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**Opificio
delle
Pietre Dure**



BOOK OF ABSTRACTS

**Colour Photography and Film: sharing knowledge of analysis,
preservation, conservation, migration of analogue and digital materials**

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ORAL SESSION 1 – March 29th 2021, 10:00 -11:20

The Jos-Pe process in the Jacob Merkelbach collection at the Rijksmuseum of Amsterdam

Laura Covarsí

Rijksmuseum

The Rijksmuseum Amsterdam holds a collection of 208 photographs from the Merkelbach Studio (1907-1961 in Amsterdam). At least 28 were made with the Jos-Pe technique, which was invented in Hamburg in 1924 and remained in use for 20 years. This photographic process allowed Jacob Merkelbach to offer his clients a product that was very exclusive in the 1930s: color prints. This dye imbibition process is part of the early history of commercial color photography, as is Kodak's Dye Transfer prints (1946-1990). Books dedicated to color photography only have sparse information about this specific technique. The fact that the Jos-Pe process was commercialized under several patents makes it even more difficult to find detailed technical information. Unfortunately, none of the patents reveal information relevant to their conservation: the materials used to make them.

This research project began with the characterization and visual examination of Jos-Pe prints on paper and three-color printing screens on glass that are part of the Rijksmuseum's Merkelbach collection. The scope was soon extended through the study and comparison of these objects with the collection of an Spanish amateur photographer held at the Institut d'Estudis Fotogràfics de Catalunya (IEFC) in Barcelona. This archive includes booklets from the Jos-Pe company, invoices and correspondence, print examples and never used Jos-Pe paper. The Rijksmuseum Jos-Pe prints and plates, as well as (aged) mock-ups were examined and analyzed with different techniques: specular light, UV fluorescence, microscopy, XRF, liquid chromatography UPLC and spectrophotometry. A cross section obtained from an unexposed JosPe paper kept at the IEFC made it possible to determine the prints' structure: a paper coated with a thin layer of barium sulfate, topped with a thin layer of gelatin. The analyzed glass plates revealed the use of dyes such as Carmine, Induline Blue and Dianil Yellow 2R. Fading tests performed on mock-ups made of the red dye showed a 1-2 Blue Wool Standard lightfastness. The lightfastness of the blue and yellow dyes is the subject of further ongoing research. So far, these findings have provided valuable insight into this early commercial colour photographic technique. The results of this research provide a better way to identify and understand Jos-Pe examples in collections and consequently adjust standards related to their preventive conservation, treatment procedures and display options.

Truelight and Film Simulation

Richard Kirk

FilmLight

Truelight was an early FilmLight product that simulated the look of film on a monitor. This allowed graders to preview how their digital images might appear when recorded to film, printed, and projected on a screen. This involved charactering each part of the film-out process

as it was in about 2004: the recorder and internegative stock, the print lab and the print stock, and the projector and its lamp spectrum.

Truelight provides a snapshot of the whole grading and film out process when film list dominated motion pictures. The tools that Truelight used also allowed us to capture existing film processes, such as bleach bypass, and cross-processing; and also to simulate old processes, such as Kodachrome, and Technicolor.

“Ceci n’est pas un Polaroid”. The materials and colours of Paolo Gioli’s works

Sandra Maria Petrillo

SMP Internaytional Photo Conservation Studio

The phrase “Ceci n’est pas un Polaroid” (This is not a Polaroid) is a reference to Magritte’s famous painting “Ceci n’est pas un pipe”, with which the surrealist painter ironically presented the relationship between reality, representation and meaning. Paolo Gioli (born at Sarzano in 1942, currently residing in Lendinara, Veneto region – Italy) brought much the same kind of disruptive energy to the art of photography, which he came to after a training in painting and experimental cinema. In Milan, in the mid-seventies, he started to use the Polaroid not so much as an industrial photographic procedure with a commercial use, but as an extremely versatile expressive means for exploring materials and colours, which can go far beyond the “instant photo” invented by Edwin Land.

In an operation that the surrealists would have approved, the artist deconstructs and reinvents the various Polaroid formats and processes for his own creative purposes, using all the constitutive elements of their multiple physical and chemical layers of materials and dyes. He intervenes on every element of the Polaroid process, disassembling the films, paper supports, protective layers, frames and templates made of black paper and metallized plastic, as well as the chemical reagents themselves, manipulating them with his personal artistic gestures, and finally attaching them to the centre of a sheet of drawing paper.

The result of this extraordinary kind of modern alchemy is a series of what he defines as “compositions”. These compound images are made of film negatives and photographic paper, or are the result of Polaroid “transfers” onto paper, using the emulsions as a printing matrix. In the darkroom Gioli intervenes on the photosensitive layers of his images, produced by contact or projection. He uses the chemical reagents to create an additional image on the white and semi-transparent weave of pieces of serigraph silk, and then adds them to his compositions next to the photographic positive. Light is an important compositional element in the artist’s work and it is applied, often playfully, by shining it through cardboard templates, which trace luminous geometric marks in all the colours of the visible spectrum. He often expands the picture space of his compositions with the addition of miniscule strokes of graphite and coloured pencils.

Painting, photography and cinema all converge in Gioli’s work. He deconstructs and reconstitutes a range of artistic approaches and techniques, in addition to the complex relationship between visual representation and reality.

In recent years SMP Studio has conducted many preventive conservation and restoration interventions on Gioli’s works, thereby acquiring an in-depth knowledge of the artist’s techniques and the conservation issues regarding the particularly fragile materials and colours involved. We are now willing to share our expertise in this presentation.

The long-term development of three-color Kodachrome. An odyssey from the additive to the subtractive method of color reproduction

Nicolas Le Guern

Independent researcher / Cokin KT s.a.s.u

The introduction of three-color Kodachrome in 1935 was possible thanks to the long collaboration between the independent inventors Leopold Mannes and Leopold Godowsky and the managers of the Kodak Research Laboratory at Rochester, New York. This presentation considers this long research work initiated in 1917 by examining the technological solutions Mannes and Godowsky progressively followed, in the historical context of the first cinematographic additive processes.

The two researchers tried to improve the additive technology of color reproduction based on existing processes such as Kinemacolor and Prizma. They faced the complexity of adapting their first additive process to the existing projection apparatus. They progressively realized that the additive principle was a dead end and that only an elegant but theoretical subtractive process at this time could constitute a solution to the proper reproduction of natural colors. Besides the technological context, my presentation analyzes the evolution of Mannes and Godowsky position into Kodak research. Working independently at the beginning, the two young men were funded by their families first, then by Eastman Kodak and Kuhn, Loeb & Co, experimenting in their personal laboratory. In a second step, Mannes and Godowsky were finally employed by Kodak in 1931 as consultant researchers and incorporated with the team of the Kodak Research Laboratory at Rochester.

Despite a fierce competition with the fundamental research of Technicolor in photographic chemistry and the patent strategy of the director of research Leonard Troland, Mannes and Godowsky were able to develop a two-color cinematographic process, which finally evolved in the three-color Kodachrome process. This innovative process was announced in April 1935, despite the fact that the Kodak researchers did not succeed in finding a correct development process for exposed films. The presentation clarifies the hard work done in the American laboratory to find a correct sequence of chromogenic development in the summer 1935. When the photographic version of three-color Kodachrome was introduced in 1936, the development issue was solved, but the corresponding process was complicated as it involved no less than 28 stages. My presentation concludes this long research odyssey by showing how the Kodak research team was able to drastically simplify the development process of exposed Kodachrome rolls in 1938, encouraged by the recent German competition and the Agfa Color Neu process. The description of this technological evolution from the additive to the subtractive method of color reproduction stresses the correlation between the conduct of a constant innovation by big firms in the photographic and movie industry and the progressive rise of a new visual culture in color in the second half of the twentieth century.

ORAL SESSION 2 – March 29th 2021, 11:30 -12:50

Two Prizma Color films, a curious finding in the Mexican National Film archive

Paolo Tosini

Centro sperimentale di cinematografia, Sede di Lecce

Few years ago an important collection of silent movie was found in the National Mexican film archive. The collection did not contain any Mexican movie, unfortunately, but it was rich in coloring techniques of the silent era; two findings were particularly interesting, the first on the Apache trail (1921) in the United States and the second on the clay making in Ohio (probably '20).

The added value of both titles is that they were shot using the Prizma Color technique, a very original color processing invented around 1913 by William Van Doren Kelley and Charles Raleigh.

This particular color system was an subtractive color technique that eventually evolved into a bi-pack system:

“In its final form Prizma made use of duplitzed positive film. As in previous Prizma systems, the original negatives were alternate frame sequential exposures. The Prizma negative was printed on both sides of the positive film in a special printer. After developing in a normal black and white developer it was bleached in a bath that converted the two images to silver iodide” (Ryan, Roderick T. (1977): A History of Motion Picture Color Technology. London: Focal Press, pp. 91-94.)

Even if a complete restoration it is not yet completed, the films were a particular challenge for a proper conservation and film restoration.

The paper will examine the research on the film, the color process and suggest some possible restoration techniques.

"Making the beautiful even more beautiful": Luriki practice of hand tinting analogue photography in the late soviet epoch

Oleksandra Osadcha

Museum of Kharkiv School of Photography - Ukraine

The word 'luriki', known thanks to the similarly named series (1971-1985) by the celebrated Ukrainian photographer Boris Mikhailov, was used in the Soviet republics to define the utilitarian practice of enlarging, retouching and tinting vernacular portraits. Although the very idea of colorization of black and white photographs wasn't a Soviet invention, it's the context of the 1960s — 1980s that turned luriki into the social, economic and aesthetical phenomenon of the USSR.

It's claimed that, while colour photography was an essential part of the Western mass culture, it remained largely exotic for the Soviet consumers. Despite persistent attempts, the Soviet photographic industry was lagging behind, struggling to produce quality materials for colour photography, while foreign ones were extremely expensive, deficit, unavailable for ordinary photo amateurs. This factor, together with a tight state control, resulted in the emergence of the "shadow" business of luriki, which flourished in Kharkiv, the city on the East of Ukraine, during the Brezhnev and 'perestroika' eras (1960s-1980s).

State photo ateliers, located in the centres of consumer services (so-called "bytcombinaty"), offered similar options of colourizing portraits. However, they were available mainly in the big

cities, while the population of the countless provincial town (in Kazakhstan, Uzbekistan, Caucasus and other regions) often had no professional photographers. This was the target audience of the self-organized groups, engaged in luriki business. It was a multilevel system, involving several people: 'naborshchiky' ('gatherers', who were sent off to collect 'orders'), photographers, who enlarged and printed the images, 'pokraschiky' ('overpainters', who coloured prints), retouchers (who removed/added details according to the client's instructions), 'zakatchiky' ('sealers', who arranged a protective cover for the finalized portraits), 'prokrutchiky' ('errand men', responsible for transferring orders from executor to another) and 'khozain' ('master'), who controlled the whole process.

The paper will expand on the materials and technical specificity of creating 'luriki', their types, purposes and social significance. The final accent will be made on the migration of the 'low practice' into the realm of 'art', on the material of the projects by the authors of the Kharkiv School of Photography – an artistic movement originated in the late 1960s, which united several generations of photographers (like Boris Mikhailov, Evgeniy Pavlov, Roman Pyatkovka, Viktor and Sergiy Kochetov and others), who sought to broaden the conventional vision of photography language. The kitsch and anonymous nature of luriki inspired the artists to exploit similar techniques and aesthetic in the series that explore the (post)Soviet modus operandi.

Prokudin-Gorskii's technique of colour photography: colour separation, additive projection and pigment printing

Nadezhda Stanulevich

Peter the Great Museum of Anthropology and Ethnography (the Kunstkamera)

Russian scientist and photographer Sergey Prokudin-Gorskii (1863-1944) studied the additive method of colour photography at Adolf Miethe's laboratory in Berlin-Charlottenburg from 1901 to 1903. Prokudin-Gorskii photographed the Russian Empire between 1905 and 1915. The Library of Congress purchased Prokudin-Gorskii's collection the photographer's sons in 1948. The entire collection of glass negatives and albums with sepia-tone prints was digitized in 1999 and is available worldwide on the Internet.

As Adolf Miethe, Prokudin-Gorskii created his photographs by using a camera which exposed one oblong glass negative plate three times in rapid succession through three colour filters. In December 1902, Prokudin-Gorskii gave the first presentation of the additive method at the Photographic Section of the Russian Imperial Technical Society.

Commenting on his colour images that published in the journal *Fotograf-Liubitel'*, Prokudin-Gorskii mentioned that he developed a special emulsion that hypersensitized the Ilford "red label" plates. He opened a photographic lab called Prokudin-Gorskii's Art Photomechanical Studio at the early 1900s in Saint Petersburg. The Prokudin-Gorskii's Studio was a typical printing enterprise before the showing colour slides for Emperor Nicolas II on May 1909. Prokudin-Gorskii started to obtain patents in Great Britain, USA, France and Russia before the First World War for production of coloured slides, improvements in and relating to optical systems for the photographic camera, making multiple copies of colour slides etc. Some of them mentioned on *The history of three-color photography* (E.J. Wall, 1925) and *History of colour photography* (J.S. Friedman, 1945). For example, from the Russian patent in 1913, we can derive that he started to use colour separate negatives exposed through red, green and blue filters for printing two autotype clichés (for magenta and yellow inks) instead of making a glass slide like a "sandwich". Through gelatin solution, magenta and yellow images transferred from paper support to one glass plate. The third part was a cyan slide printed from a half-tone negative that had been exposed through a red filter. The last step was mounting both-glass slides - the magenta and yellow on one and the cyan slide on the other - together so that its result is one lantern slide. Sergey Prokudin-Gorskii wrote that in projection, the slides looked

like a pigment colour image. After the moving to Europe on September 1919, Prokudin-Gorskii founded a company “Société de Photochimie Elka” (later renamed to “Gorsky Frères”) in Nice in 1924. Before the 1950s, they specialized in commercial printing for Nestlé, Fléchet, L’Illustration and Figaro.

Prokudin-Gorskii’s notebooks (copies of them are preserved on The Polytechnic Museum in Moscow) speak of the history of colour photography and an especially additive method. These documents give evidence that Prokudin-Gorskii started to use film since the second part of the 1920s.

The origin of the colours of the first colour photograph: an absorption phenomenon

Victor de Sauve¹, Marie-Angélique Languille², Bertrand Lavédrine³

¹Centre de recherche sur la Conservation, ²CNRS, ³ Centre de recherche sur la Conservation-MNHN

The “photochromatic image” of Ed. Becquerel is well known to be the first colour photograph. However, the origin of the colours was still not understood until recently.

In 1848, Edmond Becquerel (French physicist, 1820-1891) developed a printing-out positive process to produce colour photographs onto sensitized silver plates [1]. Among the first images he obtained, he recorded the solar spectrum by directly projecting it onto the sensitized plate [2]. This very first colour photographic process did not see any practical development because of its low sensitivity that implies long exposure times, and because it was not possible to fix those images that slowly fade while exhibited. Although only a small number of photochromatic images have survived till today, these images have never ceased to intrigue with regard to the origin of their colours.

We will show how we produced in the lab photochromatic images samples following the writings of Ed. Becquerel [3]. The optical properties of sensitized and coloured plates we examined reveal that the absorption is the major responsible for the colours of the plates. This result, combined with a micro-structural study of the plates performed by scanning transmission electron microscopy, led us to propose a plasmonic origin of the colours of the photochromatic images [4].

[1] Becquerel, E. « Chapitre IV. Reproduction des couleurs par l’action de la lumière ». In *La lumière, ses causes et ses effets. Tome second : Effets de la lumière. Livre III : Photographie*, 209-34. Paris: F. Didot frères, fils et Cie, 1867. <http://gallica.bnf.fr/ark:/12148/bpt6k90369m>. [Online; accessed 02-Jan.-2021]

[2] <http://www.museeniepce.com/index.php?/collections/enjeux-de-la-photographie/L-utopie-photographique>. [Online; accessed 02-Jan.-2021]

[3] V. de Sauve, M.-A. Languille, S. Vanpeene, C. Andraud, C. Garnier, B. Lavédrine, *J. of Cultural Heritage*. 2020, 45, 114-121.

[4] V. de Sauve, M.-A. Languille, M. Kociak, S. Belin, J. Ablett, C. Andraud, O. Stéphan, J.-P. Rueff, E. Fonda, B. Lavédrine, *Angew. Chem. Int. Ed.* 2020, 59, 9113.

ORAL SESSION 3 – March 29th 2021, 13:40 -15:00

The effects of finish coatings on ultraviolet and visible light stability of inkjet prints (master's thesis)

Ella Solomon

University of Amsterdam

As part of the technological developments in inkjet printing industry, products such as finish coatings are marketed to achieve long-lasting durability of the prints. The study shows how the colours of coated inkjet prints change over time as a function of exposure to UV and visible light radiation. Six finish coatings for inkjet prints were chosen for their various protective properties. The finish coatings were applied on eighteen samples: twelve directly on Hahnemühle unprinted Photo Rag® fine art paper and six on printed paper with Epson UltraChrome Pro inks. Three of the coatings were analysed using GC-MS. The material analysis provided further understanding of the polymer matrices and the UV and light resistance additives. The analysed samples were exposed to a spectrum of 320–800 nm using Xenontest for approximately 121 megalux hours overall. To quantify the change in colour, the difference between unexposed and exposed areas was compared in each sample using the ΔE^* value, calculated from chromatic coordinates $L^*a^*b^*$.

The results showed that uncoated paper yellows over time but that unprinted coating-paper systems yellow even more, except for one sample. According to the material analysis conducted, this coating contains combination of light stabilizing additives. The colour measurements in the coating-ink-paper system showed that most of the coated yellow ink had faded, while the colour change in a coated magenta and cyan was slowed down by the presence the coatings. Theoretical study can offer an explanation: most of the polymer binders in the coatings degrade within the UV-A range and different light stabilisers react within UV-A spectrum. Thus, the rate of photodegradation slows considerably. Due to the different protective chemical mechanisms of light stabilisers, the combination of UVAs and HALS in a polymer offers a major advantage in preventing colour changes. Given the numerous variables and unknown materials that might influence colour changes, it is difficult to evaluate the reason for their occurrence. This study offers a basis for further research into the chemical characteristics and degradation behaviour of contemporary finish coatings on digital media; to raise awareness among conservators and collection managers regarding the presence of finish coatings on inkjet prints; to enable conservators to implement suitable preventive measures, conservation treatment and exhibition protocols for inkjet prints with finish coatings; and to provide a base of knowledge for artists and printers who use these products, thereby enabling them to choose the optimal product by advising the conservator.

This presentation will describe the results of lightfastness tests and their meaning in terms of materials science, and include reflections and questions that remained open for further research. The presentation will end with few inputs on how the acquired knowledge can be applied on day to day practice of a photograph conservator.

Towards a Standardized Terminology for Photographic Materials in the Netherlands

**Kayleigh van der Gulik¹, Magdalena Pilko¹, Martin Jürgens²,
Sanneke Stigter³, Clara von Waldthausen³**

**¹Dutch Foundation for the Conservation of Contemporary Art (SBMK),
²Rijksmuseum Amsterdam, ³University of Amsterdam**

In Dutch museum collections the technological specifications of photographic objects currently do not follow a standardized terminology. Especially in the case of contemporary black-and-white and colour photography, a variety of terms and techniques, often translated from English or deriving from brand names, coexist at the expense of clarity. This can be an obstacle when correctly identifying and preserving these objects.

Our project aims to improve this situation as part of the 'Project Collection Knowledge 2.0 / Photography', a three-year research program on the preservation of photographic objects in Dutch collections, initiated by the Dutch Foundation for the Conservation of Contemporary Art (SBMK) in collaboration with the University of Amsterdam (UvA), the Cultural Heritage Agency of the Netherlands (RCE) and sixteen renowned Dutch museums [1].

A working group of nine specialists from Dutch museums holding photograph collections and the Department of Conservation and Restoration of Cultural Heritage at the UvA has been established to determine standardized terminology for photographic processes, objects and materials in Dutch. The working group is building upon systems created by the Rijksmuseum, the Dutch Institute for Art History (RKD) and the Getty Research Institute (Art & Architecture Thesaurus ®). The newly established terminology should improve the understanding of the type of photographic objects held in collections, help to clarify preservation needs, and contribute to the overall professionalization of communication relating to photographic materials in the Netherlands.

This talk will offer insight into the group's working methods to establish a standardized terminology. Topics include: selecting the sources, choosing the processes, developing the structures and considering options for implementing the terminology into existing registration systems. This study could prove beneficial for other collections in the world that do not yet use a standardized terminology in the national language, and it will include general advice on improving the registration of complex artworks that involve photographic materials.

[1] Amsterdam Museum, Museum Boijmans Van Beuningen, Bonnefanten, De Domijnen, Frans Hals Museum | De Hallen, Het Nieuwe Instituut, Huis Marseille, Kröller-Müller Museum, Kunstmuseum Den Haag / Fotomuseum Den Haag, Stichting Nationaal Museum van Wereldculturen, Rabo Kunstcollectie, RCE-kunstcollecties and Stedelijk Museum Amsterdam with the National Archives, the Nederlands Fotomuseum, the Netherlands Institute for Conservation+Art+Science+(NICAS) and the Rijksmuseum as advisory partners.

Interpreting 35mm chromogenic slide film: the Ed van der Elsen case-study

Lénia Oliveira Fernandes

Nederlands Fotomuseum

Visual culture would not be the same without chromogenic slide film. Its commercial success, especially in the 1950s-1960s, relates to the photographic industry's capacity for mass production. One of the appealing properties of colour slides was their ability to become projected. Amateur photographers used them to review their family vacations, university

professors illustrated their lectures with them, and conceptual artists adopted them in the ongoing quest to express themselves in new ways.

Dutch artist Ed van der Elsken (1925-1990) began using this versatile medium in the 1950s. He often incorporated slide shows in his exhibitions and included colour images on his photobooks and commissioned magazine work. The Van der Elsken's photographic archive is kept at the Nederlands Fotomuseum (Rotterdam). Because of onset biological decay, these slides were at the core of a mass conservation, digitization and registration project that took place between 2016 and 2018. The slides were individually assessed and it became possible to make connections between their materiality and their condition. Often questions arose about image aesthetics and the artist's intent, which are particularly relevant from a curatorial point of view. Colour slides are more than a visual medium - they are a material and immaterial carrier of ideas. For example, we cannot interpret a light damaged image in the same way as one intentionally recorded on a film made for artificial light conditions but used in broad daylight. Van der Elsken often made image selections that are now disassociated from their historical context, as well as duplicates. In these cases, identifying film brands and types helped to determine the period in which the photographs were made and to distinguish in-camera film originals from later copies.

Although all chromogenic slide film is composed of a transparent plastic film with organic dyes in a gelatine emulsion, its interpretation is not always straightforward. Scientists working in the photographic industry continuously strived to improved image stability and colour accuracy. Consequently, even film of the same brand and type produced a few years apart might age differently. This is not an unknown fact; it just hasn't been thoroughly documented, and especially not in a way that can be used as a visual tool. On the other hand, films produced by companies such as Kodak, Agfa and Fuji are present in many collections and likely present similar issues as those in the Nederlands Fotomuseum. Therefore, the information gathered through the Ed van der Elsken project can potentially be extrapolated and used as an interpretation guide by heritage professionals worldwide.

Preliminary Photographs and Improved Positives: Discovering The New York Public Library's Arctic Exploration Album

Elena Basso¹, Federica Pozzi¹, Jessica Keister², Elizabeth Cronin³

¹The Metropolitan Museum of Art, ²Steel City Art Conservation, ³The New York Public Library

In the late 19th and early 20th centuries, original photographs were sent to publishers so that they could be reproduced in print. The photographs often needed to be reworked with overpainting and masking, and such modifications were especially necessary for low-contrast photographs to be reproduced as a letterpress halftone. As altered objects, many of these marked-up photographs were simply discarded after use. An album at The New York Public Library, however, contains 157 such photographs, all relating to the Jackson-Harmsworth expedition to Franz Josef Land, from 1894 to 1897. Gifted from publishing houses, the photographs are heavily retouched with overpainting and masking, as well as drawn and collaged elements.

The intense level of overpainting on many of the photographs, but not on others, raised questions about their production and alteration. Jackson's accounts attested to his practice of developing and printing photographs on site, testing different materials and techniques—including platino-bromide and silver-gelatin papers—to overcome the harsh environmental conditions. In this context, sixteen photographs from the album were analyzed through a

combination of non-invasive and micro-invasive techniques, including X-ray fluorescence (XRF) spectroscopy, fiber optics reflectance spectroscopy (FORS), Raman and Fourier-transform infrared (FTIR) spectroscopies, and scanning electron microscopy with energy-dispersive X-ray spectroscopy (SEM/EDS). This analytical campaign aimed to evaluate the possible residual presence of silver halides in any of the preliminary and improved photographs, which would support a hypothesis that some of them may have been printed on site, in the Arctic, and incompletely processed. Additional goals of the study included the evaluation of the extent of retouching, providing a full characterization of the pigments and dyes used in overpainted prints, and comparing the results with contemporaneous photographic publications that indicate which coloring materials were available at the time. Further analyses shed light on the organic components present in the binders and photographic emulsions. This research increased our knowledge of photographic processes undertaken in a hostile environment such as the Arctic, and shed light on the technical aspects of photographically illustrating books during the late 19th and early 20th centuries.

ORAL SESSION 4 – March 29th 2021, 15:10 -16:30

Preserving the Process Knowledge of Dye Transfer Printing

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With the rise of digital printing, analog color technologies are disappearing. As materials become unavailable, and expert printers retire, or commit to digital printing, the knowledge of these complex and nuanced analog color technologies is at risk of being lost. As fewer practitioners work with analog color printing, study collections become essential to archive, not only the prints, but also the practices used to make them.

One rapidly vanishing color process is dye transfer printing. Developed by Kodak in the 1940s, dye transfer was one of the premier color processes of the 20th century, and was valued for its nuanced color rendering and dark stability when compared to contemporary color processes. Guy Stricherz and Irene Malli are masters of dye transfer. Their business CVI Laboratory is one of the premier labs for artist prints, and is one of the few labs still producing dye transfer prints in the world.

Over the past several years, Guy Stricherz and Irene Malli partnered with conservators across institutions to create a set of prints for an analog print set. This sample set was distributed to conservators as a resource for process identification and testing. In February 2020, Guy and Irene donated the materials used to create the prints to the Metropolitan Museum of Art Photograph Conservation Department's Study Collection to help researchers understand the largely obsolete dye transfer process. The gift was accompanied by notes to further elucidate the details of the process.

The goal of this project is to supplement the invaluable collection with descriptions, illustrations, and animations, creating a comprehensive resource explaining the dye transfer process. This project is a collaboration between CVI Laboratory, the Metropolitan Museum of Art's Photograph Conservation Department, and Tess Hamilton, a student at the Conservation Center of the Institute of Fine Arts, New York University. Their collaboration allows for a synthesis of expertise in art history, process knowledge, education, and conservation to expand on and share the study collection with researchers regardless of their background in photographic practice.

In a time when virtual learning and digitized research materials are necessary to share knowledge within and beyond local communities, this project provides an exciting opportunity to use digital technology to activate an analog technique for a 21st century audience and to preserve the art of dye transfer printing for future generations. This oral presentation fits into the Historical and Current Technologies, Materials, and Processes session, and will explore our collaborative approach to developing the multidimensional research tool, and our ongoing work to enhance and make accessible The Study Collection's dye transfer printing process materials. It is hoped that this project will encourage others to build technical photography study collections for the future access to analog photographic processes.

Digitizing Dufay

Simon Lund

Cineric

Cineric recently scanned a Dufay release print of the film *Garbacito de la Mancha* (1945) for the Filmoteca Espanola and the presentation of this work would cover the following: The selection of led illumination and additional filtration in the scanning of the material which dyes are out of the standard rgb color gamut, post processing of the files to achieve better saturation to match the original print visually and what's needed to lift audio with a superimposed dye réseau.

The Flexichrome: visual examination and scientific analysis of an overlooked color process.

Nayla Maaruf¹, Maria Kokkori¹, Sylvie Pénichon¹

¹The Art Institute Chicago

The recent display at the Art Institute of Chicago of a color photograph by Herbert Lyman Emerson (Untitled (for a Propaganda Poster), c.1950) prompted in-depth research into the photographic process. Prior to its acquisition, the print had been identified as a hand-colored gelatin silver print. Due to the vibrancy of colors and overall appearance, however, it was suspected that it could instead be a carbro print, overpainted for commercial printing purposes. Non-invasive, portable XRF analysis confirmed the absence of silver, consistent with the carbro process, but a more detailed visual examination did not reveal evidence for the superimposed color layers characteristic of this process, and suggested that it was instead a Flexichrome. This finding led to further material research into the Flexichrome process.

The Crawford Flexichrome process was first developed and marketed by Jack Crawford in the early 1940s. Kodak purchased the patent from Crawford and remarketed it as the Kodak Flexichrome from the late 1940s until the early 1960s. This paper presents an overview of the Flexichrome process and, through the study of the Art Institute's photograph alongside selected Flexichrome reference prints and historic Kodak Flexichrome dyes from the Art Institute's collection, investigates the technology and variations in the formulations available. Prints and dye samples were characterized using a complement of analytical techniques including visible and fluorescence light microscopy (VLM, FLM), x-ray fluorescence (XRF) spectroscopy, and Fourier transform infrared (FTIR) spectroscopy. A key goal of the study is to establish visual identification markers for Flexichromes, to provide future guidance for conservators and collection managers, informed by analytical markers derived from invasive and non-invasive analytical techniques.

The Start of the Rainbow: Possibilities of Color Motion Photography for the Amateur

Louisa Trott

University of Tennessee

The earliest era of amateur moviemaking offered an inventive array of color possibilities for the film enthusiast. From the fifteen discreet colors of an Automatic Colorator and the subtlety of tinting & toning to the subdued hues of Kodacolor and Vitacolor, and later the accessory-free magic of Dufaycolor's réseau and Kodachrome's eye-popping saturated color.

This session will offer a richly-illustrated exploration of amateur cinematography's kaleidoscopic color history. Drawing on advertisements and articles from amateur moviemakers' publications (US & Europe) and the popular press, to provide a chronology of the broadest spectrum of color motion photography and effects available to amateur cinematographers in the 1920s and '30s. The presentation will consider the equipment needed to make and project the movies, as well as the processes themselves. Examples will include Dufaycolor, Vitacolor, Kodacolor, and tinted/toned 16mm.

POSTER SESSION 1 – March 29th 2021, 16:50 -17:50

Digitizing Archive Film: Image, Information and History

Manuel Goetz

owner-proprietorship

This abstract is based on a concept paper drafted resulting from a talk at The Reel Thing-symposium in August 2019 and is rooted in my observations from work practice, as well as my Master's thesis at the University of Amsterdam. It brings forward an experimental notion of film scanning for further development within the community.

Film restoration practitioners aim to restore digitally (that is, two-dimensionally) what exists as a three-dimensional object-carrier, the film strip. This historical object displays not only photochemical effects of deterioration (silver emission, emulsion detachment, base decomposition, dye fading, etc.) but also mechanical markers of time engraved through previous utilization: splices, marks, notes, scratches, generations of repairs, etc.

I argue that it is essential for future film restoration to acknowledge and employ this surplus of information. I envision film scanning to strive beyond the capture of an image's sheer content and move towards the use of the historical information it contains. I believe that, having achieved a certain state of technological progress appropriate for a film's aesthetics, future technologies in film digitization need to secure also the sculptural and thus further the bibliographical qualities of the sample in question.

With scanning taking place at a very early stage in film restoration, this information can inform decisions in the subsequent process, be that in retouching, conforming, or color grading, to the point of presentation and long-term storage. It has the potential to support an authentic, elaborate film restoration and a final visual interpretation that more rightfully pays respect to the original's historical properties in its many variances.

While arguing that there have been attempts to reach out to similar sets of data in the past, I say that to gain this information more properly and to allow a different curatorial use, film scanning technologies would have to be adjusted. Hence, this idea drafts technological change conjoined with an altered discourse: I present adjustments to scanner's light source and the light color(s), the focus point, film transport and gates, as well as data storage and file formats, and offer a bridge to new uses of metadata. With examples illustrating this approach, I compare samples scanned for a film's aesthetic content with scans calibrated for its historical information. I claim that this second pass does not necessarily need to produce aesthetically interpretable images.

In order to foster a critical understanding of analog film as a culture and practice, we need to be careful to render images that would not exist without its object-carrier into anamorphic facsimiles that sit next to any visual content produced today. For film restoration to be both rightly informed by, and respectable to its object in question, the representation of the full scope of film, as a culture, an art and a technology, is essential.

The Autumn Colours of Sound: Reading the records of Old R2R Audio Tapes of the 70's

Maja Kostadinovska

National and University Library "St. Clement of Ohrid" – Skopje

Despite the magnetic technology invention in 1928, reel-to-reel audio recording tapes were most popular analogue storage media in the 1980s, and today as most prominent carrier media

for digital audio archiving in libraries they re-establish a specialist thread in the 21st century. Tackling the challenges in managing sustainable preservation strategies for open-reel magnetic audio tapes in a library is not uncommon. The intrinsic factors that affect these media, which staff cannot control, are the physical components and variation of the manufacturer's quality of the purchased tape and the future availability of system technology for playback. However, these materials are extremely vulnerable in handling and the quality of the storage conditions. The present work concentrates preservation issues on old traditional R2R audio magnetic tapes in a special collection "Struga Musical Autumn" kept at the National and University Library in Skopje. The collection represents a corpus of unique oral and musical achievements in the musical, scientific and cultural field in the country and beyond. All audiotapes are ¼ inches open-reels, mostly on a polyester film. The collection includes eighteen 5" (BASF, AGFA, SCOTCH and off-brand products) and two 7" (SCOTCH 3M) standard long play audio tapes, but also six non-standard 5¾" (SCOTCH 3M) audio tapes. Some audio tapes are difficult to identify as the original storage container is missing, but according to the recorded material all date from mid-1970s to 1980.

The most common preservation problems found for the audio magnetic tapes are due to poor handling, poorly maintained equipment, and storage conditions. Physical damages (50%) include tape pack abnormalities such as edge curling, popped strands, flange pack and slotted hubs. A small part (19%) of the polyester film tapes exhibit a chemically related deterioration process known as Soft Binder Syndrome (SBS) such as sticking, squealing, and abnormal shedding during playback, which occurs because of oxidative decomposition (hydrolysis) of the binder and loss of lubricants from the substrate. By-products of this hydrolytic decomposition are organic acids, which further accelerated the process and attacked the magnetic particles (instability). Another concern with the collection was the particulate contamination observed, such as dust and accompanying paper material. There was no presence of biological damages as mould, insects or pests i.e. their action or secretions throughout the collection.

Finally, the work presented here can serve as a cross-study for comparison of same or similar formats to facilitate the understandings of priority preservation issues. In conclusion, by observing certain standards for care and limitation of the access to the phonetic materials, i.e. the usage frequency or by providing multiple copies for patrons, libraries can control and prolong their collection's life-time for more than only a decade.

Non-destructive analysis of Hand-Colored photographs: A Case study on photographs dating back to the 19th century

Emil Henin

Ministry of Tourism and Antiquities - Egypt

While the world awaited the discovery of natural colour photography, an alternative was sought and found in the use of pigments to hand-colour photographs. Only three years after Daguerre's announcement, the first American patent for hand-colouring daguerreotypes was granted to Benjamin R. Stevens and Lemuel Morse. Later that same year, a second American patent for colouring daguerreotypes was granted (Rinhart, 1981). As photographic imaging processes became more sophisticated, with photographic images appearing on everything from glass to leather (Towler, 1969) to ceramics, so did the colouring techniques (Hensch, 1996). For every photographic medium, a method for hand-colouring was developed. Photographs were coloured in one of two ways: hand tinting or hand colouring refers to a lightly painted image that is still distinguishable as a photograph; over-painting refers to an image that has been heavily painted and whose photographic origins may have been completely obscured (Rinhart, 1981; Hendricks, 1991; Hensch, 1996).

In particular, the main aim of this study is the characterization of the samples to identify chemical composition of the pigments and dyes in Hand-Colored photographs with X-ray fluorescence. These techniques are useful for the evaluation of the optical and chromatic characteristic of the samples and for the individuation of chemical elements, respectively. X-ray fluorescence spectroscopy (XRF) is commonly used in the field of heritage science and conservation for the in situ and non-destructive elemental analysis of a broad range of art and archaeological artifacts. In studies of fine art photography, both modern and historical, XRF is used primarily to identify the photographic processing chemistry and the nuances associated with chemical composition of the image layer.

Image Quality Metrics for Digital Film Restoration

Majed Chambah

Universite de Reims Champagne-Ardenne

Many digital film restoration techniques have emerged during the last decade and became more and more automated but restoration evaluation still remains a rarely tackled issue. In the sphere of cinema, the image quality is judged visually. In fact, experts and technicians judge and determine the quality of the film images during the calibration (post production) process. As a consequence, the quality of a movie is also estimated subjectively by experts in the field of digital film restoration.

On the other hand, objective quality metrics do not necessarily correlate well with perceived quality. Plus, some measures assume that there exists a reference in the form of an “original” to compare to, which prevents their usage in digital restoration field, where often there is no reference to compare to. That is why subjective evaluation is the most used and most efficient approach up to now. But subjective assessment is expensive, time consuming and does not respond, hence, to the economic requirements. After presenting the several defects than can affect cinematographic material, and the film digital restoration field, we present in this paper the issues of image quality evaluation in the field of digital film restoration and briefly present an IA based image quality assessment system.

Mounting chromogenic prints – potential solution to prevent yellowing issues on photopaper

Markus Paul Müller¹, Ute Pd Dr. Henniges²

¹recom ART GmbH & Co. KG, ²Konservierung und Restaurierung, Staatliche Akademie der Bildenden Künste Stuttgart

In recent years, there has been a growing awareness that laminated chromogenic prints, a technique used worldwide for the presentation of contemporary photographic art, can cause undesirable color changes in the medium term. With the aim of a technically feasible solution to improve durability, comparative light and climate aging protocols were carried out on photographic sample materials. First, the individual materials relevant for producing laminated chromogenic prints were aged, after which the corresponding material combinations were also tested. Care was taken to ensure that all materials are commercially available and can be processed in a technically satisfactory manner. Based on color measurements taken before and after aging on test fields designed specifically for this purpose, it was found that the chromogenic print does not show any yellow discoloration under the conditions tested if processed correctly. Instead, yellowing of chromogenic photo prints originates, among other factors, from the double-sided adhesive film.

In a second phase of the project, all internationally available double-sided adhesive films for lamination of chromogenic prints were subjected to the previously established color measurements and aging conditions. The same type of discoloration occurred in all tested

materials, so that none of the material combinations for lamination of chromogenic prints were recommendable for long-term use. In exchange with development engineers from the photo industry, possible chemical reactions between double-sided adhesive films and photo papers were discussed. Since the exact chemical compositions of both commercial adhesive foils and photo papers are unavailable to us, subject to respective trade secrets, we had no latitude of implementing improvements at that stage of the project. In-house experiments with alternative adhesion techniques and liquid adhesives application were conducted to achieve an improvement; however, none of the tested protocols resulted in the desired quality. It was through cooperation with Neschen Coating GmbH, a manufacturer of adhesive films, that the previous findings could be shared in a further project step and a solution on the technical side could be embarked on. Tests on identical sample material with the same measurement and aging methods are intended to ensure comparability with previous findings. The focus points of this ongoing research are good handling properties of the product and the minimization of the chemical reactions with photo papers. Through close cooperation between science, industry, and processing service providers, we believe that technical improvements and commercial feasibility, while at the same time maintaining high aesthetic quality and conservation requirements, are feasible.

Digitization of large-scale artwork with LED technology

Markus Paul Müller¹, Raffael Pollak²

¹recom ART GmbH & Co. KG, ²DEDO Weigert Film GmbH

The latest developments in light sources, especially semiconductor LED technology and phosphor recipes, and with it the lowered risk for damage to photographic work, have led to a joint venture between Dedo Weigert Film and recom ART. The basic idea is to build upon the designated "DOM" system and allow for larger templates, up to 3 x 6 meters, to be handled. By developing special instruments for shaping the light, surfaces of walls will be illuminated homogeneously, making the following application examples possible:

- LEDs which can be controlled in color temperature would enable the production of photographic works to be viewed under conditions similar to those of the final presentation (CCT of reproduction typically are 5000K, in exhibitions however, often 3000K or 4000K).
- Thanks to the standardized light and coordination of all components, color-correct and calibrated digitization by photo cameras would be possible without subsequent processing.
- Due to our already existing mobile and standardized technical structure there would be ease of access to digitization on site in the depots and exhibition areas. Accurate surface images of artworks are able to be achieved through controllable light situations and light directions. The D-FACE program is also able to precisely simulate different light directions. The single files can be used for a conservation related documentation.
- The use of UV LEDs for UV fluorescent photography and other selected spectra could also be incorporated in a standardized way. e.g. an automated sequence of different lighting situations could lead to an international standard for the documentation of artworks and thus enable more accurate comparisons between the condition.
- The homogeneous illumination would enable a gentler digitization than previous methods. High-quality LEDs presumably have a lower risk of damage than conventional lighting sources. This would mean that longer examinations for conservation and art-technological purposes would be possible.

The project is in the emerging phase and would like to invite interested institutions and specialist groups to take part in the challenge. First, perfected wall lighting will be developed to allow practical work and documentation on the large-scale objects. Subsequently, lighting concepts for the presentation of artworks using the same requirements and knowledge gained

during the first phase, are to be further developed and new instruments for shaping the light are to be created. In a research project, the effects of LED lights on artworks are to be researched. The intended focus will also include the practical handling and feasibility of using these lights. Additional crucial questions such as the effect of the PWM dimming frequency and of the harmful blue components in the color spectrum on the work of art. The experience of artists, restorers, curators and users of light will also be jointly discussed and should be incorporated into the product.

Reference scan - an objective way to document colors and surface changes in artworks

Markus Paul Müller

recom ART GmbH & Co. KG, ²DEDO Weigert Film GmbH

In both analog and digital image output, there are usually color deviations between the color definition in the file or negative and the produced artwork due to manufacturing processes and material characteristics. In unique art such as mixed media, there are usually no color definition available to conduct a later comparison which could objectively determine signs of aging and possible damage. The point of the reference scan is to digitize the finished work of art and thus create an accurate color-correct record available for future analysis. In accordance, we ensure that the color values of the digital file correspond to the measurable color values of the work of art. The colors are documented in ECI-LAB color numbers, which are media neutral. With the appropriate long-term archiving of the digital file, the comparison of the color values is theoretically infinite. In addition, the reference scan also includes typical production characteristics such as retouched areas, sharpness and density of color of the media used. Following this model, future reference scans are repeated and the data sets compared both visually and via the color measurements.

With the inclusion of the scanning technology, under the name "DOM", the surface structure of typical materials can be documented in 75 individual images and visually displayed by the corresponding software "D-FACE" for better visualization. The technical features of the DOM are, it has 75 different light-angles and the color management of the photo camera is matched to the light sources. Ideally, the reference scan and D-FACE should take place immediately after the work has been produced. Under the informal designation "digital recovery", the reference scan can serve as an output file for the digital recovery of discolored or missing image content. The advantage of this file is that, in contrast to the digitization of negatives, for example, it contains all typical production characteristics such as vignetting and manual post-exposure. If a reference scan was made before the damage or discoloration, this file can be used for what is currently designated as "reprinting". The reference scan does not necessarily replace a typical documentation of artworks like the Photographic Information Record, since it does not contain information about the material, the printing techniques and so on. The reference scan is simply a modern and objective way to document colors and surface changes during an artwork's life. Therefore, we suggest that a combination approach which includes both typical documentation and the reference scan is the most thorough method.

Screen processes - general identification methods and deterioration

Monika Supruniuk¹, Izabela Zajac²

¹Academy of Fine Arts in Warsaw/National Film Archive - Audiovisual Institute, ²Academy of Fine Arts in Warsaw

Our aim is to present selected photographic and motion picture film processes of additive synthesis, classified by Barbara Flueckiger as "screen processes". In the presentation, we will

be focusing on their application in cinematography, incl. Dufaycolor, Kodacolor from 1928 and Agfacolor lenticular. We will be presenting short descriptions as a basis for the identification of selected screen processes along with a comparison of the Autochrome with Dufaycolor and Kodacolor from 1928. In addition, examples of "screen processes" from the collection of the National Film Archive - Audiovisual Institute in Warsaw (Poland) will be shown, along with a detailed description and series of close up images taken under magnification. Based on analysis of these examples, we intend to provide an overview of some methods of identifying "screen processes" as well as their typical cases of deterioration. As a conclusion possible causes of damage and problems related to the digitization of these types of colour processes will be discussed.

A novel compact probe for gloss measurements on photographic films.

Giovanni Bianchini¹, Lorenzo Lisi², Barbara Cattaneo³, Marcello Picollo⁴

¹INO-CNR, ²Università degli Studi di Firenze, ³Opificio delle Pietre Dure, ⁴IFAC-CNR

Whenever we encounter physically damaged photographs or films, we come to the awareness that the optical changes of the surface or supports lead us, as viewers, also to a change in our perception. These changes do not only affect our aesthetic appreciation of the photographic object, they also decrease the readability for research purposes and prevent from a correct reproduction, i.e. through digitization. Conservation, especially consolidation treatments, aim to stabilize the photographic object from a physical and chemical point of view, in order to increase its lifespan, but also to recover its surface features. One of the parameters often used to evaluate the surface damage and the efficacy of the conservation treatment is the use of spectroscopy and optical measurements. In particular, gloss measurements are often performed, thanks to the affordable and easy to use instruments available on the market, which are able to measure the average gloss of areas of a minimum 3 mm diameter. In the conservation – restoration of photographic films, however, the area to be analyzed is usually smaller in order to obtain the most accurate results. Moreover, the commercially available gloss meters are not designed with a fine control of the analyzed area in mind, and often block the view of a much bigger area of the sample.

This research aims to investigate the feasibility of a novel small footprint glossmeter probe, able to perform measurements on an area of a few square millimeters with visual access to a larger part of the sample. The probe has a modular fiber coupled design that allows the researcher to use different sources and detectors, and perform spectrally resolved measurements. In the present communication, the description of the device, its measurement methodology and its first application to the study of photographic films under conservation – restoration treatments will be reported.

ORAL SESSION 5 – March 29th 2021, 18:00 – 18:40

Observations on Preservation Issues for Contemporary Photography Artworks

Roberta Piantavigna

San Francisco Museum of Modern Art

In recent years, the Photography Department of the San Francisco Museum of Modern Art has increasingly acquired contemporary artworks representing artists' creative explorations of the meanings, forms, and possibilities of what photography is today. These works are photographs and complex art installations, such as "Ponte City" (2008) by Mikhael Subotzky and Patrick Waterhouse, "The People's View" (2014-ongoing) by Rein Jelle Terpstra, and "241543903" (2009-ongoing) by David Horvitz and are, respectively, a complicated art installation of found objects and prints, ephemeral material and large framed inkjet prints; a living-archive of vernacular photographs; and an ongoing social-media experiment. These acquisitions challenge the museum's existing accession, cataloging, and preservation procedures traditionally employed for photographic artworks. The ontological differences between traditional photographs and complex works may appear self-evident; however, recognizing their differences and specificities - what the art actually is and consists of, and what its preservation needs are - is not so straightforward.

Existing museum accession and cataloging procedures, developed to categorize and process volumes of works based on their media, pairs with preservation strategies conceived within the theoretical and practical framework of a material-based approach. SFMOMA's recent acquisitions challenge these categories and urge curators, conservators, and collection division experts to interrogate themselves on the works' identity and invest in the artist's involvement throughout the accession process. Ultimately, an approach that encompasses and values the work's material and conceptual nature would likely be more fitting than the existing one. Conservation has a critical role in identifying flaws and limits of the museum's current preservation procedures and working collaboratively with collection division experts to change and adapt them as the works' change.

Scarce literature on the preservation issues of contemporary photographic artworks may suggest that the topic is still new to the photography conservation community; however, the abundance of publications focused on treatments and technical analysis of traditional photographs underpin conservators' preference for the tangible, concrete, and measurable aspects of photography. Significant contributions have been made to the conservation of contemporary art theory over the last decades and provide today's conservators of any specialty with critical resources to form their approaches and recognize their responsibilities. As some contemporary photography installations and works may have more in common with conceptual and media art installations, my reflections suggest that rethinking photography conservation through the framework of the philosophical and theoretical advancements of contemporary art conservation would only be beneficial to the discipline and the relevance of our profession.

A Long-Term Study of Light-Induced Yellowish Stain Formation That May Develop Over Time in Chromogenic Color Prints and Contemporary Inkjet Prints Exposed to Light on Display Followed by Storage in the Dark

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Light-induced yellowish stain formation in photographic papers that developed in dark storage was first documented in the 1993 book, "The Permanence and Care of Color Photographs: Traditional and Digital Color Prints, Color Negatives, Slides, and Motion Pictures" by H. Wilhelm and C. Brower. At the time, the phenomenon was described by the authors as "RC Base-Associated Image Fading and Yellowish Staining" (pp. 72-77). With Kodak Ektacolor 74 RC prints (1977-1982) for example, levels of light-induced yellowish stain continued to steadily increase after 10 years in dark storage at ambient room temperature and relative humidity. Further investigations of light-induced and thermally-induced yellowish stain formation in chromogenic and inkjet prints were reported by H. Wilhelm in Japan in June 2003: (Proceedings of Japan Hardcopy 2003) and in the United States in October 2003: (Proceedings of IS&T's NIP19: International Conference on Digital Printing Technologies).

While light-induced yellowish stain is most easily observed in the white borders of prints, high levels of yellowish stain can have visually devastating effects in, for example, pale blue skies, and in near neutral areas of a print. In museum collections, many examples of prints made in the 1970s and 1980s by Stephen Shore, Joel Meyerowitz, and Richard Misrach, and many others, exhibit high levels of light-induced and thermally caused yellowish stain, generally accompanied by severe dark fading of the cyan image dye.

For this study, more than 10,000 light-exposed and subsequently dark-stored samples from the 50-year period covered by "The Wilhelm Analog and Digital Color Print Materials Reference Collection" (1971-2021) were examined. The study is focused on identifying the specific types of print media that are highly susceptible to the gradual development of light-induced yellowish stain after light exposure, those that are moderately susceptible, and those that are not noticeably affected by this problem.

Optical brightening agents (OBAs) may be directly involved in light-induced yellowish stain formation (beyond the simple loss of UV-activated fluorescing brightening activity). In this study, the presence and subsequent decay of OBAs is measured and reported using a MegaVision Multispectral Imaging System (H. Wilhelm, K. Boydston, K. Armah, and B. Stahl: Proceedings of "Imaging Conference JAPAN 2011").

ORAL SESSION 6 – March 30th 2021, 10:00 – 11:20

Re-makeable Art and the digitally constructed image: Case study of Geoff Kleem's wallpaper installation

Analiese Treacy¹, Asti Sherring²

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The site-specific installation, Untitled 2016 -2017 commissioned by Art Gallery of New South Wales (AGNSW) in 2015, is a compelling large-scale photographic mural conceived by Australian Artist Geoff Kleem. As described by the artist, the “work engages with notions of photography, sculpture and installation as a means of critically exploring our relationship with visual culture. I am concerned with what lies between these areas and how they interrelate”. In this work, Kleem uses photography to displace seemingly random architectural components that physically exist within the architectural spaces of AGNSW. He then employs digital software tools to reconstruct and relocate these institutional fragments to create a 1:1 constructed image of an 11-metre-long museum wall. Digitally printed over 9 sheets of Hahnemuhle wallpaper and installed by a team of specialists, this work creates a dramatic intervention within the AGNSW site by representing itself as a believable architectural element of the space.

The work's site specific nature ensures that the work must be destroyed post display, with the artist providing digital image files for the purpose of re-printing for future iterations. For the artist the process of refabricating was both a necessity due to the temporary nature of the wallpaper support but also offered the assurance of careful contextual consideration for future display. However, the inherent vulnerability of digital files and the rapid technological advancement of printing techniques jeopardises the long-term future of this artwork. This paper explores:

1. The concepts of re-makeable art in relation to issues of reproduction, availability of photographic materials and technologies and the sustainability of such a practice.
2. Addresses the conservator's role in the conservation of this work in preparation for display, which increasingly require conservation staff to act as 'facilitator' in the actualisation of the work.
3. Contemporary art approaches required to document the iterative nature of the work for future display.
4. The long-term issues surrounding the preservation of digital files which requires unique skills in time-based art conservation to ensure that the work can be preserved and displayed in the future.

In the face of the Typhoon 19: a report on salvaging the Kawasaki City Museum's photography and film collection

Kanako Nakanishi¹, Kanako Nakano¹

¹Kawasaki City Museum

Kawasaki City Museum is a cultural complex of history and art with its basic theme of 'The City and Its People'. We present the history and progress of the city of Kawasaki on the one hand, illustrated with archeological, historical and folk exhibits; and, on the other, modern and contemporary artistic expressions with exhibits of posters, photographs, manga, films and videos by artists who have drawn inspiration from the urban environment of Kawasaki and

other cities. Our collection embraces wide range of media from historical documents, earthenware to painting, drawing, prints, photography and film.

On October 12, 2019, the Typhoon 19 / Hagibis which landed in Japan caused severe damage to wide areas in eastern Japan. This extremely violent and large tropical cyclone had affected Kawasaki City Museum as well, which is located along with the Tama River in Kanagawa prefecture. It harmed 230,000 items which were stored in the nine underground storages (except for the 31,000 items that were not stored in the basement). In this oral presentation, we hope to share how we dealt with the disaster damages and how we salvaged our artworks as well as the multiple cases of damaged photography and film caused by inland water flood.

Digital Battles: from Film Restoration to a Digital Historical-Critical Environment

Simone Venturini¹, Serena Bellotti¹

¹University of Udine

Our presentation will be focused on the reconstruction and restoration of "La battaglia dall'Astico al Piave" (Silvio Laurenti Rosa/Regio Esercito – Sezione Cinematografica, 1918, 35mm, tinted and toned, film certificate no. 13649 of 01.09.1918, 1255 m), currently being carried out by the University of Udine in collaboration with La Cineteca del Friuli, Istituto LUCE and Cineteca Italiana, with the support of MIBACT.

"La battaglia dall'Astico al Piave" was made by Italian director Silvio Laurenti Rosa on behalf of the Italian Royal Army Film Department. There are three existent versions of the film: the 1918 Italian and French versions, both made by the military film department, and a further one, named "Ta Pum", probably re-edited by Istituto LUCE in 1927, which was still in circulation around 1930. The project aims both to reconstruct the first Italian edition of 1918 and to give an historical and visual report of the other versions, especially the one from 1927.

The restoration and reconstruction is based on both film materials collected after a first survey of the film archives and several non-film materials such as journal articles, archival documents, etc.:

- witness "K": the main reference for the Italian version, retaining most of the narrative order, the original intertitles, the tinting and toning and handwritten information on the film edge about the colour palette (from Associazione Kinoatelje: 35mm print on three reels; 900 m ca.);
- witnesses "G1" and "G2": two 35mm fragments of the French version preserved by Cineteca del Friuli (35mm copies restored from the nitrate prints preserved by Lobster Films);
- witness "G3": a short fragment of the Italian version, preserved by Cineteca del Friuli, contained in "Da Capodistria a Fiume italiana";
- witness "RM": a long duplicate negative with flash intertitles on 35mm safety stock, preserved by Istituto LUCE. Looking at image contents and intertitles, it probably dates back both to the late 1920s re-release and the 1918 edition;
- witness "MI": 35mm fragment on nitrate film preserved by Cineteca Italiana in Milan and close to the 1927 edition.

The aim of our contribution will be twofold: on one hand, we will highlight specific restoration and reconstruction issues (film material description, documentation and analysis; versions, editions and re-releases; tinting and toning reconstruction; performative aspects concerning the specific status of the film, in terms of both commemorative aspects and trauma relived during the screenings); on the other hand, we will focus on reloading and reframing the long-standing and sensitive field of digital research and educational-oriented critical film editions. As part of this, we will propose an innovative digital design environment and new interdisciplinary approaches to document the restoration and reconstruction process and give

a wider account of material, visual and cultural film history as a whole comprising apparatus, discourses and practices.

A novel digital method for the color reconstruction of lenticular film

Chenfei Fan¹, Stefano D'Aronco², Giorgio Trumpy³, Jan Dirk Wegner²

¹RWTH Aachen University, ²ETH Zurich, ³University of Zurich

The lenticular film is a unique color film technique for amateur filmmaking. The most popular product was released by Kodak in 1928, under the name 'Kodacolor'. Color films produced with this technique provide precious records of everyday life in the first half of the twentieth century. The film's surface is engraved with a microscopic array of cylindrical lenses (the lenticules). Within each lenticule, the color of a vertical slice of the image is spatially encoded in grayscale. It requires a specific projection set-up to regain the color images on the screen. However, we can also reconstruct the colors from a high-resolution scan of the film material by digital processing.

As a legacy of the work done in the framework of the doLCE project (University of Basel, 2012), the University of Zurich has a software solution to reconstruct lenticular colors. The first step of color reconstruction is a precise identification of the boundaries between the lenticules. Its precision suffers from common imperfections on the film, such as misalignment, defocusing, and noise. Since lenticules are very narrow, this often leads to false or inconsistent colors in reconstruction.

Inspired by deep learning approaches for a wide range of edge detection tasks, at the EcoVision Lab, ETH Zurich, we develop a practical lenticule boundary detector using the U-Net architecture. The training dataset is composed of successful color reconstruction results of the doLCE software. Since the training samples are limited, we use data augmentation methods, such as affine transformation and random erasing, to extend the dataset.

To get even sharper lenticule boundaries, we introduce an iterative approach to refine the identification results based on the constraint that the width of the lenticules is approximately constant within one image. Without losing much color information, this increases color consistency and speeds up the process of color reconstruction.

Preliminary results of the color reconstruction of the analyzed lenticular films show that the proposed deep learning method improves the result provided by doLCE, reconstructing more truthful and consistent colors.

ORAL SESSION 7 – March 30th 2021, 11:30 – 12:30

Multispectral capture of film colors with LEDs

Giorgio Trumpy^{1,2}, Sony George², Jon Yngve Hardeberg², Barbara Flueckiger¹

¹University of Zurich, ²Norwegian University of Science and Technology

The projection of historical motion pictures in digital cinemas suffers from major limitations in the standard practices of film scanning, which too often rely on black-box operations. A multispectral method of image capture could greatly improve the digital cinematic experience and its fidelity with the supposed visual experience in the cinema theaters of the past. The urge of such innovation has been demonstrated in the framework of the ERC Advanced Grant 'FilmColors' at the University of Zurich (CH) by analyzing the multitude of historical film color processes, investigating their optical properties, developing and testing a multispectral scanner prototype, and gathering the feedback of experts during simultaneous analog/digital projections. In the late 2020 the optical design of the future multispectral film scanner and the computational pipeline of the captured images have been further elaborated at the Colour and Visual Computing Laboratory in Gjøvik (NO). Following the insights from 'FilmColors', a new multispectral imager in transmission mode has been built, designed to benefit from both condensed and diffuse illumination on the film, and offering a multiband setup that allows an excellent image capture of all kinds of film colors. The color accuracy provided by the new LED-based imaging system in comparison with the images projected with a slide projector will be presented, and the challenges posed by the actual implementation of the multispectral workflow with LED illumination will be discussed. Between the first samples that were used to test the new multispectral imager is the set of slides of the Art Institute of Chicago (US) that entrusted a pilot set of samples in view of a bigger digitization campaign of its slide art.

Hyperspectral Imaging applied to the study of negative and positive films

Marcello Picollo¹, Costanza Cucci¹, Andrea Casini¹, Lorenzo Stefani¹

¹IFAC-CNR

Hyperspectral imaging (HSI) technique, well established in the art conservation field, was applied for the first time on contemporary negative and positive films within the Tuscan Region (Italy) and IFAC-CNR Florence (Italy) "Memoria Fotografica" (Photographic Memory, 2018–2019) project. In this project, different classes of photographic materials (color negatives, color slides, prints with chromogen and inkjet development) that were severely compromised by a dramatic flood, were studied. In order to investigate photographic negatives the IFAC-CNR HSI device had to be re-designed for this purpose. Thus, an instrument was assembled to operate with a spatial sampling of approximately 27 points per millimeter, equivalent to almost 700 ppi, and with a spectral sampling of 400 bands, resulting in a spectral resolution of approximately 2.8 nm in the 400-900 nm operating range. The acquired HSI data are then processed in order to obtain some knowledge on the state of conservation of the items, to support with accurate spectroscopic information the digitalization phase and the subsequent digital restoration of the photographic materials.

In the present communication, the instrumental set-up and some examples of the application of HSI device on negative films will be discussed in order to highlight the potential and drawbacks of this imaging technique applied on these types of materials.

POSTER SESSION 2 – March 30th 2021, 13:45 – 14:50

The Digital Witness. Film Reconstruction and the Forensic Imagination in New Media Environments

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Early on 2020, University of Udine signed a collaboration with Istituto LUCE, aimed to a digital restoration of a supposedly lost expedition film: Spedizione Franchetti nella Dancalia (Mario Craveri, 1929, b/w, silent). LUCE and University of Udine brought to light a large amount of film materials that included 35mm original negatives, DupPos Lavanders, Positives, and a 9.5mm reduction print but no trace of an edited version of the 35mm film. The pandemic forced the project to shift remote and forbid working on the original film materials. Therefore, a long time was dedicated to an inspection of edge-to-edge digital scanned copies of every element: a “digital fac-simile” (Gschwind 2002) through continuous scanning.

Planning the philo-genetics of each digital element, as a crucial stage of film reconstruction, on one hand we assume that digital environments support and sustain an “ideal allographic environment” (Goodman 1976), as to say “a premeditated material environment built and engineered to propagate an illusion of immateriality” (Kirschenbaum 2008) – a premise that allows us to legitimate a philological enterprise led on digital witnesses of analog films; on the other hand, digital technology tends to and “must produce perfect outputs from imperfect inputs, nipping small errors in the bud. This is the essence of digital technology, which restores signals to near perfection at every stage” (Kirschenbaum 2008). Given this premise and the pivotal role that errors and innovations play in the stage of recensio and collatio, this proposal intends to reframe the “digital witness” by stressing the materiality of film (in digital film preservation) as an ongoing process of interpretation (rather than a given characteristics of the object), where digital philology is always digital hermeneutics. In fact, in this digital environment we are forced to constantly find a balance between a “Formal materiality” and a “Forensic materiality” (Kirschenbaum 2008) of film. The first refers to the evidence perceived “at the junctions” between the analog and digital states of the film: the “differences” restorers perceive while shifting from the state of the analog film in their mind (a “forensic imagination”), to the state of film appearing in the digital witness (i.e. discerning forms of frame instability, by focusing on the scanning settings and identifying mechanic glitches produced by camera lenses and mattes). The second pertains to the evidence of practices that impacted on the “hardware”, as to say something that is occurring only in the digital object (i.e. digital artifacts produced by the digitization procedure, digital metadata or the physical characteristics of the digital file). This implies to discuss this film’s “digital witness” as a “physical object” (traces inscribed in the digital file), a “logical object” (data extraction through software), a “conceptual object” (the image as it appears on the screen), and as a physical data “storage”.

Digitization and Conservation Film Materials : A case Study on a Color Positive Film - Chromogenic reversal films

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Historical images are essential documents of the recent past. Nevertheless, time and bad preservation corrupt their physical supports. Digitization can be the solution to extend their “lives”, and digital techniques can be used to recover lost information.

A rare collection of slides dating back to the year 1960. This collection has a unique Technique, so we consider it to a professional photographer who may have been a correspondent for a foreign magazine and At that time, high-quality colored slides were not available in Cairo or developed for this type of films, and it seems that he developed and prepared them outside Egypt.

These slides show many views of many countries of the world, and Egypt as example of the Egyptian countryside and the Nile, especially the Qasr al-Nil Bridge area.

Through which it can track the architectural development of this region. The slide collection has been subjected to many types of deterioration and needs intervention to be preserved, treatment and archived. This collection was obtained from one Old Book Dealers.

The primary purpose of this research is to contribute to the preservation of slides(color-positive film) film (Chromogenic reversal films are first-generation positive) with application on a privet collection dated in 1960.

Slide-based artworks can be classed as time-based media art since they have duration as a dimension. Contrarily to 'conventional' art, these types of works only exist when exhibited, and therefore, have an intangible and temporary nature ,so the risk of losing value is high.

To do so,. In what concerns the conservation of contemporary art, its need to (conservation and restoration, conservation science, art history,) to achieve a proper intervention in order to select the better solutions for the preservation of modern and contemporary artworks, converting into another technology, such as digital, to its longterm preservation and display.

The Teutloff Collection at the Centre National de l'Audiovisuel (CNA), Luxembourg

Anke Reitz¹, Francesca Vantellini²

¹Centre National de l'audiovisuel, ²FV Conservation Sàrl-s

The Centre National de l'audiovisuel (CNA) is a public cultural institution based in Luxembourg, founded in 1989. Its core missions are the collection, conservation and the enhancement of the national heritage in the fields of film, sound and photography. The photography archive comprises +/-500.000 documents, including the Steichen Collections, tied to the heritage of Luxembourg born artist and curator Edward Steichen. The once itinerant photographic exhibition The Family of Man is conserved and exhibited as a historical artifact in the North of the Grand-Duchy.

At the end of 2017, the CNA took over a large collection of contemporary photographs from a private German art collector, Lutz Teutloff. He entitled his collection The Contemporary Family of Man and over the years, created an impressive thematic collection, inspired by the historical exhibition.

The Teutloff Collection consists of around 850 artworks, ranging from 1968 to 2017. The sizes, mountings and processes are very heterogeneous: from digital prints, C-prints, chromogenic prints, Polaroids, to silver gelatin prints, the collection also includes limited edition books, artworks on paper and some sculptures/installations.

For the analysis of the collection, the CNA invited a multidisciplinary and international team of experts, composed of conservators, archivists, photographers and curators. Together we developed and refined a complex workflow, where the different phases of a conservation/archive project are carried out at the same time: inventorization, unframing, condition report, restoration, authentication, digitization, framing and archiving.

The experience of the project and of working with the team demands a high degree of flexibility and availability at the same time from all the experts involved. It has shown to be quite exceptional and fostering new questions concerning the handling and conservation of photographs at the CNA archive. Due to the complexity of the collection, we developed e.g. a specific condition report that could encompass and adapt to all the artworks and document

every step of the workflow. Conservation and ethical concerns alike guide the handling of the artworks, which dictate their own interrogations as e.g. the decisions and interventions of the artist on the work and frame, its authenticity, how to store and pack the different processes and mountings, Finally, we are also dealing with the institutionalization of a private art collection and what this involves on different levels (the information we can gather on the artwork, its conservation and exhibition history, the handling of the artist's rights etc.).

eTDP - extended Technical Documentation of Photography

Markus Paul Müller¹, Jessica Morhard¹

¹Working Group „CONSERVATION CONTEMPORARY PHOTOGRAPHY“, Deutsche Gesellschaft für Photographie

Contemporary photographs, due to delicate materials and unexplored material interactions, are sometimes subject to rapid changes in condition as well as deterioration from mechanical damage.

As a conservation methodology, damaged photographic artworks are reproduced or exhibition copies are made. However, for authentic reproduction, information is usually lacking and objective comparison to the original condition cannot be completed.

Although there are helpful tools for conservation, such as the Photographic Information Record, there is a lack of acceptance and inadequate implementation of the form in Germany. Decisive criteria that enables an objective assessment of the change in condition, such as LAB-color-values made immediately after production, are not taken into account, and valuable information on material and production is documented with too much imprecision.

In order to fill this fundamental gap, which also contributes to the discourse on the subject of reprinting, an interdisciplinary working group consisting of restorers, photo-laboratories, curators, representatives from the industry, experts and scientists has been formed under the umbrella of Deutsche Gesellschaft für Photographie e.V.. The first focus of this working group "Conservation of contemporary Photographs", is the development of an extended Technical Documentation of Photography (eTDP), which includes information on technical aspects of image output as well as color documentation.

The inclusion of new features, such as drop-down menus with attached thesauruses of terms within an app format, should in theory lead to the documentation being completed in the future by producers such as photo labs or the artist himself. In addition, the app would be accessible to a specific set of people on a web-based database.

In order to strengthen the required acceptance and broad support of all stakeholders of this topic, the working group is conducting high-profile public education on the content. This is made accessible on the group's own website through the documentation of working meetings, events and expert discussions on the topic and opens itself up to public dialog by providing a comment function.

Furthermore, additional issues which are being discussed include the long-term safeguarding and accessibility of the eTDP, material samples, criteria for reproduction, recording of authorized damage shortly after manufacture, criteria for tolerated and no longer tolerable changes, as well as handling notes.

Thus far, successful implementation of the eTDP has made generating data easier upon receipt of photographic artworks into collections, as well as plays an important component in the development of the preservation approach.

The working group would like to present itself at the symposium with the intention of attracting more members. We sincerely hope that the working group will have this opportunity.

The colour in the images of early cinema

Annamaria Poli

Università degli studi di Milano Bicocca

Since the origins of cinema and the first forms of entertainment made with pre-cinema machines, the colour of the images has acquired multiple roles in the history of film thanks to the presence of movement in the images. Fundamental is the role of colour in the narrative dimension which aims to offer another code to the viewer to understand the content and the space-time location of the scene. A further role of colour is the evocative dimension in space-time terms as colour guides the viewer in understanding the passage of time between past, present and future, as for example in the flash-back, another role is perceived in the emotional expressive dimension, when colour appears as a symbolic element and a "significant" element. The experience of colour is therefore an intimate part of human thought, its perception acts on at least three levels: physical, psychological and physiological. Therefore the artistic value of colour cinematographic images is also given in the colours of the moving images and in the expression of movement of this chromatic "experience".

Sergej Ejzenštejn in his writings on colour had investigated, in the context of the so-called "absolute relations", the links existing between particular emotions and particular colours in such a way that colour was for him an experimentation between sensorial correspondences. While Bèla Baláz, taking up Ejzenštejn's studies, underlined the expressive value of the colours of moving images, stating that: "The painter can paint the redness of a face, but he cannot paint a face that suddenly turns pale from pale", and therefore the artistic value of colour cinematographic images is contained in the colours in motion and in their ability to generate emotions in the viewer.

The historical excursus intends to highlight the extraordinary role of colour in some films starting with the early films of the pioneers of cinema. The applications of the chromatic pigment, placed directly on the celluloid frames of these films, has made the opera particularly fragile and delicate, vulnerable to corrosion caused by aging of the material. These films needed a conservation strategy which is somewhat difficult to maintain over the long term. The digitization technique has become essential in order to obtain digital copies and to be able to start a method of the originals conservation. At the same time, their digitalization has allowed for a wide dissemination and greater knowledge and awareness of their existence a modality of preservation their memory.

Green and greener solvents for the conservation of photographs

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¹Opificio delle Pietre Dure, ²Indipendent Conservator

Green chemistry and sustainability have now been known to be the key words for the coming age of the conservation of cultural heritage. Since the 1980s, environmental issues changed the market orientation perspectives, both in the production of photographic materials and films. The discontinuing of Polaroids, also due to the toxicity of its components, is just one example. Almost the same happened in the photographic conservation fields, where solvents have been widely used for routine operation, mainly for superficial cleaning, like fingerprints removal and PST removal. One example is 1,1,1-Trichloroethane, a low polarity solvent commonly used to clean photographic films until it was banned by the Montreal Protocol of 1996, due to its contribution to ozone depletion.

New restrictions and regulation, especially the REACH processes (EC 1907/2006), which aim to improve the protection of human health and the environment, led to a deeper study and to a

new interest in the, so called, green solvents. In order to be considered as 'green', solvents must accomplish a list of principles, which involves human, animal and environmental safety, energy saving during the production cycle, and waste reduction. Some of the solvents that do not fulfil all the requirements, but only few of them, can be still considered as 'greener' and might be an option when treating photographic objects.

This paper aims to inform about an ongoing research that has been carried out on the application of 'green' and 'greener' solvents for stain and adhesives removal. Diethyl carbonate, limonene, ethyl lactate, and eucalyptus oil were evaluated when applied in free form, solvent gels, aerosol. Scientific analysis was performed before and after the treatments in order to determine the efficacy and the persistence of residues.

Preserving Color and Preserving Knowledge. Notes on Digitization and Restoration of Color in Film

Daniela Currò¹, Marco Pagni Fontebuoni²

¹Independent archivist and scholar, ²Film Ferrania

Cinema was originally conceived as a system to project on the big screen positive film copies created by printing from a film negative. With the transition to D-Cinema, moving images created on film are being digitized in order to guarantee wide access to film heritage also through digital projection.

However, the digital emulation of a cinematographic work born on film cannot often stand the comparison with a film print created with a photochemical workflow. The digitization process, involving the transition from one medium to another one, when not skillfully controlled is highly prone to the risk of altering, to different degrees, the image originally created on film, as well as altering the effect that the film has on audiences. This risk is particularly high for works originally created by applying color on black and white stock and by legacy color technologies such as Kodachrome, Technicolor, Gasparcolor, Ferraniacolor and Agfacolor. In these cases color reproduction has always been tricky both in the analog and in the digital domain, making accurate reproduction of original colors almost impossible.

The loss of knowledge pertaining cinema's historical processes and technologies, together with the progressive loss of technical expertise in analog laboratory practices and the disposal and scraping of laboratory equipment considered obsolete, contribute to a flawed reproduction of motion pictures where photography and color design were key defining creative aspects. Furthermore, despite the unparalleled opportunities offered by digital color correction, digitization reveals issues in color reproduction that until now have only partially been considered and studied, and that often cannot be dealt with successfully using the commercial equipment currently available.

The proposed presentation will share a few case studies on issues related to accurate representation of legacy color technologies in the digital realm (e.g. applied color, Technicolor, Ferraniacolor, Agfacolor), and describe some of the most common problems encountered in restoration and digitization workflows, from the selection and use of reliable color references to scanning issues. The presenters argue that often such problems can be solved through creative integration of analog and digital workflows, and that ultimately preservation of film heritage materials and colors is possible only when knowledge of historical color technologies, technical expertise, and versatile and well maintained lab equipment are also preserved.

The Lippmann plate at the Fondazione Scienza e Tecnica in Florence

Anna Giatti

Fondazione Scienza e Tecnica

One of the most important challenges of historical photography was color reproduction. Notable contributions came from the most renowned scientists of the Nineteenth Century that were searching for an improvement in the field of photochemistry. Nonetheless, something of ground-breaking consequences was invented by Gabriel Lippmann's research (1845-1921). In 1891, Lippmann presented a method to obtain the color photography of a spectrum to the Académie des Sciences in Paris. In the next few years, he also perfected the process towards the reproduction of real objects. Lippmann's procedure exploits the physical phenomenon of interference generated by a highly reflective surface placed in contact with the photographic emulsion during its exposure. Despite it was a technique of exquisite beauty, the process did not roll out successfully due to the complex requirements. However, his discovery stands as a milestone in the history of physic as well as in that of the color theory and in 1908 Lippmann won the Nobel Prize for his achievement.

In the 90's of the Twentieth Century, the Fondazione Scienza e Tecnica in Florence received most of the historical scientific instruments and laboratory supplies, from the Department of Physics of the local University, among them was a Lippmann's plate.

Recently, contacts made with the Museè dell'Elyseè in Lausanne, regarding the census they are conducting on the existing Lippmann plates, gave the opportunity to start a process of study and conservation of the upper mentioned plate. The work started in December 2020 and it will be illustrated in the poster proposed here. Specifically, it will be explaining the assessment of the state of conservation explored with investigations aimed at identifying the processes and materials involved in the production of the plate and its degradation.

The restoration project of the plate agreed with the Opificio delle Pietre Dure in Florence will also be illustrated as well as the preventive conservation measurements we intend to undertake for the future preservation.

This last point will be developed within the European Apache Project with whom the Fondazione Scienza e Tecnica is a partner.

Differentiating Chromogenic and Silver Dye Bleach Materials by UV Reflectance Imaging

Rahul Sharma

University of Amsterdam

UV Reflectance (UVR) imaging has seen considerable use in forensic photography to image fingerprints, footprints, and bite marks. However, this imaging modality has been less explored in art conservation, mostly being used for multispectral imaging of painted surfaces. Instead, UV induced visible luminescence (UVLum) has achieved higher traction, wherein the luminescence colours are used to indicate presence or absence of various materials such as coatings or certain pigments.

In the scope of photographs, UVLum has been used to identify different photographic materials. In modern colour materials, this is based on the presence or absence of Optical Brighteners, and UV Absorbing layers. This can be seen as the presence of a strong luminescence, or a dark purple cast. There are however difficulties in using UVLum as an identification tool, as without use of a known standard, it is difficult to gauge objectively the strength of the luminescence, or presence of a colour cast. Thus, all observations have to be comparative, and depend on the experience and qualified judgement of the user.

It is proposed here that UVR be used as an additional tool to discriminate between chromogenic and silver dye bleach materials. This low cost imaging modality depends on the presence of a UV Absorbing layer present in all chromogenic print materials post 1981. This layer is not present in Ilfochrome, Polacolor, Fuji Dye Colour, and Kodak Dye Transfer. In testing with the AIC reference set for colour materials, and other sample images, a simple image capture in UVR shows the presence of the UV Absorbing layer, allowing for easy identification of the print material. As the modality depends on a layer integrated in the emulsion itself, it is independent of effects induced by the support layer. In addition, as the workflow fits commonly used techniques; it is less susceptible to operator error.

ORAL SESSION 8 – March 30th 2021, 15:00 – 16:00

Color on glass - conservation and preservation projects of Crystoleum, Autochromes, Agfa Color Plate and Dufay/Dioptichrome Plate photographs (case studies)

Anna Seweryn

National Archive Krakow

Color photographic materials on glass are very rare in Polish photographic collections. Due to the fragile ground, relatively high price and the historical turmoil that our country underwent during the production and implementation of the first color technologies, these objects are not found in archives or museums, and even if they are present, they are not correctly identified.

My adventure with a color photographs on glass begins in 2014, when I receive photograph made in the Crystoleum technique for conservation processes. The biggest technological problem during the work was re-affixing the separated layer of the photographic image from the glass substrate. In order to choose the best adhesive, I made a series of tests for the adhesion and effects of the process of sticking the albumin print to glass, e.g. for gelatin, Klucel G, Tylose MH300, starch, Funori, microcrystalline wax, the latter of which, together with the activation of the primary binder by temperature, turned out to be the best application. Despite the long process of conservation, this work proves that objects with a silver image are conservable and their condition can be significantly improved, which is not so obvious in the case of color photographs, where the image is based on dyes.

In 2017, a group of 300 glass negatives after a fire and flooding came to my private studio. While working on consecutive negatives, I found pink-colored glass without image layer. While browsing the objects, I also found a degraded gelatin-silver image layer completely detached from the base. The observation of these two components under magnification allowed to combine them into one coherent whole. The pink discoloration of the glass was caused by the presence of a series of red lines, and at the corners of the glass there were also parts of the remaining components of the additive color screen: intersecting blue and green lines. On the other hand, local red dots can be observed on the gelatin-silver layer, which look like a microbial infection or ink stain. The whole object was identified as a photograph taken in the Dufay/Dioptichrome Plate technique. The glass base and the image layer were protected separately (image in a glass sandwich).

My last and greatest experience with color photography on glass is conservation of the collection of 145 autochromes and Agfa Color Plate photographs (2020). Despite the fact that these works were mainly technical (cleaning, sealing), they were very time-consuming and required a lot of concentration. In the conservation process itself, interesting are the differences between the surface of the glass - the base and the cover glass, the possibility of using classic methods and modern conservation tapes, and the analysis of photochemical damage, often giving the photographic image a new context.

Spliced, face-mounted inkjet print – one preservation solution for large format photographic artworks

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Large-format contemporary photography is typically adhered with silicone to its mount as a spliced C-print behind an acrylic protection. Some of the artworks produced with this technique are in poor state of conservation, as the material combination used does not have the desired durability resulting in unacceptable color changes or mechanical damage of the acrylic due to inappropriate handling. Since the photographic print and the acrylic protection form an inseparable unit, damage to one of the components affects the entire artwork with few chances of remedy. Reproduction of these artworks as a conservation strategy needs to go hand in hand with a critical discussion of the production method: a desirable and durable outcome must at the time be technically feasible and commercially available.

The new product “spliced face-mounted inkjet print”, a technical approach to overcome the drawbacks of detrimental material combinations, is developed in view of an improved durability, optical results and, above all, technical feasibility. A selection of materials with promising features includes silicone, pretreated acrylic glass, pigment printed inkjet paper, retouching ink, and adhesive tape. The individual materials, but also selected combinations thereof are submitted to accelerated light and climate ageing and compared regarding their spectrometric parameters, i.e., comparing initial color values on a specified test panel to the ones after different ageing protocols. Also, the strength of adhesion is evaluated since the composite involves back and front mounting and the mounted print must remain securely attached.

Results show a superior quality of pigment-based inks that overcome the tendency of color fading typically encountered with dyes. Also, the material combination of inkjet paper, silicon and acrylic glass tested in this study proves an increased resistance towards optical disturbances caused by the interaction between adhesives, additives, and print on the colorant. Improved mechanical properties are achieved by implementing a scratch-resistant acrylic protection. This research project highlights the benefits of a close cooperation between science, industry, and processing service providers, and shows that aesthetically convincing, technically feasible prints with an improved long-term stability can be achieved owing to a changed materiality.

BRITTLE MEMORIES. Case study of a broken photographic crystoleum

Viviana Goggi¹, Martina Trento²

¹Soseishi snc, ²Martina Trento private conservation lab

When you come across a glass object reduced to fragments, first impulse is to put together puzzle. This is more pressing when the object contains an image that otherwise it cannot be read. Many times photograph conservation questioned as to the best methods to consolidate and repair broken photographs on glass. For negative plates, it can be solved refitting in proper order the fragments that can be scanned or printed via traditional in a darkroom to have a visual record of what is on these plates. After scanning, the pieces can be placed in sink mats that keeps the glass from moving and greatly reduces the chance of further breakage. Unfortunately, it proves to be not so successful procedure to (con)serve positive images, especially if they are

on convex glass. The purpose of this case study is to share a treatment option the authors carried out on an example of this kind of object: a broken photographic crystoleum. This term - from "crystal" and "oleum" (oil) - is used to describe a type of hand-painted photographs (often albumen prints) on convex glasses in imitation of ivory and porcelain painting. Prints were pressed up against curved glass, the paper gently rubbed away until just the emulsion was left adhering to the back of the glass. Small details were then painted to the back, and a second layer of glass with larger areas of painted colours (oil-based) was added. Both pieces of glass were bound together and mounted on cardboard sheet creating a detailed and sharp image. The object of this case study is a portrait of Antonina Capece Minutolo, princess of Collereale, made by Bettini Studio in Livorno around 1880 and kept by the family. Mounted in a frame in wrought brass, photograph has been broken by accidental events. Most of fragments have been recovered, but both glasses showed overall losses of support in addition to breaks. Checked the stability of the emulsion of albumen print, best solution to preserve object and to give back a correct reading of portrait seemed to rejoin the fragments with an epoxy resin. This resin is very strong, and it can be applied on glass side by wicking. Capillarity action pulls the required amount of adhesive into the interface, without coming emulsion side, and with minimal excess on application side. Any residues can be removed, after drying, with a small amount of solvent. Resin does not interfere with the transparency of support, and low shrinkage reduces creating of distracting dark lines when viewed with transmitted light. The resin was used as well to fill losses of support and the possibility to be coloured proved to be a good solution for a stable retouching of image.

The treatment allowed to consolidate each glass separately facilitating handling and mounting one over the other on cardboard.

ORAL SESSION 9 – March 30th 2021, 16:10 – 17:10

Conservation treatments for Autochrome plates: limits and possibilities

Sara Brancato

Universidad Complutense de Madrid

The birth of photography has been a true revolution that has brought profound changes in our way of seeing the world, of understanding it and documenting it. Since its inception, it has been his desire to try to faithfully record what is observed, which has led many personalities to investigate with determination the ways of reproducing color.

These first studies resulted in techniques that are difficult to execute by non-professionals, leaving the obtaining of color images reserved for a few experts. However, in 1907 everything changed: the Lumière brothers commercialized the first plates with which to take color photographs, the so-called "Autochrome Lumière", which, due to their ease of processing, reached a rapid diffusion, not only among photographers professionals but also among "amateurs".

Although it is the first color process that had an industrial system for its manufacture, it could also involve an artisan component that, on the other hand, undoubtedly influences its stratigraphy.

On top of a varnished glass plate, a layer of potato starch grains dyed violet, orange and green mixed with carbon was applied, to which was superimposed another layer of varnish -of different composition with respect to the first-, and finally it was coated with a panchromatic gelatin emulsion. After development, many photographers used to spread a new layer of varnish and accompany the plate with a protective glass, sealing this structure, in the form of a "sandwich", with water-sensitive or heat-activated adhesive tapes. All these cares are the demonstration that already at the time of its diffusion, the fragility of this technique was taken into account and, that, to ensure its survival, auxiliary protection measures were needed, to avoid deterioration.

However, sometimes, not even these measures can prevent the appearance of deterioration in the layers that make up the autochromes. A very common example can be the case of plates with loss of adhesion between the primary support and the emulsion; or breaks in the protection glass, where the phenomenon of blocking has occurred in the image; or, also, the case of plates that have suffered mechanical damage and that have been intervened with an inappropriate seal, which in the long term has compromised the structural stability of the piece. However, the varied stratigraphy and the fragility of the materials that make up the image dictate, with extreme rigidity, the limits and the possibilities of action, since one layer admits certain interventions that another layer may not accept.

In order to illustrate the situations mentioned above, we will present some study cases of autochrome plates that have been subject to deterioration, or with emergency repairs that have modified the state of conservation of the pieces.

The aim of the proposal is, therefore, to show the results of the reported examples and, to a broader extent, to contribute to the knowledge of restoration techniques in use on autochrome plates.

I've Just Seen A Face: Preserving Photographic Memories and Hope Following a Disaster

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During the first year of study, ten graduate students in the Winterthur/University of Delaware Program in Art Conservation are introduced to the preservation of photographic materials from daguerreotypes to digital prints. Coursework has focused on fundamental issues centered on examination, analysis, treatment, and preventive care. In recent years we have harnessed the skills of our students to assist in treatment of at-risk or underserved collections and in the recovery of fire- and water-damaged photographic materials, including color photography. This presentation will summarize the treatment techniques deployed during this recovery process, including traditional and innovative approaches to surface cleaning and flattening, both challenging owing to the fragility of these vulnerable surfaces and the planar distortion that characterizes their often highly compromised resin-coated paper supports. While advancing our knowledge in and experience with the treatment of damaged photographs including chromogenic and dye diffusion color and digital materials, these projects allowed us to work together toward a common goal – helping those in need to preserve their treasured possessions during especially dark and challenging times. This often-tireless work affirmed the significance and value of our shared photographic heritage and the pressing need to develop emergency response and recovery procedures that mitigate irreversible damage and loss.

This presentation will be both practical and philosophical, addressing conservation treatment protocols, ethical challenges, research needs and opportunities, and our profession's responsibility to respond to natural emergencies with skill and compassion. During unanticipated crises from natural disasters to a global pandemic, our work in the preservation of cultural heritage from archeological artifacts to contemporary color print materials must be grounded in our ability to connect and collaborate and to share our skills and knowledge openly with others. We must lead with knowledge and kindness.

Photographic and Cinematographic Film Repository (FiRe): identification of films for digital restoration

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Among the great variety of our Cultural Heritage, photographic and cinematographic materials are fundamental and direct witnesses of the past. The classification and restoration of these materials are often needed as they can undergo severe deterioration, aging and fading. They also have to keep up with the quick technological changes. For instance, over the years the film industry has faced a lot of innovations in many fields, such as the development of different film base materials, the introduction of different colouring techniques and the advance of many acquisition and projection instruments as well as printing and developing machines. The latest step of this evolution is the introduction of the digital technology, which today is going through a deep development in the acquisition and fruition techniques. In this context, it is fundamental to analyse, study and understand the chemical and physical composition of the different films, to set up restoration workflows which are faithful to the original materials also employing modern acquisition and fruition instruments.

In the work of film and photo restoration, conservation and preservation, it is fundamental to analyse and study the original materials, in order to perform a retrieval or a correction faithful

to the original materials. In this context, the lack of technical information (especially for the oldest materials) and the absence of open source archives of the production companies, underlines the actual and concrete need of a database of physical, chemical and sensitometric data of films and photos.

The aim of this work is the creation of a unique big database of cinematographic and photographic materials, in order to support the work of conservators, restorer and researchers. So far, the catalogued films come from different photographic archives, partial databases and websites, supplemented with more detailed and useful information.

Natural development of this work is the implementation of an online open source dataset, which everyone will be able to access. Every material in the website is free to consult and download. Moreover, everyone in possession of useful material has the chance to help expand and upgrade the database, by uploading them in the dedicated section after a further supervision.

The creation of an open source database for the sharing of knowledge is of great importance, as the availability of information is essential for the preservation of our Cultural Heritage.