: late forms of the old medium, early forms of the new. In a footnote, he affirms and relativizes his technology-deterministic view of media: every cultivated art form stands, according to Benjamin, at the intersection of three lines of development. In the case of film, these are: 1. the technology geared towards a certain art form (flip books, moving-image automats), 2. the traditional art forms which worked intensely on producing effects later achieved unfettered by the new art forms (Dadaism), and 3. the social transformation which works towards changes in reception which first benefit the new art form (the *Kaiserpanorama*): "Before the movie had begun to create its public, pictures that were no longer immobile captivated an assembled audience in the so-called *Kaiserpanorama*".[5]

This trans-medial, media-teleological approach, which considers the flip book, moving-image automats, Dadaism and the *Kaiserpanorama* as early forms of the film with respect to technology development, art development and social change, disregarding the historical fact that film was already institutionalized around 1910 as cinema (that is, before the Dadaist Manifesto of 1916), illustrates the course my article will trace. My thesis is that the convergence of moving and unmoving images in digital media (on the level of post-production as well as on the level of dissemination) is already laid out in the media history of photographic and filmic images and their hybrid forms. This convergence is media-theoretically apparent in the difficulty (not unique to Benjamin)

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which arises in the attempt to clearly distinguish between photography and film. Its concrete expression can be found in productions and practices which are located in the border areas of the two medial forms. Their historical paths can be traced all the way back to the pre- and early history of photographic and filmic images.

There is already historically-based literature on the magic lantern and the various optical toys of the 19th century such as the wheel of life, the phenakistoscope, the zoetrope, the daedalum, the praxinoscope, the mutoscope, etc., which availed themselves of the physiology and psychology of visual perception for the creation of moving images.[6] These hybrid images which by means of technological devices appear to move are thus not the topic of the present discussion. Rather, I seek to challenge the established view which distinguishes between, on the one hand, technologically-moved images that move without either manual manipulation or the observer's moving, and, on the other hand, unmoving images which don't change even when the observer moves, a view which leaves aside moving images that depend on manual manipulation (flip book) or on observer movement (lenticular images, holographic images).

This somewhat narrow view is reflected in the designations in different languages. The terms "bewegtes Bild," "moving image," and "image en mouvement" seem to have different agents in mind: while the German term "bewegtes Bild" (moved image) has the projection apparatus in mind, the English term "moving image" focuses on that which moves on the projection surface, i.e. the image which continuously changes (or at least is renewed according to the image frequency). The French term "image en mouvement" (image in motion), on the other hand, can be seen as both active and passive: as a statuary image (frame) set in motion or as a moved perception image (projected image). The history of the film projector is interesting in this sense: while the prototype of the cinematograph was still a multimedia combination of camera, printer and projector, over the course of the institutionalization of the cinema, recording, postproduction and dissemination became broadly differen-

tiated. With digitalization, the three areas seem to come closer together again—at least in the home cinema, where digital videos and slide shows may be viewed directly in the camera or on the computer screen—leaving aside for once the PowerPoint presentation in the lecture hall.

While the early hybrid forms between moving and unmoving image have, with increasing historical distance, come to be considered worthy of study, the growing presence of digitally mobilized photographic images in the present visual culture has so far hardly been taken seriously as an object of research—not only on the basis of its currency and its suspicious proximity to popular culture, but also because its medial and thus academic classification is unclear. The matter-of-factness with which photo-, video- and computer-graphical recording and representation media are combined today, however, shows that the "expanded field of photography" (Baker[7]) requires an expanded concept of "the photographic" between analog and digital, print and projection, still and moving. Taken the analog/digital debate for obsolete, I will directly attack the opposition of print and projection before exposing, with the Ken Burns Effect, a specific challenge to the still/moving divide.

PHOTOGRAPHY AS PROJECTION

To begin with, the opposition between print and projection must be suspended. The projected photographic image appears to stand between the print, paradigmatic for photography, and the projection of moving images, paradigmatic for film. Projection is, however, the underlying reproduction process of both photographic forms: both the photographic print and the projected photographic image are the result of light projection: onto a photosensitive surface (print) or onto a photo-reflective surface (projection). The contact print and thus the photogram is also the result of a projection, with the difference that here the spatial distance between original and copy and thus the change in size is omitted (Frizot[8]). On the level of production, the photographic (and, in fact,

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Age of Mechanical Reproduction." In: Idem. *Illuminations.* Transl. by Harry Zohn. London: Fontana Press, pp. 211–244 (here 230).

5 Ibid, p. 242. Here, as elsewhere in this essay, Benjamin argues without regard for media-historical facts—the projection process was already long-known in the context of the magic lantern, and magic lantern projections could easily create the illusion of continuous movement (cf. Rossell 2008, Ruchatz 2003).

6 See Deac Rossell. 2008. *Laterna magica – Magic lantern*, vol. 1. Text in German and English. Translated into German by Marita Kuhn, Stuttgart: Füsslin; see also Nekes, Werner; and Bodo von Dewitz (eds). 2002. *Ich sehe was, was Du nicht siehst. Sehmaschinen und Bilderwelten. Die Sammlung Werner Nekes.* Göttingen: Steidl; and Füsslin, Georg. 1993. *Optisches Spielzeug, oder wie die Bilder laufen lernten* (*Optical Toys, or, How the Pictures Learned to Move*), Stuttgart: Füsslin.

7 Baker, Georges. 2008. "Photography's Expanded Field." In: Beckmann, Karen; Jean Ma (eds). *Still Moving. Between Cinema and Photography.* Durham, NC: Duke University Press, pp. 175–188.

8 Frizot, Michel. 1997. "Un dessein projectif: la photographie." In: Paini, Dominique (ed). *Projections. Les transports de l'image.* Paris: Hazan, pp. 73–93.

any optical) image capture itself can also be interpreted as a geometric projection process: light reflected from objects recorded through central-perspective lenses onto a photosensitive layer.

If both the photographic print and the photographic image projection are thus only two different instantiations of the photographic image, the habitual coupling of photograph/print vs. film/projection loses its argumentative basis. The division which comes to light in such a coupling, between photographic recording and photographic image projection, is also the reason why slide projection was long not considered an independent medium.[9] In *Licht und Wahrheit*, Ruchatz aptly sums up the double affiliation of the projected photographic image, which makes its medial subordination or medial independence difficult. It is at the same time a special, that is, projected state of the photographic image, whose media history begins with the Daguerreotype, and a special, that is, photographic form of the projected image which starts with the magic lantern.[10]

Although photographic images are mostly half-tone and projected, the "theoretical object of photography" (Krauss[11]) is the photographic print created through the photo-chemical process. The significance of the projected photographic image, however, was already recognized by progressive photographer and photography theorist Alfred Stieglitz, a few decades after it was introduced to the market in 1850. In a 1897 article "Some Remarks on Lantern Slides" in *Camera Notes*, Stieglitz considers the growing significance of the slide show in camera clubs, emphasizing that their artistic quality must encompass not only the photographic image, but also the control of the atmosphere created through projection: here photography mutates from flat image into spatial art.[12]

With the apparent homogenization of *all* images through digitalization, the ontological and semiological status of the photographic image has been reassessed, and new definitions have been brought forward for digitalized and digitally created images. But the historical relevance of projection has been somewhat overlooked in these debates. Rather than continuing the controver-

sial debates of the 1990s and 2000s over the status of digital images (which mostly pick up on their production and not their dissemination[13]), I suggest here a re-definition of the photographic image which on the level of production encompasses all photographs in the actual sense, i.e. records of light projections achieved with or without camera and lens, ranging from the photogram to the hologram. On the level of dissemination, "photographic image" encompasses all types of prints (photo-technical, print-graphic), the different technical forms of monitor display and slide and video projection.

The photographic image is in this way loosened from its coupling on the recording medium of photography and open for all kinds of "playbacks": static and dynamic, printed and projected. The photographic image is thus no longer tied to one of its reproductive forms, the print, but is rather *one* form or, to follow Bellour, *one* state of the projected image.[14] This state encompasses both the level of production and the level of reproduction: each photographic recording is the product of geometric-optical projection. The photographic image is thus integrated, as far as its technical production process is concerned, into the much longer history of geometric projection. On the level of reproduction, the difference between material and immaterial image, continuously brought up as an argument for a medial difference between printed and projected image, is secondary here. The photographic print is, as suggested above, the product of a projection and thus a projected image.

PHOTOGRAPHY AND MOVEMENT

Next, the dichotomy moving/unmoving in relation to the media of film and photography, already no longer reduced to projection or print, must undergo a media-historically motivated revision. Transmedial oppositions such as stillness and movement, moment and duration, are re-divided, one could say (following McLuhan), with each medial shift into the new configuration of old and new media. In the pre-photographic age, for example, it was widely accepted that painting could represent a

9   On the discourse history of slide projection see Rossell 2008, see also Alexander, Darsie, Charles Harrison, and Robert Storr (ed). 2005. *Projected Images in Contemporary Art.* Penn State Press: University Park, PA, and Ruchatz, Jens. 2003. *Licht und Wahrheit. Eine Mediumgeschichte der fotografischen Projektion.* München: Fink, pp. 150–174.
10   Cf. Ruchatz, pp. 150–174.
11   Cf. Krauss, Rosalind. 1999. "Reinventing the Me-

dium." *"Angelus Novus": Perspectives on Walter Benjamin. Critical Inquiry* 25 (2): 289–305.
12   Cf. Stieglitz, Alfred. 1978. *Some Remarks on Lantern Slides* (1897). New York: DaCapo Press.
13   Batchen. Geoffrey. 1993. "The Naming of Photography. A Mass of Metaphor." *History of Photography* 17 (1): 22–32; Bolter, David Jay; Grusin, Richard. 2000. *Remediation. Understanding New media.* Cambridge/MA: MIT Press; Lunenfeld, Peter. 2000. *Snap to Grid. A User's*

Guide to Digital Arts, Media, and Cultures. Cambridge/MA: MIT Press; Hansen, Mark B. N. 2006. *New Philosophy for New Media.* Cambridge/MA: MIT Press, pp. 248–250.
14   Cf. Bellour, Raymond. 2008. "Concerning the Photographic." In: Beckmann, Karen; Jean Ma (Hg). 2008. *Still Moving. Between Cinema and Photography.* Durham, NC: Duke University Press, pp. 253–276.

moment. As Lessing writes in *Laokoon* (1766): "If it be true that the artist can adopt from the face of ever-varying nature only so much of her mutable effects as will belong to one single moment, and that the painter, in particular, can seize this moment only under one solitary point of view; —if it be true also that his works are intended, not to be merely glanced at, but to be long and repeatedly examined; then it is clear that the great difficulty will be to select such a moment and such a point of view as shall be sufficiently pregnant with meaning."[15]

When photography, with the advent of moment photography, gained the technological ability to represent the momentary, even instants which are shorter than the perceptible present (according to current neurological calculations, 1/30s[16]), the expressive qualities attributed to painting shifted to the "synthetic image," which gathers many moments into one representative image. "Even in the representation of movement," Rudolf Arnheim observes about Degas, "the artist was concerned with the enduring essence of just this movement."[17]

With the institutionalization of the cinema in the 1910s, the scope of the concept of photography had become increasingly circumscribed—it no longer encompassed various forms of the photo-chemically-fixed, optically-projected image, but rather only the single unmoving and material image. This conception was not even contested by the Italian Futurists, who sought to imbue still images (paintings as much as photographs) with the dynamics of life. (Anton Giulio Bragaglia, in his manifesto "Futurist Photodynamism" [1913], claims to have invented a totally new means of representation, neither [chrono]photographical nor filmic.)

The "myth of origin" of both photography and film, however, is the *camera obscura*: in the case of photography, with regard to the fixation of the fleeting image projection (Dubois[18]), and in the case of cinema, with regard to that second *camera obscura*—the darkened movie theatre (Damisch[19]). In contrast to the quasi-immaterial image of the cinematographic projection, the photographic image is generally thought of as a material image object, as a print.

In the age of the moving image (film, television, video) the photograph is considered, on the basis of the immutability of its (material) form and its (immaterial) content, as an unmoving cut through abstract time (Deleuze[20]). Film is considered the mechanic sequencing of such cuts: a mere illusion of real movement (Bergson[21]). The concept of the photo as an unmoving, that is, immutable, cut through abstract time does not consider the fact that photographs (as objects in time) are also subordinate to time; most of the time they simply change very slowly. This transience (that is, mutability) of the photographic print is taken to its logical extreme in the short film *Nostalgia* (1971) by Hollis Frampton: twelve photographs burn one after the other on an umbrella heater. Each photo is held in the frame until it burns up, while the previous photo is being described.

Grounded in the conception of film as mechanic sequencing of time fragments, film archeology retrospectively represents film as the logical consequence of chrono-photography, which is thus reduced to a mere precursor medium to cinema. A rehabilitation of chrono-photography as an independent medium for moving images is achieved by Deac Rossell: through detailed historical research on one of the pioneers of the moving photographic image, Ottomar Anschütz, he shows that by no means did all strategies of so-called chrono-photography aimed towards the "invention" of film. Rossell leaves unclear what they did aim for, just as the category "moving image," which Rossell seems to use for any manually- or technologically-moved sequence of images.[22]

This tacit prerequisite in the concept "moving image" indicates the fundamental dilemma which the present essay also cannot avoid: If we want to include as many aspects of movement as possible in the definition of the moving image, and thus not reduce "moving image" to the movement of image carrier during recording and during projection (filmic image) in front of an immobile observer, the question arises of which images are NOT moving, that is, whether there is any quality at all against which "moving" can be contrasted. "Moving images", in

15   Lessing, Gotthold Ephraim. 1836. *Laocoon, or, the Limits of Poetry and Painting*. Translated by William Ross. London, p. 28.

16   Hansen, Mark B. N. 2006. *New Philosophy for New Media*. Cambridge/MA: MIT Press, pp. 248–250.

17   Arnheim, Rudolf. 2004. "Über das Wesen der Photographie." In: Idem. *Seele in der Silberschicht. Medientheoretische Texte. Photographie–Film–Rundfunk*. Frankfurt/Main: Suhrkamp, p. 22.

18   Dubois, Philippe. 1990. *L'acte photographique*. Paris: Nathan.

19   Damisch, Hubert. 1995. *The Origin of Perspective*. Cambridge/MA: MIT Press.

20   Deleuze, Gilles. 1983. *L'Image-mouvement*. Paris: Ed. de Minuit.

21   Bergson, Henri. 1907. *L'Evolution créatrice*. Paris: Alcan.

22   Rossell, Deac. 2002. "Breaking the Black Box: A Reassessment of Chronophotography as a Medium for Moving Pictures." In: François Albera, Marta Braun, André Gaudreault (eds). *Stop Motion, Fragmentation of Time*. Lausanne: Scherrer, pp. 121–150.

a broad sense, would include stationary images that depict movement of content or image carrier during exposure (motion blur), that simulate such a movement through optical effects (multiple exposure, photomontage), serial stationary images that appear to move when manually manipulated (flip book) or when viewed by a mobile observer (lenticular images). "Moving images" would also include statuary photographs re-filmed with a moving camera using a technique called Ken Burns Effect.

MOVING STILLS – THE KEN BURNS EFFECT

Ken Burns Effects are increasingly to be observed in the current visual culture and seems to be symptomatic for a certain understanding of and need for dynamic images. Producing neither photography nor chronophotography nor film in the classic sense, this effect places the habitual genre boundaries into question in a more radical way than Bragaglia's time exposures which, in spite of their dynamism, still were—still images.

The basis for the animation of any image (not necessarily a photograph) via the Ken Burns Effect is an analog image-capture technique which can be digitally simulated. Using a rostrum camera, the image, lying on a movable table, is passed in front of a camera fastened above it to create a pan effect, or the camera is moved toward the image to create a zoom effect, or the combination of both.

In digital animation, these image or camera movements are calculated according to an algorithm, and the actual camera and/or image movements are simulated. The individual photographs lose their stasis through their reproduction in so-called time-based media and through the addition of camera movement, even if they remain recognizable as photographic images due to the stasis of the photographic objects. Additional optical transition effects between the individual "takes" (in the sense of a filmic take), also suggest, as do filmic transition effects, the passage of time between the takes, and thus a narration.

Jens Schröter defines the lenticular image, which only seems to be moving through observer movement or manual image movement (as images are tilted from side to side) as "sequence images," which only present one position of a sequence at a time, a mini-narration consisting of two to five stationary images.[23] The Ken Burns effect and its "take-image" functions differently: here an unmoved photograph which (usually) only shows one moment from one perspective is brought to life. It artificially creates new movements and perspectives as the virtual camera moves through the photograph simulating a move of the camera through photographic space.

The Ken Burns Effect was introduced and became widely known in 2003 through the feature of the same name in the iPhoto and iMovie software from Apple. The choice of the name emphasizes the effect's proximity to an effect used by, among others, the American documentary filmmaker Ken Burns to animate unmoving objects (predominantly images, usually paintings and photographs). The Ken Burns Effect is thus, technically speaking, not a radical new mode of appearance for photographic images, but merely a digital emulation of a photographic perception convention well-known from television and documentary film. Devoid of any syntactical meaning, however, the digital Ken Burns Effect has been adapted as a pure random effect for the large audience. It allows to create mouse-click animated digital slide-shows, the new version of home-made cinema where effects meant to be special and surprising become very fast stereotypical in their predictability.

Ken Burns effects can also be observed every day in public space—on the Internet, on information and advertising screens, in public transport as well as in the museum, where the opposition to the traditional understanding of photography becomes especially apparent. The animated image, whose framing and composition can change constantly, stands out sharply from the museum conception of photography. One just has to look at any Museum website and one will find, instead of static images, a dynamic image presentation, which almost always makes use of the Ken Burns Effect. Digi-

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23   Jens Schröter. "Technologies Beyond the Still and the Moving Image: The Case of the Multiplex Hologram." In: Ingrid Hölzl (ed). *History of Photography* special issue *Photography and Movement* 35 (1): pp. 23–32.

tal photographs of artworks and artifacts, as well as genuinely photographic images and artworks are set into motion using slow pans, zooms and fades, and are combined with animated text and eventually with sound—to attract the eye of the possible museum visitor.

STILL MOVING?

A step beyond the binary opposition of still photograph (being still and depicting stillness) and film (moving and depicting movement), challenged by Bragaglia, but still in place today, I propose the following definition: photography and film, are synthetic "image states": they both display aspects of stasis and movement.

For instance with the so-called Ken Burns effect, "affected" photographs are still because perspective and figures do not change; they are moving because there is camera movement, added during postproduction. The photographic images gaining a new oxymoronic temporality, as in Benjamin's Kaiserpanorama, "are no longer immobile"—"Bilder die bereits aufgehört hatten, unbeweglich zu sein".

Whereas in Ken Burns' documentary filmmaking, image animation is deliberate and seeks to augment the emotional impact of the voice over narrative, with random Ken Burns effects in digital consumer media (Apple iphoto and others), the image animation creates a purely retinal effect—and a narration of a new kind?

The Algorithmic Combine

Digital Special Effects
in an Art Historical Perspective

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EIVIND RØSSAAK

ALGORITHMIC CULTURE

The current mediascape forces us to rethink the relationship between photography and film, the still and the moving. Digital convergence and its new practical work-environment have led to an upheaval of our habitual conceptualizations; the old terms are no longer in accordance with the terrain. It used to be fair to distinguish between the spatial and the temporal or the still and the moving according to certain specific qualities inherent to the medium. This has been debated and argued most convincingly from Gotthold Lessing to André Bazin. Now, the cultural matrix has changed. The still and the moving are no longer necessarily medium-specific qualities; in continuously more and more complex ways they are integrated in optional procedures and interchangeable interfaces in the informational matrix. Now, all visual information (whether old or new) can be presented as an algorithmic "combine" of either moving or still or both.[1]

1   The term "combine" is inspired by the artist Robert Rauschenberg who used the term "combines" to cover a host of works in the 1950s where he employed non-traditional materials and objects in innovative combinations in collages and objects. In this article the term addresses combinations of stillness and motion in special effects where analogue and digital material is mixed as in the bullet time effect. Elements of the arguments in this article are taken from my book, *The Still/Moving Image:* *Cinema and the Arts* (Saarbrücken: LAP, 2010).

This new audio-visual culture is increasingly produced, processed, disseminated and received according to what I call algorithmic machines, that is, a finite sequence of coded instructions implemented in some sort of electronic computational devices. Algorithmic machines come in a variety of forms, from hardware to software, PCs and portable devices. In this new work-environment, the still/moving-divide is often part of a process of inter-activity combining the logic of the software and the input from (potentially multiple) users. These practices play different roles in different cultures or communities, in archival institutions, among gamers, bloggers, artists, developers, etc. We see it in presentations of archival material on the Internet, TV-documentaries, in one's own computer files, in for example the popular Ken Burns effects available in most photo-presentation software programs. New image forms, yet to be named, are produced on many real-time Flash applications, in inter-active or dialogic functions on social websites and in new geographical information systems such as Google Earth. Some of the foremost developers in these fields, such as Mario Klingemann (aka Quasimodo), have become renowned artists in their own rights. And this development is not for the elected few; these applications and experiences are available for the many. Also several artists, directors and visual effects designers like Sergio Prego, Peter Greenaway and John Gaeta (inventor of the bullet-time effect for the movie *The Matrix*) employ these tools. These algorithmic cultures address the *ends* of photography in many ways. Indeed, the traditional media-based archival distinction between film and photography is challenged, and secondly, many of these practices are radically post-photographic.

STILLNESS AND MOTION THEN AND NOW

In the beginning, cinema exhibitors were concerned with demonstrating the abilities of the new medium of the *Cinématographe*, as the Lumière Brothers called their multipurpose machine. Time and again they would astonish their audience by a special technique of pres-

entation. Initially, they presented the moving image as a stilled image, before the projectionist stirred life into the images, by cranking the machine.[2] A hundred years later, one of the most striking features in contemporary cinematic practices in movie theatres, art galleries, and new media platforms is the frequent use of slow motion and other techniques of delay. It is as if the moving image has become increasingly refashioned in the direction of demonstrating its abilities to not move, or to move in ways barely visible. This also seems to be due to new moving image technologies making new speeds of motion and new combinations of motion and stillness possible. Moving images, particularly the ones in galleries and museums, seem to excel in indiscernible differences between motion and stillness, in stops, still frames, freeze-effects, slow-motion effects, and even stuttering. Moving image artworks investigating new forms of slow motion such as Bill Viola's later works have refashioned the questions concerning old and new media, and a piece such as Douglas Gordon's *24 Hour Psycho* has become paradigmatic for the art scene's way of commenting upon the relationship between cinema and the arts.

The experiments with new and strange forms of the halting of moving images are not only experienced when moving images enter art galleries. The fame of a block-buster movie like *The Matrix* (Andy and Larry Wachowski, 1999) rests to a large extent on its striking use of special effects such as the so-called *bullet-time effect*. This was a new, never-before-seen combination of slow motion and frozen movement effects in commercial cinema that was immediately copied in all kinds of cinematic practices around the turn of the last millennium.

When I, approximately 100 years after the Lumière exhibitions, experienced the fabulous bullet-time or frozen time shots of *The Matrix*, I didn't believe my own eyes. The strange way this effect manipulates time-space and movement had never been seen before. "Movies as we knew them changed," art and film critic David Edelstein reported in the *New York Times*.[3] Here I will focus on the mind-boggling play between the still

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and the moving in the bullet-time effect. In this respect, the effect also seems to recreate or follow the principles of attraction and the demonstrations of the abilities of the medium associated with early cinema as analyzed by Tom Gunning.

On the level of narrative and character psychology, *The Matrix* is in many respects a fairly typical turn-of-the-century blockbuster. But in retrospect, the overall impression of the film is rather a series of attractions. The special effects are what most spectators and commentators remember from the film. In this sense, *The Matrix* may resemble a cinema of attraction. The DVD release of *The Matrix* with its trailers and the-making-of featurettes demonstrated to the full that it is the special effects that get the attention. These DVD features are almost like the so-called film lecturer of the old days who, before or during a cinema screening, announces the attractions to sharpen "viewer curiosity," as Gunning reminds us (826). Gunning's description of a typical cinema of attraction from the early period could also fit with *The Matrix*:

> Confrontation rules the cinema of attraction in both the form of its films and their mode of exhibition. The directness of this act of display allows an emphasis on the thrill itself—the immediate reaction of the viewer. (Gunning 1999: 826)

The main attraction in early cinema was the transition from stillness to movement. *The Matrix* seems to get as much of its energy from the inverse transition, that is, from movement to a sudden display of stillness.[4] Before we go on to discuss these complexities, a short summary of some of the story elements is necessary. The whole film is set in a kind of in-between position, in between the real and the simulated, in between real time and warped time, and, as highlighted in the bullet-time effect, in between invisible fractions of time.

The plot is a simple sci-fi plot of man against machine, structured as a hit-and-run narrative with great special effects, dramatic fights and high-speed chases. After a war or environmental disaster the world has been taken over by machines. Human civilization is gone, or has gone underground. In the minds of most of the world's citizens, they still exist in beautiful well-functioning cities. They do not experience the wasteland that the upper world has become. The illusion is total. Every appearance is actually produced by a machine, a gigantic computer, also called the *matrix*, which is run by some supposedly evil power of unknown origin.[5] The matrix is protected by an infinite number of self-duplicating agents. They function as a kind of anti-virus program within the matrix, eliminating any suspicious activity or critical thought. We follow a group of hackers or cyberpunk rebels who have broken the code and are hiding underground, and must make dangerous forays back into this gigantic sim-city, the matrix. They know it is all a hoax, a self-replicating evil machine that uses the energy from human beings as batteries. The hackers have come to destroy the matrix. The story has elements of apprentices in it. The hackers, and the hacker hero Neo (Keanu Reeves) in particular, learn gradually to decode the codes of the matrix so as to better and more easily fight the agents. Thus, the hackers enter a virtual world that obeys laws and speeds of a different order, a strange space of simulations somehow outside or beyond real space and real time. The hackers move somewhere in-between the two worlds, the real and the simulated. They are able to crawl into the interstice between every communication and representation in the city, inside the networks that condition what the citizens can see. In many ways, the whole film enacts the fantasy of entering into a computer and travelling and behaving according to the speed of information. The scenario is, in other words, proto-typical for a digital age and implicitly, as Boris Groys would have it, reflects on the possibilities and dilemmas of digital cinema in relation to both the reproduction/simulation of reality, as well as the relationship to gestures of delay and arrest typical of new media artworks and new media platforms such as the DVD and the computer (see also Groys 2002: 13f).

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4   When I published my arguments for this observation in Røssaak (2006), Vivian Sobchack published an article in the same anthology (Sobchack 2006), where she argued for a similar observation in regard to the relationship between mobility and immobility in early cinema and digital cinema. We both use Tom Gunning's concept of attraction as a starting point. While I base my findings on *The Matrix*, Sobchack uses *The Hero* (Zhang Yimou, 2002) as her example. While she relates the reversal of the processes between motion and stillness to a philosophy of aesthetic defamiliarization (cf. Shklovsky 1989), I focus more on the complexity of negotiations with other art and media forms.

5   The origin, form or status of the evil power is unknown in the first film *The Matrix*, but it is clarified into banal proportions in later sequels: it seems to be a sly looking man with a foreign, that is, French accent.

Fig. 1: Trinity jumps frozen time style (film still from *The Matrix*)

FREEZE!

The Matrix opens *in media res* in a dramatic chase scene. Somebody's talking on a telephone. A computer screen fills the image. The numbers on the screen showing algorithms may indicate that this line is being tapped. Then the camera suddenly moves *into* the green numbers on the screen and into, perhaps, cyberspace. A group of policemen are preparing an action in some dark hallway. They line up in front of a door. The location is dark and shadowy; the style is neo-noir meets S&M, and the scene is soon set for the film's greatest attraction. Approximately two minutes into *The Matrix*, the audience encounters the first use of the bullet-time effect. Cyberpunk rebel Trinity (Carrie-Anne Moss) hides in an abandoned downtown hotel trying to hack into *the system*. She is interrupted by a group of policemen breaking into the apartment. A policeman screams "Freeze!" and it looks like she surrenders, but as the policeman is about to handcuff her, she turns around and swiftly breaks his arm. She runs towards the next policeman

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and jumps up in the air. As a master in martial arts, she prepares to strike a blow to his face. Suddenly she appears to freeze in midair while a camera seems to track 180 degrees around her.[figs. 1, 2] A raucous soundtrack evaporates into a calm silence. Trinity appears to float like a ballet dancer in an impossible pose in thin air. She is frozen and the camera flows around her as if it were skating on ice. It is as if we have entered a limbo between the movements of film and the otherworldly contemplation of a sculptural freeze. A second later, the film mutates back into normal speed and Trinity's foot hits the policeman with enormous power, sending him crashing into the wall. She throws a chair at the third cop and swerves away from the fired bullets before she hits the last cop. The danger is temporarily over; she turns around and picks up the phone. While she talks to her superior, she significantly turns her head around and in a close-up she stares right into the camera, at the audience. It is as if she is asking the audience in an aside: did you see that, did you like it? The gesture of looking the audience straight in the eye temporarily breaches

the limits of the diegesis as a direct address to the audience. The gesture is reminiscent of the attractions of early cinema. "The aesthetic of attraction addresses the audience directly," writes Gunning (1999: 825); "its energy moves outward towards an acknowledged spectator rather than inward towards the character-based situations essential to classical narrative" (Gunning 1990: 59). Trinity's address to the audience is an exception in this film, but it still appears at a crucial moment, right after the mind-boggling bullet-time effect.

The bullet-time effect appears as a rupture in the film; it suspends the time-flow and the narrative abruptly and it happens at a crucial moment of high-speed action, at the moment where a super-fighter is about to prepare for some of her most magnificent tricks of the trade. At the simplest level, and in most catalogues of narratology, this kind of special effects scene will be described as a form of slow motion used to convey enormous power, super-fast motion, and unusual fighting abilities.[6] This is a fairly legitimate explanation, but my focus is rather on how this special effect partakes in a refashioning of aes-

thetic qualities of older art and media forms as well as the implicit re-imagining of aesthetical problems concerning time and space as a source of new sensations.

The bullet-time effect induces a series of special sensations in the spectator. When Trinity's body freezes suspended in the air, the image enters a very special state in between motion and stillness, and in between a temporal ordering and a spatial ordering. This creates the sensation of being in a very complex passage between cinema and perhaps a sculptural mode of experiencing something, that is, physically encircling an object.[7] But the appearance is not simply sculptural. Due to high-speed camera technology, we have paradoxically moved from slow-mo to no-mo within a mobile frame.

Some of the unique character of the effect may be easier to grasp when compared to the magical last moment of *Les Quatre cents coups* (*The 400 Blows*, 1959) by François Truffaut. When the troubled Antoine reaches the sea and then turns around and looks at the audience, the frame is stilled on a medium shot of the boy, but the camera uncannily continues to zoom in to a

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6   See Bordwell and Thompson 2004. See also Boggs and Petrie (2008: 203-212) for a typical list of the uses of slow motion in classical and post-classical narrative cinema.
7   The effect's aesthetic negotiation with a sculptural mode of appearance is significant. The sculpture is in many ways the most immobile and the most auratic of the arts, the cinema the most mobile and the least auratic of the arts, according to Walter Benjamin (1979: 211-244).
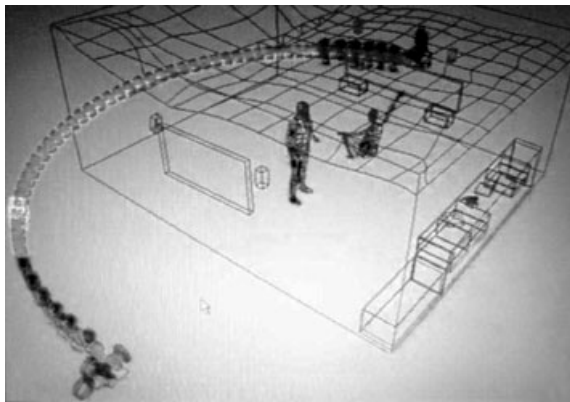
Fig. 2: In the first appearance of the bullet time effect 48 still cameras are arced in a half circle around Trinity. This is a graphic model of the set. (Still from behind-the-scene feature on *The Matrix* DVD)

close-up of the still. In *The Matrix*, the bullet-time effect is of a different order. The bullet-time effect even has a history that can be traced quite specifically back to Eadweard Muybridge and his photographic motions studies (more on this below). This so-called Muybridge effect was not used extensively in film before the experiments of artist-scientist Tim Macmillan in 1980, when he started experimenting with the relationship between new technology and the theory of cubism. During the 1990s, director Michel Gondry used the technique in commercials such as Smirnoff's "Smarienberg," Polaroid's "Live for the moment," and Virgin Records' music video "Like a Rolling Stone" (see Linnett 1998). The year *The Matrix* was released something similar to the bullet-time effect was also used in the film *Titus* (Julie Taymor, 1999).

But the effect was not widely known to the cinema audiences before 1999, when the special effects team of The Matrix refashioned and refined the technique into what they called the bullet-time effect. Here a large number of digital still cameras are placed in an arc around the actress (see fig. 2). Each of the cameras takes a large series of digital still photographs within the same fraction of a second, that is, several snapshots are taken

simultaneously from 48 different angles. These images are subsequentially re-edited so as to create a film-sequence simulating an impossibly fast and smoothly revolving camera movement. To avoid disturbing flicker-effects, computer grafted images of the actress are also digitally interpolated into the sequence. When several hundred images produced within the same fraction of a second are played back in normal time, that is, 24 fps, we are presented with a sequence of images, which do not present an ordinary time sequence, but literally present a spatialization of a fraction of a second. Time becomes space. But that is not all. Equally fascinating are the transitions between senses of mobility and im-mobility. The two high-speed movie cameras at the head and tail of the rig of still cameras make sure the transitions are smooth. These specially made cameras, called photo sonic high-speed movie cameras, can adjust the speed of frames per second via a computer program while shooting a live action sequence. Complex algorithms make sure that the speed of action (actually, of frame?) moves gradually and musically from a crescendo to a decrescendo and back. Thus, we move from a sequence of stills *outside time*—a Zen Buddhist moment of stillness—back into time. The next moment of action that we were waiting for, the super-fast kick at the jaw of the policeman, restores the out-of-jointness of time. A very complex digital editing procedure makes sure that the spectator is taken on a never-before-seen roller-coaster ride from high-speed action to a process of deceleration and into a freeze-like Zen-moment before the film accelerates smoothly and takes us back into high-speed action again.

We are taken from a sequence of time into a sequence outside time and back into time again. But the time called "outside time" here is not experientially outside time; the spectator experiences it *in time*, that is, he or she gets a chance to *see* something that is outside time while time is running. The effect of this strange inside and outside time is of course also a result of the fact that it takes place inside a narrative. A narrative unfolds in time. It is very rare in a narrative film, except in the

use of the classical freeze frame, etc., that moments of description unfold outside of narrative time in this way, but here it does—in a completely new way. The malleability of the virtual body and the film edit enter into a sublime cooperation. The poor policeman should never have shouted the word "Freeze!" The ease and flexibility of the bullet-time effect in the treatment of any bodily movement and configuration of body, time and space astound the audience. They literally experience new bodily sensations as Trinity enters new time-space dimensions. Gaeta concludes as much: "All of these techniques and alterations in time created new physiological and psychological moments for the audience."[8]

Trinity's bullet-time sequence has a strange sense of immobility and an outside of time quality. Film Studies still lacks a good name for this kind of extraordinary special effect. It looks like a sequence of ordinary slow motion produced by a single high-speed camera, but technically it is the result of a large number of still cameras simulating the slow movement of a motion-picture camera, a kind of dolly shot and a swish pan of paradoxically crisp images slowed down. Is it possible? The clue is: the camera seems to move, but time stands still. Trinity floats, freezes. The strange mix of movement and stillness in the effect challenges some of the habitual ways of talking about cinema. André Bazin argued that cinematography liberates the arts from their "convulsive catalepsy" (Bazin 1967: 15). The bullet-time effect extends the language of cinema and renews its relationship to what Bazin called "the tortured immobility" (11) of sculpture and painting. The effect explores sensations in the passage in between the still and the moving. Cinema here renegotiates its relationship to other media and art forms in a new way.

We have already pinpointed one of the most revolutionary technical aspects of this effect in the Trinity sequence, that is, the way it combines stasis and kinesis in the same image sequence. The bullet-time effect combines two opposing aspects of the ontology of the image as Bazin has analyzed it: it embalms an object outside time (like photography), and circles an object, that is, it embalms the unfolding of time (like cinema). The represented object, Trinity, is captured in midair, frozen, evoking the technique of instantaneous photography. Photography is, as Bazin writes, the art of freezing a moment of time. On this level the effect evokes photography, but in itself this is not at all an uncommon technique. The use of frozen images, still-images, or the inclusion of photography is not uncommon, as seen in the Truffaut example. The tricky thing with the bullet-time effect is that it both captures a figure at a moment in time like in photography, and circles around the captured object in a way only cinema can do. But the circling camera circles around an object, which is completely stilled (the body of Trinity). The object does not unfold in time. But still… time unfolds, the camera moves, and cameras move in time. Bullet-time demonstrates a hyperbolic version of Erwin Panofsky's legendary statement from 1934: cinema is the "*dynamization of space*, and accordingly, *spatialization of time*" (Panofsky 1999: 281). But the way this is done with the bullet-time effect creates a further paradox.

Here, cinematography renders visible a relation to its other—immobility—in new ways, while at the same time retaining the appearance of extreme cinematics. In this way, cinema borrows energies from the suspended stasis of earlier arts such as the sculpture. In the bullet-time effect, the audience is moved from a portrayal of the living as animate to a moving portrayal of the living as inanimate, or sculptural. The mobile frame of the freeze-time shot keeps the imagery within the medium of cinema, in the sense of cinema as living pictures, but the way it re-figures the relationship between the still and the moving—the animate and the inanimate—in the same shot, thickens the aesthetic experience, which begins to oscillate between a sensual experience of the cinematic *and* a sensual experience of something we can associate with the sculptural.

To a certain extent, the association toward the quality of the sculptural is quite to the point. The bullet-time effect, at least the first version of it in Trinity's scene, shares a fundamental quality with sculpture. The circling

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8   This quotation and information on technical features of the bullet-time effect are taken from Martin (1999: 66-89).

camera-movement so typical for the bullet-time effect also simulates the mobility of the spectator of a sculpture who may walk around the object. The spectator moves while the object is frozen. But the evocation of the principles of classical sculpture may seem to serve several purposes.

CINEMA AND SCULPTURE

To understand how cinema can evoke the sculptural, it is important to understand some of the ways the traditions and aesthetics of sculpture have also been governed by a relationship between aspects of mobility and immobility, although differently of course, than in cinema. In the history of art, the tension between the materiality of a medium and its potential level of kinesis, for example, using the "immobile" marble or bronze to depict a strong sense of movement, has been important at least since the ancient Greeks. Art historians have often treated the presence of the play between the actual immobility of the support (stone, canvas, etc.) and the appearance of motion in a painting or sculpture as a sign of quality. Today it is commonplace to view the history of art, that is, the transition from the archaic to the Classical and the Renaissance, as fundamentally a history in which the representation of motion is transformed from being indicated by simple signs or graphic poses, as in Egyptian art, to the representation of motion, as in the art of illusionism in the Renaissance and the Baroque. The dialectic between stasis and kinesis is striking in the works of art historian E. H. Gombrich. His comment on the famous *Statue of Bartolomeo Colleoni* (1479)(fig. 3) by Andrea del Verrocchio, Leonardo da Vinci's teacher, is typical. This bronze is great, according to Gombrich, because it looks as if General Colleoni is "riding ahead of his troops with an expression of bold defiance" (Gombrich 1989: 221). Gombrich cannot explain in any simple way why it looks as if the statue is moving. He simply talks of a certain "energy": "[T]he greatness and simplicity of Verrocchio's work […] lies in the clear outline which his group presents from nearly all aspects, and in the concentrated

energy which seems to animate the man in armour and his mount" (ibid.). Still, it is important to consider the fact that the concentrated energy that animates the man is not overstated. Things that seem to move too much may lose the dignity these Renaissance monuments strive for. That may be the reason Bazin linked what he called a "tortured immobility" specifically to Baroque sculptures, because they tend to be made with a sometimes too-strong desire to make a sculpture that seems to be moving. Their faces sometimes look as if they are struggling to get their bodies in motion, as if that is their strongest desire.[9] They may, in other words, look tortured by their own material immobility. The calm, but firm harmony of concentrated energy dominating the impression of a monument such as Verrocchio's *Statue of Bartolomeo Colleoni* does not emanate this kind of "tortuous immobility." Rather, it emanates harmony, dignity, and power. This is also one of the qualities conveyed in the bullet-time effect. The way Trinity's body is frozen while preparing the lethal blow likewise gives her harmony, dignity, and power. Even if Trinity in this scene is supposedly moving super-fast, she is nevertheless represented as doing it with a sculptural dignity resembling Verrocchio's *Statue of Bartolomeo Colleoni*.

But still, Verrocchio doesn't leave out all traces indicating motion in his sculpture. As Gombrich underscores, Colleoni *is* animated with a concentrated energy. There is a certain energy that animates the inanimate; it is an energy that imbues the immobile with movement of some sort. How can the immobile appear to some of our senses, but not intellectually perhaps, as moving?

Sergei Eisenstein has written several articles on this issue, and to him, these evocations of movement in the arts before the invention of cinema are due to a kind of cinema *avant la lettre*. Among his richest articles on the issue is the long essay entitled "Laocoön," which is a comment to Gotthold Ephraim Lessing's *Laocoön: An Essay on the Limits of Painting and Poetry* from 1766 (see Eisenstein 1991). Eisenstein's reading of this essay is obviously linked to his particular conception of the history of art, where movement is plotted as part of a politi-

9   A good example of a Neo-Baroque sculpture with this kind of extreme Baroque desire to move is Jean-Baptiste Carpeaux's *La Dance* (1869) situated on the right side of the façade of the Opéra Garnier in Paris.

cal history, and the arts are gradually being liberated through their increasing access to means of dynamic expression and movement, until finally, the revolution comes with the art of cinema, the absolute art of mobility. The *Laocoön* essay is well known for dividing the arts into temporal arts (poetry, music, etc.) and spatial arts (painting, sculpture, etc.). The value of each artwork, Lessing writes, lies in the way it observes the limitations of the medium:

> It remains true that the succession of time remains the province of the poet just as space is that of the painter. It is an intrusion of the painter into the domain of the poet, which good taste can never sanction, when the painter combines in one and the same picture two points necessarily separate in time, as does Fra Mazzuoli when he introduces the rape of the Sabine women and the reconciliation effected by them between their husbands and relations, or as Titian does when he presents the entire history of the prodigal son, his dissolute life, his misery, and his repentance. (Lessing 1962: 91)

Eisenstein disagrees with Lessing's normative approach, but, nevertheless, Lessing is looked upon as a transitional figure. Eisenstein quotes from the preface of the Russian translation of Lessing's *Laocoön*. Here Lessing becomes the hero of a struggle "between two diametrically opposed views on art: the aristocratic courtly attitude" and "the bourgeois-democratic attitude" (Eisenstein 1991: 156). In this scenario, Eisenstein puts himself in "a further, third stage": the synthesis. According to Eisenstein, Lessing's aristocratic opponents defended and extended the primacy of static pictoriality "even into the dynamic art forms (that is, poetry)" (Eisenstein 1991: 157). Lessing criticized this attitude and removed from the art of poetry, as Eisenstein observes, "the enslaving function of depiction." Lessing, Eisenstein continues, "stresses the principle of dynamic coming-into-being, [but] without admitting it beyond the confines of poetry [and music]" (ibid.). Eisenstein believes that Lessing was

Fig. 3: Andrea del Verrocchi: *statue of Bartolomeo Colleoni* (*Il Monumento a Bartolomeo Colleoni*, Campo SS. Giovanni e Paolo, Venice, 1479) Photo: Eivind Røssaak

not able to see that this latter principle is pregnant with the future of all the arts, as they are realized in cinema: "in Lessing's day neither Edison nor Lumière had yet supplied him with that most perfect apparatus for research and assessment of the aesthetic principle of art: the cinematograph" (154-155).

Eisenstein re-reads the history of art according to the gradually emerging aesthetic principle dominating the, to him, most technically advanced art form, cinema. According to Lessing, only poets, not painters, ought to challenge the primacy of static pictoriality. But to Eisenstein, it was importunate to celebrate the tendency towards dynamism, the principle of the future, wherever it crops up, like in the drawings and paintings by Daumier and Tintoretto. "The 'trick' of the unusual mobility of their figures is purely cinematic," he says (111). He analyses at length some of the characteristics at work in paintings by these two artists, and it is the montage principle he is looking for. It is not clear which Tintoretto painting Eisenstein is referring to, but *St. George and the Dragon*

Fig. 4: Jacopo Robusti Tintoretto, *St. George and the Dragon* (1560) (The National Gallery, London)

(1560) is a good suggestion. Here Tintoretto upsets the integrity of form and literal reality by using what Eisenstein calls the "chopped-up" method (110). That is, he spatially juxtaposes three scenes (the heroic deed of St. George, the divine revelation and the escape of princess Sabra), which were originally separated in time. This creates enormous tension and drama in the image. Additionally, the movement of each image group is given force, direction, and energy by being guided by what Eisenstein calls "the law of *pars pro toto*" (ibid.), that is, the depiction of parts substitutes for the whole. Each limb of the body indicates metonymically the phase of the movement of the whole body. We experience a strange co-presence of temporally conflicting gestures, all of which animate the image with movement, particularly the figure of Sabra. Eisenstein's ability to explain emotional phenomena with scientific precision is exquisite.

> Unlike the miniatures of the Middle Ages, however, they [Daumier and Tintoretto] do not give the temporally sequential phases of the movement to one limb [of the body] depicted several times [like in some Futurist painting] but spread these phases consecutively over different parts of the body. Thus the foot is in position A, the knee already in stage A + a, the torso in stage A + 2a [...] and so on. (ibid.)

This is a very apt description of princess Sabra's dramatic body. She is animated by a series of almost impossible gestures. Her left hand and upper parts of the body are moving away from her right hand, which seems to already be in a future present. Her head and parts of her lower body and feet seem to belong to an earlier phase of the movement.[10] Perhaps her thigh and knee are already placed in a future phase. Is she running, walking, kneeling or even falling? It is hard to tell. The curtain blowing violently in the wind further dramatizes the heterogeneity of the movement.[11]

The bullet-time effect has a similar way of concentrating the kinetic energy. On the one hand, the repre-

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10   This kind of temporal montage is rare in cinema, but Viola's reconstruction of the compositional logic of Mantegna's group painting may be said to use this form of montage where one image juxtaposes spatially five figures seemingly separated in time.

11   In addition, there is an optical illusion in *St. George and the Dragon* that further enhances the *cinematics* of the attraction here. When one moves in front of the image, Sabra's outstretched hand seems to poke right through

the canvas and reach out after the viewer, no matter what angle she is seen from. The effect works in the same way as the cinematic images of early cinema: "[it] displays its visibility, willing to rupture a self-enclosed fictional world for a chance to solicit the attention of the spectator" (Gunning 1990:57).

sentation of Trinity is static, she is frozen; on the other hand, the way she appears is extremely dynamical because of the dizzying camera movement. In a way, the representation combines both the serenity of sculptural calm and Baroque madness. But the way she appears, if the images are isolated, is closer to instantaneous photography. While a sculpture (or a painting) can create the impression of movement as a function of a temporal displacement within the representation of a single body or a group of bodies and faces, the photograph—at least the classical instantaneous photograph—cannot. In cinema, on the other hand, movement is created when a series of still frames passes through a projector, which "reduces them to a single process which our perception interprets as movement," (Eisenstein 1991: 109). The bullet-time effect uses this process to create the impression of the appearance and logic of sculpture. But it is not the principle of *movement* of a sculpture that is evoked; it is rather the calm, indeed the aura of the sculpture that is evoked. Part of this aura comes from the fact that a sculpture or a monument such as *Statue of Bartolomeo Colleoni* gets its power and dignity from the fact that the spectator can walk freely in a circle around the sculpture, and from all angles Colleoni displays this "bald expression of defiance that struck Gombrich." The circle around the object dynamically establishes—and with the help of the time passed circling the object—a power and a dignity that only grows. Thus, I would conclude that the evocation of the sculpture in the bullet-time effect is due both to the heroic freeze and the circular camera movement which recall the gesture of walking around a sculpture. Now, the effect also includes a clear association to Eadweard Muybridge's motion studies as well. How does this work?

EADWEARD MUYBRIDGE
AND INSTANTANEOUS PHOTOGRAPHY

During the second half of the 19th century, a series of photographers used a so-called instantaneous photography technique to study motion. The pioneer in this field was Eadweard Muybridge. In the 1870s, he developed a camera technique that was able to capture an object in high-speed motion beyond the realm of unaided human vision. The bullet-time effect is, in many ways, a digital and cinematic version of the older techniques of analogue instantaneous photography developed by Eadweard Muybridge, before cinema as we know it. Muybridge's scientific eagerness to use photography's ability to mechanically register nature as a means of testing, confirming, and constructing a total view of human and animal locomotion made him both famous and an object of ridicule. His early photographs of horses in motion from the 1870s where first received with scepticism. People didn't trust them because the images of the horses in action now looked different from how they appeared to unaided human vision. Thus, many thought the photographs were fakes. Muybridge showed—for the first time in history—that the so-called "flying gallop" position depicted in many earlier paintings simply does not occur in the way people and painters at the time believed. With Muybridge's instantaneous photographs a new technical medium could actually "see" elements in nature human vision is not fast enough to capture.

After his experiments with horses, Muybridge, again with the help of instantaneous photography, went on to produce some of the largest photographic studies of human locomotion ever conducted. Of particular relevance to the bullet-time effect are his shots of sportsmen in action from the 1880s. When comparing the stills of Muybridge with the bullet-time effect, especially the type represented by plate 522[fig. 5] from his catalogue (Muybridge 1979), the similarities are obvious. Plate 522 shows the result of the use of Muybridge's new speed cameras. The use of a new and fast shutter in combination with a new extremely light-sensitive plate that was able to absorb light faster than any other chemical solution at the time enabled Muybridge to shoot some of the most exact stills of human locomotion ever taken. Muybridge rigged six super-fast cameras in an arch around the naked body of a man jumping. The six cameras were triggered at the same time and produced six exact

images of the jumper in the air, at one single moment of time from six different perspectives. Muybridge's images were done primarily to see, for the first time, how the human body moves in different situations. Their primary value was at the time scientific, not aesthetic.[12] The bullet-time effect pulls out some of the fascinating aesthetic qualities hidden within Muybridge's scientific experiment. (Martha Braun would not agree here...)

It is interesting to note in this connection that the bullet-time effect does not recreate and allude to any of the other chronophotographic techniques used to study human locomotion before cinema, like Jules Marey's technique. The bullet-time effect relates specifically to Muybridge's technique. Some have thought that primarily Marey's chronophotographic style bears the most promising prospects for a future cinema, and not Muybridge's style. The reason for this belief lies in their techniques. Marey is famous for his photographic gun. It was shaped like a stylized weapon, and it was loaded with a photographically sensitive disc that spun as an exposure was made.

> With each successive exposure, the disc would spin slightly, enabling the operator to record the sequence of events. Characteristic of Marey was a concern with maintaining a single point of view, which is seldom in Muybridge's photographs. Marey produced most of his sequential images on a single plate [...]. The advantage of this approach was that it provided a single perspective from which the subject could be seen. Muybridge used a battery of cameras, each of which was separated from its neighbour by a variable distance, depending on the subject. (Prodger 2003: 167f)

Their difference is obvious. Marey develops the chronophotographic style into a registration of movements *in time*, each image is separated by equidistant intervals, and he uses only a single fixed lens. Muybridge develops the style into a registration of movements from different places *in space*. This resulted in a series of shots roughly perpendicular to the subject. Marey's style seems more similar to the modern film camera's way of shooting an event. While Muybridge in his early experiments with horses in motion incorporated both time *and* space. In some of his later studies of human locomotion like in plate 522, the element of time, of *chronos*, is dismissed. Here the human body is captured at an instant from six different angles in space, but outside time or temporal development. It is even questionable if this experiment can be called chronophotographic since it leaves out the element of time, but that is another debate. The important thing here is to note that in the Trinity sequence of the bullet-time effect this late style of Muybridge used in plate 522 is recreated and alluded to. Thus, the bullet-time effect has in other words proven that what I call Muybridge's late style also has an afterlife in digital cinema.

I have never seen or heard John Gaeta who created the bullet-time effect for *The Matrix*, give credit to Muybridge for the effect, but a reference to Muybridge is perhaps hidden in the fact that in the Trinity sequence Gaeta used 48 cameras (the number can be divided by 12, which is the number of cameras Muybridge used in some of his famous horse-experiments) and in the sequence featuring Neo he uses 112 camera (again a reference to the number 12). Nevertheless, the visual and technical evocation, consciously or not, of Muybridge's scientific experiment in the bullet-time effect brings forth unexpected sensations of a crucial aspect for which photography has always been hailed. Photography has revealed and celebrated its gradually increasing ability to capture an object at high speed. Portraying an object in an unnatural or unusual state has always been fascinating. Muybridge was a pioneer in this endeavour to capture fast moving objects to study them from any possible angle. With these photographic studies, he records the human and animal locomotion in positions invisible to the human eye, revealing new and unseen aspects of reality. The consequences of photography in this sense are eloquently summed up in a quote of Aaron Scharf in a comment on Muybridge's experiments and photography's innovative uses:
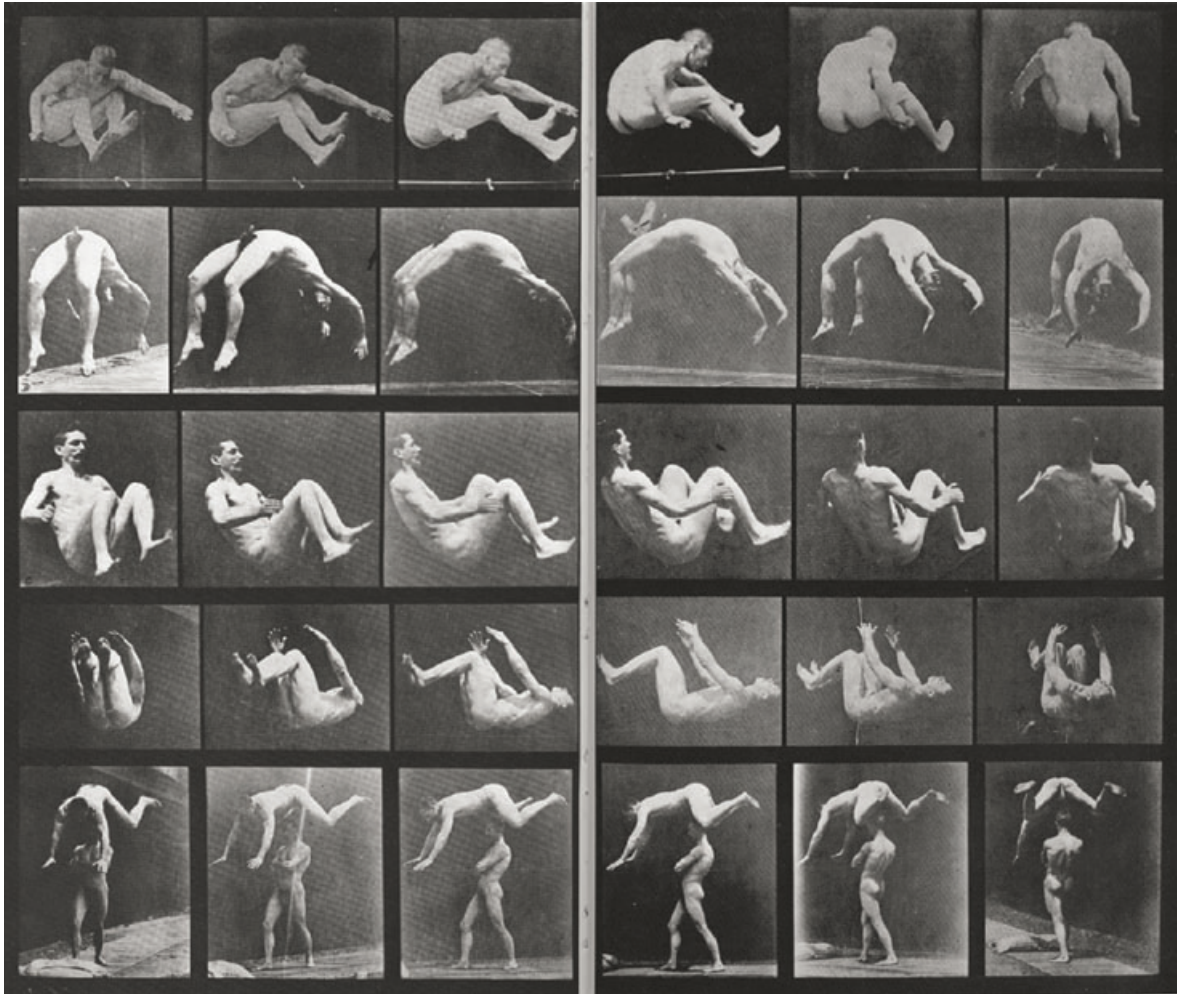
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Fig. 5: Man jumping (from Eadweard Muybridge's *Human and Animal Locomotion*, plate 522)

The meaning of the term 'true to nature' lost its force: what was true could not always be seen, and what could be seen was not always true. Once again the photograph demonstrated that for many artists *truth* had really been another word for *convention*. (Quoted in Mitchell 1992: 26)

I showed above how the bullet-time effect borrows dignity and power from the sculpture, but what does it borrow from evoking the motion studies of Muybridge's photography? I think it is two things, but in complex and partly conflicting ways. On the one hand, it seems to borrow a certain truth-effect from scientific photography, and on the other hand, it uses aspects of Muybridge's original set-up to create a new attraction. Let me explain the function of the truth-effect first. What is photographed is true; that we learn from Muybridge, and as Scharf extends it, a photographic rendition of a movement, that is, a decomposition of movement, will reveal truths unavailable to unaided vision. Thus, photography reveals not only truth in an ordinary sense (as in "seeing is believing"), but truth in a scientific sense, that is, science as a discipline concerned with objective, mathematical, measurable truths. In Muybridge's experiments, the camera is used as a scientific instrument of measuring the objective trajectory of motion. The bullet-time effect alludes to science, but not just any kind of science; it alludes specifically to the kind of truth-effect—or let me underline, the kind of truth *force*—in a motion study set up and made famous by Muybridge. The exact reference to Muybridge is of course not available to the ordinary spectator of the film, but some of its force may be there still. I would assert that if the spectator is familiar with Muybridge's experiment, the force of this effect is not lessened, but becomes even stronger and richer. How does the bullet-time effect play specifically upon the truth-force of the experiment? It emphasizes the camera's ability to show exactly what *really* happens. It alludes to the camera's truth function. This truth-function may be somewhat threatened in an age of digital special effects. Thus, it may be especially significant

to allude to the style of analogue chronophotography to restore this traditional truth-quality of photography.

While many special effects may lose some of their force by relying too heavily on digital or artificial imagery (so-called CGI) or by the diffusion of the image through the layering of darkness, fog or smoke to somehow hide the hoax, the bullet-time effect pretends to hide nothing and to reveal everything in detail and in slow motion. It paradoxically demonstrates that what looks unbelievable (how can she jump like that?), is actually true; this special effect is true. Usually, a special effect is by definition a veritable lie, a visual trick. This effect somehow wants to reveal itself as not a special effect at all. It alludes to scientific photography in order to evoke a contrast with the special effect's reputation as always being a hoax. While Muybridge demonstrated what ordinary human beings are capable of, by the same means the bullet-time effect demonstrates what extraordinary humans are capable of. By using the technique of digitally erasing the wires holding—the actress Carrie-Anne Moss' body stable in the air while the instantaneous photo cameras shoot her, the bullet-time effect is able to reconstruct the jump simulating Muybridge's analogue technique, as if the jump were done without any help or devices.

Secondly, the bullet-time effect uses aspects of Muybridge's original set-up to create a new attraction. It is important to distinguish between motion studies and the cinema of attraction. Why? Let me explain via a short comment Gunning made in the article where he connects the cinema of attraction to an aesthetic of astonishment (Gunning 1999). Gunning seems to implicitly refer to the Muybridge experiment when he tries to differentiate the style of the Lumière's exhibitor from what he calls "a scientific interest in the reproduction of motion." What is important to note here is that Muybridge's experiments were decompositions of motion. He was not trying to evoke the illusion of motion, but the *decomposition* of motion.[13] There is no doubt that the Lumières were familiar with Muybridge. Muybridge made headlines in Paris several times during the late 19th century.

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13   That is, in his scientific experiments Muybridge advocated decomposition. Later, he animated some of his photographs using a Zoopraxiscope to entertain a larger audience, but also to prove that his photographs weren't fakes, but images based on actual motions. As Gunning asserts, it is the transformation from still image to movement—from unfamiliar and often ungainly poses to satisfying, graceful, and natural movement—that constitute the *clou* of Muybridge's spectacles, their main event and attraction (Gunning 2003: 256).

Thus, when the Lumière's exhibitor demonstrated his fondness for using still images of motion, like Gunning has shown, one could think that he also was evoking Muybridge and the motion studies, but according to Gunning he was not:

> The initial projection of a still image, withholding briefly the illusion of motion which is the apparatus' *raison d'être*, brought an effect of suspense to the first film shows. The audience knew that motion was precisely what the cinématographe promised [...] By delaying its appearance, the Lumière's exhibitor not only highlights the device but signals his allegiance to an aesthetic of astonishment which goes beyond a scientific interest in the reproduction of motion. (Gunning 1990: 823)

In other words, the Lumières had interests that reached beyond scientific motion studies; they were working as much on how motion—or the correct presentation of motion—can increase the level of astonishment and shock, according to Gunning. I have no reason to deny Gunning's assertion in this case, but in the case of the bullet-time effect, I believe the interests are perhaps more complex. Here the motion in question is namely a motion related to jumping—even somehow flying in the air. There is no doubt to me that both an element of scientific analysis and an aesthetic of astonishment are involved in this effect. Even if the ultimate goal of the effect is not scientific analysis, part of its sensation has to do with giving the audience a chance to see what a flying jump actually looks like in the air. But as Gunning writes, the *combination* of the still with a surprising swerve toward motion in the Lumière premiere is part of an aesthetic of astonishment rather than the science of motion studies. No doubt, this is correct. But I will assert that in reconstructing the camera set-up of Muybridge's scientific experiment, the bullet-time effect's combination of stillness and motion in the same sequence of images combines science with astonishment in a mind-blowing way. The phrase "mind-blowing" is used on

purpose here, because science is not supposed to blow the mind away, but to appeal to reason, to a gathering of all the faculties of reason, not a blowing away of these faculties. The bullet-time effect seems here to restore some of that strange allegiance between science and circus, which was so popular in the decades leading up to the invention of the cinema.[14] Today, this allegiance is most obvious in the genre of science fiction cinema. It is as if part of the thrill of such films comes from the combination of science and astonishment on many levels. They not only harvest the dangers of new sciences as fodder for stories (like in the typical science fiction plot: the machines take control, etc.), they also *use* new science (the application of the digital in contemporary cinema and in special effects in particular), and allude to (old) science and techniques in new ways (like in the bullet-time effect). The paradox of humans versus machines in *The Matrix* also has an ironic twist in the sense that in this film, mankind's final victory over digital machines is told in a style completely dependent on digital special effects through and through. Even the bullet-time effect has this paradoxical dichotomy integrated into its structure. This effect pretends to reveal the objective truth of real human locomotion, but without the help of digital after-effects, that is, the interpolation in the film of non-photographic, CGI-based reconstructions of the bodies of the actors, the effect would not appear smooth and natural at all, but as an old fashioned and uncomfortable stroboscopic flicker effect. In other words, the realistic illusion in this film had to be aided by the digital at every turn, or to put it more dramatically; the reality-effect is constituted here by the digital.

CONCLUSION

In this article we read how the bullet-time effect functions as an instrument to renegotiate aesthetic relationships with principles borrowed from sculpture, photographic motion studies, and early cinema. The bullet-time effect is not simply an effect that breaks with all previous forms of representational procedures. It is an

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14   The history of this allegiance between science and magic is the theme in Christopher Nolan's film *The Prestige* (2006).

effect that creates a new attraction by implicitly renegotiating other art and media forms according to, or in alignment with, new digital techniques. Here the sculptural is not negotiated as a static, old-fashioned or regressive form (as in for example Eisenstein's *October*, 1928, where statues are literally smashed), but as a source evoking dignity and power, as seen above. Likewise, the Muybridge style motion studies are negotiated on many levels. The technique is in part borrowed from and inspired by Muybridge, and the aesthetic appearance of the bullet-time effect takes the impression of these images and recodes them within a narrative where it is used to portray superhuman abilities.

We also saw that the bullet-time effect renegotiates aspects of the technique of presentation, which Tom Gunning associates with early cinema. The bullet-time effect makes the spectator aware of a certain tension between mobility and immobility, but differently and in a rather reversed way if compared to the Lumière screenings. In the bullet-time effect cinema has created a new attraction by negotiating with and borrowing from the appearance of sculpture and still photography. Here the spectator is not simply moved from immobility to mobility which was so crucial in early cinema. The bullet-time effect conveys an extraordinary aesthetic appearance of not simply mobility, but by how effects of immobility affect a mobile figure at its most mobile moments. This creates a new cinema of attractions. It lures to temporarily put cinema under erasure in an almost complete surrender to immobility, so as to kick the audience even harder the next time. Just like Trinity.

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