Ornament and Transformation - the Digital Painting of Robert Lettner at the Interface of Analogue and Algorithmic Art

Harald Kraemer

School of Creative Media, City University of Hong Kong

H.Kraemer@cityu.edu.hk

Abstract

In the late 1960s, there was a revival of ornamental visual language under the term 'Neue Ornamentik'. Inspired by the Chinese game Tangram, the idea of "geometrical ornaments" by Wassily Kandinsky, the writings of Max Bense, and Josef Frank's design of wallpaper and fabrics in the late 1960's, Austrian artist Robert Lettner (1943–2012) developed an interest in ornament and ornamental structure. Since he didn't understand ornament as a symmetric repetition of motifs, but more as a strategy to visualize complex structures, he first developed an analogue, and later, together with Walter Worlitschek and Philipp Stadler, a digital visual language, which resulted in a series of more than 250 digital paintings from 1995 to 2012.

Based on the structural-systemic approach of ornament, there are three principles in the digital paintings of Robert Lettner: (1) the principle of the serial sequence, (2) the modular principle, which supports the idea of replacing single elements within a closed system, and (3) the principle of the algorithmic image composition, in which the computer defines the visual outcome.

This text provides an introduction to Robert Lettner and a comprehensive overview of the results of a research project to build an archive and database. The project was started in 2013 and completed in 2018. We honour his work as a lesser-known pioneer of computational art, or rather algorithmic art. It is my hope that this essay will establish a basis for future research that will relate Lettner's digital paintings to the works of pioneers of computer art.

From Analogue Drawings to …

In the mid-1960s, about half a century after the end of historicism, engagement with the ornament experienced a revival, known as 'Neue Ornamentik' ('New Ornamentation'). Klaus Hoffmann claimed that this revival "is pointing out the denunciation of the ornament and discovers a new consciousness of ornamentality." [1]

Vienna-based artist Robert Lettner indulged himself in the passion for ornament during those years. He received the British Council Scholarship for his studies in 1972-73 and moved to London. During his scholarship-funded studies, he deepened his interest in ornament by visiting the Victoria & Albert Museum to study its rich collection of works by William Morris and the Arts & Crafts Movement, and created drawings that show his engagement with the repetition structure of iron fences, which he drew in an abstract form as an array of lines. [2] The drawings he made near the subway station of Royal Oak in London in 1973 were attempts to combine the experience with the spatial environment, together with the extensive character of ornament. [3]

Two other ink drawings from 1972 show strongly rasterized and extremely fragmented structures (see Fig. 1 and 2). [4] Upon closer observation, it becomes clear that Lettner created his drawing in three stages. After doing a rough pencil layout he redrew the lines in ink with a Rotring pen, and then he filled in the gaps, creating a dense structure. He used this time-consuming procedure to create drawings of chestnut blossoms in 1975 and more than 70 ink drawings of plants from 2008 to 2012. [5] From research made in the framework of the exhibition *In Dialogue with the Chinese*

Landscape in 2017 in Hong Kong, we conclude that Lettner combined two drawing techniques from the classic *Manual of the Mustard Seed Garden* (芥子園畫傳) and adapted them to his ink drawings. [6][7] Following this manual of Chinese painting from the early Qing Dynasty, Lettner first made a pencil sketch and used the double-line method to outline the shape in ink.

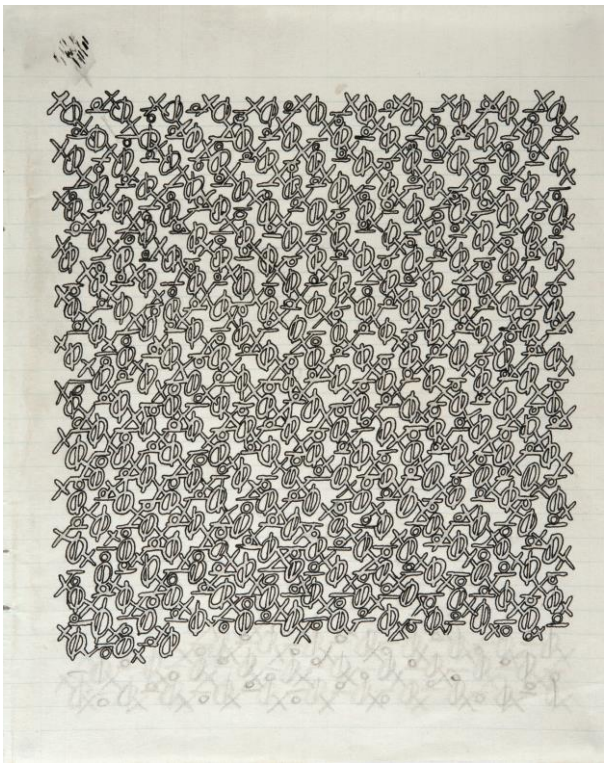


Fig. 1. *Raster (grid)*, 1972, Robert Lettner, pencil, ink on paper, Robert Lettner Archive, Vienna.

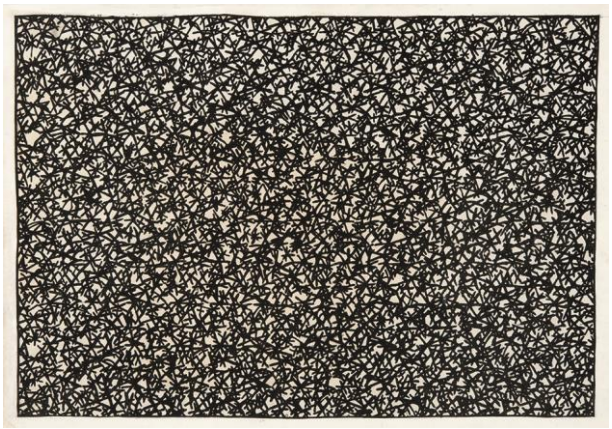


Fig. 2. *Raster (grid)*, 1972, Robert Lettner, pencil, ink on paper, Robert Lettner Archive, Vienna.

Figure 1 anticipates his motif of the knot, while Figure 2 anticipates the series of digital *Images of the magical geometry*, which he created between 1995 and 1998.

When Lettner introduced his sketches to mathematician Herbert Fleischner, he learned that his analogue drawings dealt with a mathematical problem that engaged both mathematicians and pioneers in computer graphic development. The problem refers to the idea of Max Bense, which he elaborated in his four essays *Aesthetica.* Bense claimed that it is possible to calculate the aesthetic value of information through a mathematical formula. [9] Since the algorithmic-based software in the late 1960s was far from offering visually oriented solutions for complex problems, computer graphics served a merely decorative purpose, classified as OpArt, as many results show. The “artists” of those early years were often computer scientists, mathematicians or engineers who were interested in the aesthetic issues of algorithmic design, such as Frieder Nake, Georg Nees, Herbert W. Franke, and A. Michael Noll. [10]

In contrast to many professional artists who rejected the output of these creative dilettantes as 'doodles', Lettner was fascinated by the huge potential of computational power and pursued the question of how to create art with information technology devices in the following decades. Ornament became a strategy for visualizing complex structures within analogue and digital systems.

... to Digital Painting

Lettner's approach to ornament is complex and can be divided into three main areas:

1. The principle of serial sequence. This principle can be found in his works in the series *Das Spiel vom Kommen und Gehen* (*The game of come and go*, 1976–1990), *Die reproduzierte Reproduktion* (*The reproduced reproduction*, 1989–1992), and *Landschaft Bilder Therapie* (*Landscape Paintings Therapy*, 1982–1990).

2. The modular principle, which supports the idea of replacing single elements within a closed system, which Lettner applied in *Landschaft Bilder Therapie* (*Landscape Paintings Therapy*, 1982–1990), and most importantly, *Disketten-Bilder* (1986–1989), *Figurationen*

(*Configurations*, 1991), *Eindeu-tigkeiten* (*Unambiguities*), *Mutationen* (1992), *Dubliner Thesen zur Informellen Geometrie* (*Dublin thesis on informal geometry*, 1992–1994), and *Mein Herbarium* (*My Herbarium*, 1990–1994).

3. The principle of the algorithmic image composition can be shown in his digital paintings (1995–2012), e.g. in the series *Bilder zur magischen Geometrie* (*Images of magical geometry*) in the series of *Über die Dialektik des Fadenscheinigen im Ornament* (*About the dialectic of the flimsiness in the ornament*) and in a variety of his *Spiegelungen* (*Reflections*) works. Since Lettner varied his motifs and compositional elements, the borders of those three principles are fluid and their content is strongly connected.

1. The Principle of Serial Sequence

When Lettner started the series *Das Spiel vom Kommen und Gehen* (*The game of come and go*), he asked himself what to do with the leftover tapes of the airbrush production. In 1970, he came up with the idea of sticking acrylic paint-polluted tape into a spiral bound photo book. This idea resulted in a series of artworks: *Klebestreifen* (*Tapes*) in 1976 and *Zeilen* (*Lines*) in 1978 (Fig. 3). The artist created a small passe-partout, which enabled him to select and focus on certain sections of the images. Some of the image sections inspired him and led him to a new series of artworks. While he focussed on simple and low-saturated visual language in his paintings in 1976, his 1982 paintings, which were up to 200x200 cm were much closer to the idea of his early tape works.

Some of his paintings were given new titles for the exhibition *Philosophie der Landschaft* (*Philosophy of Landscape*) in 2011, so they are now named *Eine frühe Aufzeichnung des Messbaren* (*An early record of the unmeasurable*) or *Ungenau aber schön (Unprecise but beautiful*). He also created simple line-based ink drawings in 1982, which refer to the principle of the serial sequence and can be seen as 'audiovisual' drawings in terms of *Farbpartituren* (*Colour scores*) (Fig. 4).

For the exhibition *Elements. Austrian Paintings since 1980*, which was held in Dublin in 1996, Lettner used his original material and

Fig. 3. *Das Spiel vom Kommen und Gehen* (*Klebebilder*) (*The game of come and go, tape images*), 1978–2010, Robert Lettner, acrylic on tape, Robert Lettner Archive, Vienna.

created an artist's book, titled *Das Spiel vom Kommen und Gehen* (*The game of come and go*). The members of the Viennese *Low Frequency Orchestra* assigned the tape to a score and create a performance, which has been displayed several times as a video installation and as a concert since 2006.

According to musicologist Stephan Sperlich, the series *Das Spiel vom Kommen und Gehen* "renders readability (and in its consequence visibility and audibility as well) of an implicit structure [...]. A readability that can only happen in the process of creation." [11] In 1990, the series of *Das Spiel vom Kommen und Gehen* (*The game of come and go*) appeared again. This time Lettner created them in portrait format with higher contrast and played with elements of the *Disketten-Bilder* series. This is visible in his *Figurationen* series (1991–1992), which show the compositional concept after sequencing (Fig. 5).

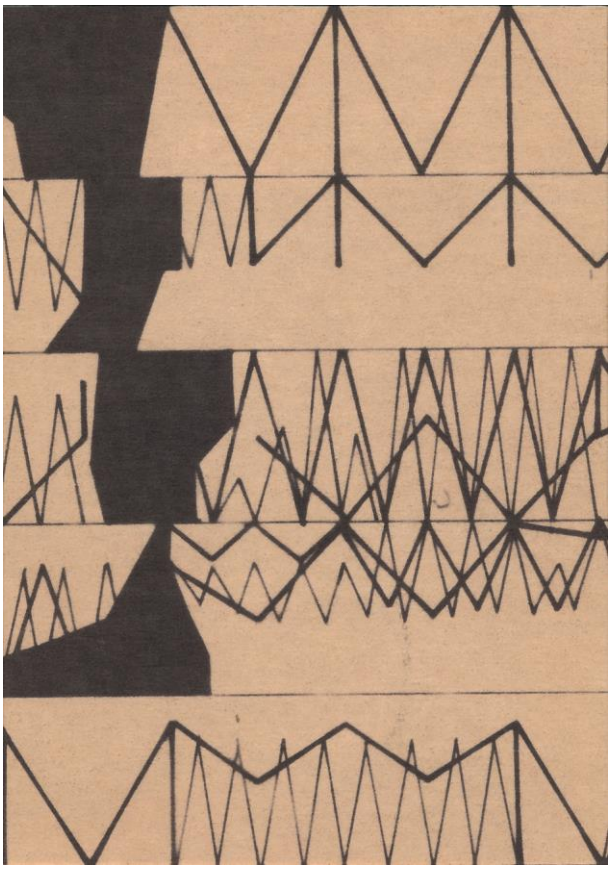


Fig. 4. *Das Spiel vom Kommen und Gehen* (*Tuschzeichnungen*) (*The play of come and go, ink drawings*), 1982, Robert Lettner, ink on paper, Robert Lettner Archive, Vienna.

Fig. 5. *Figurationen* (*Configurations*), 1991–1992, Robert Lettner, acrylic on canvas, Robert Lettner Archive, Vienna.

Between 1989 and 1992 Lettner dealt with the problem of the “reproduced reproduction” and was interested in the question of when a reproduction becomes an original. For this purpose, he used motifs from daily events, which can create different interpretations through multiple reproductions based on the intention of the content. One example for this series of works is *N.Y. Times Square 1987 February 22, 5 p.m.* (1989), which is a tribute to Andy Warhol. Lettner took a photograph of the news ticker at Times Square about Warhol's death on 22 February 1987, as he was in New York when Andy Warhol died.

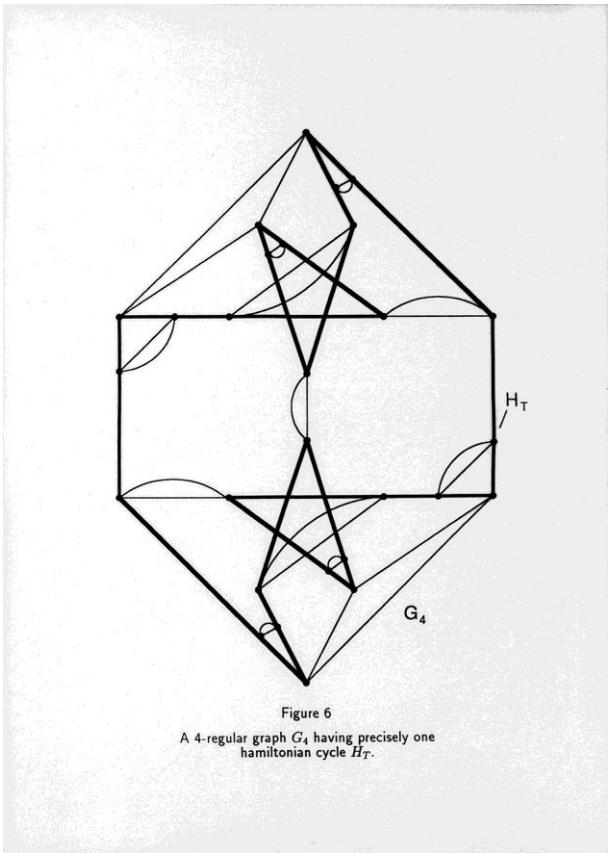
The unusual design for the exhibition *Landschaft Bilder Therapie* (*Landscape Paintings Therapy*), which was organized by Lettner in the Krems Minority Church in Krems in 1988, also relates to the principle of serial sequences. The exhibition showed 84 artworks from 1982 to 1988, separated into six groups of 14 paintings of the same format. The sequential arrangement of the artworks shows the strength of the variety of motifs. From a distance, the arrangement of the paintings recreates ornamental banding.

2. The Modular Principle

The artist’s library contains a book about *Tangram*, the traditional Chinese puzzle with seven shapes. [12] Lettner pointed out the importance of this game "since it creates a constellation of seemingly incompatible elements of the same system, all in a playful way." [13] The hidden principle of modularity which supports the exchangeability of single elements within a system, can be applied to some series of Lettner's work, like the *Figurationen* (*Configurations*) (Fig. 5). This series contains forms that seem to spring directly from the Tangram game and at the same time demonstrate the infinite potential of juxtaposing forms.

The previously mentioned series *Landschaft Bilder Therapie* (1982–1990), which is an example of the principle of serial sequence, can be understood as the modular principle as well. This modularity is even more evident at the interface of the series *Disketten*, which includes *Disketten* (1986–89), *Kosmopolitisch* (1989), and *T1* to *T4* (1992). [14] Inspired by the Tangram puzzle, Lettner used simple single

shapes for the wall design of a hospital in Mödling in Lower Austria (1993–1995).



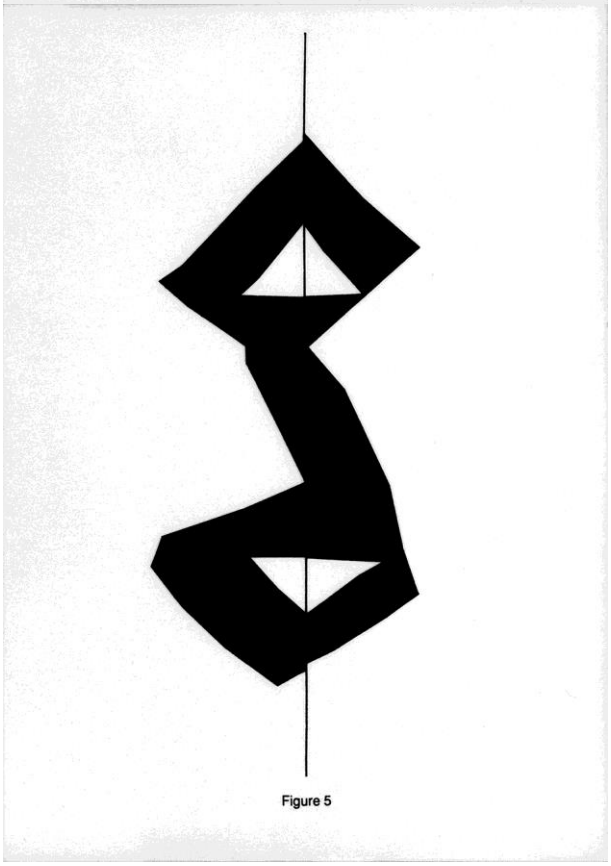


Fig. 6. *Drei Eindeutigkeiten des Mathematikers Herbert Fleischner* (Figure 6) / *Drei Mutationen des Malers Robert Lettner* (Figure 5), 1992, Robert Lettner, silkscreen on canvas, Robert Lettner Archive, Vienna.

In *Drei Eindeutigkeiten des Mathematikers Herbert Fleischner* und *Drei Mutationen des Malers Robert Lettner* (*Three uniquenesses of the mathematician Herbert Fleischner* and *Three mutations of the painter Robert Lettner*) Lettner was also influenced by the philosophy behind Tangram (Fig. 6). But this series of three pairs of silkscreens was the result of collaboration between Lettner and mathematician Herbert Fleischner in 1992. The starting point of their collaboration was three graphs of the mathematician that had similar features and could be combined through transformation.

Herbert Fleischner explained that mathematicians "think in abstract cases to recognize connections between the features of any object (e.g. the mentioned graphs)" and used this to visualise his thoughts. Hence, the mathematician created a new reality and clarity. Lettner was inspired by this and abstracted the clarity by comparing the mind-set of the mathematician with the mind-set of the artist. The term "Mutations" is of central significance, since "every single graph can be transformed into the other two graphs with their specific features." [15]

3. The Principle of the Algorithmic Image Composition

Lettner described the technical structure of his digital paintings as follows: "A hand-drawn sketch has to be digitally printed in two colours on large plastic foils and attached to an aluminum bar." [16] Even though it sounds like a simplification of the artistic process, it is the result of a process the artist called "the merger of organic and inorganic aesthetics. The organic aesthetic is based on an automated hand drawing that is digitally edited." The “digital editing process", which Lettner calls an "inorganic process", "creates the final result, which is not new, but represents something new in the way it was produced. This understanding of aesthetics is the result of the merger of two processes; historically, we are on that point of merging the

manual and technical worlds. That is the actual

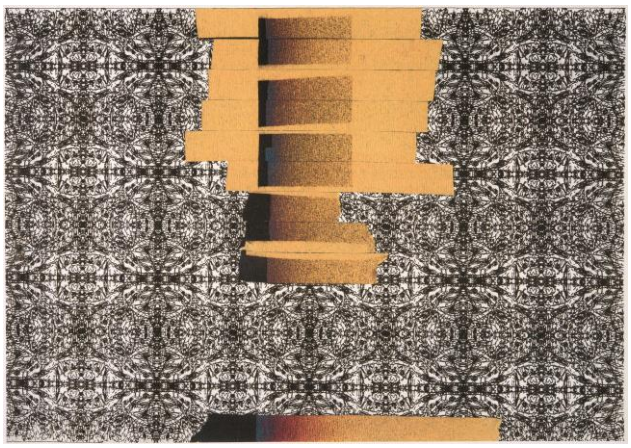


Fig. 7. *Die magische Geometrie (Klebebild) (The magical geometry, tape image)*, 1981, Robert Lettner, tape with acrylic on photocopy, Robert Lettner Archive, Vienna.

transition process." [17] The digital paintings have a playful approach to the laws of algorithmic ornaments.

The works in the series *Bilder zur magischen Geometrie* (*Paintings of magical geometry*, 1995–1998), which were exhibited in Wiener Secession in Winter 1998/1999, were inspired by the series *Die magische Geometrie* (*The magical geometry*), created in 1981 (Fig. 7).

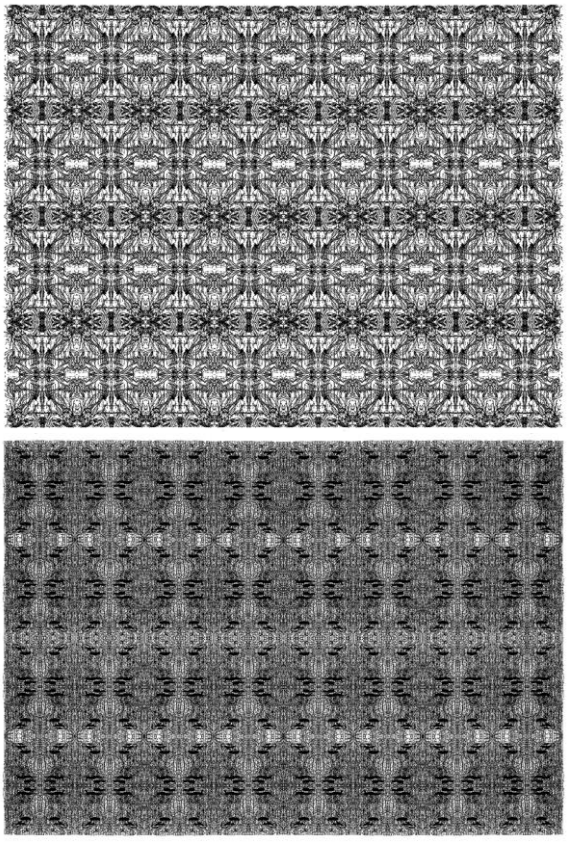


Fig. 8. *Bilder zur magischen Geometrie, Serie I/13; Serie I/2* (*Paintings of magical geometry*), 1996, Robert Lettner, Plotterprint, Robert Lettner Archive, Vienna.

This work is based on a complex hand-drawn grid, which contains repetitive forms and a horizontal and vertical sequence, following the ABAB-scheme. Lettner copied his own drawing in 1981 (Fig. 7), decorated photocopies individually with tape and called his work *Die magische Geometrie*. Since the mid 1990s, printing technology has improved, enabling Lettner to print large-scale prints on acrylic plastic.

In the Viennese Secession exhibition, several variations of *Paintings of magical geometry* were shown (Fig. 8). The ornamental structures he produced in an algorithmic process of data processing contain clear symmetrical features of the classic understanding of ornament, as well as the infinite multiplication of the Celtic understanding of ornament to create dynamic structures. [18]

The following series, *Über die Dialektik des Fadenscheinigen im Ornament* (*About the dialectic of the flimsiness in the ornament*), produced in Lettner's collaboration with Walter Worlitschek in 2000, generates special interest, since the motif of the knot appears in R. Lettner's analogue paintings as well (Fig. 9). [19]. His paintings in the *Knotenbilder* (*Knot Paintings*) series show floating knots in a fictional landscape, which creates a connection between different creation techniques. The knots of his digital paintings are more highly saturated, but they relate more to the first generation of images of the *Bilder zur magischen Geometrie* series. Lettner's knots can be associated with Arabian inspired ornaments as well as arabesque.

The arabesque motif was described in 1893 by Austrian art historian Alois Riegl in his book *Stilfragen. Grundlegungen zu einer Geschichte der Ornamentik.* It is a prototype of ornamental design. [20] With this tendril from which buds and flowers sprout in infinite succession, like a Mandelbrot set, R. Lettner succeeds in interrupting and reinforcing the symmetrically arranged grid by means of another variable element. Arabesques are "the result of a highly complicated mathematical formula, which, as

Muslims feel, indicates the wonderful structure of the world." [21] In later conversations, Lettner said that during this time he studied the repetitive methods of Arabic and Celtic ornament. He understood his digital painting as an artistic reaction to the writings of Alois Riegl, Wilhelm Worringer and Max Bense, but also to the notion of Benoît B. Mandelbrot's fractal geometry. [22]

In 2003, R. Lettner started a new collaboration with Philipp Stadler and created a new series of works. The *Das unsichtbare Archiv des Arcimboldo (The invisible archive of Arcimboldo)* series was inspired by oriental carpets. Illustrations of old Viennese cookbooks were cut out and scanned. This series, along with *Bilder zur magischen Geometrie*, is an example of the "mathematization of the arts", as Max Bense said, citing the "repetition of one single element after the laws of symmetry." [23] Mathematicians Herbert Fleischner and

Fig. 9. *Über die Dialektik des Fadenscheinigen im Ornament* (*About the dialectic of the flimsiness in ornament*), 2000, Robert Lettner and Walter Worlitschek, inkjet on canvas, Robert Lettner Archive, Vienna.

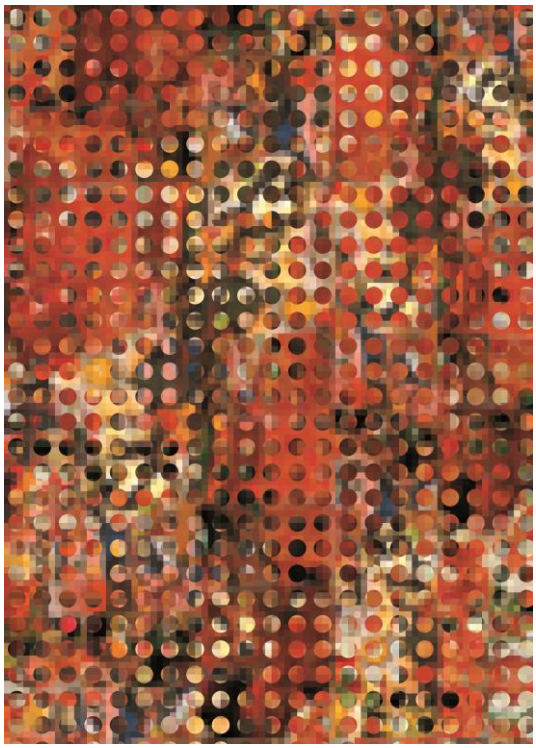


Fig. 10. *Das unsichtbare Archiv des Arcimboldo* (*The invisible archive of Arcimboldo*), 2003, Robert Lettner and Philipp Stadler, plotterprint on canvas, Robert Lettner Archive, Vienna.

Christoph Überhuber, and philosophers Burghart Schmidt and Mara Reissberger, a specialist in the history of ornament, developed a huge interest in this new series of works, since the Information Technology industry uses the idea of “structural design patterns” as well.

In the same year, 2003, R. Lettner created the series *Mein Uterus verlangt nach deinem Zungenkuss* (*My uterus requires your tongue kiss*) (Fig. 11). At first glance, it seems to show surfaces as they would develop from the process of marbling paper and invite random associations à la Rorschach. But through rotations, multiplications and mirroring, the program creates tensions between the elements, while the borders vanish. This work gains its tension from the co-existence between symmetrical order and asymmetrical chaos, which fight for attention. *An der Schnittstelle zur Unendlichkeit* (*At the interface to infinity*, 2009) is an extended version of this strategy (Fig. 12).

Fig. 11. *Mein Uterus verlangt nach deinem Zungenkuss, Reflection A4 V1* (*My uterus requires your tongue kiss*), 2003, Robert Lettner and Philipp Stadler, plotterprint on canvas, Robert Lettner Archive, Vienna.

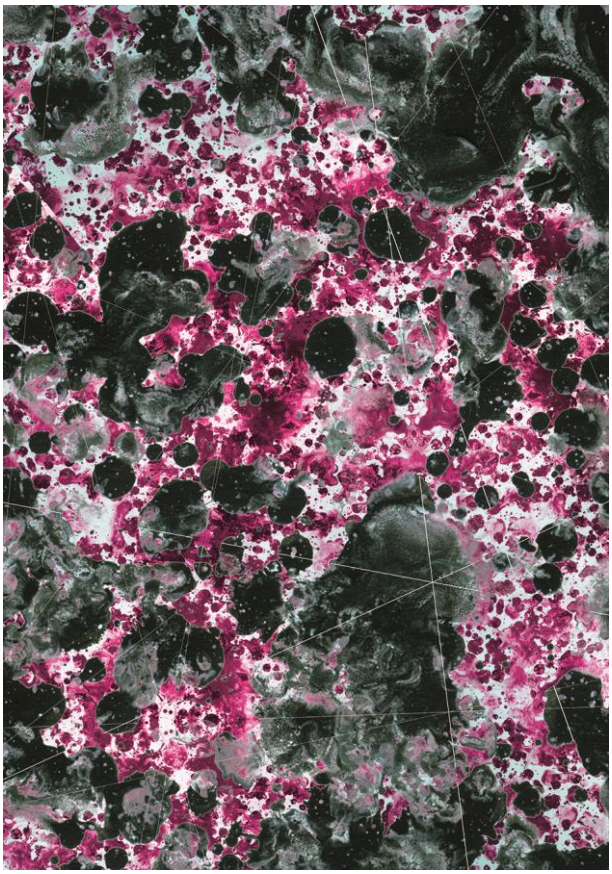


Fig. 12. *An der Schnittstelle zur Unendlichkeit (Reflection A67 V4)* (*At the interface to infinity*), 2009, Robert Lettner and Philipp Stadler, plotterprint on canvas, Robert Lettner Archive, Vienna.

Though the works already had titles, some of them were renamed for the exhibition: *Philosophie der Landschaft* (*Philosophy of Landscape*), *Natur ist keine Katastrophe* (*Nature is not a catastrophe*), *Der Wassergarten im Hause Neptun* (*The water garden in the house Neptune*), *Kalvarienberg – von allen Seiten kamen sie* (*Calvary – they came form all sides*), and *Bikiniatoll* oder *Ein Kreuzklangsonett* (*A cross sound sonnet*). Lettner said the titles of his works float and can change over time, just as the audience will change over time. Also, he considered the title of a work a rebus to hide something about the work rather than giving an actual explanation. [24]

Spiegelungen (*Reflections*, 2004–2012) and *Synchronwelten* (*synchronous worlds*, 2010-2012) are small-scale studies that R. Lettner created in large number. The scanned versions are the foundation for digital paintings. As described in the exhibition catalogue for the exhibition in Hong Kong, Lettner and Philipp Stadler had different approaches to finding a visual language. The work *A27* (2005) and the three versions of it *V1*, *V2* und *V3* from the series *Spiegelungen* (*Reflections*) utilize the technique of zooming and therefore focussing on details. The microcosm and macrocosm are at the same level of importance since they complement each other. They appear as opposite coloured pairs, as in *A25* and *A26*, or unite and complement each other, as in *A61* to *A 63* and *A95*.

The pointillist work *Solaris 1* (*Reflection A17 V1*) (Fig. 13), *A28* and *A30*, and *A38* to *A40*, look like colour plays, which visualize the simultaneous and successive contrasts of the colour theories of Maurice Chevreul. The inspiration for the motif were patchwork patterns and the ornamental visual language of the Orient.

An interesting exception in the *Spiegelungen* (*Reflections*) series are the works *A45* to *A47*, which are also named *33 liegt zwischen den Zahlen* (*33 lies between the numbers*) (Fig. 14). In these three panels, Lettner skilfully combines the principle of serial sequences with the modular principle.

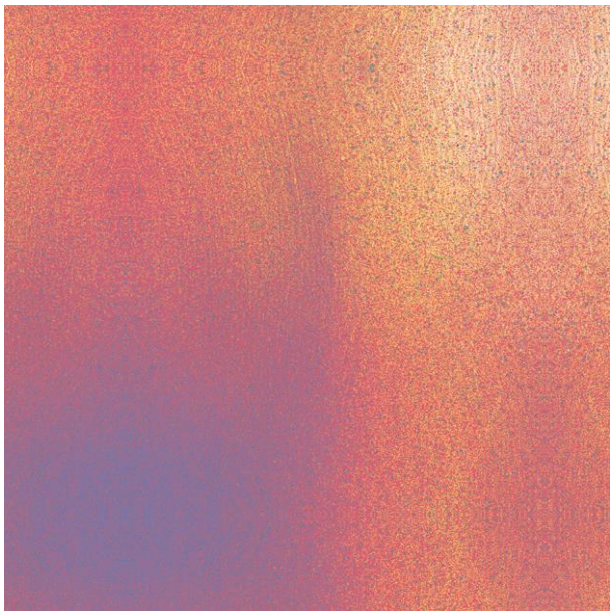


Fig. 13. *Solaris 1 (Reflection A17 V1)*, 2005, Robert Lettner and Philipp Stadler, plotterprint on canvas, Robert Lettner Archive, Vienna.

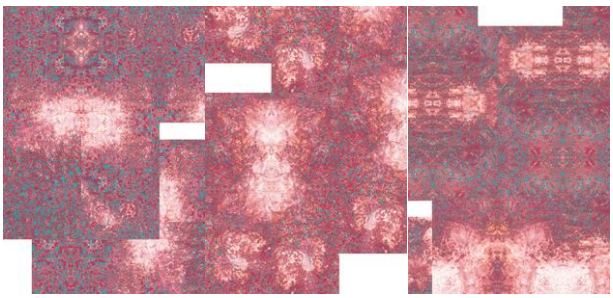


Fig. 14. *33 liegt zwischen den Zahlen (Reflections A45, A46, A47)* (*33 lies between the numbers*), 2007, three parts, Robert Lettner and Philipp Stadler, plotterprint on canvas, Robert Lettner Archive, Vienna.

If we examine *Spiegelungen* (*Reflections*) in relationship with the works of other artists, we see a connection with the fabric and wallpaper patterns of Viennese architect and designer Josef Frank (1885–1967), [25] who said about ornamental design on digital paintings: "A pattern of organic lines has always the desire to dissolve the geometrical form which it is connected with."

In the fabric pattern *seagrass (seaweed)* (Fig. 15), a block print from the 1930s, the floral elements of the ornaments are woodcuts, which are printed on fabric and vary by rotation. This work, created with stamps or paint rollers, has simple motifs and complex ornaments created by multiple rotations. This was a common design on room walls, in corridors, and in

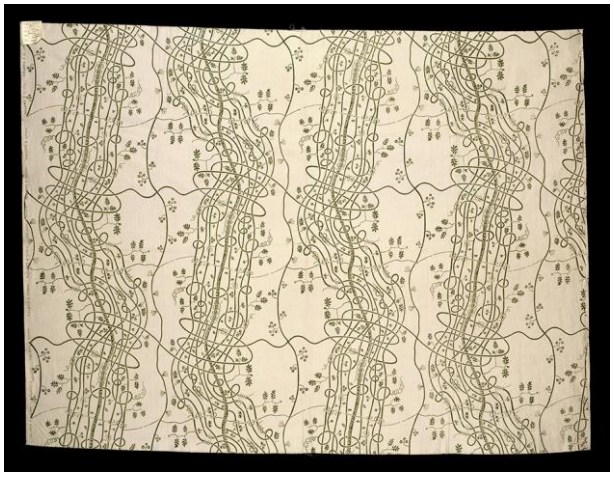


Fig. 15. *Seegras* (*Seagrass*), ca. 1930, designed by Josef Frank for Haus & Garten, Austria, furnishing fabric of hand block-printed and glazed cotton, Inv. No. CIRC.830-1967, Victoria & Albert Museum, London.

fabric samples in Vienna around 1900. Lettner and Philipp Stadler used a similar approach in their work *Kalvarienberg – von allen Seiten kamen sie* (*Calvary – they came form all sides*, 2010) and *A38* to *A40* (Fig. 16). But they used algorithms that created reflections and twists. Since a comparison with the works of Josef Frank would not be comprehensive enough, I compare the digital paintings and landscape paintings of Lettner with those of William Morris and the Arts & Crafts Movement, and examine the influence of Josef Hoffmann, Koloman Moser and the ornamentality of Wiener Werkstätten. [26]

Echoes of Worringer, Kandinsky, and Bense

It is perhaps surprising that simple drawings and simple arranged shapes can create complex ornamental patterns and reveal artistic qualities. Lettner pointed out that every shape seems to be familiar, but they actually don’t exist in their form itself: "It only looks like one. More accurately, it is the fragment of a structure which is identifiable as such throughout our civilization and throughout nature and the world, but ultimately breaks free if it is stretched, and passes from being a microcosm to a macrocosm. Ultimately it becomes infinitely large, and I experience these intervening spaces. The structure, the ornament, is no longer identifiable. But if I move away, the ornament

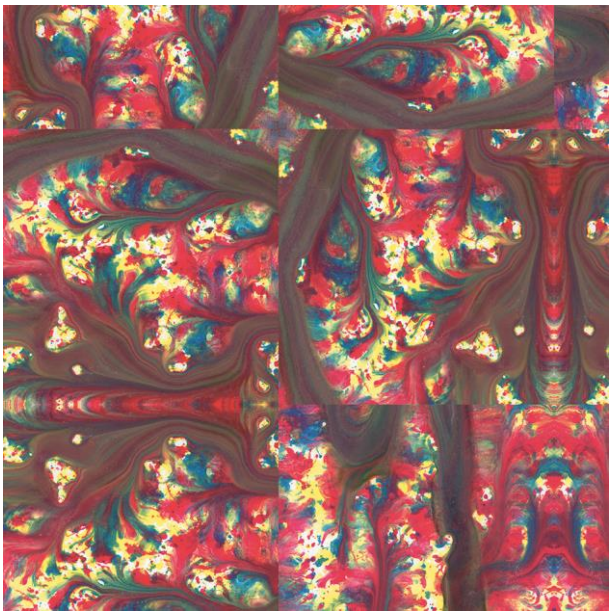


Fig. 16. *Kalvarienberg – von allen Seiten kamen sie* (*Reflection A10*) (*Calvary – they came from all sides*), 2004, Robert Lettner and Philipp Stadler, plotterprint on canvas, Robert Lettner Archive, Vienna

once again becomes the perceivable detail to be identified. All in one, one in all." [27] This observation also shows how close the artist Lettner was in his aesthetic perception to the principles of algorithmic methods and mathematics. Thus, his notion of ornament can be localized in the tradition of Alois Riegl and Wilhelm Worringer, as well as Wassily Kandinsky and Max Bense.

For art historian Wilhelm Worringer, who created with his dissertation *Abstraktion und Einfühlung* (*Abstraction and Empathy*) in 1907 one of the theoretical foundations for the understanding of modern abstract art, these "abstract legal forms" of ornament are "the only ones and the ones the highest" and therefore "it was natural to see in mathematics the highest art form." [28]

Max Bense, who quoted in his chapter "Die Mathematik in der Ornamentik" whole passages from Worringer, declared that it is "irrelevant at first whether the geometric ornament already existed as such or if it developed from a plant ornament." [29] For him, the mathematization of art has “a morphological purpose; it’s not just creating certain figures from the material prescribed for the artistic act that is subject to mathematics; the composition of artistic details and artistic elements also fall prey to mathematization." As an example, Bense calls the "repetition of an element according to the laws of symmetry one of the most general and the oldest processes of mathematization in fine art." [30]

It wasn’t just Max Bense who took Worringer's *Abstraction and Empathy* as inspiration; artists like Wassily Kandinsky and Franz Marc saw in this important work the theoretical basis for their artistic involvement in abstraction. In order to grasp the gaps, Lettner approached his works with a vision of a "geometrical ornament" as it was envisioned by Wassily Kandinsky in 1911: "If we start to destroy our connection to nature, enforce liberation by all means, and remain satisfied with a combination of pure colour and independent shapes, we will create art that looks like geometrical ornaments that will look like a tie or a carpet." [31] It is surprising, that the works of digital painting with its visual language come so close to Kandinsky’s vision of a carpet. But Lettner was more engaged in lines and forms that can be ordered as structures, embody ornament, and lead to an ornamental consciousness. [32]

Lettner continued developing the question of ornament with help of digital computing technology for scientific research purposes and included the art discussion, since just as the evolution of language affects society, the evolution of ornament affects the artistic system. [33] The calculability of the algorithm leads to unpredictable virtual space of experience since "it cannot be found more magical than in the order." [34]

Acknowledgments

This essay is dedicated to Herbert Fleischner in honor of his 75th birthday. I would like to thank Margit Lettner, Markus Lettner, and Philipp Stadler, and especially Park Ji Yun Jade, Alexandra Woermann and Tobias Klein for their help.

References

1. Klaus Hoffmann, *Neue Ornamentik. Die ornamentale Kunst im 20. Jahrhundert* (Cologne: DuMont, 1970).
2. Jorge Enciso, *Design Motifs of Ancient*

Mexico (New York: Dover Publications, 1953); Claude Humbert, *Ornamental Design* (Fribourg: Office du Livre, 1970); Jules Bourgoin, *Arabic Geometrical Pattern & Design* (New York: Dover Publications, 1973); Carol Belanger Grafton; *Traditional Patchwork Patterns* (New York: Dover Publications, 1974).

3. Illustrations in: Harald Kraemer, *Robert Lettner. Das Spiel vom Kommen und Gehen. Widerstand – Utopie – Landschaft – Ornament* (Klagenfurt: Ritter Verlag, 2018), 131.

4. Harald Kraemer, *Robert Lettner*, 133.

5. Harald Kraemer, *Robert Lettner*, 130.

6. *Robert Lettner. In Dialogue with the Chinese Landscape – Utopia of Ornaments – New Wunderkammer of Rococo*, ed. Florian Knothe and Harald Kraemer, exhibition catalogue (Hong Kong: University Museum and Art Gallery, The University of Hong Kong, 2017), 10–11; illlustrations 29–35.

7. *Der Senfkorngarten. Lehrbuch der chinesischen Malerei*, 2 Vols., ed. Hans Daucher (Ravensburg: Otto Maier, 1987, Vol. 2), 21; illustrations see 60–61.

8. Max Bense, *Aesthetica (I). Metaphysische Beobachtungen am Schönen* (Stuttgart: Deutsche Verlags-Anstalt, 1954); *Aesthetica (II). Aesthetische Information* (Agis, Baden-Baden: Agis, 1956); *Aesthetica (III). Ästhetik und Zivilisation. Theorie der ästhetischen Zivilisation* (Krefeld/Baden-Baden: Agis, 1958); *Aesthetica (IV). Programmierung des Schönen. Allgemeine Texttheorie und Textästhetik* (Krefeld/Baden-Baden: Agis, 1960)

9. Grant Taylor: "Routing Mondrian: The A. Michael Noll Experiment," in *Journal of the New Media Caucus* 8, no. 2 (2012), accessed August 28, 2018, http://median.newmediacaucus .org/routing-mondrian-the-a-michael-noll-experiment/

10. *Cybernetic Serendipity. The Computer and the Arts*, ed. Jasia Reichhardt, exhibition catalogue (Institute of Contemporary Art, London 1968, Studio International Special Issue, Praeger, 1970); Günter Pfeiffer, *Kunst und Kommunikation. Grundlegung einer kybernetischen Ästhetik* (Cologne: DuMont, 1972); Herbert W. Franke and Gottfried Jäger, *Apparative Kunst. Vom Kaleidoskop zum Computer* (Cologne: DuMont, 1973); *Frühe Computergraphik bis 1979. Die Sammlungen Franke und weitere Stiftungen in der Kunsthalle Bremen*, ed. Wulf Herzogenrath and Barbara Nierhoff-Wielk, (Munich: Deutscher Kunstverlag, 2007).

11. Stephan Sperlich, "Das Spiel vom Kommen und Gehen," in *Low Frequency Orchestra plays Robert Lettner: Das Spiel vom Kommen und Gehen*, Wien, 2006. Reprinted in Harald Kraemer, *Robert Lettner*, 262–263.

12. Joost Elffers, *Tangram. Das alte chinesische Formenspiel* (Cologne: DuMont, 1978).

13. Robert Lettner in conversation with the author on 27.06.2012.

14. Konrad Paul Liessmann, "Zu Robert Lettners Diskettenbilder," in *Robert Lettner. Dubliner Thesen zur Informellen Geometrie*, Exhibition catalogue (Galerie Heiligen-kreuzerhof, Wien, 1994). Reprinted in Harald Kraemer, *Robert Lettner*, 241.

15. Herbert Fleischner & Robert Lettner, "Mathematik in der Kunst Oder Kunst in der Mathematik?" Reprinted in Harald Kraemer, *Robert Lettner*, 231.

16. Robert Lettner: *Letter to Purchase Commission of Cultural Department*, Lower Austria Provincial Government on 07.03.1997.

17. Robert Lettner and Harald Kraemer, "Art is Reedeemed, Mystery is Gone. Conversations with Robert Lettner and Harald Kraemer," in Robert Lettner, *Die Kunst ist erlöst, das Rätsel ist zu Ende. Bilder zur magischen Geometrie*, ed. Wiener Secession, exhibition catalogue (Vienna: Wiener Secession, 1998), 15–23. Reprinted in: Florian Knothe and Harald Kraemer, *Robert Lettner*, 39–45.

18. Harald Kraemer, "Ornamentik zwischen Opulenz und Virtualität: Worringers Vermächtnis?" in *Hundert Jahre 'Abstraktion und Einfühlung.' Konstellationen um Wilhelm Worringer*, ed. Norberto Gramaccini and Johannes Rössler (Munich: Wilhelm Fink, 2012), 259–276, 271.

19. Harald Kraemer, Robert Lettner, Mara Reissberger and Burghart Schmidt, *Im Bild über Bilder sprechen. Über die Dialektik des Fadenscheinigen im Ornament* (Vienna: Verlag

der Universität für angewandte Kunst Wien, 2006).
20. Chapter IV "Die Arabeske," in Alois Riegl *Stilfragen. Grundlegung zu einer Geschichte der Ornamentik* (Berlin: Verlag von Georg Siemens, 1893), 259–346.
21. Annemarie Schimmel, "Die Arabeske und das islamische Weltgefühl" in *Ornament und Abstraktion – Kunst der Kulturen, Moderne und Gegenwart im Dialog*, ed. Markus Brüderlin, Fondation Beyeler Riehen/Basel, exhibition catalogue (Köln: DuMont, 2001), 31–35, see 31.
22. Robert Lettner in conversation with the author on 28.06.2012.
23. Max Bense, "Die Mathematik in der Ornamentik," in *Konturen einer Geistesgeschichte der Mathematik II. Die Mathematik in der Kunst* (Hamburg, 1949), 57–77, see 57.
24. Robert Lettner in conversation with the author on 28.06.2012.

25. *Josef Frank 1885 – 1967*, exhibition catalogue, (Vienna: Hochschule für angewandte Kunst, 1981); *Josef Frank. Stoffe Tapeten Teppiche*, exhibition catalogue (Vienna: Hochschule für angewandte Kunst, 1986), 62, see also 28, illustrations 25–28.
26. Linda Parry, *William Morris. Textiles*, ed. Victoria & Albert Museum, London (V&A Publishing, 1983, Reprint 2013); Linda Parry, *Textiles from the Arts and Crafts Movement* (London: Thames and Hudson, 2005); *Josef Hoffmann. Ornament zwischen Verbrechen und Hoffnung*, exhibition catalogue (Vienna: Museum für angewandte Kunst, Wien, 1987); Angela Völker, *Die Stoffe der Wiener Werkstätte 1910–1932*, ed. MAK Wien (Vienna: Brandstätter Verlag, 1990/2004).
27. Robert Lettner, *Die Kunst ist erlöst*, 16. Reprinted in Florian Knothe and Harald Kraemer, *Robert Lettner*, 40.
28. Wilhelm Worringer, *Abstraktion und Einfühlung, Ein Beitrag zur Stilpsychologie* (Neuwied: Heuer'sche Verlags-Druckerei, 1907), at the same time Dissertation, Faculty of Philology, University Bern, 12.1.1907. Reprint: Munich: Fink, 2007, Vol. 1, 39–139, see 76. On the input of Worringer: *Hundert Jahre 'Abstraktion und Einfühlung.' Konstellationen um Wilhelm Worringer*, ed. Norberto Gramaccini and Johannes Rössler (Munich: Wilhelm Fink, 2012).
29. Max Bense: *Konturen einer Geistesgeschichte der Mathematik II. Die Mathematik in der Kunst*, (Hamburg: Claassen & Goverts, 1949). See chapter "Die Mathematik in der Ornamentik", 57–77; about Worringer 59-61.
30. Max Bense, *Konturen*, 59, 57.
31. Wassily Kandinsky *Über das Geistige in der Kunst* (München, 1912), (10. edition, Bern: Benteli, 1973), 115. See also Harald Kraemer, "Ornamentik zwischen Opulenz und Virtualität: Worringers Vermächtnis?" in Norberto Gramaccini and Johannes Rössler, *Hundert Jahre 'Abstraktion und Einfühlung'*, 273.
32. *Robert Lettner. Vienna Secession*, 16. Reprinted in Florian Knothe and Harald Kraemer, *Robert Lettner*, 40.
33. Niklas Luhmann, *Die Kunst der Gesellschaft* (Frankfurt/Main: Suhrkamp, 1995), 349.
34. Robert Lettner, *Die Kunst ist erlöst*, 16. Reprinted in Florian Knothe and Harald Kraemer, *Robert Lettner*, 40.

Bibliography

Belanger Grafton, Carol. *Traditional Patchwork Patterns*, New York: Dover Publications, 1974.

Bense, Max. *Konturen einer Geistesgeschichte der Mathematik II. Die Mathematik in der Kunst*, Hamburg: Claassen & Goverts, 1949.

Bense, Max. *Aesthetica (I). Metaphysische Beobachtungen am Schönen*, Stuttgart: Deutsche Verlags-Anstalt, 1954.

Bense, Max. *Aesthetica (II). Aesthetische Information*, Agis, Baden-Baden: Agis, 1956.

Bense, Max. *Aesthetica (III). Ästhetik und Zivilisation. Theorie der ästhetischen Zivilisation*, Krefeld/Baden-Baden: Agis, 1958.

Bense, Max. *Aesthetica (IV). Programmierung des Schönen. Allgemeine Texttheorie und Textästhetik*, Krefeld/Baden-Baden: Agis, 1960.

Bourgoin, Jules. *Arabic Geometrical Pattern & Design*, New York: Dover Publications, 1973.

Cybernetic Serendipity. The Computer and the Arts, edited by Jasia Reichhardt, Jasia. Institute of Contemporary Art, London 1968. Exhibition catalogue. Studio International Special Issue, Praeger, 1970.

Daucher, Hans (Ed.). *Der Senfkorngarten. Lehrbuch der chinesischen Malerei*, 2 Vols., Ravensburg: Otto Maier, 1987.

Elffers, Joost. *Tangram. Das alte chinesische Formenspiel*, Cologne: DuMont, 1978.

Enciso, Jorge. *Design Motifs of Ancient Mexico*, New York: Dover Publications, 1953.

Fleischner, Herbert and Robert Lettner. "Mathematik in der Kunst Oder Kunst in der Mathematik?", In Harald Kraemer: *Robert Lettner. Das Spiel vom Kommen und Gehen. Widerstand – Utopie – Landschaft – Ornament*, Klagenfurt: Ritter Verlag, 2018, 231.

Frank, Josef. *1885–1967*. Hochschule für angewandte Kunst Wien. Exhibition catalogue. Vienna: Hochschule für angewandte Kunst, 1981.

Frank, Josef. *Stoffe Tapeten Teppiche*. Hochschule für angewandte Kunst Wien. Exhibition catalogue. Vienna: Hochschule für angewandte Kunst, 1986.

Franke, Herbert W. and Gottfried Jäger. *Apparative Kunst. Vom Kaleidoskop zum Computer*, Cologne: DuMont, 1973.

Frühe Computergraphik bis 1979. Die Sammlungen Franke und weitere Stiftungen in der Kunsthalle Bremen, edited by Herzogenrath, Wulf and Barbara Nierhoff-Wielk, Kunsthalle Bremen. Exhibition catalogue. Munich: Deutscher Kunstverlag, 2007.

Grant, Taylor. "Routing Mondrian: The A. Michael Noll Experiment." In *Journal of the New Media Caucus*, Fall 2012, V.08, No. 02, Accessed August 28, 2018. http://median.newmediacaucus.org/routing-mondrian-the-a-michael-noll-experiment/

Hoffman, Josef. *Ornament zwischen Verbrechen und Hoffnung*. Museum für angewandte Kunst Wien. Exhibition catalogue. Vienna: Museum für angewandte Kunst, Wien, 1987.

Hoffmann, Klaus. *Neue Ornamentik. Die ornamentale Kunst im 20. Jahrhundert*. Cologne: DuMont, 1970.

Humbert, Claude. *Ornamental Design*. Fribourg: Office du Livre, 1970.

Hundert, Jahre. *'Abstraktion und Einfühlung.' Konstellationen um Wilhelm Worringer*, edited by Norberto Gramaccini and Johannes Rössler. Munich: Wilhelm Fink, 2012.

Kandinsky, Wassily. *Über das Geistige in der Kunst*. [Munich, 1912], 10th edition, Bern: Benteli, 1973.

Kraemer, Harald. *Robert Lettner. Das Spiel vom Kommen und Gehen. Widerstand – Utopie – Landschaft – Ornament*. Klagenfurt: Ritter Verlag, 2018.

Kraemer, Harald. "Ornamentik zwischen Opulenz und Virtualität: Worringers Vermächtnis?" In *Hundert Jahre 'Abstraktion und Einfühlung.' Konstellationen um Wilhelm Worringer*, edited by Norberto Gramaccini and Johannes Rössler. Munich: Wilhelm Fink, 2012, pp. 259–276.

Kraemer, Harald, Robert Lettner, Mara Reissberger and Burghart Schmidt: *Im Bild über Bilder sprechen. Über die Dialektik des Fadenscheinigen im Ornament*. Vienna: Universität für angewandte Kunst, 2006.

Lettner, Robert. *In Dialogue with the Chinese Landscape – Utopia of Ornaments – New Wunderkammer of Rococo*, edited by Florian Knothe and Harald Kraemer. University of Hong Kong Museum and Art Gallery (26.04. – 18.06.2017); School of Creative Media, City University of Hong Kong (25.03. – 19.04.2017; 25.03. – 03.04.2017), Exhibition catalogue. Hong Kong: University Museum and Art Gallery, The University of Hong Kong, 2017.

Lettner, Robert and Harald Kraemer, "Art is Reedeemed, Mystery is Gone. Conversations with Robert Lettner and Harald Kraemer." In Robert Lettner: *Die Kunst ist erlöst, das Rätsel ist zu Ende. Bilder zur magischen Geometrie*, edited by Wiener Secession. Exhibition catalogue 20.11.1998 – 17.01.1999. Vienna: Wiener Secession, 1998, 15–23. Reprinted in *Robert Lettner. In Dialogue with the Chinese Landscape – Utopia of Ornaments – New Wunderkammer of Rococo*, edited by Florian Knothe and

Harald Kraemer. University Museum and Art Gallery, Exhibition catalogue, Hong Kong: University Museum and Art Gallery, The University of Hong Kong, 2017, 39–45.

Liessmann, Konrad Paul. "Zu Robert Lettners Diskettenbilder (1994)." In *Robert Lettner. Dubliner Thesen zur Informellen Geometrie*. Galerie Heiligenkreuzerhof, Vienna, 1994. Exhibition catalogue. Reprinted in Harald Kraemer. *Robert Lettner. Das Spiel vom Kommen und Gehen. Widerstand – Utopie – Landschaft –Ornament*, Klagenfurt: Ritter Verlag, 2018, 241.

Luhmann, Niklas. *Die Kunst der Gesellschaft*. Frankfurt/Main: Suhrkamp, 1995.

Ornament und Abstraktion – Kunst der Kulturen, Moderne und Gegenwart im Dialog, edited by Markus Brüderlin. Fondation Beyeler Riehen/Basel. Exhibition catalogue 10.6. – 7.10.2001. Köln: DuMont, 2001.

Parry, Linda. *William Morris. Textiles*, edited by Victoria & Albert Museum. London: V&A Publishing, 1983. Reprint 2013.

Parry, Linda. *Textiles from the Arts and Crafts Movement*. London: Thames and Hudson, 2005.

Pfeiffer, Günter. *Kunst und Kommunikation. Grundlegung einer kybernetischen Ästhetik*. Cologne: DuMont, 1972.

Riegl, Alois. *Stilfragen. Grundlegung zu einer Geschichte der Ornamentik*. Berlin: Verlag von Georg Siemens, 1893.

Schimmel, Annemarie. "Die Arabeske und das islamische Weltgefühl (2001)." In *Ornament und Abstraktion – Kunst der Kulturen, Moderne und Gegenwart im Dialog*, edited by Markus Brüderlin. Fondation Beyeler Riehen/Basel. Exhibition catalogue 10.6. – 7.10.2001. Köln: DuMont, 2001, 31–35.

Sperlich, Stephan Sperlich: "Das Spiel vom Kommen und Gehen", in: *Low Frequency Orchestra plays Robert Lettner: Das Spiel vom Kommen und Gehen*, Wien, 2006. Reprinted in Harald Kraemer. *Robert Lettner. Das Spiel vom Kommen und Gehen. Widerstand – Utopie – Landschaft – Ornament*, Klagenfurt: Ritter Verlag, 2018, 262–263.

Völker, Angela. *Die Stoffe der Wiener Werkstätte 1910 – 1932*, edited by MAK Wien, Vienna: Brandstätter Verlag, 1990/2004.

Worringer, Wilhelm. *Abstraktion und Einfühlung, Ein Beitrag zur Stilpsychologie.* Neuwied: Heuer'sche Verlags-Druckerei, 1907, at the same time Dissertation, Faculty of Philology, University Bern, 12.1.1907. Reprint: Munich: Fink, 2007, Vol. 1, 39–139.

Illustrations

Fig. 1. *Raster (grid)*, 1972, Robert Lettner, pencil, ink on paper, H 21 x W 29,6 cm, Robert Lettner Archive, Vienna. Ill. in H. Kraemer, *Robert Lettner*, 2018, 133.

Fig. 2. *Raster (grid)*, 1972, Robert Lettner, pencil, ink on paper, H 20 x W 16,2 cm, Robert Lettner Archive, Vienna. Ill. in H. Kraemer, *Robert Lettner*, 2018, 133.

Fig. 3. *Das Spiel vom Kommen und Gehen (Klebebilder)* (*The play of come and go, tape images*), 1978–2010, Robert Lettner, acrylic on tape, H 29,7 x W 21 cm Robert Lettner Archive, Vienna. Ill. in H. Kraemer, *Robert Lettner*, 2018, 116.

Fig. 4. *Das Spiel vom Kommen und Gehen (Tuschezeichnungen)*, (*The play of come and go, ink drawings*), 1982, Robert Lettner, ink on paper, Robert Lettner Archive, Vienna. Ill. in H. Kraemer, *Robert Lettner*, 2018, 189.

Fig. 5. *Figurationen* (*Configurations*), 1991–1992, Robert Lettner, acryl on canvas, H 200 x W 100 cm, Robert Lettner Archive, Vienna. Ill. in H. Kraemer, *Robert Lettner*, 2018, 124.

Fig. 6. *Drei Eindeutigkeiten des Mathematikers Herbert Fleischner* (Figure 6) (*Three uniquenesses of the mathematician Herbert Fleischner, Figure 6*) / *Drei Mutationen des Malers Robert Lettner* (Figure 5) (*Three mutations of the painter Robert Lettner, Figure 5*), 1992, Robert Lettner, silkscreen on canvas, H 119 x W 84 cm, Robert Lettner Archive, Vienna. Ill. in H. Kraemer, *Robert Lettner*, 2018, 125.

Fig. 7. *Die magische Geometrie (Klebebild), (The magical geometry, tape image),*

1981, Robert Lettner, Klebestreifen mit Acryl auf Fotokopie, H 35 x W 50 cm, Robert Lettner Archive, Vienna. Ill. in H. Kraemer, *Robert Lettner*, 2018, 111.

Fig. 8. *Bilder zur magischen Geometrie, Serie I/13; Serie I/2, (Paintings of magical geometry),* 1996, Robert Lettner, plotterprint on canvas, H 130 x W 150 cm; H 130 x W 180 cm, Robert Lettner Archive, Vienna. Ill. in H. Kraemer, *Robert Lettner*, 2018, 252; 135.

Fig. 9. *Über die Dialektik des Fadenscheinigen im Ornament* (*About the dialectic of the flimsiness in the ornament*), 2000, Robert Lettner and Walter Worlitschek, inkjet on canvas, H 200 x W 140 cm, Robert Lettner Archive, Vienna. Ill. in H. Kraemer, *Robert Lettner*, 2018, 140.

Fig. 10. *Das unsichtbare Archiv des Arcimboldo* (*The invisible archive of Arcimboldo*), 2003, Robert Lettner and Philipp Stadler, plotterprint on canvas, H 200 x W 140 cm, Robert Lettner Archive, Vienna. Printed in H. Kraemer, *Robert Lettner*, 2018, 141.

Fig. 11. *Mein Uterus verlangt nach deinem Zungenkuss, Reflection A4 V1* (*My uterus requires your tongue kiss*), 2003, Robert Lettner and Philipp Stadler, plotterprint on canvas, H 200 x W 200 cm, Robert Lettner Archive, Vienna. Ill. in H. Kraemer, *Robert Lettner*, 2018, 142.

Fig. 12. *An der Schnittstelle zur Unendlichkeit (Reflection A67 V4)*, (*At the interface to infinity*), 2009, Robert Lettner and Philipp Stadler, plotterprint on canvas, Robert Lettner Archive, Vienna. Ill. in H. Kraemer, *Robert Lettner*, 2018, 149.

Fig. 13. *Solaris 1 (Reflection A17 V1)*, 2005, Robert Lettner and Philipp Stadler, plotterprint on canvas, H 200 x W 200 cm, Robert Lettner Archive, Vienna. Ill. in H. Kraemer, Robert Lettner, 2018, 151.

Fig. 14. *33 liegt zwischen den Zahlen (Reflections A45, A46, A47),* (*33 lies between the numbers*), 2007, three parts, Robert Lettner and Philipp Stadler, plotterprint on canvas, H 200 x W 420 cm, Robert Lettner Archive, Vienna. Ill. in A. Jankowski, R. Lettner and B. Schmidt, *Philosophie der Landschaft*, 2011, 202–203.

Fig. 15. *Seegras* (*Seagrass*), ca. 1930, designed by Josef Frank for Haus & Garten, Austria, furnishing fabric of hand block-printed and glazed cotton, Inv. No. CIRC.830-1967, Victoria & Albert Museum, London. <http://collections.vam.ac.uk/item/O267089/seegras-furnishing-fabric-frank-josef/>

Fig. 16. *Kalvarienberg von allen Seiten kamen sie (Reflection A10), (Calvary – they came from all sides)*, 2004, Robert Lettner and Philipp Stadler, plotterprint on canvas, H 200 x W 200 cm, Robert Lettner Archive, Vienna. Ill. in A. Jankowski, R. Lettner and B. Schmidt, *Philosophie der Landschaft*, 2011, 184.