An Objective Revaluation of Photograms by László Moholy-Nagy

SYLVIE PÉNICHON, KRISTA LOUGH AND PAUL MESSIER

Photograms are cameraless, one-of-a-kind images produced by placing objects between a light-sensitive surface, usually a sheet of photographic paper, and a light source. The resulting image is a negative one, where the parts that have been exposed to light are dark, while those protected from it remain white. Gradations between light and dark depend on the exposure time, the opacity of the objects, and their proximity to the surface of the paper. From the summer of 1922, when he was introduced to the technique, until his untimely death in 1946, László Moholy-Nagy produced numerous photograms and wrote extensively about them. He pushed the boundaries of these unique images by rephotographing, reprinting, “revaluating” and enlarging his photograms for exhibition and publication. Photograms are a testimony to his lifelong fascination with light and constitute a large body of work in his oeuvre.

In 2009, Renate Heyne and Floris Neusüss published a catalogue raisonné of Moholy-Nagy’s photograms [1]. The volume gathered new scholarship and a wealth of information on all the known 421 photograms made by the artist, including date, size, inscriptions, paper finish/weight/tone based on visual examination, collection and provenance. Following general technical criteria and the style of the images, Heyne and Neusüss proposed a chronology of the oeuvre [2], a task complicated by the fact that many of the prints were postdated from memory by Moholy-Nagy himself or after his death by third parties. They grouped multiple copies of a single image (enlargements, portfolios, contact prints from copy negatives, etc.) under a unique entry, with a single fgm number [3]. They also raised several questions as to the dating of certain works, stressing that further research into photographic papers might lead to more accurate dating. In recent years, new techniques for the characterization of photographic papers have been proposed [4]. The scope of our research was to use objective measurements taken on photograms to uncover additional information on Moholy-Nagy’s artistic practice during different periods of his life and possibly answer some of the questions raised by Heyne and Neusüss.

PROCEDURE

Measurements on Moholy-Nagy’s prints included dimensions (height and width), paper thickness, surface gloss, color and surface texture of the image and paper support [5]. Complete sets of measurements were made for 117 photograms from collections in Europe and the United States; an additional 90 prints could only be partially measured [6]. These photograms span all the periods of the artist’s production.

Results were plotted and put into context within the body of the Moholy-Nagy photograms that were analyzed. Thus, a sheet thickness of 0.363 mm yields a plotted percentile of 94 percent, indicating only 6 percent of the assessed Moholy-Nagy photograms are thicker. Plotting texture, paper thickness, gloss and base tone on four opposite axes results in a kite-shaped glyph useful for visualizing four expressive dimensions (EDs) of the photographic paper (Color Plate E.1) [7]. More “expressive” papers, those with rough textures, thick paper bases, matte reflectance and warm highlights produce more expansive glyphs that graphically fill the plot area. By contrast, more “functional” papers—smooth, glossy, cool (or neutral) toned and thin—are plotted close to the center [8].

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FINDINGS

A review of the print measurements confirmed that, over time, Moholy-Nagy gradually increased the size of the paper on which he was creating his photograms (Color Plate E.2). Printing on larger sizes allowed him to exhibit his originals directly, without having to rework enlarged copy prints that would have lost details and tonal range in the process [9]. Overall, the size of his papers is fairly consistent within each period. Photograms were usually enlarged when reprinted.

During the early Berlin years (1922–1923), Moholy-Nagy used printing-out papers (POPs) of relatively small size, from 9 × 14 cm postcard stock up to 13 × 18 cm. POPs are moderately light-sensitive photographic papers. Handling and processing these papers can easily be done anywhere, in subdued light, and the progressive darkening of the image allows for the final effect of the picture to be controlled visually at every step of the process. Once the image is fully formed, the print is fixed and washed. With POPs, Moholy-Nagy learned to understand the behavior of photographic materials and how silver salts react to light. Years later, in Chicago, he would have the students of the School of Design make photograms on POPs first, noting that this exercise would often be the “first conscious approach to the subtle gradation scale of light to dark which this medium offers” [10].

When he moved to Weimar to teach at the Bauhaus in 1923, Moholy-Nagy gained access to the school’s darkroom and adopted 13 × 18 cm or 18 × 24 cm developing-out papers (DOPs) that were more light sensitive and required much shorter exposure than the POPs. DOPs allowed Moholy-Nagy to record even rapid movement of light and objects. However, these papers had to be handled in safelight and the latent image created through exposure only became apparent during development. Heyne and Neusüss noted that several works from the Weimar period possibly were made on gaslight papers (GLPs). GLPs are a subset of developing-out papers with particularly slow emulsions of gelatin and chlorobromide of silver that could be handled and processed in subdued light but were sensitive enough to be exposed in artificial light, as opposed to POPs that had to be exposed outdoors. Exposure could vary from 20–30 seconds to a few minutes and, like conventional DOPs, the final image only appeared during development. A wide variety of tones could be obtained with GLPs, from neutral black to reddish [11]. Most of the prints identified as gaslight in the raisonné have been so because of their warm, brownish tone, and it is likely that neutral GLPs have been undetected. We studied our color measurements for clues that would produce a classification system matching the results of visual discernment in the raisonné. When sorting the *b* value (yellow to blue) measured in their Dmin (minimum silver density or areas where the photograms are the lightest), the suspected GLPs were the coolest and the warmest from the Weimar period (both extremities of the range). When sorted by their *a* value (red to green) measured in the Dmax (maximum silver density or areas where the photograms are the darkest), the identified GLPs had the warmest values and clustered together. The EDs did not provide much insight in differentiating the raisonné’s subset of GLPs from the more conventional DOPs.

In Dessau (1925–1928), Moholy-Nagy had a darkroom in his home and used conventional DOPs, mostly in the size 18 × 24 cm. There is only one photogram on identified gaslight paper attributed to the Dessau period in the raisonné (fgm246). Heyne and Neusüss rightly noted that the paper is not typical of the period, yet they left it in that period because of its style. This print has the same EDs as fgm75, attributed to the earlier Weimar period (Color Plate F). Incidentally, Heyne and Neusüss thought that the style of fgm75 was reminiscent of the Dessau period [12]. We compared the EDs of these two photograms with those of other prints from the Dessau and Weimar periods but could not assert if these photograms belonged to one period rather than the other, as both periods contained photograms with similar EDs. When considering color measurements, the *a* value in the Dmax of fgm246 places it in the cluster with the other GLPs, while the *b* value in the Dmin puts it on the edge of the cool-toned GLPs, on the border of the group of conventional DOPs. Based on these observations, one could argue that fgm246 belongs to the Weimar period rather than the Dessau period.

Recent research on photographic standard sizes has defined clear differences between the sizes of papers available on American, British and Continental Europe markets [13]. Correlating the height and width values of Moholy-Nagy’s untrimmed photograms against standard sizes available in different geographic regions allowed us to attribute an origin to the papers used by Moholy-Nagy and plot the results (Color Plate G.1). An unexpected group emerged in the London period, where all the prints measured appear to have been made on papers originating from Continental Europe. Although Moholy-Nagy could have brought boxes of photographic papers purchased on the continent with him to England, there is a possibility that these prints were instead produced prior to his arrival in London.

Comparing print dimensions to de facto standard sizes of photographic papers helped determine if the sheets of papers had been trimmed. Out of the 207 prints we measured, only 17 percent have been trimmed, indicating that Moholy-Nagy favored working his compositions within the borders of his sheets of paper and did not feel a need to adjust size afterward (as opposed to Man Ray, for example, who trimmed his photograms 66 percent of the time [14]). The trimmed papers were found across all periods of Moholy-Nagy’s artistic production and consist of a mix of original photograms, positive revaluations and enlargements.

Paper thickness was measured on 155 photograms made throughout Moholy-Nagy’s career. Roughly half (48 percent) of the measured papers were classified as double weight (> 0.25 mm), with the balance being split between single (< 0.20 mm) and middleweight papers (31 percent and 21 percent, respectively) [15]. Papers from the Dessau period (1925–1928) are the most diverse, with roughly equivalent totals in all three categories. Papers of the Weimar period (1923–1925) show a similar split, but only across single and double weight categories. This trend continues in Chicago (1937–1943), with a nearly identical division between single (49 percent) and double (51 percent) weight papers.
This study afforded an opportunity to compare the subjective descriptions of gloss and thickness reported in the raisonné with measured values. For thickness, an estimation of single or double weight corresponding to measured values of less or greater than 0.20 mm, respectively, was applied. The raisonné is remarkably consistent in these designations, with only four measuredphotograms crossing the 0.20 mm threshold and being mischaracterized (either as double weight measuring less than 0.20 mm or single weight measuring more than 0.20 mm). These designations are very much in line with de facto standard designations applied by manufacturers [16]. For paper finish, the raisonné included five designations ranging from “high gloss” to “matte.” However, each of these categories has broad overlaps when compared to measured gloss values (Color Plate G.2). For example, the raisonné “matte” category contains prints that show a measured gloss of 2.8 to 54 gloss units. This range substantially overlaps with each of the other gloss designations (“semi-matte” ranges from 3.3 to 63.5; “semi-gloss” 8.0 to 65; “glossy” 51 to 69.3; and “high gloss” 33.3 to 83.4 gloss units). These results underscore the advantage of objective measurements of materials’ properties to supplement and inform scholarship. The raisonné’s significant and admirable effort to convey materiality seems to have been undermined, in this instance, by a lack of references and the very human characteristic of an evolving visual memory.

Moholy-Nagy contact printed some of his photograms to create reversed images he called “revaluations” [17]. He is known to have made 33 of these pairs. We obtained complete sets of measurements on three revaluation pairs (Color Plate H). While ED glyphs suggest that pairs fgm256/fgm256A and fgm84/fgm84A were made on similar papers, photograms fgm116 and fgm116A appear to have been made on different papers, with the original photogram made on cooler, thinner and coarser paper than its “revaluated” counterpart, suggesting that Moholy-Nagy might have revisited older photograms to produce revaluations. The revaluations fgm256A and fgm116A were made on a very similar paper and could have been produced at the same time.

CONCLUSION

A few trends emerged from studying the data collected directly from Moholy-Nagy’s photograms, confirming Heyne and Neussü’s own observations, such as the increase of the size of his prints over time, with larger sizes coinciding with the exhibition of photograms rather than their publication, or the variety of papers used by Moholy-Nagy during the Weimar period, for example. A close review of the data showed that Moholy-Nagy did not seem to favor any type of paper, alternating between glossy and matte, warm to cool, or thin to thick, which, knowing his constant quest for new materials and his experimenting habits, is not surprising. His choices might have been dictated by availability but also by aesthetic or practical considerations: glossier surfaces render more details, more saturated tones and more contrast; matte papers give fewer details but have longer tonal range; thicker papers are easier to manipulate when sheets are larger and are more suited for display. We confirmed that, although he was not shy about “enhancing” his photograms with addition (graphite, airbrushed paint, etc.) or subtraction (incisions) to the medium [18], Moholy-Nagy rarely trimmed his photograms and tended to create his design within the constraints of full sheets of photographic papers, seldom feeling the need to adjust the composition by cropping. Comparing expressive dimensions, within each period or across Moholy-Nagy’s entire career, helped define groups or pairs that could potentially lead to reassessment in the dating of certain works, but the technique also showed some limitations.

Collecting a complete set of measurements on every photogram proved to be challenging. For example, when a print was hinged or inlaid, we did not have access to the edges and were unable to take thickness. Even though photograms typically have large areas of minimum density, not all of Moholy-Nagy’s photograms had sizable enough white (or unexposed) areas for us to successfully image paper texture. This, unfortunately, left us with missing data points, which complicated the comparison between papers. In addition, color measurements cannot be adjusted to account for changes a photographic paper may experience over time in regard to its color and/or surface characteristic, due to environmental conditions or conservation treatments. Moreover, the automatic, computer-based classification of our surface texture images gave results that were overall coarser, compared with those already amassed by Messier from the reference collection at Yale’s Lens Media Lab (LML) (containing over 6,000 samples, spanning roughly 100 years), which were made using slightly different equipment. At the moment, our texture data is only comparable within Moholy-Nagy’s universe. A set of control samples has been imaged to investigate these differences, and whether an adjustment could be built into the processing of the images. The adjustment would not only permit comparing Moholy-Nagy’s photograms with the LML but also would help develop protocols allowing for meaningful aggregation and comparison of data.

Despite the limitations outlined above, this work provides an intrinsically valuable baseline against which other photograms, by Moholy-Nagy or others, can be objectively compared. Made accessible, this asset would provide a significant scholarly benefit by moving toward a more fully realized model for a materials-based catalog raisonné. An additional benefit, the resulting “system for looking,” summarized and documented with the trapezoidal glyphs, cultivates significantly improved discernment. Given the underlying numerical basis, this heightened acuity can be effectively communicated and shared with others. Presently limited by the compilation of all project data into a standalone database, new tools, interfaces and visualization strategies are needed to fulfill this promise and truly animate the relationship between Moholy-Nagy and his materials.

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References and Notes

3 In the raisonné, the prefix fgm indicates that the work is a photogram. Positive copies of original photograms include an A after the number. Enlargements and contemporary duplicates made by Moholy-Nagy do not have a separate number. In this article, we will use the same numbering system used in the raisonné, i.e. fgm numbers, to identify individual photograms.
5 Equipment and procedures used for the study were based off those used to analyze selections from the Thomas Walther Collection at the Museum of Modern Art and published in the following: Paul Messier, “Image Isn’t Everything: Revealing Affinities across Collections through the Language of the Photographic Print,” in Mitra Abbaspour, Lee Ann Daffner and Maria Morris Hambourg, eds., Object:Photo. Modern Photographs: The Thomas Walther Collection 1900–1949 (New York: The Museum of Modern Art, 2014) pp. 331–339. Equipment included a Mitutoyo QuantuMike 293–180 micrometer to measure the thickness, a BYK Micro-Tri gloss meter to measure the surface gloss, an X-Rite eXact spectrophotometer to measure the color (CIE L*a*b*) and a Lumenera Corp. Infinity 2-3c imager 3.3 MP with an Edmund Optics VZM 100i zoom imaging lens to image the surface texture. To capture the texture, the surface of prints was illuminated with a LED line light manufactured by Schott and positioned at a 25-degree angle from the surface of the paper. The micro-raking images were processed and the affinity maps were created based off research reported in the following: C. Richard Johnson, et al., “Pursuing Automated Classification of Historic Photographic Papers from Raking Light Images,” Journal of the American Institute for Conservation 53, No. 3, 159–170 (2014).
6 Photograms were analyzed in the following collections: Museum Folkwang, Essen (931); Musée National d’Art Moderne, Paris (87); George Eastman Museum, Rochester (22); and the Art Institute of Chicago (5). Photograms in the collections at the Museum of Modern Art, New York; Museum of Fine Arts Houston; Museum of Fine Arts Boston; Harvard Art Museums, Cambridge; National Museum of American History, Washington, D.C.; and the J. Paul Getty Museum, Los Angeles, were also examined but not measured.
7 Messier and Sexton [4].
15 Sexton and Messier [13].
16 Sexton and Messier [13].
18 Barton et al. [9].

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“The Overview” panel and dinner at Balance-Unbalance
22 August
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**Color Plate E.1.** Glyphs of the expressive dimensions (EDs) of three different photographic papers. (© Paul Messier)

**Color Plate E.2.** Size and photographic paper type of original photograms (in cm²) against time and location of work’s production. Horizontal lines indicate standard sizes of photographic papers commonly available in Europe and the United States. (© Krista Lough and Paul Messier)
**Color Plate G.1.** Regional standard photographic paper sizes plotted against Moholy-Nagy’s location. (© Krista Lough)

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**Color Plate G.2.** Catalogue raisonné’s categories of surface finish against measured gloss. (© Krista Lough and Paul Messier)
Color Plate H. Photograms (left) with their revaluations (right) and overlapping expressive dimension glyphs (center).

Row 1: fgm256, Photogram, ca. 1925, 26.1 x 23.2 cm (1981.2163.0019) and fgm256A, Photogram, ca. 1925, 26 x 23.1 cm (1981.2163.0018).

Row 2: fgm116, Goerz, 1925, 30.2 x 22.5 cm (1981.2163.0026) and fgm116A, Goerz, 1925, 30 x 22.4 cm (1981.2163.0002).

Row 3: fgm84, Photogram, ca. 1923, 38.6 x 29.6 cm (1981.2163.0025) and fgm84A, Photogram, ca. 1923, 38.4 x 28.6 cm (1981.2163.0023). All gelatin silver prints, purchased with funds from Eastman Kodak Company, George Eastman Museum. (Glyphs © Krista Lough and Paul Messier)