Muz., 2022(63): 112-119
Annual, eISSN 2391-4815

received – 05.2022
reviewed – 06.2022
accepted – 06.2022
DOI: 10.5604/01.3001.0015.9745

JAN ZDZISŁAW WŁODEK'S AUTOCHROMES: DIGITIZING FROM AN INTERDISCIPLINARY PERSPECTIVE

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According to the preamble to its Statute the Zofia and Jan Włodek Foundation in Krakow was created in order to *consolidate the memory of landowners' merits.* One of its most important activities is the care taken of the legacy of its patrons and founders, including the collection of 249 autochromes whose digitizing is the topic of the present paper.

Established by the siblings Prof. Zofia Albina Włodek and Prof. Jan Marian Włodek, the Foundation bears the name of their parents: Prof. Jan Zdzisław Włodek, a landowner, a legionary, diplomat, agricultural scientist, and a photographer, as well as Zofia Włodkowa née Goetz-Okocimska, a columnist, translator, and a social activist. The activity and the story of the Włodek family of the Sulima coat-of-arms was reflected in an extensive archive deposited at their family Dąbrownica manor in the Bochnia County, and arranged by Jan Z. Włodek. Following the nationalization of the estate, his wife saved the collection under dramatic circumstances, and transferred it to their Krakow home where it has been kept until this very day. Enriched with some new elements following WWII, it was preserved in a good state thanks to Zofia Włodek's efforts, while tidying it was crowned with a computer inventory made by their son Jan M. Włodek.[1] At the same time, the archive was transferred under the Foundation's guidance which, in compliance with its founders' wish, launched a full activity following the death of the last of the co-founders: Zofia A. Włodek in 2018. Currently, works are underway on the re-inventorying of the collection and its preservation.

A substantial part of Włodek's archival records is made up of photographs taken by the family's three generations, constituting a precious source for investigation into the development of photography technologies in the Polish territories. Almost 250 coloured positives on Autochrome plates manufactured by Lumière and Agfa-Farbenplatten constitute a rare example of a larger set of photographs in this technology by one photographer only preserved in Poland until today. They contain shots typical of photographers involved in autochromes: portraits in plein-air, family scenes, flowers, landscapes. Many of them are botanical photographs registering plants in their natural environment. Recording in the film of a section of the botanical environment was in harmony with phytosociology[2] dynamically developing at that time, and this academic perspective was not unfamiliar to Jan Z. Włodek analysing, e.g. phytocenosis in the Tatras.

The first commercial colour technology invented by the Lumière brothers: Auguste and Louis, was marketed in 1907. Autochromes on glass plates of a multi-layer structure were taken with the same cameras as the traditional black-and-white photos. The plates coated with panchromatic emulsion were positively processed, while the final effect was achieved thanks to a layer of coloured starch grains which after having been exposed to light acted as a colour filter showing the image.[3] Although expensive: four Lumière plates 13 x 18 cm cost the same as 12 black-and-white plates of the same manufacturer, almost immediately after they had been marketed won high popularity in the

Polish territories. Public shows of coloured transparencies were held by e.g., photographic societies who were following market novelties.[4] Regardless of this, however, in Polish collections very few plates of different manufacturers have been preserved, for historical reasons and technical ones, e.g., damage in use. Marta Miskowiec of the Museum of Photography in Krakow, an expert on the topic, in the publication which accompanied the exhibition presented on the centenary of the invention of the technology enumerated the few preserved ones: apart from Włodek's photos, there are those by Tadeusz Rząca at the Museum of Photography, by Stanisław Krygowski at the Central Mountain Library of the Polish Tourist and Sightseeing Society (PTTK), Zygmunt Szczotkowski's collection, or Stanisław Lilpop's legacy from Stawisko containing most likely the earliest autochromes.[5] Therefore, the decision to conserve, digitize, and share Włodek's autochromes online was not merely justified by the needs of the Foundation wishing to preserve and disseminate an essential element of their own collection, but it was also in public interest to foster the knowledge of photographs taken in this technology Poland-wide in harmony with the strategic goal of the Digital Culture Programme, namely to *share digital resources and make them available for re-use for dissemination, education, and research.*[6] Thanks to the financing obtained from the Ministry of Culture and National Heritage as part of that Programme in two subsequent years: 2020 and 2021, it was possible for a multidisciplinary team to complete the works climaxing with the uploading of the digital images of the autochromes onto Internet portals open to the general public.[7] Interestingly, the Foundation who do not employ conservators and do not have their own digitizing equipment would be bound to fail in the effort if it had been not for a close cooperation with external experts: the photograph conservator Anna Seweryn; the conservator of archival materials Małgorzata Bochenek of the National Archives in Krakow; the specialist in digitizing photographs and transparent materials, expert of the National Digital Archives Wojciech Staszkiewicz; as well as the specialist in photographs and image records Mirosław Żak of the Museum of Photography in Krakow, the latter partner in the Project; and last but not least Daniel Florek, a specialist in digitizing archival records and sharing digital images of the National Archives in Krakow, focused on controlling the quality of the digital copies. All the endeavours of the team connected directly with the work on the archival materials were, first of all, conditioned by the safety of the items involved and the conservatory requirements headed by the basic principle of conducting conservation on site in order to avoid risky transportation. As mentioned above, Włodek's coloured positives were preserved in his Krakow house inhabited by the family uninterruptedly from 1914 to 2018. Over that period the collection must have been moved more than once from room to room or from floor to floor. It finally ended up in the archival room arranged in 2012 as instructed by Zofia A. Wlodek, and has remained there to-date. In the inventory made by Jan M. Włodek the autochromes were defined as coloured *glass transparencies,* and were recorded under several entries.[8] The majority of the plates (204) feature the dimensions: 9 x 12 cm. In their bigger part they are kept in collective boxes: one of them was bought ready-made, the

1. Ferns, northward descent from Barania Góra, 7 July 1926, Photo Jan Z. Włodek, Autochrome Lumière, Archive of the Włodek Family of Dąbrowica, cat.no. 412/1/0/5.4.1/59

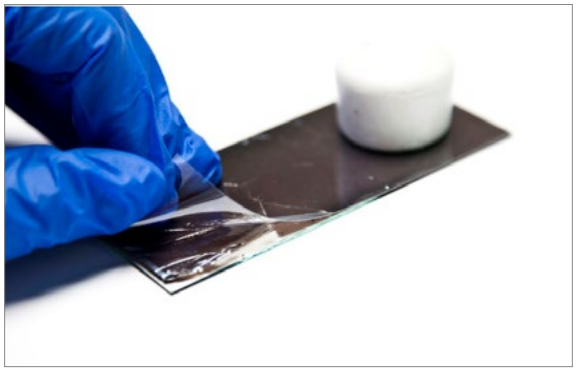
remaining three were commissioned from the Krakow bookbinder Robert Jahoda.[9] The arrangement of the plates in respective boxes is random.[10] The remaining autochromes were kept in brand covers and in secondary boxes and envelopes. The plates' preservation state depended on how they had been kept; they were also dirty, with partially detached or missing protective tapes. The state of the stereoscopic autochromes deprived of the protective glass in which the emulsion layer had been detached was critical. All required conservator's intervention, particularly in view of the preparation for digitizing.

The basic requirement for the works' launch was the setting up of provisional laboratories: for conservation and digitizing. The room adjacent to the archival room was adapted to serve as a conservation lab. The stability of climate conditions in this smallish room with a large window was achieved through window foil screens reflecting sunlight and glass panel blending; furthermore, dehumidifiers and devices monitoring the temperature and RH were introduced. The works were conducted by the photograph conservator Anna Seweryn. The assessment of the preservation state and the character of damage of the autochromes was conveniently supported by a high-resolution microscope she had brought into the lab. The programme of conservation and alterations at the implementation stage was consulted with the specialist in autochrome conservation Stéphanie Ledamoisel of the Atelier de Restauration et de Conservator des Photographies de la Ville de Paris. The

conservation process was conducted on each item separately, either dry or semi-dry,[11] and in harmony with the principles it was limited to cleaning the surfaces, sealing or completing the protective tapes which feature author's notes preserved on them, as well as to the exchange of cracked glass plates or adding the covering glass plates. The highest risk factor for autochromes is the humidity penetrating the sensitive starch halftone, that is why it was attempted to seal the protective tapes with dry methods, using attested transparent films widely applied for this type of conservation works.[12] However, the aesthetical result of their application was not satisfactory. Following consultations with Ledamoisel the actually used solution was spot-applied thick starch pap, put on with a scalpel or a bristle-pointed brush.[13] The genuine stainings resulting from the application of excessive glue attaching the tapes were left with the intention for those author's imperfections to testify to Włodek acquiring prowess in the new technology. What proved the greatest challenge was the reintegration of the detached and cracked layer of the photographic image in eight stereoscopic autochromes (ACNOs 412/0/5/4.3/244–251). A trial was made to glue it with solvent fumes following the method invented by Bertrand Lavédrine, Clara C. von Waldthausen, and Ulrika Müller. It proved, however, to lead to a visible contrast increase in the coloured sections of the starch grains, which disqualified this solution in the preparation for reprography of the items in question. Meanwhile, Anna Seweryn came up with a fully reversible method for stabilization of emulsion layers with the application of electrostatic polyester film (Melinex). This method allowed to preserve the image quality in the digitizing process both in the cast light and penetrating light.[14] Placing respective autochromes in protective covers in P.A.T. certified collective boxes completed the preparation stage for their digitizing.

The Foundation decided to propose a partnership cooperation in the digitizing process to the Museum of Photography in Krakow, bearing in mind both the recommendations to be found in the *Digitizer's Manual,*[15] as well as equipment requirements and the experience of the institution in digitizing autochromes from their own collection. Thanks to the Museum's openness, the digitizing laboratory was set up at the Foundation, in the one-storey library building adapted for the purpose following the stabilization of humidity and temperature. As mentioned above, the need to eliminate transportation risk was a decisive factor to opt for the on-site digitizing. Autochromes: three-dimensional transparent items on a glass base, constitute a challenge in the process. Włodek's autochromes' integral element is to be found in the author's notes written down on protective tapes. Thus, the digitizing applied not only to the image in the given photograph, but also to the appearance and the physical state of each autochrome. In harmony with the recommendations contained in the above-mentioned catalogue and the instruction issued by the Managing Director of the State Archives on digitizing archival resources of state archives,[16] a camera was used to produce master copies of the autochromes. Mirosław Żak and Wojciech Staszkiewicz photographed each item using the camera of the following data-sheet: PhaseOne XF IQ4, 151MP EIP/TIFF_16bit/JPG/JPG1500; lens: Schneider Kreuznach 120 LS Makro f/4,0 'Blue Ring', using study Hensel/Flash Box flashes (calibration standard: ISA Film Targets). Each autochrome was digitized in penetrating light and mixed: penetrating and diagonal in order to record the information contained on the editing tapes on the obverse and reverse of the items, thus producing three digital master copies of each plate. During the digitizing of a part of the set, Staszkiewicz conducted

2. Autochromes in protective boxes made in Robert Jahoda's workshop, Photo Anna Seweryn



3. Process of placing the disconnected and deformed image layer onto stereoscopic autochrome with the use of Melinex polyester film, Photo Anna Seweryn

the first in Poland experimental digitizing of eight stereoscopic autochromes with the use of directed bright field[17] to check how this type of lighting affects the quality of copying digital coloured positives of a multi-layered grainy structure. Staszkiewicz's genuine experiment was inspired by the findings of Barbara Flückiger and Giorgio Trumpy of the University of Zurich, who when investigating the first coloured film reels created following the autochrome concept noticed that their digitizing in diffused light did not retain the features *of an image in directed light, as was created by the lighting system of a film projector.*[18] In other words, when a film reel was projected, similarly as when autochromes were, the so-called Callier effect occurred which altered the image quality. *The phenomenon occurred as the result of introducing enlargers with so-called condenser lighting. A directed bright-field produced a much higher contrast of the image and exposed its granularity.*[19] In order to achieve digitizing rendering the visual effect resulting from projecting autochromes with the use of the originally applied optical sets, it was necessary to adapt the equipment involved. Let us quote the experiment's author: *In order to form the optical bench recreating projector's optics I used various elements of old enlargers, LED light, magnetically attached 'tables', high-quality Nikon D850 digital camera with an apochromatic reproducing lens corrected to 1:1 mapping scale. I had to add to that a set of active cooling to protect the LED diode working in an untypical configuration.*[20] The experiment results confirmed the original assumptions; however, with a higher contrast, colour saturation, and contour sharpness of the image it also excessively exposed the material defaults and damages reducing the aesthetical values of the achieved digital copies. Thus the digitizing with the use of directed bright-field could be useful in conservation documentation in which visualization of damage and changes in photographic image are of importance. Furthermore, as observed by the experiment's author, *an additional argument favouring the use of this lighting method is the extremely low risk caused to transparent*

4. Fragment of stereoscopic autochrome with visible damages to the image layer (Archive of the Włodek Family of Dąbrowica, cat. no. 412/1/0/5.4.3/248), digitizing with the use of directed bright-field, Photo Wojciech Staszkiewicz

objects in the course of digitizing [which can be applied – A.W.] *to visualize in a museum display of transparent objects sensitive to light exposure.*[21]

As a result of the factual arranging of Jan Z. Włodek's autochromes, they were classified in view of their subject and chronology, which led to, e.g., reintegration of the secondarily disrupted thematic series. The collection's inventory and digital copies were uploaded to the following platforms: https://zbioryspoleczne.pl/ administered by the Centre of Community Archives and www.szukajwarchiwach.gov.pl administered by the National Digital Archives. A catalogue was created: it contained the list of photographs with reference to chronology and subject, with notes including the execution date, dimensions, old and new accession numbers, technology (Agfa-Farbenplatten or autochrome), copies of the notes on the protective tapes, and accession numbers of the photos taken on the same day or representing the same motif. It was accompanied by the reproductions of all the autochromes and the following essays: *Colours of Nature. Jan Zdzisław Włodek's Autochromes* by Agata Wolska, *Autochromes' Digitizing. An Attempt at a Different Approach* by Wojciech Staszkiewicz, and Anna Seweryn's *Light of the Colours.* The catalogue is available online at the Foundation's website. During the first stage of the Project, the advertising activity focused on the photographs' author and his output, signalling at the same time the technology itself. The COVID-19 pandemic moved the Project elements to the virtual reality. The exhibition presenting e.g., motifs shot by Włodek and his inspirations was uploaded to the Foundation's website. Paradoxically, its virtual character enabled to achieve an effect very close to the genuine projection of autochromes, almost unattainable if the reproductions were displayed or the digital copies were projected. Shows with projectors[22] or viewing autochromes in slide projectors: small frames with a mirror, just as was the case of viewing digital reproductions on a computer screen, were connected with the perception of an ephemeral image, depending not only on the technical perfection of the photo, but also the intensity and colour of the bright-field. The exhibition was complemented with a cartoon explaining in a simplified manner how autochromes are created and a documentary video about the collection. A talk about autochromes in Polish collections participated by Marta Miskowiec and Wojciech Nowicki was registered and shared on-line.

In the second year of the work on Włodek's autochromes, attention was paid to botanic photographs which dominate in the collection. A preliminary research in a scarce source base, limited to correspondence and financial documents, as well as the analysis of the photographs and notes on the protective tapes consolidated the hypothesis that they were to serve as didactic and research materials. The coloured positives were made by Włodek following the conferment of his post-doctoral degree at the Jagiellonian University in 1922, and having been entitled to teach.[23] Not only to Włodek, but also to many other scientists, autochromes were a tool supporting their in-field research, appreciated regardless of the plates' price or fragility, or a long exposure time.[24] A certain unpredictability of the achieved effect must have been the reason why Dezydery Szymkiewicz of the Botanical Laboratory of the Department of Agriculture and Forestry at the Lvov University of Technology, in order to achieve the best photos photographed the same motifs several times, oblivious to the costs entailed.[25] It is likely that this is how Włodek acted, too, repeating certain shots, not merely of botanical specimens. Writing down on the tapes the aperture value, exposure time, occasionally the hour, and recording the atmospheric conditions, the type of the lens used, as well as of the filters, or the application of the Wynne's Infallible exposure meter, Włodek created a kind of a data base useful in taking other photos. He collected contemporary literature on scientific photography in which autochromes, the only easily available and tested colour technology, despite all the difficulties related to their reproduction were recommended as a tool for natural sciences.[26] Autochromes' unquestionable advantage was the overcoming of the impossibility to render colour differences of leaves and fruits of various species in black and white, while keeping the mechanical objectivism of photography.[27] Despite the fact that this objectivism needs to be approached cautiously in view of the findings of Lorraine Daston and Peter Galison.[28] Interestingly, a curious perspective for investigating Włodek's autochromes stems from the reflection elaborated within Horst Bredekamp's circle: it relates to image media and the perception of a scientific photograph as a carrier of knowledge, visual fostering of the argumentation, as well as an immanent element of a scientific disquisition, at the same time preserving the definite style testifying to the aesthetical trends of the period.[29] The fact of sharing Włodek's autochromes may at the same time not only promote the very collection, but also allow to reach a deepened analysis of coloured photographs in a broad context of contemporary history of art and science. What seems important as well is the dissemination of the knowledge of the autochrome technology in the hope that further photographs of the type will be identified in public and private collections in Poland.

Such was also the goal of the on-site mini-exhibition in the Botanical Garden of the Jagiellonian University presenting the reproductions of autochromes shot at the very same spot almost a hundred years earlier. Apart from the obvious historical reflection in the public, big enlargements of the scans allowed viewers to see how coloured starch grains build up the image. The exhibition also showed how the author was looking for the best ways of photographing plants. Respective specimens shown in their natural environment were to constitute model examples of a given species, with the frame composition and lighting serving this very purpose as well.[30]

The to-date activities connected with Włodek's autochromes have used, obviously, only a limited potential that digitizing brings to various photography collection types. Bearing this in mind and basing on their own experience of an institution not equipped with their own professional laboratory, the Foundation has decided to mount a video addressed to enthusiasts of old photographs in which it promotes cooperation with external specialists and acquiring grants from the Ministry of Culture and National Heritage. As emphasized earlier, thanks to the experts' creative and flexible approach to Włodek's collection, their Project was successful. Its long-term effect is the introduction into digital circulation of the images of photos, extension of the conservatory knowledge in Polish, and a proposal of some innovatory digitizing methods. The digitizing and sharing of the autochromes also allowed to more thoroughly investigate

5. *Gentiana verna L. (spring gentian), Western Tatras, 10 May 1925, Photo Jan Z. Włodek, Autochrome Lumière, Archive of the Włodek Family of Dąbrowica, cat. no. 412/1/0/5.4.1/33*

coloured photography, including scientific photography, which may serve as an introduction to a better systemized reflection. To conclude, the Project to digitize Włodek's autochromes forms part of the resource digitizing conducted by individuals and institutions who can secure and share their culturally valuable collections thanks to external grants and experts' support. Following this stage, these collections function in a broader, world context (among various projects of the type let us recall here the 'Endangered Archives Programme' administered by the British Library[31]).

Abstract: The Zofia and Jan Włodek Foundation in Krakow takes care e.g., of the photographic legacy of its patron Prof. Jan Zdzisław Włodek. Its most valuable element is a collections of 240 coloured positives on Autochrome plates manufactured by Lumière and Agfa-Farbenplatten; it is one of the largest sets of photographs of this type taken by a single author which has been preserved in Poland. In 2020–2021, thanks to the financing from the Ministry of Culture and National Heritage, the collection underwent conservation and was digitized, following which it was made available to broad groups of viewers on the www.szukajwarchiwach.pl and www.zbioryspoleczne.pl portals. The unique photo technology used for their production constituted a real challenge in the set's conservation and digitizing; moreover, attempts were made at an experimental digitizing of the selected autochromes with the use of directed bright-field. In order to promote the knowledge of the set, its author, and the works he conducted, videos and exhibitions were prepared. The whole project was quite challenging to a relatively small NGO. The key to its success was the cooperation of experts who proved to be flexible and creative in their approach to this particular task and peculiar conditions in which the project was implemented.

Keywords: digitizing, autochrome, coloured photography, Callier effect, photograph conservation, stabilization of photographic emulsion, Museum of Photography, Zofia and Jan Włodek Foundation, www.konserwacjafotografii.pl, Małgorzata Bochenek, Daniel Florek, Anna Seweryn, Wojciech Staszkiewicz, Jan Zdzisław Włodek, Mirosław Żak.

Endnotes

1 J.M. Włodek, *Archiwum rodziny Włodek z Dąbrowicy. Główne opracowanie*, 2009, bound computer-printed copy.

2 I would like to acknowledge Bogusław Binkiewicz, PhD, for drawing my attention to this context in Włodek's output.

3 In the event of potato starch grains alkaline dyes were used: green, blue-purple, and red-orange, which were later mixed to achieve neutral greyness. What dominated in the mixture were green grains, then followed the blue-purple ones, and the red-orange ones were the least numerous. These were all applied onto varnished glass plates. The space in-between the grains was filled with carbon black. About 6.000 to 7.000 grains were approximately applied on 1 sq m. The plates were rolled to make them thinner and more transparent. In the course of the rolling, the starch grains were pressed under high pressure (5.000 kg/sq cm). The crushed grains were coated with another thin layer of damar gum in benzene to increase transparency. The top was coated with fine panchromatic emulsion (ca 0.4 μ). See W. Staszkiewicz, *Technika*, https://fundacjawlodkow.org.pl/wirtualna-wystawa/ [Accessed: 11 March 2022].

4 'Kronika', Czas, 15 September 1907, 212, p. 1.

5 M. Miskowiec, 'Autochromy w Polsce. Krótkie omówienie', in: *Autochrom. Triumf koloru. W 110. rocznicę wynalazku fotografii barwnej*, exhibition catalogue, Gdańsk 2017, pp. 53-61.

6 Annex no. 4. Specification of the Programmes of the Ministry of Culture and National Heritage 2021, p. 21, https://www.gov.pl/attachment/eb9ddbe7-4bc4-4419-9f59-c60501308e67 [Accessed: 22 March 2022].

7 Task: 'Conservation, Digitizing, and Sharing of the Collection of Jan Zdzisław Włodek's Autochromes', implemented in the 2020 Digital Culture Programme, overall cost: 98,157.88 zlotys, financing from the Ministry of Culture and National Heritage: 77,292.00 zlotys. Task: 'Conservation, Digitizing, and Sharing of the Second Part of the Collection of Jan Zdzisław Włodek's Autochromes' implemented in the 2021 Digital Culture Programme, overall cost: 72,676.33 zlotys, financing from the Ministry of Culture and National Heritage: 54,652.00 zlotys.

8 A. Wolska, 'Barwy natury. Autochromy Jana Zdzisława Włodka', in *Autochromy. Katalog autochromów Jana Zdzisława Włodka*, ed. by A. Wolska, Kraków 2021, pp. 12-13, https://fundacjawlodkow.org.pl/wp-content/uploads/2022/03/katalog_autochromow_2022.pdf [Accessed: 20 May 2022].

9 Włodek commissioned many works from him. The *Invoice for executing two boxes for plates with wooden compartments of 50 spacings each, covered with green canvas* stood at 55 zlotys. Archive of the Włodek family of Dąbrowica, ACNO. AWD-II-80/2, R. Jahoda, Invoice to J.Z. Włodek, Kraków, 25 August 1925.

10 The inscriptions preserved on the collective boxes' covers may be a trace of the Author tidying his collection. A. Wolska, op. cit., pp. 12-13.

11 So-called dry conservation processes entail works without the use of liquid solvents, e.g., mechanical brushing of an item. Semi-dry processes are works done with a minimum volume of liquid solvents, e.g., cleaning an item with a cotton swab slightly moistened with distilled water or a solvent mixture. Such works do not pose a threat of liquid substances dripping to the structure of the item sensitive to humidity, like autochromes.

12 Transparent Filmolux s23 conservation films and transparent films for film reel splicers (Christy's, Editorial Film Supply, Gaylord Archival). A. Seweryn, 'Konserwacja i zabezpieczenie kolekcji autochromów autorstwa Jana Zdzisława Włodka', *Notes Konserwatorski*, 23 (2021), p. 136.

13 Ibidem, p. 137.

14 Archive of the Zofia and Jan Włodek Foundation, A. Seweryn, *Dokumentacja konserwatorska. Konserwacja fotografii autorstwa Jana Zdzisława Włodka wykonanych w technice autochromu*. Fundacja im. Zofii i Jana Włodków. Stage 2, 2021, pp. 10-11.

15 *Podręcznik digitalizatora*, comp. by Narodowe Archiwum Cyfrowe, p. 56, https://www.nac.gov.pl/wp-content/uploads/2018/07/NAC_Podrecznik_Digitalizatora_2018_pm.pdf [Accessed: 22 March 2022].

16 Regulation No. 14 of the Managing Director of the State Archives of 13 August 2015 on digitizing the archival resources of state archives https://www.archiwa.gov.pl/images/docs/akty_normatywne/zarz_14-2015.pdf [Accessed: 8 April 2022].

17 Taking photographs of transparent objects, in this case autochromes, in directed bright-field requires lighting them with the use of a condenser: an optical set made up of lenses changing the bulb spot light into a parallel beam. The condenser's role is to intensify the brightness of the obtained image at the same level of exposure as with diffused light.

18 W. Staszkiewicz, 'Digitalizacja autochromów. Próba innego podejścia', in: *Autochromy. Katalog…*, p. 29.

19 *Ibidem*, p. 28.

20 *Ibidem*, p. 30.

21 *Ibidem*, pp. 35-36.

22 On technical difficulties connected with this type of shows see C. Fuchs, 'Anticipation and Reality. A Re-Evaluation of Autochrome Projection', *PhotoResearcher*, 19 (2013), pp. 33-42.

23 A. Wolska, op. cit., p. 16.

24 Archive of the Włodek family of Dąbrowica, ACNO AWD-XII-80.2, M. Korczewski to J.Z. Włodek, Warsaw, 25 May 1925, unnumbered pages; *ibidem*, ACNO AWD-XII-84.2, D. Szymkiewicz to J.Z. Włodek, Rabka, 19 July 1924, unnumbered pages: ibidem, ACNO AWD-XII-80.2, Stefan K. to Jan Z. Włodek, 25 May 1925, unnumbered pages.

25 Ibidem, ACNO AWD-XII-84.2, D. Szymkiewicz to J.Z. Włodek, Rabka, 19 July 1924, unnumbered pages.

26 See e.g., K.W. Wolf-Czapek, *Angewandte Photographie in Wissenschaft und Technik*, Berlin 1911; *Photography as a Scientific Implement*, ed. by A.E. Conrady, New York 1923.

27 A. Wolska, op. cit., pp. 17-18.

28 L. Daston, P. Galison, 'The Image of Objectivity', *Representations*, Autumn 1992, 40, p. 112.

29 See *The Technical Image. A History of Styles in Scientific Imagery*, eds. by H. Bredekamp, V. Dünkel, B. Schneider, Chicago 2015; C. Fuchs, *Das Autochrom in Grossbritannien. Revolution der Farbfotografie*, Berlin 2017.

30 The educational activities were complemented with online games in which botanical autochromes were used.

31 See https://eap.bl.uk/about-programme [Accessed: 8 April 2022].

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Word count: 3 986; **Tables:** –; **Figures:** 5; **References:** 31
Received: 05.2022; **Reviewed:** 06.2022; **Accepted:** 06.2022; **Published:** 08.2022
DOI: 10.5604/01.3001.0015.9745

Competing interests: Authors have declared that no competing interest exits.
Cite this article as: Wolska A.; JAN ZDZISŁAW WŁODEK'S AUTOCHROMES: DIGITIZING FROM AN INTERDISCIPLINARY PERSPECTIVE. Muz., 2022(63): 112-119
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