special issue:

P r a c t i c e - l e d I c o n i c R e s e a r c h

Contents

Introduction

The thematic issue of *Visible Language* on hand introduces 'practice-led iconic research' as a methodology developed over the past decade. 'Iconic Research,' an interdisciplinary field of scientific inquiry into all kinds of images, emerged from the description of the 'iconic turn' (Boehm 1994) and the "pictorial turn" (Mitchell 1995) in the mid-1990s within the scope of art history. In reference to the linguistic turn – a term coined in the 1960s in philosophy (Rorty 1967) – the lack of reflection on how images create meaning was pointed out in comparison to the analytical reflection on language starting in antiquity. This lack of a scientific analysis of images is especially significant considering the exponential increase of image production and dissemination caused by digitalization. Based on this argumentation, a number of interdisciplinary research clusters have been established in Europe (cf. page 14 of this issue). Philosophers, art historians, linguists, theoreticians, and historians of science, anthropologists, psychologists, and other disciplines from the humanities and the sciences became involved in the "alphabetization" of images, contributing to the question on how images generate meaning within the context of social exchange. The Swiss National Center of Competence in Iconic Research, *eikones*, was founded with the support of the Swiss National Science Foundation at the University of Basel in 2005. Considering the tradition of Swiss Graphic Design and Visual Communication, as well as the relevance these fields have in shaping the flood of images in daily life, the Visual Communication Institute, The Basel School of Design HGK FHNW was involved in the project ever since the preparatory phase. The large-scale project, involving around 30 PhD candidates and Post Docs, was initiated by Gottfried Boehm, who had coined the term 'Iconic Turn' in 1994.

Through their co-operation, it became gradually clear, that the visual communication designers involved in the project brought other aspects to the discourse about images through their understanding of the very process of image generation. With the ability to generate visual variations and the interpretation of a field of visual alternatives, the informed communication designer can, in this context, develop a unique approach complementing existing scientific methodologies. This finding led to the development of the methodology we call today 'practice-led iconic research' (Renner 2010). In short, this term means the systematic creation of visual variations as a methodology to describe a specific effect images cause in a beholder. The verbal description is based on the comparative analysis of visual alternatives created beforehand.

We can distinguish two major trajectories within the described methodology. The first trajectory is focusing on the understanding of the image generation processes and differentiates the description of how decisions in processes lead to an unpredictable visual result. The second trajectory is focusing on the understanding of a specific image category or a specific situation we encounter images in, e.g. diagrammatic images, documentary images, ornamental images, typography and image, etc.

The articles published in this issue describe and demonstrate what distinguishes the design of images for communication in a design office from the design of images to contribute to a scientific question related to iconic research. The articles present projects which were developed in the context provided through the co-operation of the Visual Communication Institute, The Basel School of Design HGK FHNW with eikones from 2005 till 2013 as well as research projects which were developed independently at the Visual Communication Institute since the turn of the Millennium until today.

The publication is structured into three parts.

Part 1 consists of two texts framing the methodology of practice-led iconic research applied to the concrete projects described in Parts 2 and 3. Michael Renner's article introduces the concept of practice led-iconic research. It provides a brief background on the relation between 'text and image.' The article introduces practice-led iconic research as an approach starting from the making of images and distinguishes the two trajectories described above. Both trajectories of iconic research aim to provide evidence perceived by the visual sense that augments the evidence provided by language. Arno Schubbach's contribution argues that the opposition of theory and practice is outdated and not adequate to conceive practice led-iconic research. That rather, it should be understood as a specific research practice based on the production of images. In order to characterize this kind of practice-led research, Schubbach compares it to a theory-driven approach to images and its use of visual examples as well as to the ways in which the natural sciences and artistic research deal with pictures.

Part 2 presents two inquiries into an image-generation process describing the process of taking a photographic picture and writing the Korean alphabet Hangeul. Jinsu Ahn's contribution investigates the design properties of Hangeul that appear in the process of practical writing. They are in contrast to the first publication of the script in 1446 by King Sejong the Great, which introduced letters based on basic geometric shapes. Basic writing experiments and the analysis of their outcome were performed to find answers to the questions of what formal properties Hangeul strokes have, and what role they play in connecting letters to form a fluid vertical line of text. Helga Aichmaier's article explores, based on her dissertation, how taking pictures within a research context enables the analysis and verbalization of strategies that are employed in photographic design processes. Despite a growing body of knowledge on image creation, little research has been conducted into photographic design processes. Viable contact sheets, sketches, proofs, or notes have not been available yet for proper research. Thus practice-led iconic research is adapted as a method for photography – possibilities of photographic practice and its strategies are explored as an instrument of research.

Part 3 presents four articles addressing the image category of the documentary image, the diagrammatic image, the interaction between two pictures, as well as the representation of objects for accessing those objects in an archive. Susanne Käser approaches the question of how a documentary image sequence has to be designed to convey a temporal development. Using the method of practice-led iconic research, aspects such as the

scope of the sequence, temporal distances between the images, gradations between the difference and similarity of the image material, light situation, color palette, and image section are investigated and discussed with the help of practical examples. Paloma López's paper, is based on her PhD thesis, and starts with the observation that the visual process is formed by a broad variety of choices. The knowledge about and the practical experience of these options are at the very core of a particular manner of looking at images. A famous diagram that Charles Darwin drew, is used to show how a different understanding of images can allow us to uncover new insights on the intrinsic meaning of the diagram itself. Claire Reymond's article presents an explorative study using the method of practice-led iconic research to detect the premises that allow connection processes between two images. The analysis documents the relevance of different image features such as, for example, the analogy of the main vectors within the images or the width of the stroke in line drawings. A pilot study using eye-tracking, that was conducted as a subsequent step, strengthens the findings of the practical research. Michael Hübner's contribution presents a practice-led investigation on a diversity of visual strategies to represent objects, and their effects on the perception of the latter. How and what kind of knowledge can be gained from the representation of objects? Series of photographs as well as hand and digital drawings alternate with analytical observations, thus formulating diverse findings and opening up further perspectives not only applicable to the practice of object archives.

We hope that the articles in this issue demonstrate an approach of inquiry and research closely related to the practice of visual communication and representing a relevant contribution to the interdisciplinary field of iconic research. It is our understanding that the basic nature of the research approach presented in this issue is different to applied research, which is oriented towards its direct applicability. Besides, the basic nature of the practice-led methodology presented here is not comparable to a purely theoretical or historical approach. Therefore, we should like to describe the methodology of practice-led iconic research as basic practice-led research in the hope that the outcome of these research activities will help establish a community of communication designers and improve the recognition of design in the research community and in society in the long run.

We should like to thank all the authors contributing to this issue, and all the reviewers of the articles, who have contributed with their constructive criticism to the actual form of this issue. In particular however, we should like to thank the editor of *Visible Language*, Mike Zender, for his outstanding efforts as to the realization of this issue.

The team of guest editors,
Michael Renner, Claire Reymond, Arno Schubbach

Boehm G. (1994). Die Wiederkehr der Bilder, in: Boehm, G. (1994) (ed.). Was ist ein Bild?, München: Wilhelm Fink Verlag, pp. 11 – 38.

Mitchell, W.J.T. (1995). The Pictorial Turn, in: Mitchell, W.J.T. (1995) (ed.). Picture Theory, Chicago: The University of Chicago Press, pp. 11 – 34.

Renner, M. (2010). Practice-led Iconic Research, in: diid, disegno industriale industrial design, 41: pp. 76 – 82.

Rorty, R. ((1967) 1992). The Linguistic Turn; Essays on Linguistic Method. Chicago US: University of Chicago Press.

Practice-led Iconic Research:

Towards a Research Methodology

for Visual Communication

Michael Renner

This article introduces the concept of 'practice led-iconic research.' It provides a brief philosophical background on the relation between 'text and image,' and a theoretical frame to investigate how images generate meaning. The article introduces practice-led iconic research as an approach starting from the making of images, which consists of two trajectories. The first trajectory focuses on the design process, especially on looking at the various conditions that guide decision-making in the becoming of unseen images. The second one examines the characteristics of an image category, i.e. it concentrates on the generation of a specific category of images from a field of variations. Both trajectories of iconic research aim to provide evidence perceived by the visual sense that augments the evidence provided by language.

....

keywords

practice-led
research methods
word versus image
image and meaning

Introduction:

Investigating Visual Design Processes

The following contribution proposes a research approach in the field of visual communication with the aim of developing design-specific methods from the core competence of design. The claim that a design process can be employed to gain knowledge is contested by many established research communities of the humanities and sciences. Even the review of proceedings of recent design research conferences indicates a preference for adapting methodologies from established scientific disciplines, rather than developing a design-specific research approach. Design processes become the subject of anthropological studies, design solutions are evaluated through standardized interviews, usability is tested with eye-tracking technology, and design movements and their protagonists are described by means of historical inquiries into archives and libraries.

The key issues of the creation of visual messages for the purpose of social interaction are the generation of images and an analysis of their perception by viewers.

One might object to this definition and say that objects of visual communication always consist of a combination of an iconic and a linguistic message – images and words. Or we may embrace the idea that visual communication is a phenomenon that can be read as a language. The definition of visual communication as a practice of image creation is opposed to the classification of visual communication as an exchange of conventional signs in language. In order to understand the field and its potential research contribution, it appears to be necessary to evaluate the relationship between the opposite classifications of visual communication as language or as image and to recapitulate the historical development of the relationship between image and language in general.

The Uneasy Relationship

between Language and Image

The general question of the relationship between language and image – the dichotomy between sensuous experience and conceptual inference – has been a key issue of Western thought and leads us to the philosophical discourse on epistemology. Four phases of Western intellectual history – Plato, Platonism, German Criticism, and German Idealism – were described by Friedrich Nietzsche in a aphoristic summary under the title of "*How the 'True World' Finally Became a Fable: The History of an Error*" (Nietzsche 1888) which was interpreted by Martin Heidegger under the title of "*Nietzsche's overcom-*

ing of Platonism" (Heidegger 1961). Nietzsche analyses the above-mentioned historical phases of philosophy and concludes that all of them continue the hierarchical relationship of the "supersensuous" over the sensuous experience established by Plato. Based on this conclusion Nietzsche bases his philosophical position by initially proclaiming, for phase five of Western thought, the superiority of the sensuous over the conceptual. By positing the sensuous experience over conceptual thought, a hierarchical relationship would be maintained. For the sixth phase of philosophy Nietzsche, therefore, argues for the necessity to continuously re-evaluate between the sensuous and the "supersensuous" and to free the relationship from a hierarchical order.

With the request for a continuous re-evaluation, the relationship between language, as a central component of a logocentric epistemology, and images as objects providing a sensuous experience, has been fundamentally shifted. Language is no longer an exclusively epistemological domain, and the evaluation of the relationship between sensuous perception and thinking in an abstract system of symbols is based on a new foundation.

Following this line of thought, we can describe a large part of the postmodern phase of Western thought as an elaboration of Nietzsche's contribution. Following his claim for a non-hierarchical re-evaluation, Jacques Derrida (1967), for example, describes in great detail in "Of Grammatology" the biased approach of Ferdinand de Saussure, who employs a Platonic hierarchy in his foundation of linguistics (de Saussure 1916). Derrida contests de Saussure's position that the notation, perceived by the visual sense, has a negative effect on the interpretation of language. De Saussure advocated without ambiguity to keep linguistics free from the influence of the visual sense and, therefore, of notation and typographic form in his "Cours de linguistique générale" (de Saussure 1916, p. 53 referred to by Derrida 1967, p. 41).

"But the tyranny of writing goes even further. By imposing itself upon the masses, spelling influences and modifies language. This happens only in highly literary languages where written texts play an important role. Then visual images lead to wrong [vicieuses] pronunciations; such mistakes are really pathological."[1]

Derrida accentuates de Saussure's preconception of the "interiority" of language and his exclusion of its "exteriority" in the form of the visual appearance of language in a notation system and suggests looking at the phenomenon of language in a holistic manner.

1   Derrida, J. (1997 (1967)). Of Grammatology, translated by Chakravorty Spivak, G. (1997). Baltimore: John Hopkins University Press p. 41. Original quote: "Mais la tyrannie de la lettre va plus loin encore: à force de s'imposer à la masse, elle influe sur la langue et la modifie. Cela n'arrive que dans les idiomes très littéraires, où le document écrit joue un role considérable. Alors l'image visuelle arrive à créer des prononciations vicieuses; c'est là proprement un fait pathologique." de Saussure, F. (1916 (1995)), Paris: Editions Payot & Rivages, p. 53.

"It is this logocentrism which, limiting the internal system of language in general by a bad abstraction, prevents Saussure and the majority of his successors from determining fully and explicitly that which is called 'the integral and concrete object of linguistics'[2]." (Derrida 1967, p. 43 quoting de Saussure 1916, p. 23)

Derrida's elaborations describe the reason why typography has never been considered a discipline of linguistics and was, until recently, understood as a mere craft subject to rules developed over centuries. The understanding of typography as a non-linguistic discipline and the focus on its inherently carried visual message allows us to understand typography as a part of the realm of the image.

The term of "Script-Iconicity" (Schriftbildlichkeit), coined by Sybille Krämer in the context of iconic research, provides a more recent approach of looking at this neglected side of language (Krämer 2003). In the introduction of Schriftbildlichkeit, Sybille Krämer and Reiner Totzke describe four concepts of the term of script-iconicity: (1) **spatiality**, (2) **graphism**, (3) **operativity/explorativity** and (4) **mechanizability** (2012, page 13-35).

"**Spatiality**" is the two-dimensional character of script and its need for a fixed order and orientation under the title of "spatiality". The importance of the blank space ("Zwischenräumlichkeit") between the signs is emphasized in reference to Nelson Goodman's description of language as a disjunct system versus the image as a dense sequence of visual entities. The need to introduce the term of "Zwischenräumlichkeit" and to ignore the typographer's term of "white space," might be interpreted as another consequence of the historical gap between the "sensuous" and the "supersensuous."

The dependence of script on a tool and a surface of inscription is described by Krämer and Totzke as "**graphism**". They see this quality of script as a result of the uniquely human ability to coordinate between hand, eye, and brain. Drawing shares the same foundation, and in this respect, a direct connection can be established between written words and images. In addition, the authors point out that the line as a trace of a gesture carries two aspects, which become central to their concept of "Script-Iconicity". On the one hand, the line is an unintentional expression as an index of an individual gesture, and on the other hand, the line can be an arbitrary sign standing for something. This double function of the line makes it possible that script, typefaces, notation systems, and typography can become, in the words of Sybille Krämer, "the shifting point between the sensuous and the sense" (Krämer et al. 2012, p. 24), or in Nietzsche's words, the sensuous and the supersensuous – what we see in a form and what we read in a text.

With "**operativity/explorativity"** Krämer and Totzke emphasize

that the idea of extending the field of language beyond a mere concept of a notation system means to include the creative, explorative and cognitive role of scripture: "We understand therefore: writing, overwriting, altering and erasing of written signs, the formation and transformation of schemata, can become an epistemic workshop, a design studio (Entwurfsbüro), and become an artistic laboratory: workshops and tools out of paper come into being. In short: scripture is not only a space for the representation of scientific and artistic ideas and objects, but also a location of their genuine discovery, invention and exploration." (Krämer and Totzke. 2012, pp. 20/21)[3]

The term of "**mechanizability**" addresses the fourth concept of "Script-Iconicity". The binary code, understood as a form of text, caters for an additional involvement of time in the script, which can be used for text that is automatically generated or text as a simulation resulting from the interpretation of data.

In "Script-Iconicity," the diverse contributions focus on different writing and notation systems as well as on diagrammatic images. But the publication does not discuss many examples where the transition between the readable and the seeable, the sensuous and sense, is a result of formal exploration in a design context. The contributions address existing notation systems in language, dance, or music and focus on diagrammatic images. We may critically ask inhowfar the exteriority of script is of interest in the systemic conditions of established academic research disciplines.

Following Krämer's description of the two levels of meaning of a line as (1) the result of an interior gestural utterance and (2) as the carrier of a conventional but arbitrary sign, we can suggest the following proposition for visual communication and its research activities in general: employing the arbitrary sign in visual communication can be attributed to the field of language and semiotics and can, therefore, be analyzed with the theoretical tools provided by these disciplines. We can, for example, talk about the catchline in an advertisement using rhetorical Figures or critically look at the grammatical construction of a sentence. But we cannot use the same theories to explain the meaning which is expressed by the letterform and typographic composition, not to mention any other level of meaning expressed by additional iconic elements. We can describe the meaning of the arbitrary conventional signs fairly well, but we cannot analyse the impact of the gestural utterance for the above-stated historical reasons. Since visual communication, as its name implies, is primarily concerned with visual and not with linguistic aspects, we can safely focus on images and look at recent research developments in this field to further develop the practice

2   Original quote: Quel est l'objet à la fois intégral et concret de la linguistique? de Saussure, F. (1916 (1995), Paris: Editions Payot & Rivages, p. 23.

3   Original quote: "Wir sehen also: Das Schreiben, Überschreiben, Umschreiben und Löschen schriftlicher Zeichen, die Formation und Transformation von Schemata kann zur Erkenntniswerkstatt, zur Gedankenschmiede, zum Entwurfsbüro und zum Kunstlabor werden: Werkstätten und Werkzeuge aus Papier entstehen. Kurzum: Schrift ist nicht nur ein Darstellungsraum wissenschaftlicher und künstlerischer Gedanken und Objekte, sondern auch eine Städte ihrer genuinen Entdeckung, Erfindung und Exploration." Krämer and Totzke, 2012, pp. 20/21, English translation by the author.

of visual communication. We can now focus our quest for a unique research contribution to visual communication on the field of iconic research and ask 'how can the practical knowledge of visual communication contribute to the understanding of how images generate meaning.'

An Increasing Focus on the Image:
a Theoretical Basis

With the discourse on "Script-Iconicity," we have already entered into a wide research field that emerged in the 1990s under the term of "iconic research". Following the observation that digital tools and media channels significantly increase the generation and dissemination of images, the terms of "iconic turn" (Boehm 1994, p. 17) and "pictorial turn" (Mitchell 1995, pp. 11 – 34) were coined within the scope of the history of art to describe the shift from written communication to communication with images (Boehm & Mitchell, 2009). Along with the iconic turn the lack of scientific research about images and, therefore, also a lack of fundamental understanding of how images generate meaning was observed. This becomes especially evident if we consider the long history of scientific reflection about language (Mitchell 1986; Boehm 2007, pp. 28 – 43). Thus, the lack of awareness of how images affect a beholder and the increase in communication through images based on digital technology might need to be considered as a potential threat to any democratic process.

Since the emergence of the iconic turn, a series of interdisciplinary research clusters have been initiated in Europe and in the United States with the aim of developing knowledge on how images generate meaning[4]. The rejection of the semiotic theory as a means of understanding images has been one of the starting points of image research[5] (Mitchell 1986, Elkins 1995, Boehm 1994). Mitchell (1986) refers to a series of authors describing the problem of applying the semiotic theory inferred from language to explain the effect of images. He summarizes this approach with the term

---

4   Since the 1990s: research work was done at the University of Chicago by W. J. Thomas Mitchell et al. Since 1996: International Research-Center Cultural Sciences (IFK) in Vienna directed today by Thomas Macho affiliated with the University of Art and Design Linz. 2000 – 2009: Graduate College Image – Body – Medium. An Anthropological Perspective, founded by Hans Belting at the HfG Karlsruhe. 2001 – 2007: Schrift Bild Zahl, founded by Horst Bredekamp at the Humboldt University Berlin. 2005 – 2017: eikones, Swiss National Center of Competence in Iconic Research, founded by Gottfried Boehm at the University of Basel. Since 2012: Image Knowledge Design, founded by Horst Bredekamp and Wolfgang Schäffner at the Humboldt-University Berlin.

5   If we take Roland Barthes early elaboration on the Panzani pasta advertisement stated in "Rhetoric of the Image" (Barthes 1964), the blind spot described above in the context of language/typography becomes evident in the missing differentiation of the qualities of the image. Barthes describes forms of the linguistic message and the symbolic message, but the literal message which we could call the iconic message is simply explained by the mimetic effect that the photograph of a tomato is representing a tomato. There is no attempt to differentiate the iconic message through the consideration of visual contingencies.

"linguistic imperialism" (Mitchell 1986, p. 56) and quotes Umberto Eco in support of his argument for the necessity of strengthening iconic research:

"Iconic signs are partially ruled by convention but are at the same time motivated; some of them refer to an established stylistic rule, while others appear to propose a new rule. … In other cases the constitution of similitude, although ruled by operational conventions, seems to be more firmly linked to the basic mechanisms of perception than to explicit cultural habits. … One and only one conclusion seems possible at this point: *iconicism is not a single phenomenon*, nor indeed a uniquely semiotic one. It is a collection of phenomena bundled together under an all-purpose label (just as in the Dark Ages the word "plague" probably covered a lot of different diseases). … *It is the very notion of sign which is untenable* and makes the derived notion of 'iconic sign' so puzzling." (Eco 1976, p. 216 quoted from Mitchell 1986, p. 57, emphasis by Eco)

Noam Chomsky's view on the relationship between language and image opens up an alternative point of view based on cognitive linguistics. He describes linguistics as a study of a specific cognitive subsystem of the human mind concerned with language that is different to other subsystems such as movement or vision.

"What is currently understood even in a limited way seems to me to indicate that the mind is a highly differentiated structure, with quite distinct subsystems. If so, an understanding of the properties of one of these systems should not be expected to provide the principles by which others are organized and function. Even an account of knowledge of language that is overflowing with insight is unlikely to directly contribute to the study of factors that enter into our understanding of the nature of the visual world, or vice versa. This is not do deny, of course, that these systems interact, and may share some general properties. But we should remain open to the possibility – even the strong likelihood – that they are organized in quite different ways." (Chomsky 1980, p. 27)

With these statements, the discovery of the terra incognita can begin, and the research into the phenomena of images has developed since Eco's and Chomsky's remarks from diverse disciplinary backgrounds. We could follow the ideas of the embodiment and work out the connection between the iconic and the physical constellation of the human body and its ability to move in space (Lakoff/Johnson 1999). This would allow us to substantiate the argument that images generate meaning more closely related to the individual physical experience than language but, then again, not entirely detached from social exchange (Johnson 2007, Renner 2011). In contrast, language relies more on social interaction but it, too, can be traced back to the human body (Lakoff/Johnson 2003).

From the point of view of art history, Gottfried Boehm has described the "intrinsic logic of images" as a unique quality of images to generate meaning through their deictic ability to show. He explains the generation of meaning as follows:

"Matter becomes meaning, since the visual values react on each other in the act of viewing" [6]
(Boehm, G. 2006 (2007), p. 52.)

An Alternative Method: Starting from the Sensuous Experience

Taking Boehm's "intrinsic logic of images" and Chomsky's description of the existence of a visual cognitive system as a starting point, we can critically ask how it is possible to understand the effect of images through relying exclusively on the verbal analysis of existing visual instances created for a specific purpose in the context of art, communication, science, or entertainment. Does this approach not run the risk of continuing the placement of the sensuous experience below conceptual thought? The answer to this question depends on the role sensuous experience and materiality play in a specific, analytical approach. We can refer to the experience of viewing an image with language, but we cannot substitute verbal description for the visual experience. We can imagine variations on an existing image, but it is hard to consider them without the materialized objects in view. In reference to the above-quoted statement in the context of "Script-Iconicity," we can recall Krämer and Trotzke's claim that "[…] the formation and transformation of schemata, can become an epistemic workshop, […]" (Krämer et al. 2012, pp. 20-21).

If we extend this statement to the practical generation of images in general, we can argue that the practical processes of creating and transforming images to understand their meaning leads to a more balanced relationship between sensuous decisions and their circumscription in language. In contrast to the primarily language-based approach of the humanities, the practical field of visual communication can make a research contribution using the singularity of images as a foundation for its quest to differentiate how images generate meaning.

[6]   Aus Materie wird Sinn, weil die visuellen Wertigkeiten im Akt der Betrachtung aufeinander reagieren. Boehm, G. (2006 (2007)), p. 52.

A Scientific Image Generation Process: Practice-led Iconic Research

After anchoring the proposed approach in the discourse of the humanities, we can now turn to the phenomena on which the practice of image generation is based. We can look at the processes of drawing, composing, taking photographic pictures or at processes of generative design and describe them all as distinct methods to generate image variations. Through the generation of variations, it becomes possible to gain an overview of a field of options enabling a designer to evaluate the effect of the single visual composition in comparison to the other variations. This is the basis of any practical design process and enables the designer to develop a solution for a given communication problem in a realm of expression which lies beyond the exchange of conventional signs.

What we call "practice-led iconic research" can be described as a method to create image series in order to elicit their meaning through images as opposed to language (Renner 2010). By leaving the field of analyzing existing images, practice-led iconic research either focuses on the processes of image creation and examines the conditions under which an unexpected shift can happen (Derrida 1993, Lyotard 1997, Renner 2011/2013), or it uses the creation of images as a method to inquire into a specific category of images such as documentary images, ornamental images (Renner 2014), diagrammatic images, or portraits (Renner 2015).

Two Trajectories

In order to distinguish the practical process of creating images for visual communication from the practical process of creating images for the purpose of iconic research, we need to separate two trajectories of practice-led iconic research:

(1) research into the design process, and
(2) research into the characteristics of an image category.

Trajectory 1: Research into Design Processes

Research into design processes means looking at the various conditions that guide the decision-making in the becoming of unseen images. In contrast to the Design Methods Movement of the 1960s, the suggested research into the design process does not aim at a schematic "flowchart-like" description of processes to improve the search for solutions to 'wicked problems' (Cross 2006). The intuitive search for the unknown visual solution becomes the

focus of attention in the suggested inquiry into the design process. This can only be done if you are aware that the core of the invention of the new eludes itself. And even though research into the design processes is significant for the awareness of conditions allowing the unpredictable to happen in practice, in education and in research on visual communication. The following statement of 1971 by Christopher Alexander, one of the founders of the Design Methods Movement, can be used in support of the practice-led approach but also to critically assess the proposed research direction:

"Since the book was published [in 1964], a whole academic field has grown up around the idea of the leading exponents of these so-called design methods. I am very sorry this has happened and want to state publically that I reject the whole idea of design methods as a subject of study, since I think it is absurd to separate the study of designing from the practice of design." (Alexander 1964 (1972), quoted from Langrish 2016)

We may ague that the proposed field of inquiry into the design processes in the context of practice-led iconic research is an attempt to involve the existing competence of the practice in order to avoid a discourse detached from the practice of visual communication. On the other hand, we may also interpret Alexander's statement as a statement against any kind of scientific reflection on design processes and on design in general. John Christopher Jones, another Design Method Movement protagonist and author of the publication *Design Methods: seeds of human futures* (1970) stated in 2001:

"I'd like to correct a misconception: when in the 1970s I criticized and appeared to leave design research it was not because design methods had become rigid tools that inhibited the imaginative skills of individual designers – it was because I was angry, and still am, at the 'inhumanity' of abstract design language and theories that are not alive to all of us as people, or to actual experience – and which threaten to reduce the reality of life to something less than human."

The inquiry into design processes by the Design Methods Movement of 1962 has been characterized by three layers which, according to John Langrish (2016), have all failed:

"1. A general all-purpose optimistic zeitgeist that saw the world as getting better than it had been.
2. A belief that the process of designing had an important part to play in this 'getting better.'
3. A belief that the design process could itself be made better through becoming more scientific."

Practice-led iconic research responds to these three issues in the following ways:

1. Only in one respect does the inquiry into the design process after the iconic turn attempt to "change the world" by implying that the understanding of images is a crucial part of information dissemination in a society that is based on democratic principles.

2. The importance of design in improving the world is shared until this day, but, following the iconic turn, the inquiry into the design process aims, more than anything else, at providing evidence that the practice of design actually does have an impact on society.

3. At the core, the practical design processes will not be improved by the means of scientific inquiry. But research will provide the means to conceptually frame the processes in new ways and help to further develop the design practice, the educational design principles, and the knowledge about images.

In due consideration of the declared differences from the Design Methods Movement, the inquiry into the design process suggested by practice-led iconic research places the practical procedures of image generation at the center of its attention. The processes are executed and recorded for the purpose of later comparative analysis.

....

Example 1:

Helga Aichmaier

Helga Aichmaier's dissertation project, for example, has shown how the careful documentation of her own photographic process and the organization of images in tableaus for the purpose of comparative analysis has allowed her to analyze and critically extend the existing theoretical positions of the description of documentary photography in a plausible manner (Aichmaier 2016). She was able to show that the photographic process was for a long time mainly attributed to technical conditions, and she was able to infer from her own processes that taking a photograph is as much a process of elusive design decisions as is, for example, the process of drawing, even though we attribute authenticity to the photographic image.

In the context of the daily practice of visual communication, design processes can only rarely be reconstructed since the careful documentation of decision making is often neglected. The goal of the practical projects is to come up with a surprising, intriguing and convincing solution. How the goal is achieved is rarely reflected, it simply does not interest the client. On the other hand, all the experiences made in the design process are crucial for the ongoing development of the designer's archive of ideas and his or her potential to continue the search for unexpected solutions.

Through the execution of realistic and fictional design processes including a specific goal of inquiry, an appropriate documentation method and a comparative analysis following the completion of the process, we can develop a growing archive and reflect on its content. The definition of a specific research goal, the documentation of the process, the reflection on the documentation and the informed analysis of the existing descriptions

of design processes, distinguishes the design processes for design process research purposes from the design processes for practical purposes. The outcomes of this branch of iconic research inquiring into design processes allow us to elicit the traits and conditions that produce more or less successful results. This is contributing to the awareness of the design practice, design education and allows us to claim the design processes, even though they are essentially guided by decisions taken below the threshold of consciousness, as a research method, or a specific experimental system[7] guided by social, cultural, individual, physical, material, economical, and political conditions.

Trajectory 2:
Research into the Characteristics
of an Image Category

The second trajectory of practice-led iconic research focuses on the generation of categories of images. This assumes that there is a difference between the generation of images and the design processes of the daily practice of visual communication. It also assumes that it differs from an analysis conducted with existing images through language.

Here, too, a prerequisite of conducting a research-oriented design process is the ability to formulate an informed research question. If I want to add by means of an experimental approach to the knowledge of, for example, the diagrammatic image, I need to be aware of the historical and current state of the discourse on diagrammatic images. Only on this basis is it possible to seriously contribute to the discourse by means of a practice-led approach. Understanding the state of the art is the condition which allows us to "throw" the ball in the "right" direction, as the German term "Entwurf" standing for the design process suggests[8]. But it would be wrong to believe, that throwing the ball in the right direction automatically means hitting the target, to remain in the ball-throwing figure of speech. As soon as we let go of the ball, it is out of our control. We can try to throw the ball as carefully and precisely as possible, but that does not mean that we are going to hit the target. On the contrary, we might stand a better chance of hitting the target if we approach the task with less ambition, intention, and expectation. In terms of the design process, the above-described awareness of the state of the art and the research question(s) inferred therefrom do not guarantee a successful process of visual experimentation if the ambi-

7   Hans-Jörg Rheinberger defines an experimental system as follows:

"A basic unit of experimental activity combining local, technical, instrumental, institutional, social, and epistemic aspects." Rheinberger 1997, p. 238

8   See also Figal 2006, §11 Darstellendes Erkennen, pp. 91 – 104.

tion, intention, and expectation are not given up for productive phases of intuitive exploration. In short: a field of visual contingencies is never a result of extrapolation from a described research aim. Only through the phases of experimentation, when the designer is involved in the process of decision-making below the threshold of consciousness, an interesting overview of visual stimuli, beyond the expected and obvious, can be achieved. The results of these experimentations are analysed in the process every once in a while by stepping back from the activities of experimentation and redirecting the next phase of intuitive search. The moment of stepping back is the time in which the defined framework set up by the research question takes effect, and the designer but also other visually trained beholders can judge whether the images resulting from the experimentation are providing evidence in the search for an answer. Usually, the iterative process of experimentation and analysis develops slowly, and does not directly provide answers to the questions raised. Instead, series of images provide evidence of unexpected aspects of the image category in focus. Ideally, the practical phases of experimentation and the analytical phases of conscious evaluation lead to an overall view of a field of visual contingencies that allow the description of the effect of one visual variation in comparison to other instances in the field. To recapitulate, it is not the primary aim of the experimentation to create images of artistic value, nor is changing the world through design and making it to a better place the objective. The idea of this method is to contribute to the understanding of how images generate meaning in a specific cultural context.

....

Two examples:

Paloma López Grüninger and Marie-Louise Greb

This approach has been used by the dissertation project of Paloma López Grüninger. The title of her project was *"Design and Evaluation of Qualitative Diagrams, and their Application in the Analysis of Visualzations of Biological Classifications".* Based on her own experimental design process to visualize scientific biological developments and the study of historical diagrams, López Grüninger was able to show the implicit and unintended meaning inherent in many tree-diagrams. Due to the limitation of the two-dimensional surface, proximities and distances are suggested between entities that do not represent their actual relationship but are never questioned by the biologist or the scientific illustrator (Lòpez Grüninger 2015, pp. 52 – 73).

The second example describes a Master Thesis Project conducted in 2013 by Marie-Louise Greb at the Visual Communication/The Basel School of Design HGK FHNW on the relationship of words and images in diagrammatic images. This project demonstrates how the process of generating variations can be used to develop visual evidence for a comparative analysis.

Diagrammatic images rely on a combination of words and images to provide instant comprehension of complex data by the beholder. This experiment uses as basic data the marks [Figure 1] and the video recordings of a felt pen moving in the wind to explore the description of the process by means of language [Figure 2], with references to coordinates [Figure 3, Figure 4] in the form of a table [Figure 5] and through different variations of diagrammatic interpretations. The variations allow the demonstration of an ideal combination [Figure 6] of the two entities to provide an insight at a glance to a beholder. As soon as the plane and lines are used to show similarity between the original marks and the diagrammatic image, the numbers of the two entities', figuring as specific signs of mathematical language, and the plane represented by the lines complement each other in a meaningful way. The last example of the series also demonstrates how the graded system of language is not transferrable to the ungraded system of images [Figure 7]. The dissection of the original traces and arrangement by directional orientation do not allow us to grasp the information in one go, as was the case in the previous variation [Figure 6].

Concluding:
On Relating Visual Communication and
Scientific Inquiries

After this brief demonstration of an experimental approach to image creation in the context of practice-led iconic research, we can assess the role of the visual and the role of language in the scientific inquiry into images in order to add to the conditions which allow us to differentiate a scientific design process. In comparison to an approach based on the analysis of existing images, practice-led iconic research applies a strategic creation of images as a basis for their differentiation. The materiality is altered to achieve a variety of visual results and to test the effect on the beholder. Testing can be conducted as an open survey comprising at least one person, the designer, who communicates his or her interpretation and publishes it in a research paper, giving the scientific community a chance to examine the findings and, as the case may be, falsify or verify the proposed evidence. Or the testing can be done using the methods common to psychology and the social sciences with the aid of standardized interview techniques or other methods. Either way, the unique contribution of design and the practice of visual communication is the ability to generate the material and visual objects which provide sensuous evidence as a basis for a verbal circumscription.

As Arno Schubbach described with regard to the use of scientific images, there are two phases of employing images in an emerging field of science:

(1) The phase, in which the method of visualization is discussed and
(2) The phase, in which the methods of visualization are completely standardized and the image is an acclaimed method providing evidence (Schubbach 2017).

In light of this observation, we may ask whether the proposed method of practice-led iconic research is based on a consensus that already exists in the design/visual communication community as to how images are generated. We could argue, that aesthetic and procedural methods that are loosely outlined by the term "basic design" provide a starting point for an elaboration on this issue.

Moreover, in contrast to the catchy umbrella term of "critical making" which was recently established in the context of the digital humanities and compares aspects of critical approaches in design practice to the collaboration of designers with various disciplines of the humanities, the proposed method does not claim to make a contribution to any research field of the humanities, but specifically to iconic research (Barness/Papaelias 2015). In contrast to what is termed artistic research, where an object of art exhibited in a gallery space is considered the result, the proposed approach relying on the experimental creation of images is bound to a hermeneutic interpretation in language. The role of the images is to provide evidence perceived by the visual sense. We can say that a method of practice-led iconic research goes beyond language-based hermeneutics and provides an approach, in which the relationship of the sensuous and the conceptual – the 'supersensuous' – is in balance.

References

Aichmaier, H. (2016). Strategien einer Bildpraxis. Fotografisches Entwerfen anhand dokumentarischer Bilder von öffentlichen Plätzen, Archiv PhD Thesis Kunstuniversität Linz.

Alexander, C. (1964 (1971)). *Notes on the Synthesis of Form*. Harvard University Press.

Blackmore, S. (1999). *The Meme Machine*. Oxford University Press.

Barness, J./ Papaelias, A. (2015), critical making; Design and the Digital Humanities, *Visible Language*, 49.3, Cincinnati: University of Cincinnati Press.

Barthes, R. (1964 (1980). *Rethorik of the Image*, in: Trachtenberg, A. (1980). *Classic Essays on Photography*, New Haven: Leete's Island Books, pp. 269 – 285.

Boehm G. (1994). *Die Wiederkehr der Bilder*, in: Boehm, G. (1994) (ed.). *Was ist ein Bild?,* München: Wilhelm Fink Verlag, pp. 11 – 38.

Boehm, G. (2006). *Jenseits der Sprache*? in: Boehm, G. (2007). *Wie Bilder Sinn erzeugen; Die Macht des Zeigens,* Berlin: Berlin University Press, pp. 34 – 53.

Boehm, G. & Mitchell, W.J.T. (2009) 'Pictorial versus Iconic Turn: two letters'. Culture, Theory and Critique. 50 (2-3), pp. 103 – 121.

Chomsky, N. (1980). *Mind and Body*, in: Chomsky, N. (1980). *rules and representations*, New York: Columbia University Press, p. 27.

Cross, N. (2006). Designerly Ways of Knowing, Heidelberg: Springer.

Daston, L./Galison, P. (2007). Objectivity, New York: Zone Books.

Derrida, J. (1993). *Memoirs of the Blind: The Self-Portrait and Other Ruins*, Chicago: The University of Chicago Press.

Derrida, J. (1997 (1967)). *Of Grammatology*, translated by Chakravorty Spivak, G. (1997). Baltimore: John Hopkins University Press.

de Saussure, F. (1916 (1995)). Cours de linguistique générale, Paris: Editions Payot & Rivages, p. 53.

Eco, U. (1976). *A Theory of Semiotics*, Bloomington: Indiana University Press, p. 216.

Elkins, J. (1995). *Marks, Traces, "Traits," Contours, "Orli," and "Splendores": Nonsemiotic Elements in Pictures*, in Critical Inquiry, Vol. 21, No. 4 (Summer, 1995), pp. 822 – 860, Chicago: The University of Chicago Press.

Figal, G. (2006). Gegenständlichkeit. Das Hermeneutische und die Philosophie, Tübingen: Mohr Siebeck, §11 Darstellendes Erkennen, pp. 91 – 104.

Heidegger, M. (1961). Nietzsche's overcomig of Platonism, in: Farrell Krell, D. (1991). Nietzsche, San Franciso: HarperCollins, first published in 1961 based on a lecture manuscript of 1936/1937, quoted from: Christopher Kul-Want (ed.): Philosophers on Art, from Kant to the Postmodernists, New York: Columbia University Press, pp. 121 – 128.

Jones, Chr. J./Thornley, D. (1963) *Proceedings Conference on Design Methods: papers presented at the conference on systematic and intuitive methods in engineering, industrial design, architecture and communications, London, September 1962*, Pergamon Press, London, New York and Paris: Pergamon Press.

Johnson, M. (2007). *The Meaning of the Body; Aesthetics of Human Understanding*, Chicago: The University of Chicago Press.

Krämer, S. (2003). *Schriftbildlichkeit*, pp 157 – 176 in: Krämer, S., Bredekamp, H. (2003). *Bild, Schrift, Zahl*, München: Wilhelm Fink Verlag.

Krämer, S. and Totzke, R., 2012. Einleitung, pp. 13 – 35 in: Krämer, S., Cancik-Kirschbaum, E. ,Totzke, R. *Schriftbildlichkeit; Wahrnehmbarkeit, Materialität und Operativität von Notationen*, Berlin: Akademie Verlag.

Lakoff, G./Johnson M. (1999). *Philosophy in the Flesh; The Embodied Mind and its Challenge to Western Thought*, New York: Basic Books.

Lakoff, G./Johnson M. (2003). *Metaphors We Live By*, Chicago: The University of Chicago Press.

Langrish, J. Z. (2016). The Design Methods Movement: From Optimism to Darwinism, in: P. Lloyd & E. Bohemia, (eds.), Proceedings of DRS2016: Design + Research + Society – Future Focused Thinking, Volume 1, pp. 51 – 64, DOI 10.21606/drs.2016.

López Grüninger, P. (2015), Diseño y evaluación de diagramas cualitativos y su aplicación al análisis de visualizaciones de la clasificación biológica (Design and Evaluation of Qualitative Diagrams, and their Application in the Analysis of Visualizations of Biological Classsifications), Granada: Editorial de la Universidad de Granada.

López Grüninger, P. (2015). Defying the limits of the plane: two-dimensional space and its consequence in the search for the order of nature, Journal of Illustration, 2: 1, pp. 52 – 73, doi: 10.1386/jill.2.1.51_1

Lyotard, J.-F. (1997). *The Paradox on the Graphic Artist*, in: Lyotard, J.-F. (1997). *Postmodern fables*, Minnesota: Minnestota University Press, pp. 33 – 48.

Mitchell, W.J.T. (1986). *Iconology; Image, Text, Ideology*, Chicago: The University of Chicago Press.

Mitchell, W.J.T. (1995). *The Pictorial Turn*, in: Mitchell, W.J.T. (1995), (ed.). *Picture Theory*, Chicago: The University of Chicago Press, pp. 11 – 34.

Nietzsche, F. (1888). *How the "True World" Finally Became a Fable: The History of an Error*, in: Nietzsche, F. (1888). *Twilight of the Idols*, quoted from: Christopher Kul-Want (ed.): *Philosophers on Art, from Kant to the Postmodernists*, New York: Columbia University Press, pp. 63 – 64.

Renner, M. (2010). *Practice-led Iconic Research*, in: diid, disegno industriale industrial design, 41: pp. 76 – 82.

Renner, M. (2011). *Die stumme Bildkritik des Entwurfs – The Mute Iconic Criticism of Design*, in: Rheinsprung 11. Zeitschrift für Bildkritik, 1: pp. 92 – 116.

Renner, M. (2013). Entwurfsstrategien. Ideenwettbewerb der 9. Banknotenserie der Schweizerischen Nationalbank, in: Alloa, E./Falk, F (2013). BildÖkonomie. Haushalten mit Sichtbarkeiten, Paterborn, pp. 134 – 217.

Renner, M. (2014). *Ornamental Images and their Digital Occurrences*, in: Proceedings HCII 2014 Conference, in: Marcus, A. (ed.) (2014). *Design, User Experience, and Usability. Theories, Methods, and Tools for Designing the User Experience*, Heidelberg: Springer, pp. 663 – 674.

Renner, M. (2015). *The Challenge of Drawing a Face*, in: Boehm, G./Budelacci, O./Di Monte, M. G./Renner, M. (2015). *Face and Identity*, Paterborn, pp. 166 – 189.

Renner, M. (2016). *Word to Image – Image to Word. The Contribution of Visual Communication to Understanding and Dialog*, in: P. Lloyd & E. Bohemia, eds., Proceedings of DRS2016: Design + Research + Society – Future-Focused Thinking, Volume 3, pp. 1073 – 1088, DOI 10.21606/drs.2016.

Rheinberger, H.-J. (1997). Toward a History of Epistemic Things; Synthesizing Proteins in the Test Tube, Stanford: Stanford University Press.

Schubbach, A. (2017) *Visible Language.* 51.3-52.1. pp. 34 – 55

Author

Through research and reflection, Michael Renner's practical and theoretical design activities explore the meaning of images in the context of digital tools. This "practice-led" approach to design research seeks to further develop existing image creation competencies. By gaining knowledge through the creation of images, he positions the design process itself as both central research theme and methodology.

Michael experienced the digital revolution firsthand, when he joined Apple Computer Inc. and The Understanding Business in California in 1986 as a newly-graduated graphic designer from the Basel School of Design. In 1990, he founded his own design studio in Basel, working with corporate and cultural clients. That same year, he began teaching information design, design research, and the design process in the Visual Communication Institute at the Basel School of Design (HGK FHNW). In 1999, Michael was named Chairman of the institute. Michael has lectured and taught workshops in Europe and abroad. He was a member of "eikones," the Swiss National Center of Competence in Iconic Research, from 2005 until 2013 and co-leader of the research cluster „Image and Design Process"; he has been a member of the European research network "What Images Do" since 2012.

Michael is responsible for a number of design research projects supported by the Swiss National Science Foundation and a member of the Alliance Graphique Internationale (AGI).

Figure 1

Diagrammatic images, traces on a piece of paper of a felt pen blowing in the wind, Marie-Louise Greb, MA Thesis, 2013.

Es weht ein leichter Wind. Ein Stift hängt an einem Faden über einem Blatt Papier und ist dem Wind ausgesetzt. Nach kurzem Verweilen in der zentralen Lage schwingt der Stift in einem aufwärtsgerichteten Bogen nach rechts und verweilt dort, wobei seine Position 2-3mal geringfügig verändert wird. Dann schwingt der Stift zurück, verharrt oberhalb des Zentrums, baumelt leicht nach oben und nach unten, jeweils unterbrochen von kurzen Phasen des Stillstands.

Der Stift wird nun an einen weit oberhalb des Zentrums gelegenen Punkt getragen, wird dort von einem Windstoß erfasst, verliert den Kontakt zum Papier, wird weit nach rechts hinaus getrieben und in einem kreisförmigen Bogen nach oben geweht. Dort verharrt er kurz, fällt zurück und kommt in einer Position zur Ruhe, die weit oberhalb und rechts vom Zentrum gelegen ist. Hier baumelt der Stift in kleinen Bögen und Kurven hin und her, jeweils unterbrochen von Ruhepausen.

Nach einem kleinen Schlenker nach links bleibt der Stift zunächst unbewegt, bevor ihn ein Windstoß in einem weiten Halbkreis abwärts über die linke Seite in die untere Hälfte des Papiers weht. Nach kurzem Rückschwung wird der Stift erneut weiter nach rechts hinausgetrieben und in einem weiten Bogen zurückgeführt. In kleinen Wendungen und Zickzackbewegungen gelangt der Stift in eine Position links oberhalb des Zentrums. Nach einem weiteren Schwung nach links verweilt der Stift für einige Zeit links außen in der unteren Hälfte des Blattes.

Danach wird er über die Mitte in unmittelbare Nähe des Zentrums geweht, wird erneut vom Wind erfasst und weit nach links fast an den Rand des Papiers getrieben. Er fällt zurück und kommt in einer relativ zentralen Position schließlich zur Ruhe.
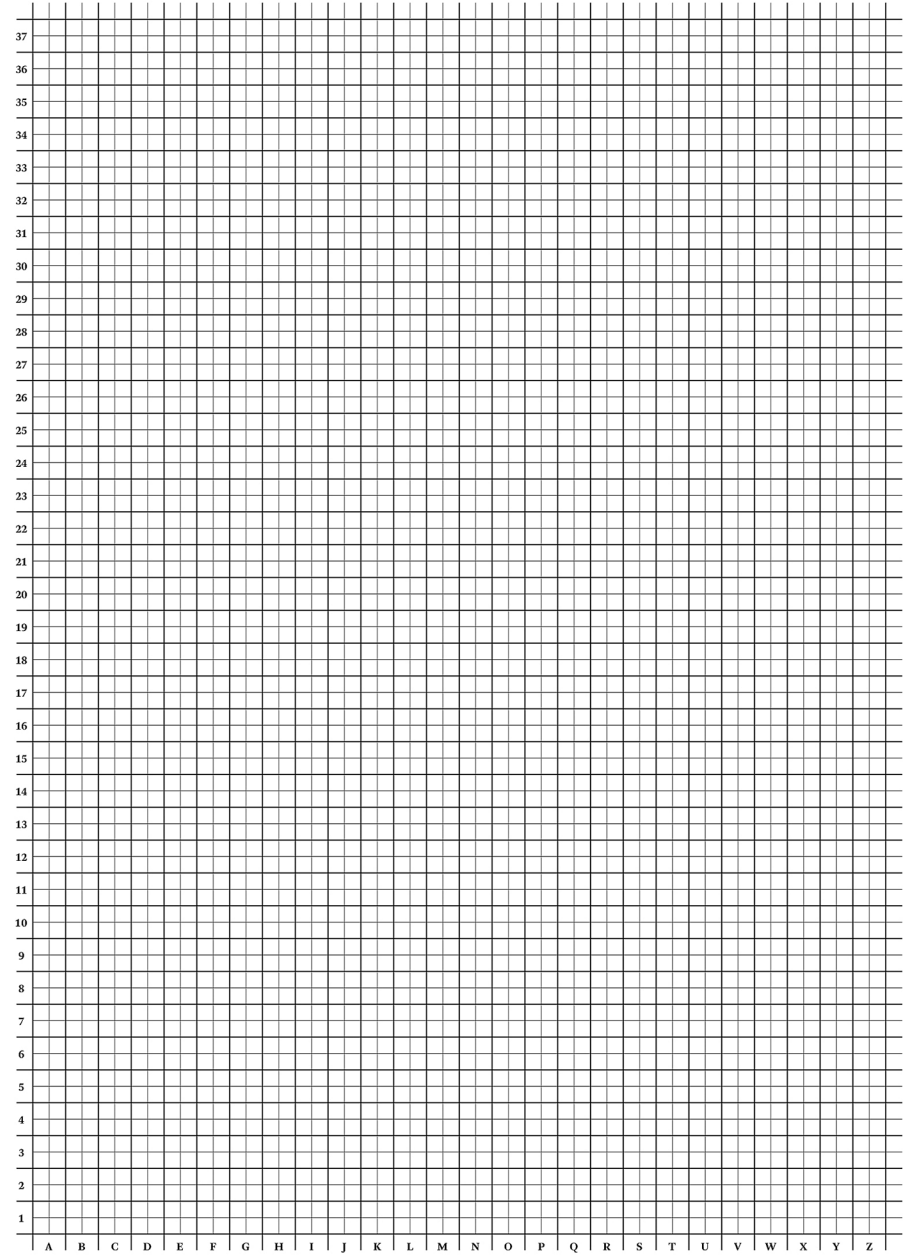
Figure 2

Description of the process with language, Marie-Louise Greb, MA Thesis, 2013.

Figure 3

Description of the recorded process with a coordinate system, Marie-Louise Greb, MA Thesis, 2013.

Ein schwarzer Stift hängt an einem Faden. Mit der Spitze berührt er das Papier. Es weht ein leichter Wind.
In Minute 00:00 pendelt der Stift über dem Feld **20M**. 54 Sekunden lang saugt sich Tinte ins Papier. In Minute 00:54 pendelt der Stift über dem Feld **20M**. 28 Sekunden lang saugt sich Tinte ins Papier. In Minute 01:22 bewegt sich der Stift ins Feld **21O**. 47 Sekunden lang saugt sich Tinte ins Papier. In Minute 02:09 bewegt sich der Stift ins Feld **22O**. 16 Sekunden lang saugt sich Tinte ins Papier. In Minute 02:25 bewegt sich der Stift ins Feld **21L**. 75 Sekunden lang saugt sich Tinte ins Papier. In Minute 03:40 bewegt sich der Stift ins Feld **20L**. 7 Sekunden lang saugt sich Tinte ins Papier. In Minute 03:47 bewegt sich der Stift ins Feld **20M**. 11 Sekunden lang saugt sich Tinte ins Papier. In Minute 03:58 bewegt sich der Stift an die Grenze der Felder **20M** und **21M**. 31 Sekunden lang saugt sich Tinte ins Papier. In Minute 04:29 bewegt sich der Stift ins Feld **22N**. 4 Sekunden lang saugt sich Tinte ins Papier. In Minute 04:33 bewegt sich der Stift innerhalb des Feldes **22N**. 5 Sekunden lang saugt sich Tinte ins Papier. In Minute 04:38 bewegt sich der Stift innerhalb des Feldes **22N**. 9 Sekunden lang saugt sich Tinte ins Papier. In Minute 04:47 bewegt sich der Stift innerhalb des Feldes **22S**. 1 Sekunde lang saugt sich Tinte ins Papier. In Minute 04:48 bewegt sich der Stift ins Feld **21R**. 2 Sekunden lang saugt sich Tinte ins Papier. In Minute 04:50 bewegt sich der Stift ins Feld **23Q**. 4 Sekunden lang saugt sich Tinte ins Papier. In Minute 04: bewegt sich der Stift ins Feld **23P**. 5 Sekunden lang saugt sich Tinte ins Papier In Minute 04:59 bewegt sich der Stift ins Feld **22Q**. 1 Sekunde lang saugt sich Tinte ins Papier. In Minute 05:00 bewegt sich der Stift ins Feld **22P**. 20 Sekunden lang saugt sich Tinte ins Papier. In Minute 05:20 bewegt sich der Stift innerhalb des Feldes **22P**. 5 Sekunden lang saugt sich Tinte ins Papier. In Minute 06:25 bewegt sich der Stift innerhalb des Feldes **22P**. 22 Sekunden lang saugt sich Tinte ins Papier. In Minute 06:47 bewegt sich der Stift ins Feld **22O**. 2 Sekunden lang saugt sich Tinte ins Papier. In Minute 06:49 bewegt sich der Stift ins Feld **22N**. 4 Sekunden lang saugt sich Tinte ins Papier. In Minute 06:53 bewegt sich der Stift innerhalb des Feldes **22N**. 78 Sekunden lang saugt sich Tinte ins Papier. In Minute 08:09 bewegt sich der Stift innerhalb des Feldes **22N**. 35 Sekunden langt saugt sich Tinte ins Papier. In Minute 08:44 bewegt sich der Stift innerhalb des Feldes **22N**. 36 Sekunden lang saugt sich Tinte ins Papier. In Minute 09:20 bewegt sich der Stift ins Feld **21N**. 139 Sekunden lang saugt sich Tinte ins Papier. In Minute 11:39 bewegt sich der Stift an die Grenze der Felder **20O** und **21O**. 26 Sekunden lang saugt sich Tinte ins Papier. In Minute 12:05 bewegt sich der Stift ins Feld **20N**. 42 Sekunden lang saugt sich Tinte ins Papier. In Minute 12:47 bewegt sich der Stift ins Feld **18K**. 2 Sekunden lang saugt sich Tinte ins Papier. In Minute 12:49 bewegt sich der Stift ins Feld **15P**. 1 Sekunde lang saugt sich Tinte ins Papier. In Minute 12:50 bewegt sich der Stift an die Grenze der Felder **16O** und **16P**. 1 Sekunde lang saugt sich Tinte ins Papier. In Minute 12:51 bewegt sich der Stift ins Feld **17N**. 1 Sekunde lang saugt sich Tinte ins Papier. In Minute 12:52 bewegt sich der Stift ins Feld **18R**. 4 Sekunden lang saugt sich Tinte ins Papier. In Minute 12:56 bewegt sich der Stift ins Feld **18N**. 1 Sekunde lang saugt sich Tinte ins Papier. In Minute 12:57 bewegt sich der Stift ins Feld **18O**. 2 Sekunden lang saugt sich Tinte ins Papier. In Minute 12:59 bewegt sich der Stift ins Feld **19N**. 3 Sekunden lang saugt sich Tinte ins Papier. In Minute 13:02 bewegt sich der Stift ins Feld **19M**. 2 Sekunden lang saugt sich Tinte ins Papier. In Minute 13:04 bewegt sich der Stift ins Feld **20M**. 38 Sekunden lang saugt sich Tinte ins Papier. In Minute 13:42 bewegt sich der Stift ins Feld **19L**. 3 Sekunden lang saugt sich Tinte ins Papier. In Minute 13:45 bewegt sich der Stift ins Feld **20L**. 29 Sekunden lang saugt sich Tinte ins Papier. In Minute 14:14 bewegt sich der Stift innerhalb des Feldes **20L**. 11 Sekunden lang saugt sich Tinte ins Papier. In Minute 14:25 bewegt sich der Stift ins Feld **18J**. 24 Sekunden lang saugt sich Tinte ins Papier. In Minute 14:49 bewegt sich der Stift an die Grenze der Felder **18J** und **19J**. 31 Sekunden lang saugt sich Tinte ins Papier. In Minute 15:20 bewegt sich der Stift ins Feld **19L**. 12 Sekunden lang saugt sich Tinte ins Papier. In Minute 15:32 bewegt sich der Stift ins Feld **20M** und **20N**. 41 Sekunden lang saugt sich Tinte ins Papier. In Minute 16:13 bewegt sich der Stift ins Feld **19N**. 121 Sekunden lang saugt sich Tinte ins Papier. In Minute 18:34 bewegt sich der Stift an die Grenze der Felder **20G** und **21G**. 2 Sekunden lang saugt sich Tinte ins Papier. In Minute 18:38 bewegt sich der Stift ins Feld **19L**. 2 Sekunden lang saugt sich Tinte ins Papier. In Minute 18:40 bewegt sich der Stift ins Feld **19M**. 2 Sekunden lang saugt sich Tinte ins Papier. In Minute 18:42 bewegt sich der Stift innerhalb des Feldes **19M**. 25 Sekunden lang saugt sich Tinte ins Papier. In Minute 19:07 bewegt sich der Stift ins Feld **20M**. 53 Sekunden lang saugt sich Tinte ins Papier.

	Zeit	Feld
0	00:00	20M (54 Sek.)
	00:54	20M (28 Sek.)
1	01:22	21O (47 Sek.)
2	02:09	22O (16 Sek.)
	02:25	21L (75 Sek.)
3	03:40	20L (7 Sek.)
	03:47	20M (11 Sek.)
	03:58	20M, 21M (31 Sek.)
4	04:29	22N (4 Sek.)
	04:33	22N (5 Sek.)
	04:38	22N (9 Sek.)
	04:47	22S (1 Sek.)
	04:48	21R (2 Sek.)
	04:50	23Q (4 Sek.)
	04:54	23P (5 Sek.)
	04:59	22Q (1 Sek.)
5	05:00	22P (20 Sek.)
	05:20	22P (5 Sek.)
6	06:25	22P (22 Sek.)
	06:47	22O (2 Sek.)
	06:49	22N (4 Sek.)
	06:53	22N (78 Sek.)
7		
8	08:09	22N (35 Sek.)
	08:44	22N (36 Sek.)
9	09:20	21N (139 Sek.)
10		
11	11:39	20O, 21O (26 Sek.)
12	12:05	20N (42 Sek.)
	12:47	18K (2 Sek.)
	12:49	15P (1 Sek.)
	12:50	16O, 16P (1 Sek.)
	12:51	17N (1 Sek.)
	12:52	18R (4 Sek.)
	12:56	18N (1 Sek.)
	12:57	18O (2 Sek.)
	12:59	19N (3 Sek.)
13	13:02	19M (2 Sek.)
	13:04	20M (38 Sek.)
	13:42	19L (3 Sek.)
	13:45	20L (29 Sek.)
14	14:14	20L (11 Sek.)
	14:25	18J (24 Sek.)
	14:49	18J, 19J (31 Sek.)
15	15:20	19L (12 Sek.)
	15:32	20M, 20N (41 Sek.)
16	16:13	19N (121 Sek.)
17		
18	18:34	20G, 21G (2 Sek.)
	18:38	19L (2 Sek.)
	18:40	19M (2 Sek.)
	18:42	19M (25 Sek.)
19	19:07	20M (53 Sek.)
20		

Figure 4

Description of the recorded process with text and coordinates, Marie-Louise Greb, MA Thesis, 2013.

Figure 5

Description of the process with a table with coordinates and time, Marie-Louise Greb, MA Thesis, 2013.

Figure 6

Ideal combination of word, and image, the process can be reconstructed at a glance, numbers indicate length of position at indicated point, the starting point is 54. Marie-Louise Greb, MA Thesis, 2013.

Stillstandspunkte	Bewegungsrichtung Diagonal 1	Bewegungsrichtung Horizontal	Bewegungsrichtung Diagonal 2	Bewegungsrichtung Vertikal

Figure 7

Transforming the continuous system into a disjunct system creates a result without meaning, Marie-Louise Greb, MA Thesis, 2013.

The Practice of Practice-led Iconic Research

Arno Schubbach

The approach of practice-led iconic research originated in the tradition of design and visual communication. It is often put into opposition to any research on images with an academic background or generally linked to the rather vague label of 'theory'. In contrast, this contribution argues that the outdated opposition of theory and practice is not adequate to conceive of practice-led iconic research. Rather, it should be understood as a specific research practice based on the production of images and aimed at gaining knowledge about visual communication and its specific pictorial means. All factors of image formation and the practice of design can become a subject of investigation. In order to characterize this kind of practice-led research and its usage of pictures, I compare it with theory-driven approaches and their respective use of picture examples as well as to the particular ways the natural sciences and artistic research engage with pictures.

keywords

design research
artistic research
scientific visualization
theory
practice
image

"Give a philosopher the concept of a triangle, and let him try to find out in his way how the sum of its angles might be related to a right angle. [...] Now he may reflect on this concept as long as he wants, yet he will never produce anything new. [...] But now let the geometer take up this question. He begins at once to construct a triangle."

(Kant, *Critique of Pure Reason*, ed. by
Guyer/Wood, 631sq.)

Practice-led iconic research originated in the tradition of design and visual communication.[1] Whereas the common creative practice of a designer is to produce a graphical solution for a specific communicative task based on the designer's tacit knowledge, practice-led research explores the conditions, means, and procedures of the designer's creative practice. Practice-led research is not bound by a specific communicative task and its graphical solution, but takes the liberty to examine all the conditions, means and procedures of design practice. All factors that finally coalesce in the resulting pictures can become the subject of investigation, from the trained hand and body of the designer and their interaction with the different instruments to the characteristics of design instruments, of media, of well-established procedures of design and processes of graphical innovation, of handed-down pictorial traditions and formats.[2]

This emerging *research* field has to be understood as *practice-led* in at least three senses. First, as practice-led given its historical origins and institutional contexts because it arose from the practice of design and addresses questions within the practice of design. Second, it facilitates an understanding of design practice and can aim at improving it.[3] Third, this research deploys the practical competencies and the implicit knowledge of the designer.[4] Thus, it involves the production of images for the purpose of research, i.e., images that are instrumental in dealing with the questions in focus. As this research practice is based on "gaining knowledge about im-

---

1   The following thoughts on practice-led iconic research are primarily based on the long-term collaboration between the author, a philosopher and theoretician of images, and the Institute for Visual Communication at the Academy of Art and Design in Basel, its director Prof. Michael Renner, his research assistants and the contributors to the present volume. Furthermore, the following considerations refer throughout to Renner (2010, 2011, 2013, 2014).

2   Cross (2006), 101, proposes a helpful difference between three fields of design research: research in "designerly ways of knowing," in "practices and processes of design," in "the form and configuration of artifacts." These fields have some similarities with my explorative list of examples, but at the current state of my considerations, I want to leave open the question of a "taxonomy of the field of design research" (ib.).

3   As Candy (2006), 1, puts it, practice-led research is "concerned with the nature of practice and leads to new knowledge that has operational significance for that practice." How we conceive of the change that design practice undergoes by practice-led research is open to discussion. What some see as a means for a better understanding of practice means a fruitless academization or intellectualization of a craft or an art for others, cf. for example Schultheis (2005) and Joost (2016), 182-225. This question of evaluation I leave open to discussion.

4   Cf. Cross (2006) for a differentiated account of the knowledge of the designer. Mareis (2012) argues convincingly that the common reference to Michael Polanyi's 'implicit' or 'tacit knowledge' needs further discussion.

---

ages through their creation"[5], it is furthermore characterized as image-based or *iconic* research.[6]

For the purpose of introduction to this special issue of *Visible Language*, the following considerations will characterize the practice of practice-led iconic research in comparison to other kinds of research on images or research using images. In the first section, I will specify practice-led iconic research in difference to studies on images with a background in academic disciplines like philosophy, art history, media studies or the history of science. I argue against the idea that practice-led iconic research can be conceived in opposition to 'theory,' a rather vague label used above all at the academies of art and design. Instead, I want to show that the outdated opposition of theory and practice is not suitable to grasp the way in which practice-led iconic research integrates theory and practice in a unified research paradigm and that 'image theory' or 'image studies' are themselves inherently based on specific image practices they take for granted. In the second section, I will specify practice-led iconic research by differentiating its employment of pictures from the usage of pictures common in natural scientific research as well as a form of research more akin to design: the widely discussed artistic research. Throughout, I will base my considerations on exemplary studies contained in this special issue of *Visible Language*.

1. The Practice of Practice-led iconic Research and Theoretical Approaches to images

The old opposition of theory and practice is based on the assumption that theory is to be understood as a theoretical reflection on a practice that implies a break with the same practice in order to reflect it from an external point of view. For example, the philosophy of knowledge regularly claimed to lay the grounds of knowledge gained by human faculties or scientific practice without presupposing those same faculties or practices. Yet, this claim is not only subject to philosophical criticism,[7] but seems to be historically outdated since in the 19th century the sciences began to develop their own methodological discourses whenever they ran into fundamental problems. The methodological reflection on concepts, procedures, and tools became an integral part of scientific practice so that the old claim that only a

---

5   Renner (2010), 80.

6   Following Candy (2006), 1-3, practice-led iconic research would not be called 'practice-led,' but 'practice-based research' that she defines by two aspects: 1. the research into a practice is primarily conducted by practitioners and 2. it is based on the produced artefacts: "If a creative artefact is the basis of the contribution to knowledge, the research is practice-based." We do not follow this terminological decision.

7   We find this type of critique of epistemology soon after its inception by Kant, for example in Hegel's well-known wording: "But to want to know *before* one knows is as incoherent as the Scholastic's wise resolution to learn to *swim, before he ventured into the water.*" (Hegel (2010), 38) And we find it today again, though in a very simple form, in so-called speculative realism.

theoretical reflection external and opposed to practice grasps the conditions of knowledge practices was put into question.[8]

Similarly, design research today tries to develop its own, self-sufficient methodological reflection relevant to the practice of design and deploying the competencies, procedures, and means engendered within the design practice. Put the other way round, a practice-led iconic research implements a theoretical reflection of its own embedded in practice instead of delegating it to an external discourse being the privilege of philosophy or other academic disciplines. Practice-led iconic research conceives of theory as part of its practice; it does not separate it from practice.

A further reason to not fall back into the opposition of theory and practice is the fact that this opposition only suggests a very simplistic understanding of practice but also of theory. Just as practice is not only the alleged dull occupation excluding any form of theoretical reflection, theory is not a distanced and airy reflection without its own implicit rules and embodied competencies. On a very general level, we can therefore argue that the opposition between theory and practice is obsolete because any theory has to be conceived as a practice of its own. After the practical turn, as Claudia Mareis argued,[9] or in the older pragmatist view, as I want to add,[10] it does not make any sense to oppose practice and theory. Already in the 1920's, John Dewey put forward the argument, »that the only distinction worth drawing is not between practice and theory, but between those modes of practice that are not intelligent, not inherently and immediately enjoyable, and those which are full of enjoyed meanings (Dewey 1929, p. 358). Dewey's argument is methodologically helpful, even if we skip the question how he differentiates intelligent and enjoyable practices from the others. This suggests conceiving practice-led iconic research not by the outdated opposition between practice and theory, but by characterizing it as a specific practice.

Assuming this point of view, it is helpful to characterize practice-led iconic research in comparison to theoretical research practices common in philosophy, art history, media studies, or history of science where they conduct research on images. These disciplines are, in the context of the academies of art and design, often subsumed under the vague label of theory and thereby put into opposition to the practice of design and design research. Media studies and the like build image theory on specific practices of historical research, academic discourses, or aesthetic experience: choosing examples within a specific domain of images, such as the history of the arts, the realm of scientific visualisations, the icons of popular culture, etc.; contextualizing them in respect to the technical conditions, the material-

---

8   For sure, the sketched border between internal and external reflections is fuzzy and blurred, but it is nevertheless not needless to characterize different forms of concomitant reflections in general and the practice-led iconic research in particular.

9   Cf. Mareis (2016), 35-41, esp. her conclusion 40.

10   For sure, this is not the first time that Dewey is introduced into this discussion, cf. for example Findeli (2016), 28.

---

ity of the pictures, the development of forms of representation, and so on; interpreting and comparing them in order to embed them in the narrated history or the ongoing train of thought, etc. Even if we do not take into account the practice of theory as such – reading, note taking, thinking, discussing, writing, publishing, and so on[11] –, but restrict ourselves to observing the different ways in which the various approaches make use of pictures, it seems to be clear that theoretical approaches to understanding images are intertwined with specific image practices. Nevertheless, practice-led iconic research distinguishes itself from image research approaches in other academic fields: it produces pictures which are instrumental in treating the questions it explores.

A good example is Helga Aichmaier's research on the documentary photographic image included in this volume.[12] Since its invention and triumph in the 19th century, photography has been linked to documentation. It was evident that the role of the person taking the photograph is of less importance compared to that of a painter, so that the idea came up that any photograph is an objective trace of reality necessarily documenting the things whose radiation helped to produce it.[13] In the ongoing debate, we find many opposing claims, for example, Hubert Damisch's argument that the photographic process must not be confused with a natural and causal process, because it is part of an invented technique embedded in a culture and imbued with its norms;[14] or Peter Geimer's demonstration that the theory of the trace presupposes the functioning or the technique and omits all the possible accidents, due to the recalcitrant materials and the mediality of photography;[15] or Philippe Dubois' highlighting of the irreducible factor of the photographer's decisions how to take a shot,[16] etc.. However, all of these so-called theoretical approaches illustrate their stance through pictures taken from the history of photography. In contrast, Helga Aichmaier deals with the same question by taking photographs herself. The whole debate about the documentary photographic picture is reframed from the perspective of the practitioner. Instead of discussing the claim of whether and why photography as such is documenting reality, Aichmaier poses the question of how to make a photograph that will be regarded as a documentary picture by most viewers. For this purpose, she specifies a type of object to be photographed, i.e. public places, and decides to explore four places, in Basel, Glarus, Vienna, and Linz. Furthermore, she defines parameters of

---

11   Cf. Hoffmann (2008, 2010); Trüper (2007); Schubbach (2016), 40-50 and 246-254. Initially, it was note taking in the natural sciences that triggered this kind of research, cf. Hoffmann (2003) and Rheinberger (2003, 2006).

12   Cf. Aichmaier's contribution in the present volume pp. ##

13   In this respect, the possibly most debated Barthes (2000) seems to be no more than an elegant reprise of thoughts haunting photography since its invention; cf. in respect to the scientific applications of photography Daston/ Galison (2007), 121sqq.

14   Cf. Damisch (1978).

15   Cf. Geimer (2000, 2010).

16   Cf. Dubois (1998).

the photographic process that she will vary while taking the photographs of each public place. The subsequent systematic exploration yields a rich collection of photographs that can be arranged and assessed in view of the question dealt with. As a result, it becomes evident that a lot of shots do not conform to our expectations of a documentary photograph, whereas others suit them.[17] Due to the systematic variations, we can understand which parameters are most important and can specify the range of each parameter adequate for the genre of documentary photography. Beyond that, we could explore a range of marginal cases that are possibly interesting for creative innovations of the genre.

In sum, practice-led iconic research deals sometimes with the same questions addressed in theory-driven studies but takes a new turn as the practitioner's perspective is introduced. Instead of dealing with question by selecting and interpreting given pictures, practice-led iconic research produces pictures in order to deal with the questions. For this purpose it deploys basic image-making techniques and competencies used in design practice. It produces images by "a systematic approach to generate visual variations"[18] by defining and modifying specific parameters of image production, it compares and assesses the pictures, and identifies image parameters and their ranges most relevant for possible answers to the questions dealt with. Consequently, the pictures are used here as a probe in order to explore the space of possibilities and the specific factors of picture formation.[19]

Usually, practice-led research produces pictures, whereas studies with a theoretical background make use of selected scientific, artistic or popular pictures. Nevertheless, it can be the case that a theoretical approach includes pictures produced for this special occasion or that a practical approach takes recourse to already existing pictures. But, these selected pictures function differently in the context of a practice-led iconic research than in a study with a theoretical background. If pictures of art history or the history of sciences are picked up in the context of practice-led iconic research, they are considered and assessed in view of their variations and possible alternative formations. Although in fact, they are given, they are imagined as latently made and related to possible alternatives, as Paloma Lopez shows in her contribution to this volume.[20] Consequently, the usage of given pictures in the context of practice-led iconic research is different than their role within image studies in art history or history of science.

We can observe a similar difference the other way round. Where studies in image theory not only use pictures they find in the history of the arts or the sciences, but occasionally also involve pictures specifically made
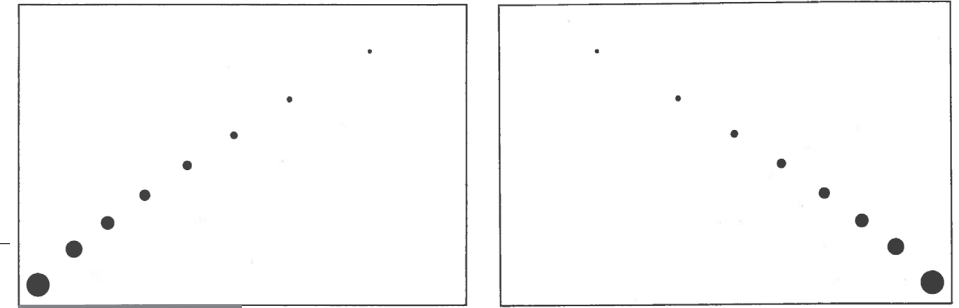
Figures 1 and 2

for this purpose, the usage of these pictures nevertheless differs of the work with pictures in practice-led iconic research. For these pictures are not systematically produced in order to explore a range of parameters of image formation. Instead, they are, for instance, sometimes used in art history to schematically modify the composition of an artwork and to illustrate the specific choice of the artist and its effects.[21] Or, they are at times included to produce evidence for an image theoretic argument, as for example in Gottfried Boehm's "Bild und Zeit" from 1987. In contrast to the widespread belief that we see only what is present when we see pictures and that we therefore do not experience time for as long as the pictures do not start to move, Boehm argues that time is "*the* basic category of painting"[22]. As evidence, Boehm presents, apart from some well-known art works, two abstract representations of black circles beaded on an invisible, slightly curved line and becoming larger or smaller along that line (*Figure 1* and *Figure 2*). These pictures are introduced into the text as a "graphic demonstration (*anschauliche Demonstration*)"[23] of the fact that we immediately see the movement of a circle. This demonstration involves the reader and viewer of this article and evoking the "fundamental experience of temporality of images"[24] emerging from the interaction of the pictures and the viewer's eyes.[25]

This usage of pictures within a theoretical consideration differs heavily from the work with pictures within practice-led iconic research. Firstly, pictures are introduced into the text in order to illustrate a theoretical analysis and not to explore a range of possible alternatives to the same communication task. Therefore, the production of the images is not even mentioned, let alone the question of how they were made and why in this particular way. From the methodological standpoint of practice-led iconic research, these pictures could be the starting point of a systematic production of pictures, including the variation of the distances between the circle, of their enlargement or downsizing, or of the harsh black-white-contrasts, in order to explore this way of depicting movement within a stable image, to specify some of its parameters and to determine the effects of choosing these parameters within specific ranges. Secondly, the pictures are sup-

---

17   In a way, Aichmaier thereby explores from a practitioner's point of view the theoretical difference between a photograph referring, but not necessarily showing a black horse and a picture showing (but not necessarily referring to) a black horse already introduced by Goodman (1976), 29.

18   Renner (2010), 81.

19   It could be tempting to speak here of 'experiments', but the question of whether and in what respect the procedures of practice-led iconic research are comparable to what we call experiments especially in the natural sciences would need a much deeper analysis and more detailed discussion, cf. for some inspiring thoughts on this question with reference to artistic research Rickli (2015).

20   Cf. in the present volume. For some further theoretic reflections on the relation between seeing images and their making, cf. also Schubbach (2008).
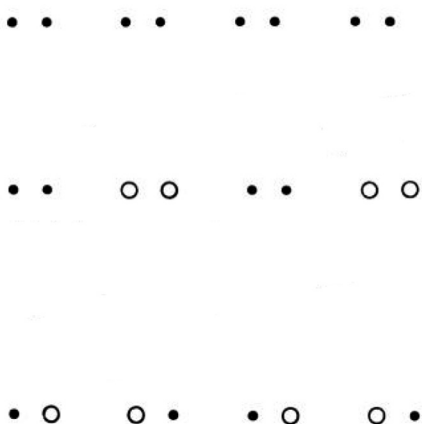
21   For an outstanding example, cf. Imdahl (1980).

22   Boehm (1987), 3, my translation.

23   Boehm (1987), 22, my translation.

24   Ibid.

25   Cf. Boehm (1987), 7-12 and 20-22.

posed to produce evidence within both approaches, but the function of evidence is of different nature in each case. Whereas in the case of Boehm's "Bild und Zeit" the pictures shall evoke the experience of a temporality arising between the picture and the viewer's eyes, studies in practice-led iconic research address the viewer in order to assess which pictures and parameters under consideration have effect, thereby making the different possibilities of image formation evident.

      In this respect, viewers' experience of pictures in practice-led iconic research is comparable to experience of pictures in the canonical texts of gestalt theory.[26] First and foremost, Gestalt theory researched the laws of seeing and the structuring principles of our visual field. For this purpose, researchers like Max Wertheimer, Wolfgang Köhler, or Albert Michotte[27] used visual stimuli in their experimental practice, but also included some of them in their texts. Therefore, these texts did not exclusively summarize the results of this experimental practice, but also enabled the readers to reenact the experiments to a certain extent. Readers and viewers can thereby experience the evidence of specific principles determining the visual relations he or she realizes and the figures he or she sees. For example, Max Wertheimer, in his "Untersuchungen zur Lehre von der Gestalt" (1922/23) uses pictures to demonstrate how a series of dots is seen as a couple of pairs of dots due to the two independent factors of closeness and sameness (*Figure 3*).[28] In the first series of dots, we tend to see four pairs instead of a series of eight dots because of the varying distances. In the second series, this effect is even intensified through using two different types of dots, i.e., small filled circles and larger empty circles, for each pair of dots. In the third series, this same-

---

[26]   Boehm's pictorial evidences also open up this link to gestalt psychology because they are put in context with Paul Klee's "Das bildnerische Denken" and Wassily Kandinsky's "Punkt und Linie zur Fläche" – cf. Boehm (1987), 8 –, both of which have to be seen in the context of evolving gestalt psychology and the imagery linked to it and its 'forerunners', cf. Teuber (1979), with focus on Klee, and Van Campen (1997), 134sq., with regard to Kandinsky.

[27]   On Gestalt psychology, cf. Ash (1995), on the lesser known Albert Michotte especially Leyssen (2013).

[28]   Cf. Wertheimer (1923), 312. I only show the first three pictures of Wertheimer's much longer series. Cf. Pratschke (2016), esp. 19-29, for a sketch of the historical background of Wertheimer's imagery.

---

ness of two types is used in contradiction to the spatial closeness making the viewer realize two different pairings, the one pairing of the close dots of different type or the pairing of the same dots in contradiction to the closeness to dots of the other type. Thereby, the pictures illustrate two principles structuring our visual perception and enable the reader to experience their effects and possible conflicts.

      As a part of the text, these pictures involve the reader as a viewer in order to provide visual evidence for the asserted results of this research. At the same time, they mirror the role of visual stimuli within the experimental practice of Gestalt psychology. This practice was very often centered on a test subject exposed to the visual stimuli and reporting what he or she actually sees. By including numerous illustrations into their publications, the Gestalt psychologists not only enable the reader to comprehend the results they achieved but also enable the viewer to at least partially reenact the substantiating observations of the test subjects. It is for this purpose, that Gestalt psychologists composed texts permeated with illustrations producing evidence for their results.

      We can see herein an important parallel to the usage of pictures within practice-led iconic research, but the role of pictures is here even more important. For example, the pairs of pictures we find in the contribution of Claire Reymond let the reader and viewer experience the asserted insights into the formal characteristics provoking a semantic interference between two pictures presented as a pair.[29] Yet, this usage of pictures in publications is not a mirror of a self-sustaining experimental practice, as is the case in gestalt psychology. Rather, images in practice-led research invite all readers to reproduce the insights gained first and foremost by the researcher's eye thus making an exchange between researchers and the readers of the publications. For practice-led iconic research, these critical assessments of the asserted evidences are at least as good a basis for forming hypothesis and delving into more comprehensive endeavors that could make us of – where it is appropriate – as are the empirical surveys and quantitative methods of psychology.

2. Picture Making in Practice-led Iconic Research, Scientific Visualization Practices, and Artistic Research

In the last paragraph, I tried to characterize practice-led iconic research by considering it in contrast to research on images in the history of art or history of sciences, media studies or philosophy. To include further aspects of practice-led iconic research into the picture, I want to consider two other forms of research linked to the use of pictures: the visualization practices in the natural sciences and the widely discussed artistic research.

---

[29]   Cf. in the present volume.

To compare the employment of pictures in practice-led iconic research and the practice of visualization in the natural sciences is hardly a feasible endeavor. The practices of scientific research are too manifold and the role of pictures too diverse for a general comparison to be possible. Nevertheless, we can take out some aspects of the many studies devoted to the role of visualizations in the natural sciences. A first important difference is that the natural scientists are not as design researchers primarily interested in pictures as such, but they are using pictures for visualizing objects or data in order to comprehend better their object of inquiry. Therefore, the relation to the depicted object or situation is indispensable for the imaging practice in the natural sciences. This does not necessarily imply that the visualizations are reduced to sheer imitations or copies of reality. Visualization techniques do not represent what we already know, they are supposed to visualize what we do not know. For that purpose, stable relation of the pictures to what shall be depicted has to be carefully established. This includes the task of drawing a difference within the pictures, namely, between aspects which can be understood as showing something 'real' and other aspects which are effects of the technique itself, the materials involved or simply defective results. At this stage of development, a visualization technique and the pictures it produces are itself objects of research, as for example photography when it was first applied in the natural sciences,[30] or the scanning tunneling microscope when it had first been developed in the 1970s and 1980s.[31]

The expectation that scientific visualizations would bluntly show things as they are can only come up when a visualization technique is already established, when its technical apparatus is hidden in a black box,[32] the visualizations are standardized in form, colors, etc., and the eyes are trained to interpret the new pictures[33]. Then we do not draw the difference between the referential and the reflexive aspects of the pictures consciously, but rather it seems to be drawn and given by the picture itself.[34] Hence, the technique can be embedded in experimental settings aiming at new and other questions or can find widespread application in medicine, industry, etc. Nevertheless, new questions concerning the visualization technique can arise at any time so that the visualization technique again becomes an object of technical inspection and possible research as well as the credibility

of the pictures and their forms subject of scrutiny.[35]

Therefore, we have to differentiate two conditions of scientific visualization practices that sometimes are hardly distinguishable. First, we have the condition of established practices, when the technical apparatus is black boxed and the pictorial outputs are highly standardized. From that first condition, the pictures seem at least for the educated eye to immediately provide evidence for what they refer to or what they verify, whereas the pictures and their making are rarely subject to scrutiny.[36] Second, we have the condition of techniques still in development when besides the form of pictures the technical process of their making and the possible reference of the output is still not clear. According to this second condition, pictures attract more attention because they still need to be established what they show. The form of depiction has to evolve, a fact that is often overlooked compared to the stabilization of the technical processes, because professional designers are rarely involved in this state of development.[37]

However, in the context of this article, it is not decisive whether designers are involved in the development of scientific imagery. Rather, it is illuminating to compare the scientific visualization practice in its evolution and the use of pictures in design research in general and practice-led iconic research in particular. In the natural sciences, the development of pictorial representation forms is rarely professionalized. Nevertheless, it is linked to a highly elaborated but implicit reflection on the shaping of the pictures that respect different audiences, that fit the sober, informative and objective schemes for the scientific communication of results, that create more attractive and eye-catching designs for persuading other scientists of a new approach, and that sometimes produce spectacular and sensational views for funding organizations and the broader public.[38] The evolvement of forms of pictorial representation in the natural sciences is highly differentiated given the diverse aims of communication, but it is, in general, aiming at specific purposes: representing scientific objects and information, persuading of colleagues or drawing attention in the broader public. Therefore, the usage of

30   Cf. Hoffmann (2001, 2002); Geimer (2002), 327-341; Schubbach (2013), 620-627.

31   Cf. Hennig (2011).

32   On 'black boxing' cf. Latour (1987), 1-4, and his theoretical account of this process ib., 128-132; cf. also Rheinberger (2006), 28-31, who describes the black boxing as the transformation of an epistemic into a technical object in order to highlight the persisting possibility that every technical object can become an epistemic object again.

33   Cf. Fleck (1986).

34   Gugerli/Orland (2002), esp. 9-12, describe and analyze these processes as "normalization" of scientific and technical visualizations.

35   Cf. Hennig (2011), 170-192, with respect to the asserted, but deceptive visualizations of the DNS-molecule by scanning tunneling microscopes around 1990, and Rasmussen (1993) with the fascinating example of the organelle called 'mesosome' that was an object of flourishing research in cell biology during the 1960s and 1970s – until it was finally considered to be an artifact produced during the complicated preparation of the cellular probes for electron microscopy.

36   To say that the pictures of an established and black boxed visualization technique are rarely subject of scrutiny in daily practice does, for sure, not exclude that the interpretation of these pictures and the imaging practice as such has its own complexity. Cf. for example Burri (2008), esp. 89-257, with focus on the daily practice of MRI in medical care.

37   This differentiation of visualization practices is linked to the often neglected difference of cutting-edge scientific research on the one hand and the established knowledge of a science taught by textbooks. This difference has to be kept in mind when we discuss practice-led iconic *research*, as Dombois (2005) already stresses.

38   Therefore, Hennig (2011), 277sq., summarizes his detailed analysis of the early visual practices linked to the scanning tunneling microscope by characterizing it as an "implicit science of the image" (my translation).

the pictures is characterized by the pragmatic aims of scientific practice. The pictures as such and the ways of their formation are black boxed.

In contrast, practice-led iconic research unboxes techniques of visualization and means of visual communication to make explicit and to understand better the pictorial means which are used in image practices in general and in design in particular. For example, Susanne Kaeser's contribution to this volume explores the general possibilities to show the development of a construction site that she documented photographically in an earlier project.[39] Instead of rigging up a solution on the basis of the given material, the practical, but implicit knowledge of an educated designer within a specific tradition of design and against the backdrop of her own individual experience, she enters into the question in a systematic fashion and specifies the approach by using the given photographic materials and arranging it in a series of pictures. Series of pictures were used for a long time in the sciences as well as in the arts,[40] but they were at least to my knowledge never systematically examined, as is done by this exemplary study of practice-led iconic research.

Given the 70 photographs of one construction site on the banks of the Rhine made from 2010 to 2016, Käser explores the possibilities how to document and visualize the development of the building process in a series of pictures. As the primary aim is to document, she sticks to non-invasive methods. The first, most basic steps, were the selection of a few pictures to be arranged in a series. Using approximate subdivisions of the six years of construction, the series of two, three, six and twelve pictures make evident that neither too few nor too many pictures make visible the development that shall be documented, albeit on different grounds: Whereas the series of two or three pictures do not show a development, because the two or three states within time are too isolated in order to coalesce into one process, the twelve pictures exceed our capacity to synthesize the many different states within time into one temporal process. Hence, it is reasonable to base the further examination on series of six pictures.

Nonetheless, it turns out to be a non-trivial task to select the six pictures that are most appropriate to document the development. To stick to objective time and to choose the pictures taken at dates dividing the construction process into regular intervals does not produce a very convincing result. In order to see a temporal process represented in a series of photographs, our eyes must be able to easily identify some objects as well as their continuous change in the consecutive pictures. The construction site apparently did not develop continuously, but in a specific rhythm combining longer phases during which the visible changes were minor and others through which a lot of changes became visible in short time. Yet, the

objective division of time is not expedient where we want to document non-continuous, abruptly changing processes, because a series of photographs that were periodically taken do not represent a temporal process for the human eyes. Therefore, Käser chooses such pictures that provide the human eyes with what they need in order to see a development of the construction site: the objects they can easily identify in two consecutive pictures and the change of these objects like the demolition or the construction of a building in progress. Given the aim that the construction process shall be displayed in a series of photographs, the demands of the eyes have to determine the selection of pictures – and not the objective measures of time. As a consequence, this form of documentation has to pay a price, because it does not show the sometimes abrupt rhythm of the real process, but a smoothed out, regular development of the construction site.

Consequently, the first interim result is that the pictures have to be chosen in such a way that the eyes can identify some objects between each subsequent picture and at the same time see the change and the differences that occur. But a further observation shows that a lot of differences between subsequent pictures are not linked to the construction process. All the photographs were taken, as far as possible, with the same photographic parameters, but the shots are nevertheless surprisingly different due to the changing weather conditions modifying the light situation, shadows, and reflections, or the colors of the objects as well as the Rhine. The technical medium of photography indifferently registers everything, so that successive pictures exhibit a lot of differences that are not at all essential to the development to be documented. Hence, the indifferent registration by the photographic apparatus does not produce a good documentation of the construction process in a series of photographs even if each photograph would indeed be an immediate trace of reality, as was often speculated in the theory of photography. Consequently, it makes sense to select only pictures with similar weather and light conditions, what seems to be impossible given the available pictures. Accepting the fact that these differences are accidental in respect to the process to be documented, it is reasonable to modify the pictures and, thereby, to take the next step in this practice-led iconic research, i.e. not only to select pictures in view of the representation of the construction process for a human eye, but to digitally manipulate them in such a way that the accidental changes are eliminated, and the essential changes are highlighted.

In the following picture series, Susanne Käser explores the question of how to cautiously manipulate some aspects of the photographs, like the Rhine, the sky or the color scheme, in order to produce a series of pictures making evident the development of the construction site. The result that manipulations which suppress too many accidental differences are not working because the eyes are irritated by a too comprehensive identity

39   Cf. in the present volume.

40   Cf. Wellmann (2010), 197-369, with a focus on the embryology emerging around 1800 and its visual representation of development.

46   47

of pictures, is highly interesting. The eyes presume to see identical copies instead of the development to be documented. Obviously, there needs to be some, but not too many, accidental variations between the pictures in order to avoid this awkward impression and enable the eyes to realize the development exhibited by pictures similar as well as different enough. I do not want to examine Käser's study into more details, but rather want to highlight the aspects of practice-led iconic research that her work exemplarily demonstrates.

As in the case of Aichmaier's contribution to this volume, Käser's study deals with the question of documentation in photography from the perspective of production. In this perspective, it becomes immediately evident that a credible documentation cannot be assured by the mere application of a technical medium like photography. Instead, a lot of conventions have to be observed and a whole set of parameters to be chosen in such a way that they are adequate for the genre of documentation and the expectations linked to it. Concerning Käser's photographic series, it becomes furthermore evident that the indifferent registration does not convey any documentary evidence, but irritates and counteracts this aim. Therefore, Käser explores ways of how to modify the photographic material, how to chose the best shots, how to digitally manipulate them in such a way that differences and similarities are in the right balance to enable the eye to realize the development documented in a series. For this purpose, it is necessary to try, to specify a selection of parameters, to produce different series and to observe their effect. Some observations reveal surprisingly unforeseeable dead ends; others prove to be seminal and hint at possible solutions. Thus, Käser's study explores a range of possibilities for documenting developments in photographic series and demonstrates viable solutions for this task.

Perhaps, every designer confronted with this task would have undertaken a similar exploration, whether he or she had heard anything of design research or not. The fundamental difference is that practice-led iconic exploration shifts from making images to communicate, to making images that make explicit the knowledge engendered by the everyday design practice or produce further knowledge beyond this practice. For this aim, practice-led iconic research transforms the everyday design practice into a "research-led practice"[41] aiming not at the ad-lib solution of the given task, but producing knowledge about the possible ways of finding a solution as well as about the helpful instruments and the necessary conditions. Hence, practice-led iconic research has to systematize and to document the explorative work with images, to observe and describe step by step the effects

of an attempt, to draw the difference between passable and impassable ways, to justify this decision, and to provide the visual pieces of evidence for them. In this form, design practice implements its own reflection and for this purpose deploys the competencies it engenders and the means as well as procedures upon which it is based. Thus, it makes explicit, collects and at the same time produces "knowledge" that, following Linda Candy, "has operational significance for that practice."[42]

Obviously, this practice-led iconic research has a particular systematic and institutional proximity to artistic research. Both are embedded in a creative visual practice and aims at gaining knowledge by producing artifacts. Both deploy for this purpose all the competencies, procedures and materials common to their respective creative practice. But artistic research adheres to the traditional aims of the artistic practice: "the prime focus in artistic research is on concrete creative practice. The research aims to make a substantial, preferably cutting-edge contribution to the development of that practice", as Henk Borgdorff sums up.[43] Gaining knowledge by way of producing pictures is not the priority of a transformed artistic practice, but mostly considered as a side-effect of producing convincing artworks.[44] Hence, artistic research seems to be an integral part of the production of the artwork that finally 'embodies' as well as communicates the knowledge gained during its production.[45] Consequently, the need to accompany the artwork by a linguistic reflection is frequently renounced.[46]

On the other hand, practice-led iconic research uses pictures to explore the possibilities of image formation relevant to the research question. Therefore, a study in practice-led iconic research will include visual documentation and will complement it with a verbalization that describes the produced visual evidence, justifies the decisions, and may suggest possibilities to explore further. The question whether the pictures are aesthetically pleasing or not, whether they are new and creative visual solutions of a task, is not of primary importance. The immediate aims of art research

---

42   Candy (2006), 1.

43   Borgdorff (2011), 49. This text gives a good overview of artistic research – as well as Busch (2014).

44   That's why it is a common position in the debate on artistic research – in difference to the case of design research – that any artistic practice includes and essentially is artistic research, cf. for example Becker (2009), 79sq., and, in contrast, Carduff/Siegenthaler/Wälchi (2010), esp. the preface ib., 12-17.

45   Already for Frayling (1993), 5, research in art *and* design is ultimately embodied knowledge: "Research where the end product is an artefact – where the thinking is, so to speak, *embodied in the artefact,* where the goal is not primarily communicable knowledge in the sense of verbal communication, but in the sense of visual or iconic or imagistic communication." Also for Borgdorff (2006), 23, it is essential to research in the arts to "reveal and articulate the tacit knowledge that is situated and embodied in specific artworks and artistic processes." Cf. similarly Borgdorff (2011), esp. 59sq., and for a harsh critique of this claim raising a lot of substantial questions Scrivener (2002). For a more balanced and nuanced discussion of the role of the artwork and the process of artistic research cf. Smith/ Dean (2009), 5-7, or Borgdorff (2006), 17-19.

46   Cf. the annoyed critique of regulations that a PhD-thesis in artistic research has to accompany the produced artwork by a written thesis in Candlin (2000).

and practice-led iconic research are not the same because only the latter transforms a creative into a research-led practice which primarily aims at producing knowledge.

Practice-led iconic research explores the conditions of the design practice as well as the possibilities of image formation in a systematic way. For this purpose, it suspends the common standards and immediate aims of design practice. It is free to explore unnoticed and unusual approaches that may have productive and creative potential for a future design practice. In order to create an impact, it is still crucial for the evolving field of practice-led iconic research to establish forums of collaboration and discussion, forms of publication and critique.[47] The practice of practice-led iconic research needs to become not the occupation of individual researchers, but as any academic practice, a social endeavor of involving people and creating spaces for encounters as well as collaborations. Seen against this backdrop, the present issue of *Visible Language* is just one more step in the evolvement of this new research practice.

References

Ash, Mitchell G. 1995. *Gestalt Psychology in German Culture, 1890-1967. Holism and the Quest for Objectivity*. Cambridge: Cambridge University Press.

Barthes, Roland 2000. *Camera Lucida*. London: Vintage.

Becker, Dirk 2009. Kunstformate (Kulturrecherche). In *Künstlerische Forschung. Positionen und Perspektiven* (= subTexte 03), 79-97. Zürich: Zürcher Hochschule der Künste.

Boehm, Gottfried 1987. Bild und Zeit. In Hannelore Paflik (ed.), *Das Phänomen Zeit in Kunst und Wissenschaft*, 1-23. Weinheim: VCH, Acta humaniora.

Borgdorff, Henk 2006. *The Debate on Research in the Arts* (= Sensuous Knowledge. Focus on Artistic Research and Development 2). Bergen: National Academy of the Arts.

Borgdorff, Henk 2011. The Production of Knowledge in Artistic Research. In Michael Biggs and Henrik Karlsson (eds.), *The Routledge Companion to Research in the Arts*, 44-63. London: Routledge.

Burri, Regula Valérie 2008. *Doing Images. Zur Praxis medizinischer Bilder*. Bielefeld: transcript.

Busch, Kathrin 2014. Künstlerische Forschung. In Stephan Günzel and Dieter Mersch (eds.), *Bild. Ein interdisziplinäres Handbuch*, 453-458. Stuttgart and Weimar: J. B. Metzler.

Candlin, Fiona 2000. Practice-based Doctorates and Questions of Academic Legitimacy. *International Journal of Art and Design Education* 19.1: 96-101.

Candy, Linda 2006. Practice Based Research: A Guide. CCS Report: 2006-V 1.0 November. Retrieved from https://www.creativityandcognition.com/resources/PBR%20Guide-1.1-2006.pdf

Caduff, Corina, and Siegenthaler, Fiona, and Wälchi, Tan 2010 (eds.). *Kunst und künstlerische Forschung*. Zürich: Scheidegger & Spiess.

Cross, Nigel 2006. *Designerly Ways of Knowing*. London: Springer.

Damisch, Hubert 1978. Five Notes for a Phenomenology of the Photographic Time. *October* 5: 70-72.

Daston, Lorraine, and Galison, Peter 2007. *Objectivity*. New York: Zone Books.

Dewey, John 1929. *Experience and Nature*. London: George Allen & Unwin.

Dombois, Florian 2005. CFF – Content Follows Form. Das Design am Übergang von naturwissenschaftlicher und künstlerischer Forschung. In *Forschungslandschaften im Umfeld des Designs. Zweites Design Forschungssymposium*, 41-52. Zürich: Swiss Design Network.

Dombois, Florian 2010. Kunst als Forschung. Ein Versuch, sich selbst eine Anleitung zu entwerfen. In Gerald Bast and Brigitte Felderer (eds.), *Art and Now. Über die Zukunft künstlerischer Produktivitätsstrategien*, 79-87. Wien: Springer.

Dubois, Philippe 1998. *Der fotografische Akt. Versuch über ein theoretisches Dispositiv*. Dresden: Verlag der Kunst.

Findeli, Alain 2016. The Myth of the Design Androgyne. In Gesche Joost et al. (eds.), *Design as Research. Positions, Arguments, Perspectives*, 28-34. Basel: Birkhäuser.

Fleck, Ludwik 1986. Scientific Observation and Perception in General [1935]. In Robert S. Cohen and Thomas Schnelle (eds.), *Cognition and Fact. Materials on Ludwik Fleck*, 59-78. Dordrecht: Reidel.

Frayling, Christopher 1993. *Research in Art and Design*. In *Royal College of Art Research Papers* 1.1: 1-5.

---

47   At this important aspect hints Dombois (2010), 83sq., with regard to research in the arts.

Geimer, Peter 2000. Noise or Nature? Photography of the Invisible around 1900. In Helga Nowotny and Martina Weiss (eds.), *Shifting Boundaries of the Real: Making the Invisible Visible*, 119-135. Zürich: vdf.

Geimer, Peter 2002. Was ist kein Bild? Zur „Störung der Verweisung". In Peter Geimer (ed.), *Ordnungen der Sichtbarkeit. Fotografie in Wissenschaft, Kunst und Technologie*, 313-341. Frankfurt a.M.: Suhrkamp.

Geimer, Peter 2010. *Bilder aus Versehen. Eine Geschichte fotografischer Erscheinungen*. Hamburg: Philo Fine Arts.

Goodman, Nelson 1976. *Languages of Art. An Approach to a Theory of Symbols*. Indianapolis, IN: Hackett Publishing Company.

Gugerli, David, and Orland, Barbara (eds.) 2002. *Ganz normale Bilder. Historische Beiträge zur visuellen Herstellung von Selbstverständlichkeit*. Zürich: Chronos.

Hegel, Georg Wilhelm Friedrich 2010. *Encyclopedia of the Philosophical Sciences in Basic Outline*, ed. by Klaus Brinkmann and Daniel O. Dahlstrom. Cambridge: Cambridge University Press.

Hennig, Jochen 2011. *Bildpraxis. Visuelle Strategien in der frühen Nanotechnologie*. Bielefeld: transcript.

Hoffmann, Christoph 2002. Die Dauer eines Moments. Zu Ernst Machs und Peter Salchers ballistisch-fotografischen Versuchen 1886/87. In Peter Geimer (ed.), *Ordnungen der Sichtbarkeit. Fotografie in Wissenschaft, Kunst und Technologie*, 342-377. Frankfurt a.M.: Suhrkamp.

Hoffmann, Christoph 2003: The Pocket Schedule. Note-taking as a Research Technique: Ernst Mach's Ballistic-Photographic Experiments. In Frederic L. Holmes, Jürgen Renn and Hans-Jörg Rheinberger (eds.), *Reworking the Bench. Research Notebooks in the History of Science*, 183-202. Dordrecht: Kluwer Academic.

Hoffmann, Christoph 2008. Festhalten, Bereitstellen. Verfahren der Aufzeichnung. In Christoph Hoffmann (ed.), *Daten sichern. Schreiben und Zeichnen als Verfahren der Aufzeichnung*, 7-20. Berlin: Diaphanes.

Hoffmann, Christoph 2010. Schreiben als Verfahren der Forschung. In Michael Gamper (ed.), *Experiment und Literatur. Themen, Methoden, Theorien*, 181-207. Göttingen: Wallstein Verlag.

Hoffmann, Christoph, and Berz, Peter 2001. Mach/Salchers Versuch: Anordnung, Durchführung. In: Christoph Hoffmann and Peter Berz (eds.), *Über Schall. Ernst Machs und Peter Salchers Geschoßfotografien*, 17-35. Göttingen: Wallstein Verlag.

Imdahl, Max 1980. *Giotto. Arenafresken. Ikonographie – Ikonologie – Ikonik*. München: Fink.

Joost, Gesche et al. (eds.) 2016. *Design as Research. Positions, Arguments, Perspectives*. Basel: Birkhäuser.

Kant, Immanuel 1998. *Critique of Pure Reason*, ed. by Paul Guyer and Allen W. Wood. Cambridge: Cambridge University Press.

Latour, Bruno 1987. *Science in Action. How to Follow Scientists and Engineers through Society*. Cambridge, MA: Harvard University Press.

Leyssen, Sigrid 2013. Albert Michotte's "artificial animals". In: Sigrid Leyssen and Pirkko Rathgeber (eds.), *Bilder animierter Bewegung / Images of Animate Movement*, 135-157. München: Fink.

Mareis, Claudia 2012. The Epistemology of the Unspoken. On the Concept of Tacit Knowledge in Contemporary Design Research. *DesignIssues* 28.2: 61-71.

Mareis, Claudia 2016. Doing Research: Design Research in the Context of the 'Practice Turn'. In Gesche Joost et al. (eds.), *Design as Research. Positions, Arguments, Perspectives*, 35-41. Basel: Birkhäuser.

Pratschke, Margarete 2016. *Gestaltexperimente unterm Bilderhimmel. Das Psychologische Institut im Berliner Stadtschloss und die Avantgarde*. Paderborn: Wilhelm Fink.

Rasmussen, Nicolas 1993. Facts, Artifacts, and Mesosomes: Practicing Epistemology with the Electron Microscope. *Studies in History and Philosophy of Science* 24/2: 227-265.

Renner, Michael 2010. Practice-led Iconic Research. *diid, diseguo industriale industrial design*, 41: 76-82.

Renner, Michael 2011. Die stumme Bildkritik des Entwurfs. *Rheinsprung 11, Zeitschrift für Bildkritik* 1: 92-116.

Renner, Michael 2013. Wissen im Entwerfen. Vom blinden Einzeller zu ungesehenen Bildern. In *Verortung Basel 2013. Aufzeichnungen der Hochschule für Gestaltung und Kunst FHNW*, ed. by Kirsten Merete Langkilde, 59-76. Basel: Christoph Merian Verlag.

Renner, Michael 2014. Die zeichnerische Geste. Soziale Bedingung und individuelle Ausprägung in der Praxis des Zeichnens. In Ulrich

Richtmeyer, Fabian Goppelsröder and Toni Hildebrandt (eds.),
Bild und Geste. Figurationen des Denkens in Philosophie und Kunst,
65-84. Bielefeld: transcript.

Rheinberger, Hans-Jörg 2003. Scrips and Scribbles. *MLN* 118: 622-636.

Rheinberger, Hans-Jörg 2006. Zettelwirtschaft. In: Hans-Jörg Rheinberger,
*Epistemologie des Konkreten. Studien zur Geschichte der modernen
Biologie,* 350-361. Frankfurt a.M.: Suhrkamp.

Rheinberger, Hans-Jörg 2006. *Experimentalsysteme und epistemische Dinge.
Eine Geschichte der Proteinsynthese im Reagenzglas*. Frankfurt a.M.:
Suhrkamp.

Rickli, Hannes 2015. Experimentieren. In Jens Badura et al. (eds.),
Künstlerische Forschung. Ein Handbuch, 135-138. Zürich and Berlin:
Diaphanes.

Schubbach, Arno 2008. Gezogene Linien sehen. Sichtbarmachung und
Sichtbarkeit von Bildern. *Zeitschrift für Ästhetik und Allgemeine
Kunstwissenschaft* 53/2: 219-232.

Schubbach, Arno 2013. Spuren in Bildern. Zur Nachträglichkeit von
Aufzeichnung und Speicherung. In Tristan Thielmann and Erhard
Schüttpelz (eds.), *Akteur-Medien-Theorie*, 615-641. Bielefeld:
transcript.

Schubbach, Arno 2016. *Die Genese des Symbolischen. Zu den Anfängen von
Ernst Cassirers Kulturphilosophie*. Hamburg: Meiner.

Schultheis, Franz 2005. Disziplinierung des Designs. In
*Forschungslandschaften im Umfeld des Designs. Zweites Design
Forschungssymposium*, 65-83. Zürich: Swiss Design Network.

Scrivener, Stephen 2002. The Art Object Does not Embody a Form of
Knowledge. Working Papers in Art & Design 2. Retrieved from:
http://www.herts.ac.uk/__data/assets/pdf_file/0008/12311/
WPIAAD_vol2_scrivener.pdf

Smith, Hazel, and Dean, Roger T. 2009. Introduction: Practice-led Research,
Research-led Practice – Towards the Iterative Cyclic Web. In:
Hazel Smith and Roger T. Dean (eds.), *Practice-led Research,
Research-led Practice in the Creative Arts*, 1-38. Edinburgh:
Edinburgh University Press.

Teuber, Marianne L. 1979. Zwei frühe Quellen zu Paul Klees Theorie der
Form. In *Paul Klee. Das Frühwerk 1883-1922*, ed. by Armin Zweite,
261-296. München: Städtische Galerie im Lenbachhaus.

Trüper, Henning 2007. Das Klein-Klein der Arbeit: Die Notizführung des
Historikers François Louis Ganshof. Österreichische Zeitschrift für
Geschichtswissenschaften 18: 82-104.

Van Campen, Crétien 1997. Early Abstract Art and Experimental Gestalt
Psychology. *Leonardo* 30.2: 133-136.

Wellmann, Janina 2010. *Die Form des Werdens. Eine Kulturgeschichte der
Embryologie, 1760-1830*. Göttingen: Wallstein Verlag.

Wertheimer, Max 1923. Untersuchungen zur Lehre von der Gestalt, II.
*Psychologische Forschung. Zeitschrift für Psychologie und ihre
Grenzwissenschaft* 4: 301-350.

A u t h o r

Arno Schubbach is a trained mathematician and philosopher. Currently, he
teaches Image Theory at the FHNW Academy of Art and Design and at the
same time is a Senior Lecturer at ETH Zürich. In collaboration with Michael
Hampe he is running a research project on "Concepts and Practices of
'Darstellung' in Philosophy, Chemistry and Painting around 1800" funded by
the Swiss National Science Foundation. His most recent publications include
*Kants Konzeption der geometrischen Darstellung. Zum mathematischen
Gebrauch der Anschauung* (Kant-Studien 1.108(2017), 1-36) and *Die Genese
des Symbolischen. Zu den Anfängen von Ernst Cassirers Kulturphilosophie*
(Hamburg 2016).

The Dynamism of Hangeul's Vertical Strokes and the Flow of Its Lines of Writing

Jinsu Ahn

The Korean script, Hangeul, did not have its starting point as a written script: it was created based on simple geometric design principles and was first introduced through a publication as printed type. Since this publication focused on educating people how to combine letters and read them, not on demonstrating the writing in practice, this first edition of Hangeul did not reveal how the writing instrument involves building a letter or making the vertical lines of writing.

The purpose of this study is to investigate the design properties of Hangeul that appear in the process of practical writing, which stands in contrast to the printed version. Simple writing experiments and the analysis of their outcome were performed to find answers to the following questions: What formal properties do Hangeul strokes have, and what role do they play in connecting letters to form a fluid vertical line of text? What formal correlations exist between the form of Hangeul characters and the vertical writing culture?

keywords

design research methods
icons, pictograms, symbols
user-drawing
user-centered

Scripts are created to document and deliver messages and, thus, should be widely used with little difficulties and challenges throughout daily life. Hangeul is a script that was designed to articulate the Korean language in a written format and for convenient everyday use. For this purpose, it was promulgated by King Sejong the Great during the Chosun Dynasty (1392 – 1897) in 1446. *Hunminjeongeum* ("the true sounds that educate the people"), a document named after the original name of Hangeul, explains that Hangeul was based on a clear principle: while the consonants were designed according to the forms or status of speech organs, the vowels visualize the concept of the human, the earth, and the universe. This publication defined how to combine the consonants and vowels to compose letters.

With its first introduction based on a publication, Hangeul had a unique starting point as a script. It was not developed naturally, but was created by a king and later introduced to the people. While it takes training to learn how to read, the consonants and vowels of Hangeul were designed to be simple and easy to memorize. And, since a script needs to be used in a variety of daily contexts, it should be based on the premise that it is not only easy to read but also easy to write. *Hunminjeongeum* indeed presents an introduction and theory of how to build a letter; however, it does not focus on demonstrating *how to write* with writing tools. For instance, whereas the Latin alphabet does not require a complicated composition of strokes for an individual letter and, thus, can be written almost at once with a few strokes, Hangeul letters consist of combinations of consonants and vowels. Since Hangeul has more strokes for each letter, it is essential to have a detailed guideline on the writing sequence of the strokes. Therefore, it is quite surprising that *Hunminjeongeum* offered limited information on the aspect of the stroke sequence, which is directly related to writing in practice. The form of a script is not instantly created within a short period, but evolves over time. One of the most potent influences on the creation of script is writing behavior originating in gesture and the constraints of the writing tool. These components not only affect the creation of letterforms but also influence the process of connecting letters in developing words and lines of writing. In most notation systems, the written forms of letters are transferred into printing type. In contrast, Hangeul did not have its starting point as a written script, but was introduced as a set of printed type in the finalized form. Therefore, the writing practice had to be developed from the printed form introduced in *Hunminjeongeum* and it is not possible to infer the printed form from the practice of writing.

Before the creation of Hangeul, the spoken Korean language had been transcribed in Chinese letters (Ryu 2015, 131 and Taylor 2015, 21).[1] Thus, the instrument and method for writing Chinese script were prevalent

1 King Sejong expressed his intention for the creation of Hangeul in the first sentence in *Hunminjeongeum*: "The language of [Korean] people is different from that of China, and thus it [the spoken Korean] does not match the written script of Chinese." (translated by the author)

throughout Korean society at that time. This writing culture manifested itself in writing tools such as the calligraphy brush, ink stick, and paper; the writing direction from top to bottom; and the composition of the lines of writing from right to left. All types of written and printed media, from letters to official documents and publications, were executed in the vertical writing culture. Therefore, it can be presumed that it was optimal and sufficient to continue the conventional writing practice, although Hangeul was created with an utterly inventive design concept. A question to raise at this point would be: does this indicate a lack of fundamental considerations regarding the formal correlation between Hangeul and the vertical writing culture? On the contrary, one cannot rule out that an adequate connection was made beforehand to the writing culture or to habits that had already been widespread in Korean society during the reign of King Sejong – and this knowledge was considered in the process of designing Hangeul. Unfortunately, the printed version of Hangeul that was first introduced in *Hunminjeongeum* does not provide any possible answers to this question. While enough studies are analyzing Hangeul's functionality and its originality, research on the figurative characteristics of Hangeul is scarce, especially from the perspective of the act of writing. What are the formal features we can find when Hangeul letters are written, and they create lines of text? The following contribution started from this set of questions.

The purpose of this study is to investigate the design properties of Hangeul that appear in the process of practical writing, which stands in contrast to the printed version. Simple writing experiments and the analysis of their outcome were performed to find answers to the following questions: What formal properties do Hangeul strokes have, and what role do they play in connecting letters to form a fluid vertical line of text? What formal correlations exist between the form of Hangeul characters and the vertical writing culture?

Stroke and Line of Text of Hangeul in *Hunminjeongeum*

In the first version of Hangeul, in *Hunminjeongeum,* it can be quickly recognized that the forms of consonants and vowels had characteristics different from those in Chinese characters. Even though the Chinese characters are printed type, it is evident that the shape and characteristics of the letters are rooted in and inspired by writing with brushes, the usual writing instrument at that time. By contrast, Hangeul does not contain any apparent trace of a writing tool. Instead, simplified lines construct the geometrical frame to build the basic elements [Figure 1]. Hangeul consists of graphic elements such as vertical, horizontal, and diagonal strokes and basic shapes includ-

Figure 1

The Haerye version of Hunminjeongeum: this edition was published as the first introduction of Hangeul, to present basic principles behind the creation of the script and offer instruction to the public. The Haerye version includes a detailed explanation of elements of Hangeul along with texts in Chinese characters.
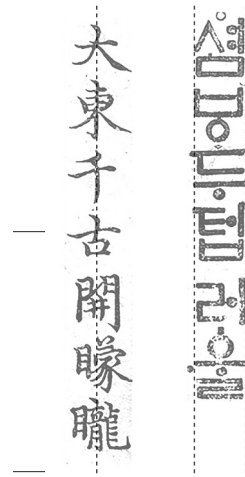

Figure 2

The flow of vertical text lines of Chinese characters and Hangeul – a combination of letters from Figure 1, arrangement by the author.

ing the circle, triangle, and dot, whereas Chinese characters show a wide range of variations in stroke direction, serif shapes and stroke endings with upward, downward, diagonal direction, or even curved stroke. All these properties in Chinese characters are expressed utilizing the brush. Korea had borrowed Chinese characters for an extended period, and hence the brush was the standard writing tool of society. The organic stroke created by a brush was a familiar element for everybody. It was strictly taught and trained at school how to use a brush to create proper forms and how to write letters with precise shapes and strokes in the correct style. Seen from this aspect, the simple geometric design concept of Hangeul can be understood as a fresh and unique starting point to introduce the new script system. The following deduction can be made as to why Hangeul was developed in a simplified graphic form in its early stage.

As the purpose of *Hunminjeongeum* was the introduction of a new script system, it can be assumed that the design concept of the individual Hangeul elements focused on enabling people to learn the new script *visually* at first. The basic elements of the consonants are the rectangle, the triangle, and the circle. In particular, the triangle and circle were unique graphic forms and not found in Chinese characters, with a few exceptions in illustrations of mathematical theory, cultural or philosophical symbols, or pattern design. The first version of Hangeul can be seen as the outcome of this experimental design research for introducing familiar sounds (the Korean language) through unfamiliar new forms (Hangeul), as printed type.

Now this remarkable achievement of creating shapes for a new script will have to be proved in the practice of reproducing them, e.g., how to write. The Chinese characters used in *Hunminjeongeum* next to Hangeul convey that they have been handwritten.

By paying close attention to how the strokes connect to each other and in which direction they flow, it can be inferred how the ductus of the strokes appears. It is also understandable how the order of strokes was developed, and how much pressure and speed were applied to the hand and arm in the process. Unlike these Chinese characters, in which multiple testaments to the writing tool and writing behavior can be seen, the early Hangeul does not include information on how the new script can be written. There is no serif visible created by the tip of brush at the beginning or the end of each stroke; both have the same termination with a rounded shape.[2] Where strokes are connected or bent, the angles are either 45 or 90 degrees. Therefore, it is difficult to read the trace and gesture executed by the hand holding the writing tool. The apex of the triangle shape is pointed, and the stroke thickness remains constant overall, even mathematically (Park 2013, 63), which is far from the properties found in brush strokes. Through these visual features, it can be surmised that this early version of Hangeul was not introduced with the objective of educating people how to write. In other words, it was presented as a demonstrating model for *visual training,* using a simplified geometric form.

Following the analysis of the formal features of each letter and stroke, I would like to focus now on how the lines of text are constructed by connecting the letters. If we closely look at the vertical line of text formed by Chinese characters, it is clear that the alignment of letters did not have its baseline on the left or right of the text lines, but in the middle of the characters' width. As shown in the first four letters in Figure 2, some vertical strokes that pass through the center of letters emphasize a robust central axis. The diagonal strokes extending symmetrically from this central axis also establish a clear principle of the vertical alignment of Chinese characters. However, this arrangement along a central axis cannot be found in the vertical text alignment of Hangeul. Because all the letters of Hangeul seen in *Hunminjeongeum* artificially fill the full width of the vertical grid, and each character has the same height as its width, each letter will fit into the outer frame that appears in square proportion. The size of this rectangular structure, in other words, the size of each character, is identical, regardless of the number of strokes. It seems to be a good starting point for creating vertical lines of text without balancing the letters on a particular axis, by simply arranging the type from top to bottom. Thus, unlike the central axis of Chinese characters, which create the visual flow of vertical text lines, Hangeul in *Hunminjeongeum* appears to be based on the width of the letters – both on the left and right side.

However, this vertical flow of the line of text is not a formal arrangement based on a consideration of stroke composition and the balance of individual letters as seen in Chinese characters. In a strict sense, it appears as the borderlines of the areas created by the physical width of the printing types of Hangeul. A question was raised in the introduction as to whether there was a design correlation between Hangeul and the vertical writing culture; however, in the printing type of *Hunminjeongeum*, evidence supporting

2 Some Hangeul calligraphy studies assume that this kind of stroke was made by a brush with a round ending (Yoon 2002, 6). However, it has to be understood as the engraving style for producing woodcut types called Pan-bon Style, rather than as a written style (Yoon 2002, 5).

a fundamental observation of such a correlation is not explicitly revealed.

Stroke and Line of Writing of Hangeul as Found in Writing Experiments

To further investigate the unanswered question from the previous examination, a simple writing experiment was conducted to explore how the lines of writing flow and what design correlations exist between the shape and writing direction of the characters. Seven Korean participants were asked to write the prepared manuscript in both writing directions, horizontal and vertical, one after another. For this experiment, the participants were asked to use a pen or a pencil so that they could write with the writing tool they are most familiar with and use their writing rhythm and speed. Of course, the brush is apparently one of the best writing tools to reveal the ductus of strokes. However, the purpose of this experiment was neither researching the quality of the brush stroke or historical writing practice, nor investigating the artistic aspects of calligraphy. Calligraphy using a brush requires different writing circumstances and settings: it needs to be written on large thin paper using an amount of ink, and consequently, the letters are written in a bigger size and with an unfamiliar, slow writing speed. The pen or pencil is better optimized for modern writing practice; the letters can be written in a smaller size at a fast pace on durable paper. The pen can be considered as suitable for the elimination of other elements and to reveal the straightforward and clearest writing gesture and the resulting traces. In contradistinction to the conventional understanding that Hangeul is learned vertically, participants were selected from those who did not have experience in vertical writing or traditional calligraphy, although they were all born in Korea. They learned to write horizontally through general Korean school education and did not have an additional lesson for vertical writing. For an optimum observation of the writing process, the creation of shapes and the connectivity of letters, a manuscript with adequate length was chosen.

The first step in the experiment was taken in the most common writing environment. The participants wrote the given manuscript in the horizontal direction, which is widely used in daily life, with the usual writing speed they felt comfortable to use [Figure 3]. They were not requested to demonstrate good writing, but rather to write in the most familiar rhythm and speed. In the analysis of the results of the experiment, the focus was placed on finding any peculiarity in maintaining the flow of the lines of writing.

This experiment shows how the area in which characters are combined often forms a frame in a square shape. Because the difference in height or width of each character is not so large, the characters display little difference in size. When these characters in the frame are brought together to build lines of writing, most of them look separated from each other, although specific instances of slight connectivity are detected when writing at a fast pace. In the quick writing gesture, the last strokes often go over to the beginning of the next letter. In other words, when a vowel such

Figure 3

Horizontal writing from one of seven participants. Duration of writing: 1 minute 28 seconds.

Figure 4

Connectivity between characters found to some extent in horizontal writing. The example on the left is handwritten excerpted from Figure 3, and the one on the right is set in one of the common sans serif Hangeul font. Arrangement by the author.
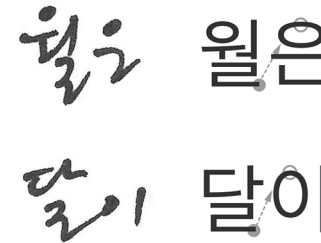
as ㄴ or ㄹ appears in the last position of a character, the final stroke with the completely horizontal ending moves to the starting point of the next character and shows a diagonal movement upwards [Figure 4]. These connections between characters appear in certain situations, but even though the letters are connected physically, they do not establish a single horizontal baseline. The lines created by writing show a visual order that is created when characters are composed in the most natural writing direction. But in this experiment, it cannot be seen at a glance how the flow of strokes establishes a dominant line of writing. In other words, the influence of the stroke connecting the letters is marginal in developing a dominant baseline of the composition. In fact, the situation in which strokes are physically connected due to the speed of writing and the location of each element is often seen in individual characters, not in lines of writing. For example in Figure 4,

the strokes in each single letter such as 월 or 달 are connected more closely than two characters next to each other, such as 달 and 이. Because the connectivity within single letters is much more dominant than between letters, the lines of writing do not look fluent. The lines do not provide the impression of a close and seamless connection among written characters; instead, it feels like the letters are just arranged horizontally.

In the second experiment, the same manuscript was written in the vertical direction. An attempt was made to keep to the usual writing speed as employed in horizontal writing, even though the writing direction may have been unfamiliar (Figure 5). In analyzing the results from both horizontal and vertical writing, we can describe the following differences:

The first difference is the proportion of the individual letters. The previous experiment showed that the visual frame of the letter, where the strokes are combined to build a letter, is close to a square shape and, therefore the width and height of the characters did not significantly differ. However, it can be observed in the vertical writing that the characters are stretched slightly vertically over the square frame and are given elongated proportions in comparison to those in the horizontal writing experiment. With a closer look at the changes in proportions, it can be found that the height of individual characters increased, rather than the widths being condensed. As shown in the example in Figure 6, the density of the combined strokes in several letters is loosened in the vertical direction, which demonstrates that it is affected by the movement and speed of the vertical writing gesture.

Secondly, the physically connected characters that were seen in

Figure 6

Comparison of the proportion of characters in horizontal writing (left) and vertical writing (right), arrangement by the author. It can be seen that the height of the individual characters increases in vertical writing.
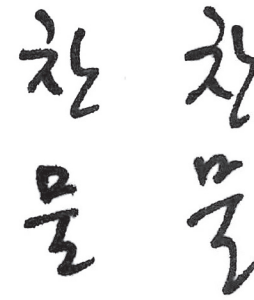
the horizontal writing experiment are hardly noticeable in this experiment. Compared to the horizontal writing experiment, in which the last stroke of an individual character proceeds to the beginning of the next in an upright direction, the vertical writing does not show this dynamic change of stroke direction between letters. It was interesting to find in the horizontal writing experiment that, although some of the characters appear to be physically connected, the connectivity of these strokes did not significantly affect the horizontal direction of the writing. In this experiment, however, the vertical flow of the lines of writing runs more naturally than in the first experiment, even though a physical connection of characters is not often found. The question of what creates this difference leads us to the next analysis.

Thirdly, another factor that cannot be overlooked in the natural flow of the vertical lines is the appearance of a new characteristic of vertical strokes with a noticeable difference as compared with the horizontal writing. When taking a look at the formal features of Hangeul, the consonants are closed geometrically or close to a semi-open shape (area), but the vowel has the character of straight strokes (line). In the horizontal writings of the first experiment, the horizontal and vertical strokes do not stand out, because the complex stroke composition within a letter appears visually more dominant. However, in the experiment with vertical writing, the flow of the vertical strokes became unexpectedly prominent. In particular, consider the seven letters on the third line from the right side of Figure 5, each of which contains a vertical stroke on its right side that plays an essential role in visually connecting the letters [Figure 7]. Unlike the results of the previous experiments, in which the characters seemed just to be arranged horizontally without any specific order, the characters now seem to have been intentionally aligned. It is one of the strongest visual components found in vertical writing, which runs parallel to the direction of the lines of writing. This finding can be regarded as a premise that the vertical strokes of Hangeul can work as a *baseline* for vertical writing. At least, one thing becomes more evident by analyzing the structure of Hangeul: When individual Hangeul characters are composed, the vertical stroke is located in a constant position at the right edge of the letter. The horizontal strokes can be located either in the middle or at the bottom of the letter height. This means it can work as a natural vertical axis for composing text lines of vertical writing.

If we look more precisely at the formal features of the vertical stroke revealed through the vertical writing experiment, we can find that

Figure 5

Vertical writing from the same participant as in Figure 3. Duration of writing: 1 minute 45 seconds.
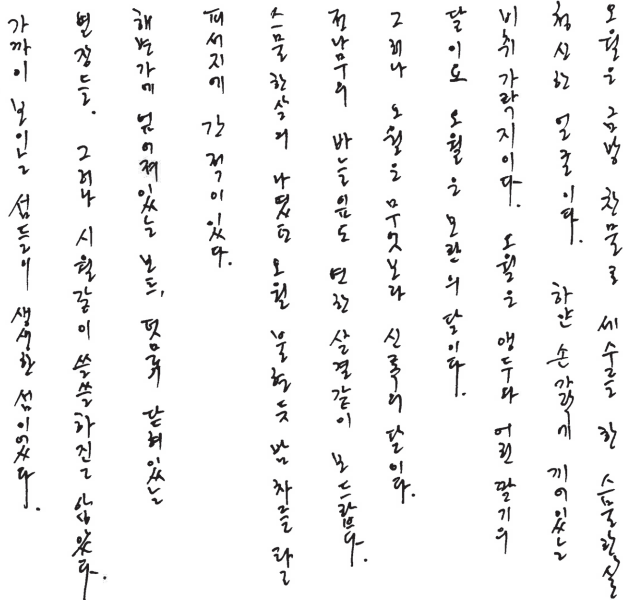

Figure 7

Vertical strokes on the right side of each character build a dominant vertical axis in the vertical writing movement. An excerpt from Figure 5.

it is fundamentally different from the vertical stroke in the horizontal writing experiment. In the outcome of the horizontal writing experiment, the vertical strokes do not draw our visual attention. They look like one of the common Hangeul components in a letter. However, if we take a close look at the vertical strokes in the vertical writing experiment, the image of the stroke is very conspicuous. This difference becomes evident by comparing the seven letters of the horizontal and the vertical writing experiment introduced in Figure 7. The vertical strokes of the vertical writing experiment are further extended downward than those of the horizontal writing experiment. This feature was not revealed in the early Hangeul types, including in *Hunminjeongeum*. The formal feature of the vertical stroke in *Hunminjeongeum,* which was unremarkable because of the composability of the strokes of printing type, is now revealed by the act of writing with the appropriate writing direction. The difference that the vertical strokes are extended is an important clue that defines the nature of the strokes in writing. The previous analysis explained that the fixed position of the vertical strokes on the right edge of the character became a device for clarifying the flow of lines of writing. However, along with the position and length of the vertical stroke, the third element that makes the flow of the vertical lines of writing more prominent is the ending shape of the vertical stroke. We can observe that the vertical strokes in the vertical writing experiment not only have increased their length but also have a different ending shape from those of the printing type of Hangeul in *Hunminjeongeum*. As shown in Figure 8, it can be seen that the ending of the vertical stroke is stretched downward and makes a *pointier* ending than in the horizontal writing. It is a formal feature that reveals the way the stroke was created by a fast vertical downwards gesture.

What can be read in these vertical strokes, along with the downward movement, is the writing speed. As seen in Figure 9, three distinct brush movements can be described. (1) Ending a stroke with a full stop (Figure 9, left); (2) flicking the stroke upward (Figure 9, middle), which is often found in Chinese characters; (3) vertical stroke without a pause or change of direction. However, there is no need to make a complete stop to shape the ending if the vertical stroke keeps the movement and runs downward. If you do not stop the vertical movement of the writing tool and keep the writing speed at the end of the stroke, and you want to write the next letter just after this vertical stroke, the ending of it naturally makes a sharp pointy ending (Figure 9, right). So, this pointy ending of the vertical stroke became an essential component for revealing *how Hangeul letters are connected in lines of vertical writing*. This finding – that the vertical strokes function as a design instrument supporting the connectivity of vertically written letters – becomes more evident if we look at the stroke order of individual Hangeul characters. If a Hangeul character includes a vertical stroke, this stroke is, in most cases, written either last or penultimately. This stroke as the last stroke is often connected to the next letter. This is a formal and structural feature of Hangeul that has been in appearance since Hangeul was introduced in a printing type in 1446, and was developed through vertical writing activities for more than 500 years until horizontal writing proliferated at the end of

Figure 8

The difference in endings of vertical strokes of horizontal writing (left) and vertical writing (right), arranged by author. Whereas the vertical strokes in horizontal writing display relatively more rounded ends, those in vertical writing are stretched downward and have pointy ends.

Figure 9

Different vertical stroke endings, written with a water-based pen by the author: ending with a full stop of the writing tool (left), ending with a direction change, flicking upward to the left (middle), and ending directly downward without a change of movement or pause (right).

the nineteenth century (Ku 2012, 5).[3]

The most apparent difference between the two experiments described above is the direction of the lines of writing. In the third experiment phase, horizontally written letters from the first experiment were cut out individually and then rearranged vertically by the author (Figure 10). During rearrangement, the tracking was adjusted to be similar to that of the second experiment, so that the density of both texts stays homogeneous. This attempt shows a different output from the analysis made in the second experiment, with vertical writing. The flow of the vertical lines made of characters that maintain the proportions of the horizontal writing experiment is not as natural as the experiment with initially vertical writing. It provides the impression that the characters are more separate and just are arranged vertically. In other words, there is less connectivity of the letters in the vertical text line compare to the originally vertical writing. If we consider the first seven characters of the third line on the right, which were analyzed in the second experiment, we can look at the difference in more detail (Figure 12). As we have seen in the vertical writing experiment, a steady position of vertical strokes on the right edge of each character is an important element that reveals the principle of lines of vertical writing. Based on that, the same seven characters from the horizontal writing are now cut out and rearranged vertically according to the same principle: they are aligned along the right-hand side of the character. However, in this comparison, the flow of the lines of writing created by the connectivity of letters is not visible as in the

3 A Korean-French dictionary, *Dictionnaire français-coréen*, published in 1868 by Stanislas Férron (1827–1903), is considered the first publication to be printed in Korea with a horizontal Hangeul typesetting (Ku 2012, 5).

Figure 10

The text initially written horizontally by a participant and converted into vertical writing. Individual characters from the text of Figure 3 were cut out and rearranged in a vertical direction by the author.

Figure 11

The direct comparison of Figure 5 (natural vertical writing) and 10 (initially horizontal writing, vertically rearranged).

Figure 12

The difference displayed in vertical strokes that form lines of writing. The left line is an excerpt from Figure 10, and the right line, from Figure 5.

original vertical writing. This means the rearrangement and re-alignment of letters is itself not a significant feature to understand how the lines of the vertical writing of Hangeul flow.

Conclusion

Written characters are fixed and defined on the paper, but the process of writing is dynamic; the writer constantly controls the hand and individual writing tool with a subtle gesture by reacting reflexively to the trace on the paper. The stroke is the single track of a tool; its characteristics can only be preserved by handwriting (Noordzij 2005, 9). In this context, the stroke is not merely the trace of the writing tool: it is the medium and visual evidence that carries out the dynamics of the writing process and reveals it in concrete form – the letter – at the same time. Also, the stroke plays an important role not only as the critical component of a single letter but also in creating a flow of lines of writing, as we have seen in the analysis of the outcome of the experiments.

At least in *Hunminjeongeum,* the first form of Hangeul did not reveal how the writing tool was involved and how the dynamism of the stroke was revealed. It was presented as printing type with an already reduced and constructed stroke;[4] this limitation led this research to the practice of writing to explore how the stroke affects the composition of lines of text, especially at the moment of writing. Of course, we need to admit to skepticism as to the lapse of time since the first printing of Hangeul was created more than five centuries removed from these practical writing experiments, and the handwriting has been developed in several styles using different writing tools, whereas there were just a few changes of the printing letter form between the first edition and modern Hangeul. Therefore, the result of this practical experiment delivers only speculative answers to the research

4 It is assumed that the Chinese characters in *Hunminjeongeum* were written by Anpyong-daegun, a renowned calligrapher and third son of King

Sejong, and the Hangeul characters were *drawn* by Kang Hee-an, a painter and calligrapher (Park 2013, 63).

questions asked in the introduction. On this premise, one of the important outcomes of the study is that the dynamism of the vertical stroke, which was discovered from the writing experiments, became a crucial clue to understand the formal properties of Hangeul and the essence of the vertical writing culture. Its straightness and the pointy ending shape made by the quick movement of the writing tool not only define how the form of the vertical stroke in Hangeul is different from that in Chinese characters; it also builds the unique connectivity among Hangeul characters in vertical lines of text.

Since Hangeul began to be printed with modern printing techniques in parallel with the modernization of Korean society in the late nineteenth to early twentieth centuries, some modern printing types were developed in response to the demands of the times. Many of these types represented the traditional formal principle of Korean calligraphy and thought with a vertical typesetting (Park 2012, 28); however, this development was hastily shifted to horizontal writing without looking at the details of the tradition of vertical writing. For instance, in 2010, over 3,000 digital Hangeul fonts from 17 font foundries were registered at the *Institute of Hangeul font development and research* (Yoo 2010, 272). However, all these fonts were designed and optimized for horizontal typesetting. In 2011, under contract from the same institute, five prominent calligraphers' handwritten Hangeul letters were digitized as a font collection (FontBank). It is remarkable to see that these fonts were optimized for horizontal writing as well, even though the forms of those letters are strictly digitized from the traditional Hangeul calligraphy in vertical writing (Figure 13).

On the other hand, since 2000, a few independent type designers have started to develop Hangeul fonts, which are focused on typesetting in vertical directions. Yong-je Lee, one of the leading Hangeul type designers for vertical typesetting, explains the weight balance of his typeface *Baram* designed for vertical setting:

"*Baram* is designed for the vertical typesetting, so there is a
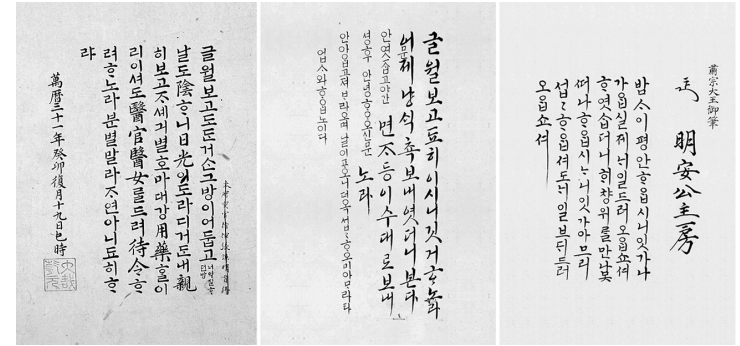
certain awkwardness if it is set horizontally. Since the position of the weight balance is put slightly on the right side of each letter, the spacing between letters looks irregular if set horizontally (Lee 2014, 17)."

For another sketch for the vertical typesetting font *Kotgil*, he said about the physical alignment of the letters:

"In the second phase of the sketch, I physically aligned the letters vertically along the vertical stroke | […] The text line looked now aligned on the right side, but then the left side looked untidy (Lee 2013)."

This indicates that the vertical stroke appearing on the right side of some Hangeul letters plays a significant role in vertical typesetting, and is at the same time a missing key, which shall have to be intensively explored in practice. Neither arguing which writing direction is ideal for Hangeul nor criticizing a specific writing direction in Hangeul typography is the object of this study. But observing this recent movement, the findings from this study can be applied for further research on the modern Hangeul type design for the vertical typesetting to find possible answers to the following questions: What was missing during this transition of the writing direction of Hangeul and what role does the vertical stroke play? A potential area that could be looked at intensively is Hangeul calligraphy, which is not covered in this investigation. There are abundant and productive developments as to its form and style, and they have provided numerous artistic inspirations for printing type even until now. This could also be an interesting field of study if an approach can be made regarding a formal analysis of strokes, rather than seeing the changes of brushstrokes in a fragmentary way from an artistic and historical perspective. The examples from Figure 14 also show some features of vertical strokes and vertical flow that are shared with the writing experiments of this investigation; these features can provide an important formal basis to develop digital Hangeul types for vertical writing. In this context, some recent studies in this field suggest that digital Hangeul types have to be designed with a different formal concept for each writing direction (Lee 2011, 1051). Thus, even though the printing type of Hangeul in *Hunminjeongeum* shows an unusual and fresh design concept with geometric shapes, and does not include the properties of handwriting, it is hard jump to the conclusion that Hangeul simply inherited the tradition of vertical writing without a critical review regarding design. As this research indicates,

the vertical stroke in written Hangeul reveals several important features for understanding the relationship between the newly designed script and vertical writing culture at that time. Therefore, the assessment that Hangeul was developed to have the formal principles appropriate for vertical writing is believed to be sufficient for further inquiries into Hangeul.

References

FontBank. "FB Calligrapher font collection 2." fontbank.co.kr. http://www.fontbank.co.kr/goods/view?no=28 (accessed October 15, 2017).

Ku, Ja Eun. 2012. "A Chronological Study on Horizontal-writing Hangeul." PhD diss., Hongik University.

Lee, Yong-je. 2011. "A relationship between direction of writing and Hangul letter-form." *LetterSeed* 3 (2): 1026–1053.

Lee, Yong-je. 2013. "The reason for the vertical typesetting." Lee, Yong-je. February 15, 2013. http://www.leeyongje.com/post/43160805004/ 세로쓰기를-만든-이유 (accessed October 30, 2017).

Lee, Yong-je. 2014. "Usability assessment for the Baram font." Hiut 7: 16–25.

Noordzij, Gerrit. 2005. *The Stroke. Theory of writing*. London: Hyphen Press.

Park, Byung-cheon. 2013. "The formal change of Hangeul fonts." *New Korean Life* 23 (3): 55–94.

Park, Ji-hoon. 2012. "New Hangeul typefaces and their specimens." *Hiet* 1:24–40.

Ryu, Hyun Guk. 2015. *Birth of the Korean type 1820 – 1945*. Seoul: Hongsi.

Taylor, I. & Taylor, M. M. 1995. *Writing and Literacy in Chinese, Korean and Japanese*. Amsterdam, Philadelphia: John Benjamins Publishing Company.

Yoo Jungsook. 2010. "A Study on the Change in the Formative Elements and the Characteristics of Typography of Digital Dodum Typeface in Hangul – Focus on Traditional Square Typeface –." *Journal of Basic Design & Art* 11 (1): 268–280.

Yun, Jeong-rae. 2002. "A Study on the Calligraphy Education in Elementary School Using Panbon-Style." Master diss., Chonnam National University.

Image References

Figure 1
https://image.artrescape.com/artwork/32682/2014-03-28/간송문화_훈민정음_해례본.jpg (accessed May 27, 2016) edited by the author.

Figure 13
http://fontbank.co.kr/goods/view?no=28 (accessed June 3, 2016) edited by the author.

Figure 14
From left, respectively, edited by the author.
http://static.campaign.naver.com/0/hangeul/2012/img/img_letter.gif (accessed December 1, 2016)
http://hangul.typographyseoul.com/files/attach/images/630/751/313/001/fd5fc7572bcc781588895c68c958063b.png (accessed December 1, 2016)
http://hangul.typographyseoul.com/files/attach/images/630/751/313/001/fd5fc7572bcc781588895c68c958063b.png (accessed December 1, 2016)

Author

Jinsu Ahn was born in Daegu, South Korea. Before graduating in 2009 with an International Master of Fine Arts in Graphic Design UIC/FHNW HGK in Basel, he completed a FH-Diploma with emphasis on typography at the FHNW HGK in Basel in 2007 and a Bachelor of Fine Art at Kyoungpook National University in Daegu in 2002.

He completed various design projects such as a research into developing public design strategy for Daegu City and documentation for the Novartis Campus. He has translated «Typographische Gestaltung» of Jan Tschichold into Korean (2014) and is contributing articles on typography in journals and magazines though out Korea.

From 2009 to 2015, he was a research associate at the FHNW HGK in Basel in the Visual Communication Institute, and since 2011 has been teaching typography and conducting interdisciplinary workshops. Since 2015, he is a full-time lecturer for typography in both Bachelor and Master programs at the FHNW HGK in Basel.
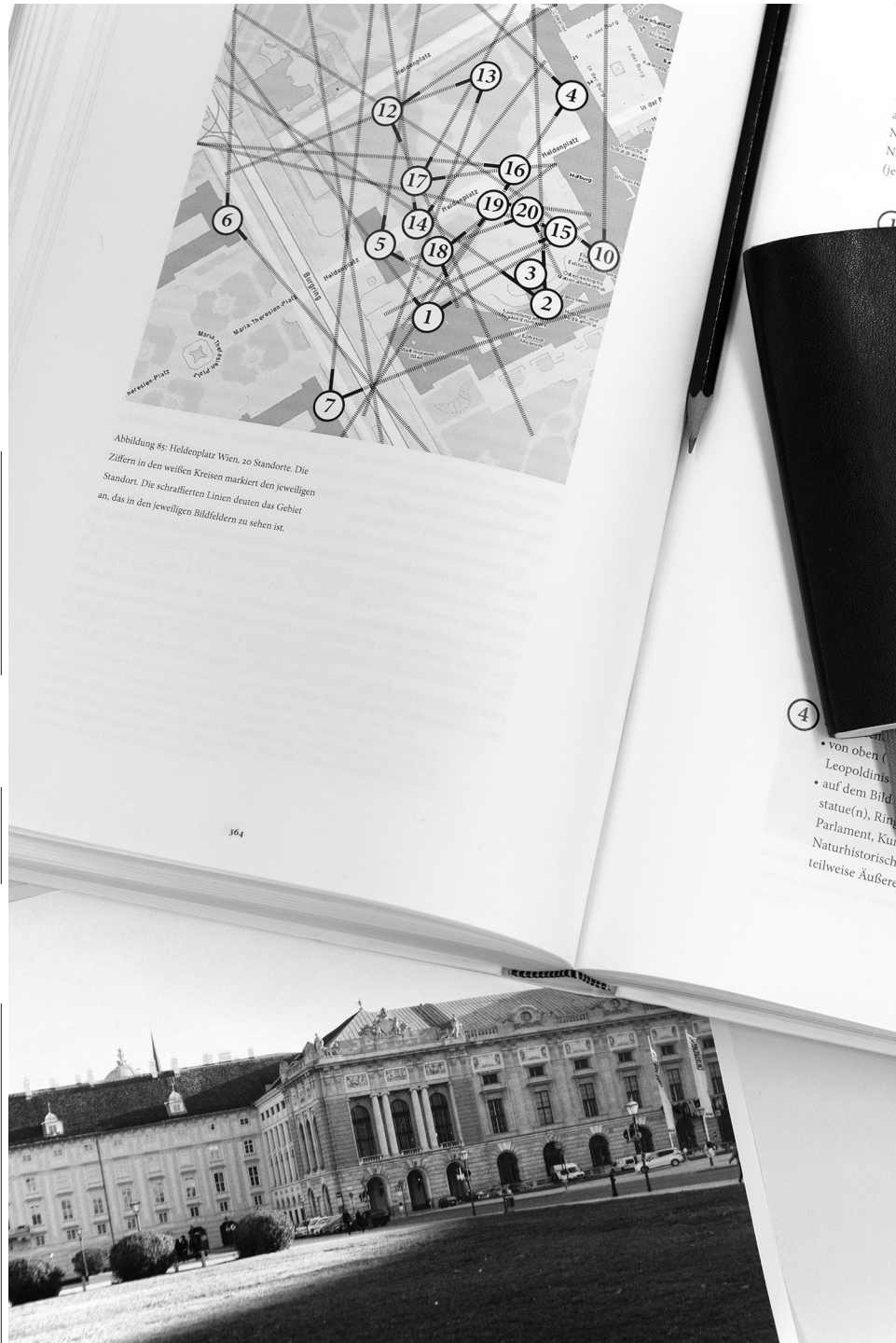
Abbildung 85: Heldenplatz Wien, 20 Standorte. Die Ziffern in den weißen Kreisen markieren den jeweiligen Standort. Die schraffierten Linien deuten das Gebiet an, das in den jeweiligen Bildfeldern zu sehen ist.

Identifying Design Processes in Photography by Analyzing Photographic Strategies in the Documentation of Public Places:

"It's hard to be down when you're up."

Helga Aichmaier

Recent research in the fields of image studies, visual communication, graphic design, and the history of science shows that there are 'design processes' – specific decision-making processes – in the practices of designing, painting, or drawing. I assumed that parallels could be drawn between those visual practices and photography. This paper explores how taking pictures within a research context enables the analysis and verbalization of strategies that are employed in photographic design processes. Despite a growing body of knowledge around image creation, little research has been conducted on photographic design processes. Viable contact sheets, sketches, proofs, or notes have not been available yet for proper research. Thus "practice-led iconic research" is adapted as a method for photography – possibilities of photographic practice and its strategies are explored as an instrument of research. The research questions were narrowed down to inquire into the image production of documentary photographs, specifically, of four public squares in Switzerland and Austria: How do photographs have to look in order to be recognized as documentation of a certain place? Is it possible to identify specific photographic strategies for documentary image generation? It was found that there are several strategies that support a documentary impression if they are employed during the creative process of photography, such as top views, critical distance, or frontality. The findings can contribute to the question of how visual meaning might be generated, enhancing an understanding of photography and design in the field of design practice as well as theory. This paper is based on the dissertation "Strategies of an Image Practice" (Aichmaier 2016).

keywords

design research methods
practice-led iconic research
design processes
photographs

Aim

What kind of strategies in the design process cause an image to emerge that is perceived as 'documentation'? This project aims to identify and name those strategies by doing photography. I claim that the decision-making process in the field of photography is comparable to that in designing, drawing, or painting. Therefore, the concept of so-called 'design processes' should be adapted to photography. By analyzing how pictures are generated, the assumption is that a better understanding will be gained about how images might produce meaning for the beholder.

Documentary Photography and Design Processes

Two terms should be introduced: namely, the concept of the 'documentary' and 'photographic design processes,' as they are central to the discussion.

Documentary Photography

If one thinks of a photograph of a public square, for example the Hauptplatz in Linz, Austria (Figure 1), how does one know that it is intended to be seen as a documentation of that specific place at a certain time?

There are different practices for creating documentary pictures; accordingly, there are manifold ways to specify a documentary picture. In general, documentary images, or images with a documentary style (Lugon 2001), are described as technical images produced by digital or analog tools that are held to guarantee a certain amount of objectivity (Flusser 1984; Bredekamp, Schneider, Dünkel 2008). Photography comprises an apparatus with a lens that renders visible light on a light-sensitive surface. From this technological perspective, the authenticity of photographs has been in question due to the possibilities of digital manipulation, although it is known that manipulation is part of the history of the medium (Rosler 2000).

To re-discuss the theoretical debates concerning the paradigms of "imprint," "trace," or "index" of the real is not crucial at this point. Peter Geimer summarized the common features of these debates: the photograph is affected by its emergence, e.g. with a photographic lens and photosensitive material that are chosen by a photographer. However, for a short moment, the human influence on the process is ineffective (Geimer 2009). These observations might be the key to the (mis)understanding of documentary photography. To this day, it is often assumed that reality gets 'fixed' mechanically in the photographic process. Therefore, documentations are often held as an objective or neutral mode of representing a person, an event, or a situation. In addition, it is still widely believed that the withdrawal of

Figure 1

Archives of the City of Linz, Hauptplatz, before 1897 (*Archiv der Stadt Linz / Archives of the City of Linz*)

the photographer's authorship legitimates the picture to be objective and factual. From a sociological perspective, photography is defined by certain aesthetics that have a "cultural legitimacy," as Pierre Bourdieu states: "Photography is considered to be a perfectly realistic and objective recording of the visible world because (from its origin) it has been assigned *social uses* that are held to be 'realistic' and 'objective.'" (Bourdieu 1990, 74) Therefore, documentary photographs also have to be seen in connection with cultural, social, political, and historical aspects.

However, I will argue here that a comprehensive definition of 'a' – or 'the' – documentary photograph is lacking. Instead, there are various trends of the documentary that replace as well as influence each other. For Allan Sekula, the use of the term "documentary" is acceptable if the "myth" of the documentary is thematized (Sekula 1978). Martha Rosler argues that documentary photography is shaped by contexts of production as well as reception and, therefore, is rather versatile. She argues that the context of publication is the most decisive factor for whether something should be held as documentary (Rosler 1989). As Abigail Solomon-Godeau put it, documentary is a "variable practice" (Solomon-Godeau 2003).

Olivier Lugon scrutinizes the documentary as a "fluid concept" (Lugon 2005). What is actually held as documentary changes – what is perceived as a documentary image is subject to constant transformation. Recalling the history of the term "documentary," Lugon points out an inconsistency: "No-one has ever known with certainty what the term 'documentary' actually entails" (Lugon 2005, 65). It is presumably this undefinedness that gives rise to the prosperity and the propagation of the "documentary" genre. Referring to Allan Sekula, Lugon stresses that whenever someone finds a "formula" to explain the essence of the documentary, suspicions are raised, and the documentary is "reinvented," in Sekula's language. With the availability of digital means, photography and subsequently the concept of the documentary are again on the verge of radical change.

Design Processes and

Photographic Design Processes

A major claim underlying this paper is that the decision-making process within photography is comparable to the design processes other fields. Within graphic design, the term 'design process' is known as the process of creating image series (Renner 2010) that lead to artifacts. It is the central category for ways of deriving a form from interactions between actors and their environments (Teixeira, Rickenberg 2008).

The word 'design process' is often used for meta-theory: there are various theories and models about how designers or architects think and work (e.g. Schön 1991; Lawson 2005; Cross 2007; Goldschmidt 2014). However, in this paper the word 'design process' is used for specific ways of understanding a particular practice of making images. Pieter Jan Stappers described developments of design thinking in research as "the act of design-ing" as well as a "method of generating new knowledge" (Stappers 2013). In other words, this article reports on an "inquiry through the *practice* of design" (Durrant, Vines, Wallace, Yee 2017).

There is a German term that embraces aesthetic processes used in practice known as 'entwerfen' or 'Entwurf'. However, these terms cannot be translated into English. They seem to be part of the English term 'designing'. In an encyclopedia of aesthetics, the term 'design' is defined as provid-ing a framework of possibilities and decision-making practices, but it also comprises the division of work or the economic capacity that is entailed within an object (Palmer, Dodson 1998). Definitions of 'design' have a broad spectrum, as indicated, exceeding the meaning of 'entwerfen'.

'Entwerfen' – a 'design process' – should not be understood as a linear, single or solitary action but a methodical process. It provides a frame-work of possibilities and decision-making practices, often by searching for the most suitable option by trial and error. Objects such as drawings, sam-ples, sketches, or notes are the residua of design processes that embody the contingencies of the process, in other words, the impossibility to influence the trajectory in all aspects when designing. It is about a general potential of an output or, to put it in a more abstract way, of options. The materialized image or writing provides information about the process in retrospect.

During the activity itself there lies an explicit and a tacit knowing about one's own design process, as Barbara Wittmann and Christoph Hoff-mann have described it for writing and drawing (Hoffmann, Wittmann 2013), or "reflection in/on action" (Schön 1991), as it is called in the field of design research. It is essential to be aware of this "expert knowledge" as a (historical or social) concept (Mareis 2012).

Transferring the term "design process" to the field of photography, a broad definition is beneficial for characterizing various photographic genres such as documentary photography – because it is still an open ques-

Andreas Feininger, diagram from the chapter "How to take a picture" (Feininger 1980, 110)
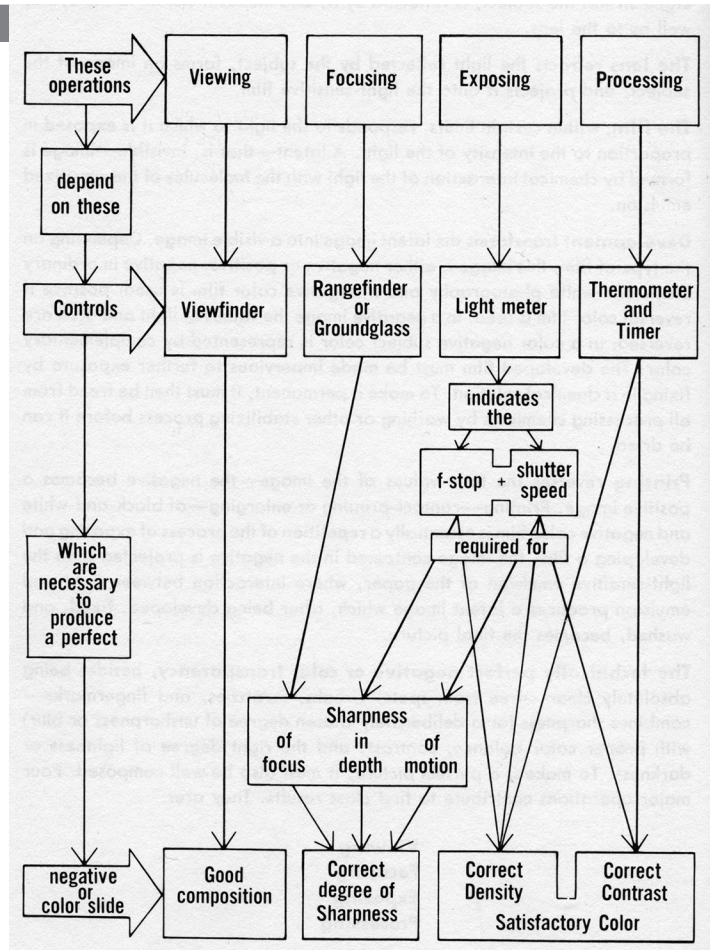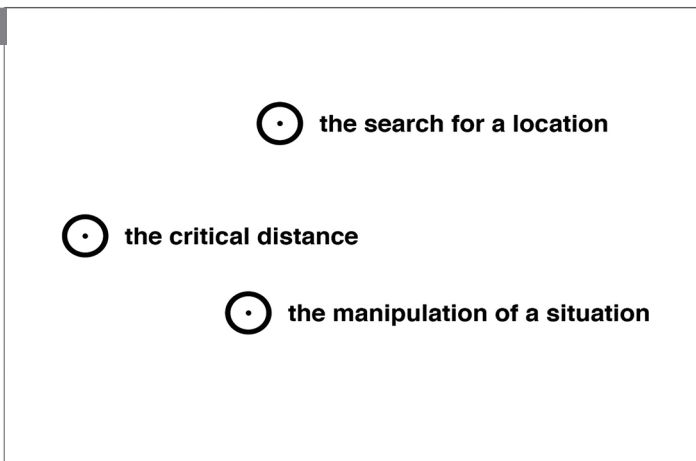
tion how to describe the process of creating (new) photographic pictures.

Compared to its concise technical language, the aesthetic dis-course about photography is rather vague. For example, a "photographic process" is a detailed description of how to render a photograph visible by certain chemical procedures (Suzuki 2006). Jean-Claude Chamboredon stat-ed in 1965, "Because it is impossible to apply traditional aesthetic language to it, photographic creation is difficult to define as such." (Chamboredon 1990, 132f.). Since then, the inconsistencies of the different photographic practices throughout the histories of photography have been explored and are part of the photographic literature (for example, Wells 2009). And yet there are various meanings in circulation: photography comprises practices such as pressing the shutter button, pre- and postproduction, the "decisive moment" (Cartier-Bresson 1952) or "photographic seeing" (Feininger 1980).

The idea that the "central act of photography" (Szarkowski 1966) only consists of choosing and eliminating, as John Szarkowski stated in 1966, is obsolete now. At the same time, in 1965, photographer Andreas Feininger proposed sharpening one's attention while doing photography. He suggests exploring different distances or point of views and imagining

Figure 3

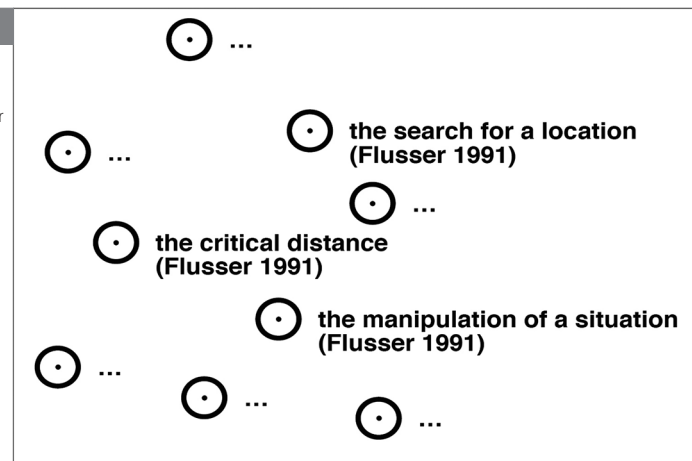Three aspects of the gesture of photography by Flusser (after Flusser 1991)

⊙ **the search for a location**

⊙ **the critical distance**

⊙ **the manipulation of a situation**

Figure 4

Photographic design processes, enlarging terminology based on Flusser (after Flusser 1991)

⊙ …

⊙ …

⊙ **the search for a location (Flusser 1991)**

⊙ …

⊙ **the critical distance (Flusser 1991)**

⊙ **the manipulation of a situation (Flusser 1991)**

⊙ …

⊙ …

⊙ …

suitable weather or lightning conditions. This set of parameters helps to decide which means of photography might be used – which lens, film, or filter, or whether to change a given situation for the better. "And once he [the photographer] has reached specific conclusions he will not stop with one shot but will explore all the promising possibilities the situation presents …" (Feininger 1980, 9).

However, Feininger's diagram from the chapter "How to take a picture" (Figure 2) could lead to the mistaken impression that it suffices to adhere to a diagram, step by step, to achieve a successful photograph. For example, Feininger points out that there are four photographic "operations," such as selecting a detail by "viewing" with the help of the control mechanism called the "viewfinder" – which together are necessary to produce a "Good Composition." This recipe-like sequence of actions seems to me to contradict the description of photographing in his text since Feininger states the following: "You always have a choice. Don't waste this precious privilege. If a subject is worth photographing, it deserves a perfect job – something which rarely can be accomplished with only a single shot." (Feininger 1980, 9) With this description, photographing seems to be a very open procedure – but when brought into the form of a flow chart, photographing becomes something with a rigid sequence, which contradicts Feininger's written enthusiasm for the possibilities of choice. In any case, it appears that photographing is a very easily controllable process, something that can be managed with a checklist.

A few years later, a more precise description of photography is found in Philippe Dubois 1983 treatise. The contents: no photo can be regarded and conceived solely as an image (Dubois 1998). A photo is above all the result of an act. Dubois stresses the "before" and "after" moments of a "Photographic Act." He meticulously describes what it takes to make a photograph and points out that this decision-making process cannot be separated from cultural or social circumstances. This approach is as promising as it is problematic. That which comprises a photographic act seems in Dubois's language to be very clearly and unambiguously nameable. In fact, as will be demonstrated, there are also unfamiliar circumstances and something resis-

tant that comes into effect during photographing. With Dubois, one could be under the impression that it is a process that has been analyzed down to the last detail and that can be exactly captured in language.

A type of openness of the process can be found formulated by Stephen Shore. He describes, in the generation of photographs, the interactions with the environment, with one's own as well as with collective ideas, and the testing of alternative pictorial concepts. "It is a complex, ongoing, spontaneous interaction of observation, understanding, imagination, and intention." (Shore 2007, 132) Shore addresses two directions in photographing: In the first, through an unconscious "filter," what is already known is simply rigidly repeated. In the second, multiple and fluid possibilities can arise during photographing, when the photographer brings them into awareness. The photographing of sunsets is his example for the spectrum of possibilities. Images of sunsets often feel interchangeable – if one becomes aware of how they work, the conditioning could be managed better. The photographer's enhanced attentiveness can enable new subjects to emerge, according to Shore.

Vilém Flusser adds another facet of photographing: to him, the search for a suitable image is a series of "abrupt decision-making procedures" (Flusser 1991, 140). Flusser developed his thoughts through his observations of portrait photography in a studio and the involved photographic gestures. He distinguishes three aspects that mutually influence each other (Figure 3): firstly, the search for a location (a viewpoint from which one is able to watch a situation); secondly, the manipulation of a situation (in order to adapt the situation to the chosen location); and thirdly, the critical distance of the photographer from the situation (because this distance is a deciding factor regarding success or failure when selecting the suitable moment for the generation of future images). In summary, Flusser shifts the analysis of a "finished" artifact to the activity of creating future photographs.

In my opinion, Flusser's thoughts are worth further elaboration since they add openness to experience. On the basis of his writing, the definition concerning design processes of (documentary) pictures should be expanded for a better understanding of photographic design processes

(a forthcoming paper will address this issue). Because a design process is generally held to be an open-ended process, a "process through which new ideas and artifacts are generated" whereby "materialized intermediary stages" are produced and these different visual variations are evaluated. It enables creating a "visual form" to be developed "that has never been seen before" (Renner 2011, 95). Materialized intermediary stages in the field of photography have various forms (Fox, Caruana 2012), such as Polaroids, negatives, contact sheets, (annotated or stamped) proofs, handwritten notes, typescript or printed text, data, folders and files, indexes or printed reproductions – or, as Lugon puts it, "half-finished products" (Lugon 2013).

To come up with a definition for the 'photographic design process,' I suggest a provisional one at the moment – because further research will clarify as yet unknown factors. A photographic design process results in an artifact, yet the photographer leaves some trace of this process with "half-finished products." However, not all the possibilities for the appearance of yet-to-be-made photographs are 'stored' in the residue of a photographic design process because of composing through the viewfinder of an apparatus. An experienced photographer only takes photos that he or she feels could embody a possible future artifact. This methodical process entails various (un)conscious decision-making procedures, and even then, there are factors or situations that cannot be completely 'controlled.' Christoph Hoffmann named these as "unfamiliar circumstances" (*unbekannte Umstände*, Hoffmann 2011) such as moments for one's own serendipity, which are also part of a design process.

Methods

To analyze images, I used methods from the field of art history such as "comparative analysis" (Bader, Gaier, Wolf 2010: comparing two or more pictures in order to name divergent or consistent visual characteristics) and "formal analysis" (Bredekamp, Fischel, Schneider, Werner 2003: naming and identifying how a work of art is made and how this process might yield a meaningful image). These are known as qualitative methods and belong to a special branch of art-history methodology in order to understand 'mechanisms of meaning,' rooted in the German writings of Erwin Panofsky, Max Imdahl, and Gottfried Boehm.

I combined these methods used by art history with a "practice-led" approach from the field of design research. This methodological combination was made because appropriate photographic design processes were not available for examination – the careful documentation of decision-making is often neglected in daily practice (Renner 2017, 144f.). As I have a background in visual communication as well as in photography, it seemed feasible to create suitable photographic design processes for research pur-

poses through my own photographic practice.

To integrate one's own creative practice in a research project is an approach that was addressed by Christopher Frayling as "research through art and design" (Frayling 1993/1994). An influential survey was published in 2007 that provided a definition for "practice-led research": "Research in which the professional and/or creative practices of art, design, or architecture play an instrumental part in an inquiry." (Rust, Mottram, Till 2007, 11) The authors of this definition point out that a researcher's practice could also be a part of this methodological approach, if an explanation is provided why and how practice is applied within a research framework.

Michael Renner further developed this experience-based approach as "practice-led iconic research" (Renner 2011; Renner 2017), whereby the researcher integrates his or her creative design processes to create suitable visual matter, e. g. image series, for research purposes. I adapted his method to photography: to gain more insight into the characteristics of a documentary image concept, I created, screened, selected, combined, and compared images in order to analyze my own practice of photographic design processes. The methodological approach is to extend the analysis of photos by also including the process of their production. A comparative and formal analysis was used for a well-considered verbalization, but the visual variations of the design process should be considered as research findings as well. The approach of combining images and words as findings follows a discourse in the humanities that images cannot be entirely verbalized (Renner 2011; Renner 2017). Visual variations often do not comprise a "mature" appearance, as is known in the case of exhibitions. Rather, they can be understood as "epistemic objects," since they shed light on an intellectual process (Rheinberger 2006).

It was necessary to determine how to manage the multitude of requirements occurring during a photographic design process in a research context – termed "exploration." In terms of research, only a few characteristics of an exploration are investigated. Therefore, the role of scholarly documentation of the design process itself was identified to be a crucial factor. This includes the question of how to secure the explorations and make them accessible.

I found that the visual outcome of photographic explorations are suitable for research purposes even if they do not lead to the desired artifacts in terms of an aesthetic innovation. By analogy, the opposite of the 'successful' or "nice pictures" in science – the ambiguous or blurry ones – are neglected by scientists but are important for historians of science (Hoffmann 2011). I suggest naming them 'research-driven pictures'. These pictures demonstrate what a future (documentary) artifact may no longer incorporate.

For a research purpose, not only 'successful' but also 'research-driven pictures' should be made visible and included in an inquiry because they may provide information about divergent alternatives. These varieties

of pictures are needed to identify and name strategies used within photo-graphic design processes.

Analyses and Findings

How to identify different strategies of photographic design processes? Four public squares were explored by a photographic documentation: Helden-platz in Vienna, Austria; Hauptplatz in Linz, Austria; Zaunplatz in Glarus, Switzerland; Marktplatz in Basel, Switzerland. "Practice-led iconic research" (Renner 2011) was transferred into the field of documentary photography. This was accomplished by following six steps: creating, screening, selecting, combining, comparing, and critically analyzing.

....

Step 1: creating.

I made 39 explorations that yielded 4100 photos, from March 1, 2011, until February 2, 2014. Without going into great detail here, some explanations about the practice of doing photography in a research context should be given: I started the explorations about collective images of a certain place in order to identify what is held as a 'typical' or 'atypical' documentary picture. Picture archives of municipal institutions are a crucial source for this analysis (Aichmaier 2016, 260–389). Observing a public square without taking photos was also important to get acquainted with its usage. Several times, appointments were made beforehand to gain access to buildings in order to view the square from above. Digital SLRs and camera lenses were used – the choice of technical equipment has a major influence on the aesthetics created. Several different weather and lighting situations were tested. Finally, with the research question in mind as a guiding principle, photographic design processes were conducted. I attempted to maintain scholarly docu-mentation by making notes and taking research-driven photos. The study of archival images, of artistic strategies in the field of documentation, and the research of relevant terminology strongly influenced my photographic practice. The following description by Pierre Bourdieu of his photographic design process as a researcher explains the benefit of combining theory and practice: "For me, it was a way to sharpen the gaze, to take a closer look, to find a way to access the topic …" (Schultheis 2003, 26).

....

Steps 2 and 3: screening and selecting.

All photographic explorations were printed as contact sheets (Figure 5) to be used as a notebook for the research project, in parallel to digital forms that were reviewed on screen. When, in screening, documentary strategies seemed to become apparent through the repetition of certain charac-teristics, pictures were selected and adjusted (Figure 6). The rather messy 'research-driven pictures' (Figures 7 and 8) seemed to be equally important as compared with the more accomplished ones (Figure 9, cf. T.1.4). In the course of a research process, those pictures also play a role that Will Steacy termed "missing pictures" (Steacy 2012). For the art context, Steacy thereby

Figure 5

Helga Aichmaier, scholarly documentation/contact sheets of the explorations ("Explorationen: Marktplatz Basel, Zaunplatz Glarus, Hauptplatz Linz, Heldenplatz Wien"), 2014
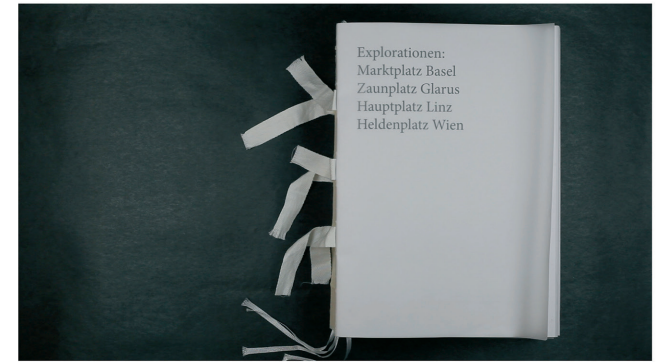
describes pictures that were not or could not be made. Here, a situation of feeling one's way occurs that normally takes place during "photographic seeing." For research purposes, such situations also have to be made visible and incorporated into the analysis. An example: if the camera was placed on the ground (Figure 7), the unevenness of the paving stones and the slope of the public square could be shown. This extremely low perspective – a so-called "worm's eye view" is not associated with documentary photography. The areas of blurring in the foreground and background are particularly ir-ritating, which recall photographs of models. However, if the camera on the ground is tipped slightly upwards (Figure 8), this enables a wealth of details to be observed. The result is a snapshot but not an overview of the square.
        Documentary design strategies were here intentionally disregard-

Figure 6

Helga Aichmaier,
photographic exploration,
Hauptplatz Linz, 2011

Figure 7

Helga Aichmaier,
photographic exploration,
Hauptplatz Linz, 2011

Figure 8

Helga Aichmaier,
photographic exploration,
Hauptplatz Linz, 2011

ed in order to test what the concrete process yields. Designing is character-
ized by its relationship to making – a principle that is well known but that
nevertheless plays a decisive role in designing. For images first have to be
made, and only then can one decide how to proceed with them.

···

Steps 4 and 5: combining and comparing.

By studying the printed contact sheets and by screening the digital files,
pictures were pre-selected.
            Firstly, the pictures of this pre-selection were marked where it was
clear that a certain characteristic is repeated throughout the whole series –
following an observation by Barbara Wittmann about the essence of design
processes in the field of hand drawings (Wittmann 2012, 139). One can
compare that qualitative way of photo editing also to 'theoretical sampling'
in the field of social science (Hildenbrand 2007). Thereby data is gathered
until the researcher is under the impression that the research question
is likely to be answered or a theory can be conceptualized. This personal
judgment – comparable to a 'trained judgment' (Daston, Galison 2007, 370f)
– was deployed in this phase of combining and comparing. This selection
was then combined to show the scope of the documentary, however, it
was important to be specific enough to demonstrate relevant details and
to keep the number of pictures as small as possible at the same time. The
combined pictures should therefore not be regarded as the most 'successful'
but as suitable ones to represent a certain characteristic. In other words, the
selected photos should represent the outcome of a certain strategy used

T.1 Tableau 1   Top views—the view from above

Figure 9

"T.1. Tableau 1", Top views –
the view from above

within a design process.
            Secondly, I decided to gather the visual variations as tableaus –
arrangements of selected pictures. Each tableau comprises a specific docu-
mentary strategy. This resulted in eight tableaus, a suggestion that is held
as neither normative nor complete. Writing in retrospect about this phase, it
should be added that in the beginning it was rather unclear how to proceed. I
tried several ways to display pictorial combinations. Combining pictures as a
tableau enables "comparative analysis," so the form of the tableau was chosen.

···

Step 6: critically analyzing.

Finally, the eight tableaus were analyzed by criticizing apparent distinctions
or characteristics. The methods I used were previously mentioned as "com-
parative analysis" and "formal analysis" from the field of art history.
            It was found that a documentary image concept representing
public squares consists of the following strategies at minimum: (1) top
views – the view from above (Figure 9); (2) lighting conditions – visualiza-
tion of topography; (3) color or monochrome – a question of emphasis; (4)
motif – selected topics; (5) critical distance – interaction with surroundings
(Figure 10); (6) frontality – points of view (Figure 11); (7) clarity – irritation or
disruption in a picture; (8) overview – full view. Three examples of the find-
ings should be given a more detailed explanation (cf. Aichmaier 2016, 484ff.,
for all tableaus):
            The first example, "T.1. Tableau 1" (Figure 9), shows a well-estab-
lished design-process strategy called "top view." It provides a presentation
of an overview at a simultaneous distance. Michel de Certeau adopted

T.5 Tableau 5 Critical distance—interaction with surroundings

T.6 Tableau 6 Frontality—points of view

Figure 10

"T.5. Tableau 5", Critical distance – interaction with surroundings

Figure 11

"T.6. Tableau 6", Frontality – points of view

the phrase "It's hard to be down when you're up" – this is the headline of a poster he saw inside the former World Trade Center in New York while climbing the stairs (Certeau 1998, 180). The phrase emphasizes a certain superiority that is inherent in elevated viewpoints.

The guiding question for explorations involving top views was, which decisions are implied in the choice of location, that is, in systematically changing the camera position in a horizontal and vertical direction. In practice, this means going from one window to another in a building to vary the camera position. The explorations were adjusted as the color was subsequently converted to grey-scale, contrasts were raised, and the picture was cropped for an increased comparability. The difference is most evident in the lower row: the perspective of the proposed picture on the left side, taken from the level of the square itself (Figure 9, T.1.6), is compared with the perspective taken from the top floor of a building (Figure 9, T.1.4). With an increase in height, the structure of the square appears more clearly, and the spatial impression of the Hauptplatz in Linz is changed. In T.1.6, one can only guess that this is a location that is bordered by three building facades. The upper half of the picture is multiply intersected with tram wires. In T.1.4, however, the viewer is looking at a square that is clearly bordered on three sides. Behind the Trinity Column at the center of the image, there is an opening upon a road that leads out of the square. An overview becomes evident with increase in height. Here, more information about the urban infrastructure, its use, and the character of the square can be learned than in the image on the left. If one follows Donna Haraway's conception that knowledge is "situated," then this elevated view is tied to questions about the power of access (Haraway 1998).

The second example, "T.5. Tableau 5" (Figure 10), deals with the question of a suitable critical distance. To lose distance would not support a documentary attitude – since, in some circumstances, the photographing person would come into contact with her environment. The question of distance involves how one enters into contact with the surroundings on location or avoids it. Vilém Flusser calls this "critical distance," which determines a successful photograph (Flusser 1991). One can observe public squares for hours and days at a time. However, one's interaction with passersby changes from the moment when one begins observing a square with a camera. Whether this is desired or not: a reaction generally ensues. If the interaction with a passerby is too significant, something other than the documentation of the square dominates one's view of the image. On the left side of the tableau, photos of Hauptplatz, Linz, were assembled. Except for one image (T.5.5), a digital compact camera was used in order not to draw too much attention with a professional camera. I took photographs from places that are accessible to anyone on the square. In viewing the possibilities, one lingers on the views of photographed passersby (T.5.2 and T.5.4). In other examples, one's own gaze leads away from the actual objective to show a square: there are too many undefined elements to see for one to acquire an overview of the square. On the right side of the tableau, Zaunplatz, Glarus, can be seen during an annual event called "Landsgemeinde" in 2012. The information that a viewer could be standing on site, in the crowd of spectators, is suggested in T.5.8. Each of the two vertical edges of the picture is occupied by a person. A gap in the center of the image allows a view of the crowd to be glimpsed between them; one can imagine oneself as part of the audience.

In T.5.9 a similar impression arises. Through the location of photographing, direct proximity to the audience is imaginable: too little distance is preserved.

The third example, "T.6. Tableau 6" (Figure 11), displays design processes of seeking suitable points of view upon iconic buildings at the Heldenplatz in Vienna. How one documents a public square also depends upon the location of important buildings around the square. Looking to the northwest, there are additional buildings in the picture, but they do not support the collective image of Heldenplatz. An example of this is T.6.14, in which the equestrian statue of Prince Eugen can be seen, surrounded by a parking lot with a view of parts of the city gate and the Leopoldine Wing of the Hofburg as well as buildings of the Ring Road farther away. In T.6.1-T.6.9, T.13, and T.6.15-T.6.17, there are views in the direction of the Neue Burg that demonstrate a search for a frontal view. There are certain photographing locations from which the square together with the building complexes can be brought into the format of an image more advantageously. If one follows the documentary design strategy of the frontal view, it is the search for a suitable viewpoint.

To complement these findings and acquire not only a technical language but also support an aesthetic discussion, it is suggested to expand the terminology concerning photographic design processes based on Flusser's writing about the gesture of photography (Figure 4; Flusser 1991).

Conclusion

"Practice-led iconic research" was adapted as a method for photography, by which photographic design processes can be identified through analyzing visual variations that are produced during photographic explorations. It was found that photographic design processes documenting a public square follow several strategies. Regarding the design processes of photographs that can be perceived as a 'documentation' undermines the assumption of the withdrawal of a photographer's authorship and the neutral mode of the pictures to represent something 'authentic'. It shows the factitious side of a documentation: the strategies used within the design processes foster an image of an 'objective' documentation. Three examples of those strategies were given in detail, explaining why "It's hard to be down when you're up" – top views – , or the importance of a critical distance, or the power of frontality.

The findings might be useful for creating images as well as working with documentary photography; however, they are not limited to the field of practice. Contributing to theory is about understanding how documentary photographs are made by applying different strategies during photographic design processes.

References

Aichmaier, H. (2016). *Strategien einer Bildpraxis. Fotografisches Entwerfen anhand dokumentarischer Bilder öffentlicher Plätze / Strategies of an Image Practice. Photographic Design Processes in the Documentation of Public Places*. PhD at the University of Art and Design Linz, Department of Art History and Art Theory. Linz: Kunstuniversität Linz.

Bader, L., Gaier, M., & Wolf, F. (2010). Einleitung. In L. Bader, M. Gaier & F. Wolf (Eds.), *Vergleichendes Sehen*. München: Fink.

Bourdieu, P. (1990). The Social Definition of Photography. In P. Bourdieu, L. Boltanski, R. Castel, J.-C. Chamboredon & D. Schnapper (Eds.), *Photography. A Middle-brow Art*. Cambridge: Polity Press, 73–98.

Bredekamp, H., Fischel, A., Schneider, B. & Werner, G. (2003). Bildwelten des Wissens. In *Bildwelten des Wissens. Kunsthistorisches Jahrbuch für Bildkritik*. 1, 9–20.

Bredekamp, H., Schneider, B., & Dünkel, V. (2008). Editorial. Das Technische Bild. In H. Bredekamp, B. Schneider & V. Dünkel (Eds.), *Das Technische Bild. Kompendium zu einer Stilgeschichte wissenschaftlicher Bilder*. Berlin: Akademie Verlag, 8–11.

Cartier-Bresson, H. (1952). *Images à la sauvette. Photographies*. Paris: Èditions Verve.

Certeau, M. de (1988). *Die Kunst des Handelns*. Berlin: Merve Verlag.

Chamboredon, J.-C. (1990). Mechanical Art, Natural Art. In P. Bourdieu, L. Boltanski, R. Castel, J.-C. Chamboredon & D. Schnapper (Eds.), *Photography. A Middle-brow Art*. Cambridge: Polity Press, 129–149.

Cross, N. (2007). Designerly Ways of Knowing. In N. Cross, *Designerly Ways of Knowing*. Basel: Birkhäuser, 17-31.

Daston, L. & Galison, P. (2007). *Objectivity*. New York: Zone Books.

Dubois, P. (1998). *Der fotografische Akt. Versuch über ein theoretisches Dispositiv*. Dresden / Amsterdam: Verlag der Kunst.

Durrant, A. C., Vines, J., Wallace, J. & Yee, S. R. J. (2017). Research Through Design: Twenty-First Century Makers and Materialities. In *Design Issues*. 33(3), 3–10.

Feininger, A. (1980). *The Complete Photographer*. London: Prentice-Hall.

Flusser, V. (1991). Die Geste des Fotografierens. In V. Flusser, *Gesten. Versuch einer Phänomenologie*. Düsseldorf: Bollmann, 127–150.

Flusser, V. (1984). The Technical Image. In V. Flusser, *Towards a Philosophy of Photography*. Berlin: European Photography, 10–14.

Fox, A., & Caruana, N. (2012). *Behind the Image. Research in Photography*. Lausanne: Ava Publishing.

Frayling, C. (1993/1994). Research in Art and Design. In *Royal College of Art Research Papers*, 1993/94 (1), 1–5.

Geimer, P. (2009). *Theorien der Fotografie zur Einführung*. Hamburg: Junius.

Goldschmidt, G. (2014). *Linkography: Unfolding the Design Process.* Cambridge: MIT Press.

Haraway, D. (1998). The Persistence of Vision. In N. Mirzoeff (Ed.), The Visual Culture Reader. London / New York: Routledge, 677–684.

Hildenbrand, B. (2007). 2.1 Anselm Strauss. In U. Flick, E. von Kardorff, I. Steinke (Eds.), *Qualitative Forschung. Ein Handbuch*. Reinbeck bei Hamburg: Rowohlt, 32–42.

Hofmann, C. (2011). Forschen mit Bildern. In H. Rickli (Ed.), *Videogramme. Die Bildwelten biologischer Experimentalsysteme als Kunst- und Theorieobjekt*. Zürich: Scheidegger&Spies, 66–68.

Hoffmann, C. & Wittmann, B. (2013). Introduction: Knowledge in the Making: Drawing and Writing as Research Techniques. In *Science in Context*, 26(2), 203–213.

Lawson, B. (2005). *How Designers Think. The Design Process Demystified.* Oxford: Architectural Press.

Lugon, O. (2001). *Le Style documentaire. D'August Sander à Walker Evans. 1920–1945*. Paris: Ëditions Macula.

Lugon, O. (2005). 'Documentary': authority and ambiguities. In F. Gierstberg, M. van den Heuvel, H. Scholten & M. Verhoeven (Eds.), *Documentary now! Contemporary strategies in photography, film and the visual arts*. Rotterdam: NAi Publishers, 64–73.

Lugon, O. (2013). La photographie, œuvre collective. In N. Mathys, W. Leimgruber & A. Voellmin (Eds.), *Über den Wert der Fotografie. Zu wissenschaftlichen Kriterien für die Bewahrung von Fotosammlungen.* Baden: Hier+Jetzt, 73–82.

Mareis, C. (2012). The Epistemology of the Unspoken: On the Concept of Tacit Knowledge in Contemporary Design Research. In *Design Issues*, 28(2), 61–71.

Palmer, J. & Dodson, M. (1998). Design. In *Encyclopedia of Aesthetics. Vol. 1*. New York: Oxford University Press, 17–20.

Polanyi, M. (1966). *The tacit dimension*. Garden City, N. Y.: Doubleday.

Renner, M. (2010). Practice-led Iconic Research. In *diid, disegno industriale industrial design*, 42/43, 76–83.

Renner, M. (2011). The Mute Iconic Criticism of Design. In *Rheinsprung 11 – Zeitschrift für Bildkritik*, 1, 92–116. Retrieved July 5, 2017 from https://rheinsprung11.unibas.ch/fileadmin/documents/Edition_PDF/Ausgabe1/thema-renner_E.pdf

Renner, M. (2017). Practice-led Iconic Research Towards a Research Methodology for Visual Communication. In K. M. Langkilde (Ed.), *Poetry of the Real. Basel 2016*. Basel: Christoph Merian Verlag, 133–157.

Rheinberger, H.-J. (2006). *Experimentalsysteme und epistemische Dinge. Eine Geschichte der Proteinsynthese im Reagenzglas*. Frankfurt a. M.: Suhrkamp.

Rosler, M. (1989). In, around, and afterthoughts (on documentary photography). In R. Bolton (Ed.), *The Contest of Meaning*, Cambridge: MIT Press, 303–340.

Rosler, M. (2000). Bildsimulationen, Computermanipulationen: Einige Überlegungen. In H. von Amelunxen (Ed.), *Theorie der Fotografie IV (1980 – 1995)*. München: Schirmer/Mosel, 129–170.

Rust, C., Mottram, J. & Till, J. (2007). *AHRC Review of Practice-led Research in Art, Design & Architecture*. Retrieved July 5, 2017 from http://arts.brighton.ac.uk/__data/assets/pdf_file/0018/43065/Practice-Led_Review_Nov07.pdf

Schön, D. (1991). *The Reflective Practitioner. How Professionals Think in Action*. London: Ashgate.

Schultheis, B. (2003). Bilder aus Algerien. Ein Gespräch mit Pierre Bourdieu. In F. Schultheis & C. Frisinghelli (Eds.), *Pierre Bourdieu. In Algerien. Zeugnisse der Entwurzelung*. Graz: Camera Austria, 21–51.

Sekula, A. (1978). Dismantling Modernism: Reinventing Documentary (Notes on the Politics of Representation). In *The Massachussetts Review*, 19(4), 859–883.

Shore, S. (2007). *The Nature of Photographs*. London: Phaidon.

Solomon-Godeau, A. (2003). Wer spricht so? Einige Fragen zur Dokumentarfotografie. In H. Wolf, S. Holschbach, J. Schröter, C. Zimmer & T. Falk (Eds.), *Diskurse der Fotografie. Fotokritik am Ende des fotografischen Zeitalters*. Frankfurt a. M.: Suhrkamp, 53–74.

Stappers, P. J. (2013). Design Thinking in Research: The Role of Design Skills in Research and Vice Versa. In M. Held, G. Joost, & C. Mareis (Eds.), *Wer gestaltet die Gestaltung? Praxis, Theorie und Geschichte des partizipatorischen Designs*. Bielefeld: Transkript, 105–116.

Steacy, W. (2012). *Photographs not taken*. Hillsborough, NC: Daylight Community Arts Foundation.

Suzuki, R. (2006), Developing Processes. In L. Warren (Ed.), *Encyclopedia of Twentieth-Century Photography. Volume 1 (A – F)*. New York: Routledge, 384–389.

Szarkowski, J. (1966). Introduction. In J. Szarkowski, *The Photographer's Eye*. New York: Doubleday.

Teixeira, C. & Rickenberg, R. (2008). Design Process. In M. Erlhoff & T. Marshall (Eds.), *Design Dictionary. Perspectives on Design Terminology*. Basel: Birkhäuser, 128–130.

Wells, L. (2009). *Photography: a critical introduction*. London: Routledge.

Wittmann, B. (2012). Papierprojekte. Die Zeichnung als Instrument des Entwurfs. In *Zeitschrift für Medien- und Kulturforschung*, Heft 1|2012, 135–150.

Author

Helga Aichmaier finished her PhD in 2016 with a project on photographic design processes of documentary images (PhD supervisors: Martin Hochleitner and Michael Renner). She holds a diploma degree from the University of Applied Arts in Vienna, Austria. She worked as a freelance graphic designer in Vienna from 2004 to 2008. Moving to Basel, Switzerland, she was a research assistant at the National Centre of Competence in Research »eikones NCCR Iconic Criticism« at the University of Basel from 2008 to 2009. From 2009 to 2012, she was a research associate at the Institute of Visual Communication at the University of Applied Sciences Northwestern Switzerland, Academy of Art and Design. From 2010 to 2016, she was enrolled in the PhD programme at the University of Art and Design, Linz, Department of Art History and Art Theory. Her research interests include visual communication, photography, design research methods, and visual literacy.

Documentary Image Sequences

Susanne Käser

The question of how a documentary image sequence must be designed to convey a temporal development was addressed based on a selection of photographs taken within the framework of the *Novartis Campus Documentation* project over a period of ten years. Using the method of the *Practice-led Iconic Research*, individual parameters are illuminated separately in order to show their influence on the perception of the sequence. In the process of designing image sequences, aspects such as the scope of the sequence, temporal distances between the images, gradations between the difference and similarity of the image material, light situation, color palette, and image section are investigated and discussed with the help of practical examples. As a result of the investigation, a statement about the mode of operation of the decisive parameters, which make an image sequence perceptible as a document of the temporal change, is described.

keywords

documentary Images
image sequence
photography
temporality
urban planning
practice-led iconic research

1. Introduction

The genre of documentary photography offers space for highly different interpretations. From art to advertising, a wide spectrum of approaches can be found in its development from the end of the nineteenth century until today, which are informed by different motivations. For example, documentary images in the late nineteenth century offered new possibilities as a form of legal evidence in the fight against crime.[1] To this day, forensic photography remains a relevant tool to support the search for truth and the making of just decisions; it also serves justice in the form of still images from surveillance camera video recordings. Thanks to the increasing circulation of illustrated magazines at the beginning of the twentieth century, a movement was formed under the title "social documentary," which took as its content the depiction of daily life. What today with social media platforms has taken on a superficial self-evidence for many people, at the time was carried out with the intention to make edifying material accessible for all social strata. "The idea was to inform the wider population, to encourage them to understand, become involved and informed about life . . . "[2]

Documentary photography received a socially critical coloring above all in Anglo-Saxon areas. In the USA, it was employed in lobbying for social reform; for example, the famous documentation project of the Farm Security Administration (FSA) was launched for this purpose in support of the New Deal.[3] Socially critical images like those of Jacob A. Riis or Lewis Hine, for example, had the intention of uncovering social ills; their photographs of destitute people in ghettos of poverty struck fear into the well-to-do middle class. From a contemporary point of view, they can be seen as precursors of sensational photography.[4] A favorite objective of documentary photography continues to be recording processes of urban transformation or changing sections of landscape. This rather conservative approach is exemplified in the photographs of Eugène Atget or Berenice Abott. With their images of the rapidly changing cities of Paris and New York, they pursued the goal of preserving the transient.[5] More modern works not only arrest the fleeting but also, by means of long-duration observation, thematize the process of transformation as such. They serve urban planners as valuable bases in the decision-making process and for communicating urban planning projects to the public.

Views on the visual qualities that characterize documentary pho-

---

1 Henri Fox Talbot, *The Pencil of Nature* (London 1844 -1846) Part I, Chapter III.

2 David Bate, *Photography: The Key Concepts* (New York: Berg, 2009) 45.

3 Abigail Solomon-Godeau, "Wer spricht so? Einige Fragen zur Dokumentarfotografie," in Herta Wolf, *Diskurse der Fotografie. Fotokritik am Ende des fotografischen* Zeitalters (Frankfurt am Main 2003) 53-74.

4 Bate, *Photography: The Key Concepts*, 52.

5 Kristine Kühn, Eugène Adget. *Frühe Fotografien, ed. Bern Evers* (Berlin: Kunstbibliothek, 1998).

tography vary greatly. Among the above-named examples are photographs that take a subjective stance; they cultivate an intuitive/playful engagement with the medium. Blurring from movement, objects that are cut off and different camera perspectives lend these images vitality. The moment of shutter release is also crucial for this effect. Henri Cartier-Bresson's photographs are exemplary here.

In contrast to this are approaches that consciously attempt to exclude authorship. The process of photographing in this case is often subject to fixed parameters. A bulky camera, as a rule a large or mid-sized format, on a tripod substantially restricts the flexibility of the photographing process. Accordingly, the images seem rather static and descriptive/neutral.

In order to define the pictorial content as precisely as possible, they are characterized by a wide range of contrast and very sharp focus in deep space. This raises the objection that they surpass human visual perception in their precision. Often they depict the subject in a frontal view. Photographs by Bernd and Hilla Becher or August Sander can be considered typical examples of this pictorial language.

Against the background of the above-described diversity that characterizes this genre, Olivier Lugon's definition seems fitting, which designates the documentary as a fluid concept that changes continuously according to the context in which it is placed and seen.[6]

However, all these approaches have in common their engagement with the relationship of image and reality and their claim to make current reality experienceable for other people or later generations. In this sense, documentary photography follows in the tradition of the narration of history in images – for instance, as could be found before the invention of photography in church windows or tapestries – and places it in a new context.7 The temporal aspect plays a central role in different respects: on the one hand, the time span that lies between the event and the viewing of the images; on the other hand, the temporal frame that the images communicate. Susan Sonntag writes, "Photographs may be more memorable than moving images, because they are a neat slice of time, not a flow."8 Her statement underscores the idea that a photograph separates a fraction of a second, or the duration of its exposure, from the timeline. Therefor they have the ability to reveal moments that are not perceptible by the human eye. For example, the famous photographs of a galloping horse by Muybridge: the frozen movement allows precise observations on the position of the hooves, but the effect of the image is artificial and static. For Peter Wollen, "static photographs cannot be seen in themselves as narrative, but as elements of

---

6 Olivier Lugon, "'Documentary': Authority and Ambiguities," in: *Documentary Now! Contemporary Strategies in Photography, Film and the Visual Arts*, ed. Frits Gierstberg, Maartje van den Heuvel, Hans Scholten, and Martijn Verhoeven (Rotterdam: NAi Publishers, 2005) 64-73.

7 Bate, *Photography: The Key Concepts*, 45.

8 Susan Sontag, *On Photography* (New York: Picador, 2001) n.p. (e-book edition).

a narration."[9]

However, if one wants to make the history of a process of transformation tangible in a sequence of images, a static/contextless row of single images seems not very suitable. In order to counteract this impression, suitable conditions are sought as much as possible during the photographing of the image material. ". . .provided it is conferred to natural light; normalized; clearly determined conditions are patiently attained (light clouds, autumn or spring light); and any theatricality of light is avoided. The photographer takes pains to show the object independent of all contingencies and to keep him or herself to as neutral a pictorial language as possible." [10] This is the description of outdoor documentary photography in the publication *Bilder leicht verschoben* by Ulrich Bilder and Matthias Vogel. Selection and post-production of image material offer further possibilities to generate a simulation of the flow of time.

The assembling of such image series can take place according to various selection criteria; aspects of content and form play a role. As exemplifies the method of "practice-led iconic research," in the following, individual parameters are illuminated separately in order to make their influence upon the perception of a sequence of photographs evident. In the process of the design of image sequences, aspects such as the length of the sequence, temporal intervals, gradations between similarity and difference of image material, light situation, color palette, and image frame are examined and discussed using practical examples. The image series were repeatedly presented and discussed within the institute's group of researchers. In addition, feedback from external research partners was included in the investigation. The picture series represent the results of the research as such, giving the viewer the opportunity to comprehend, agree or disagree the described observations. The descriptions serve to support the traceability of the individual research steps, but cannot replace the visual perception that mainly guided this investigation. A Phenomen which Maartje van den Heuvel describes with the term 'visual literacy'.[11]

2. Initial Situation of the Study

The material with which the study began comprises two series of photographs from the archive of the documentation project Novartis Campus Documentation, which has been conducted since 2003 at the Institute of

9 Peter Wollen, Feuer und Eis. In, *Theorie der Fotografie IV 1980-1995*, ed Hubertus Von Amelunxen (München: Schirmer/Mosel,2000), 358 (translated here).

10 Ulrich Binder and Matthias Vogel, *Bilder leicht verschoben. Zur Veränderung der Fotografie in den Medien*. (Zürich: Limmatverlag, 2009) 170 (translated here).

11 Maartje van den Heuvel, *Mirror of visual culture `Discussing Documentary," in, Documentary Now! Contemporary Strategies in Photography, Film and the Visual Arts,* ed. Frits Gierstberg, Maartje van den Heuvel, Hans Scholten, and Martijn Verhoeven (Rotterdam: NAi Publishers, 2005) 106.

Visual Communication/The Basel School of Design, Academy of Art and Design Basel, University of Applied Sciences and Arts Northwestern Switzerland as a commission of Novartis AG. This is a comprehensive picture documentation of a major urban development project of international importance that unites the interests of the private and the public sector.

The selected image material documents the changes to the architecture in the region of Basels oldest Rhine river port in St. Johann quarter from two different perspectives. Following the systematic approach of long-duration observation, the photographs were taken across a time span of five years at regular intervals and from constant locations, using fixed image frames. A bewilderingly immense stock was thereby created, around seventy images per photographing location (Figures 1.1/1.2). In order to make the architectural development of this area comprehensible for a heterogeneous audience, it is necessary to continue processing the existing image material: "The production of a photograph is by no means completed by the pressure on the shutter. It needs mentors, image users and viewers to promote and accompany them. "[12]

3. The Question

Despite the fixing of as many photographing parameters as possible, the images could not be more different. Too many factors remain external to what can be influenced and compromises are a constant part of this documentation process. Thus, for example, the change of the seasons has an influence on the color palette of the images, or different viewing relationships change the effect of the space. Mobile objects such as ships or construction cranes draw the viewer's attention. In most cases, the conditions for taking a documentary photograph such as are described under point 1 are not ideal; however, the progress of construction does not allow any delay in the activity of documentation.

The selection of image material according to criteria of content and form enables a refinement of the statement of an image series. In a subsequent step, by means of digital image processing, distracting components of the image can be weakened in their effect. This is a measure that may seem odd in view of the widespread conception of documentary objectivity. The question is raised as to how a documentary image sequence must be constituted in order to convey a temporal development. How many images are necessary in order to represent this change? What parameters support the communication of a process of change? What parameters are decisive in order for the viewer to be able to follow the intervention in urban space as a fluid transformation? The study pursues these questions on the basis of the

12 Ulrich Binder, Matthias Vogel, *Bilder leicht verschoben. Zur Veränderung der Fotografie in den Medien* (Zürich: Limmatverlag, 2009) 10 (translated here).

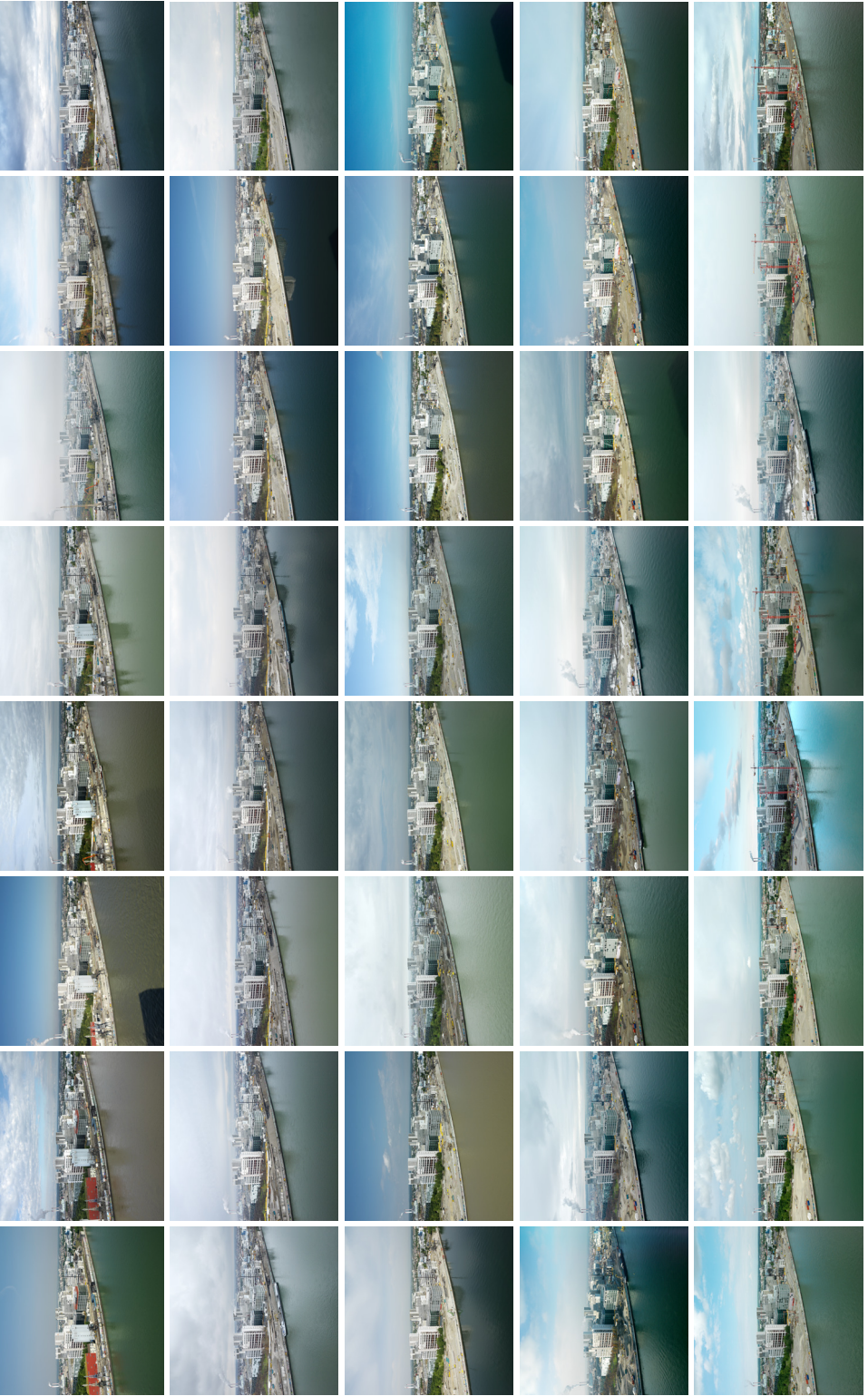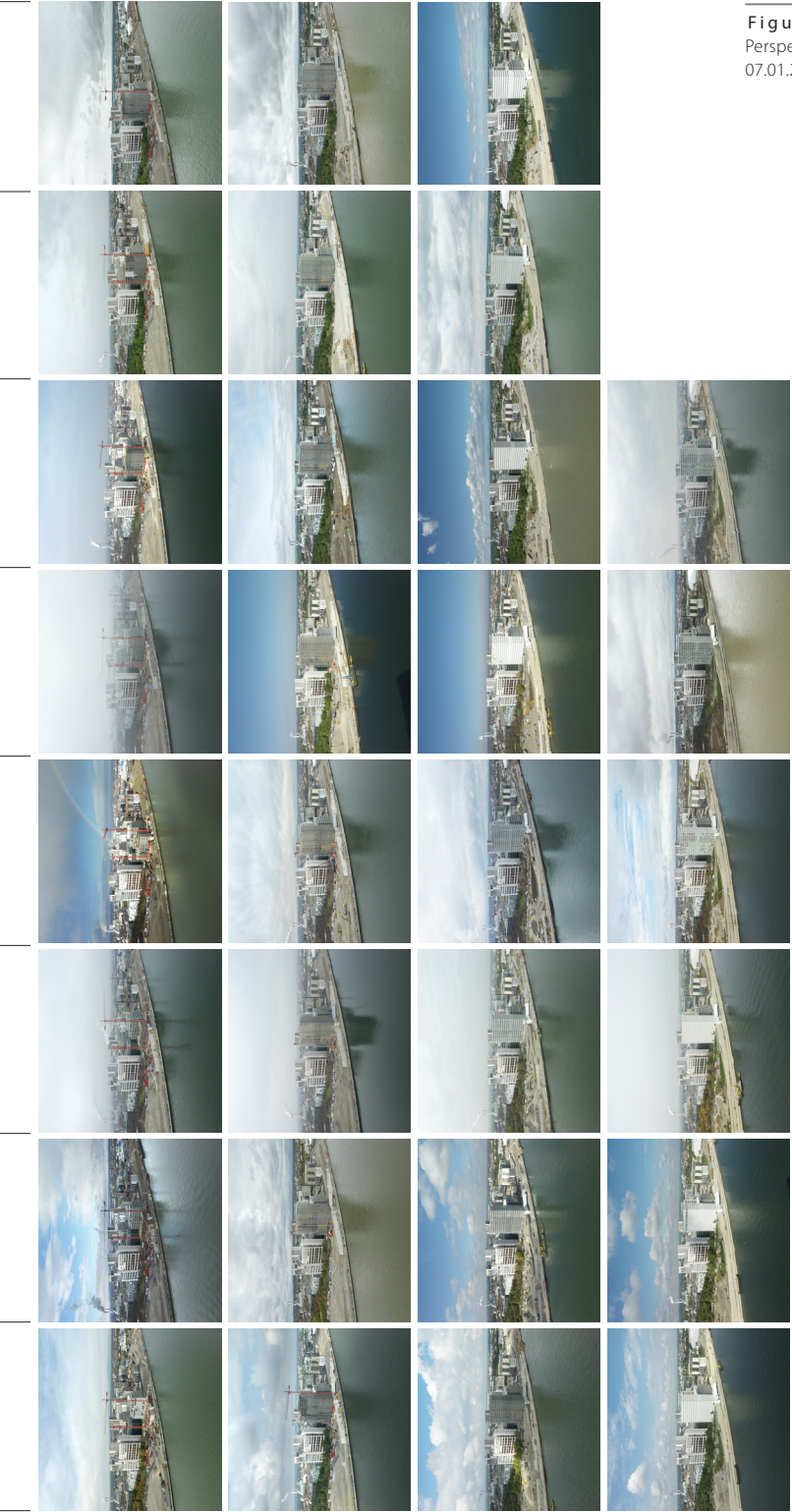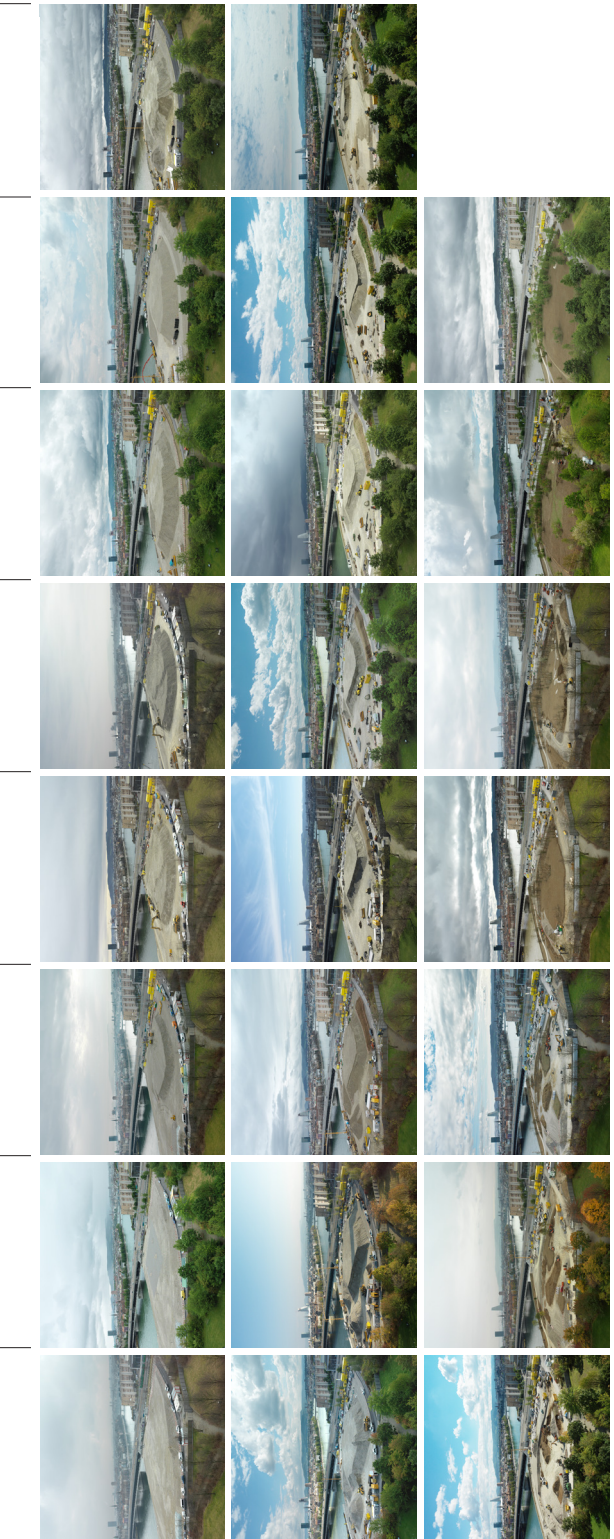Figure 1.1
Perspective A
07.01.2010 – 02.02.2016

Figure 1.2
Perspective B
15.04.2010 – 30.05.2016

photographs from two photographing locations, taken as exemplary, from the archive of the *Novartis Campus Documentation.* It places the representation of a continuous development at the center and initially leaves out of consideration all manner of irregularities in the rhythm of the course of events – which are entirely in the nature of processes of change in urbanism. The communication of a discontinuous development follows more complex visual laws that call for other forms of representation. An informational graphic in which different levels of representation can be combined, or a conversion into animation, at first glance seem better suited to represent abrupt changes than a purely photographic image series. As a basis, however, it is important to know the determining parameters for the representation of a fluid temporal experience and how they work. Therefore, the aspect of irregularity is set aside in the following study.

4. Discussion of Practice-led Research

4.1. The Number of Images in a Series

How many images are necessary in order to represent changes to the urban fabric as a fluid process that took place in a time frame of six years? The study begins with the most reduced form of series: the image pair. If the first image is juxtaposed with the last, two worlds encounter one another. The eye jumps from one image to the other, back and forth, in search of reference points – in vain. All traces of the long and drawn out, chaotic construction process are suppressed. The "before" is placed alongside the "after" as if there were nothing in between. The differentness of the color palette intensifies the impression of an absence of connection between the two photographs. The only connecting element is the consistent division into the three areas of water, land, and sky (*Figure 4.1.1*). If another image is added that lies temporally exactly in the middle between the two photographs, a series of three is produced. In observing these images, the impression arises that the image in the middle connects more strongly with the one to its right. The image on the left side stands by itself. Despite great differences in coloring, above all in the surface of the river and the vacant area on the left side of the image, the connection between the two images arises through the similarity of the skyline and the vacant area in front of it, while in the image on the left, the built-up strip of land is substantially different. The increment of change that occurs from the first to the second image seems greater than that from the second to the third image. Temporal regularity and visual effect do not coincide (*Figure 4.1.2*).

If the number of images is increased to six, the spectrum of differences and visual distractions increases. The differences in the sky's cloud structure, the color of the water, and the light situation make the changes due to construction recede into the background. In viewing the series, the differentness of the photographs is generally striking. A continuous course of action is also difficult to follow because the increments of change due

Figure 4.1.1
01.07.2010 / 02.02.2016

Figure 4.1.2
01.07.2010 / 04.04.2013 / 02.02.2016

Figure 4.1.3
01.07.2010 / 23.08.2011 / 17.10.2012 / 07.11.2013 / 08.12.2014 / 02.02.2016

Figure 4.1.4
01.07.2010 / 12.01.2011 / 01.07.2011 / 10.01.2012 / 02.08.2012 / 08.01.2013 / 03.07.2013 / 13.01.2014 / 21.07.2014 /
08.12.2015 / 20.07.2015 / 02.02.2016

to construction turn out to be quite different from one image to the next. Apart from these concerns, this image series appears well-presented and in fact detailed enough that it is able to represent the temporal change in six steps in a manner that the viewer can follow (*Figure 4.1.3*).

An expansion of the sequence to twelve images has an overwhelming effect. Twelve images are no longer graspable in a single act of looking; the linearity is also interrupted by the arrangement in two lines and is divided into two sections that are spontaneously compared with one another not only horizontally, but also vertically (*Figure 4.1.4*).

In summary, it can be stated that of the series presented for examination, a sequence of at least six images initially seems the most fitting for the communication of this process of transformation in the given time

span. Despite its ready graspability it allows enough intermediate developmental steps that do justice to the course of events without overwhelming the viewer with too much information. In conclusion, however, the question cannot be answered definitively, because the problem presents itself that the images are still not by any means perceived as a coherent series. In order to direct the viewer's attention away from the predominant, naturally induced color changes in the environment and toward the changes due to construction, in the further course of the study, there is a shifting of selection criteria to visual aspects, instead of what might seem initially logical from the perspective of a systematic documentary approach, which would orient the choice strictly according to temporal aspects.

4.2 Visual Selection Criteria

In accordance with the main objective of this documentation, the first image series of this examination was created under the aspect that the viewer should be able to follow the architectural development visually. The images were selected in such a way that the magnitude of the change seems modulated from one image to the next and is perceived as an incremental gradation. Here, it seems to be important that the change from one image to the next does not develop too erratically; consistent reference points serve orientation and help to frame the transition between two images as fluid. In considering the dates of photographing, the different temporal intervals between the individual photographs are striking. While the first two images are separated by scarcely two months, more than two years elapse between the fifth and sixth image.

However, much imaginative capacity is still required for the viewer to be able to follow the documented construction process, since at first glance, this series, too, continues to seem like a random combination of six photographs. The dominance of the different color palettes and brightness contrasts is too strong (*Figure 4.2.2*).

If the images are selected according to the criterion of "closest to identical coloring" – for example, of the water – then the initial impression of greater homogeneity is produced. The uniformity of the water color acts as the connecting element of the series. Attention is now drawn increasingly to the different cloud states and the construction area. It strikes the eye all the more clearly that the individual stages of development seem to be ordered randomly. The series divides itself into two groups of three, whereby the three images at first glance seem interchangeable in their position. Only upon closer scrutiny, small increments of change become visible that suggest a sequence but do not follow it continually. The connection from the third to the fourth image can only be reconstructed with a lot of imagination – the building has grown up to the sky as if overnight. Under the aspect of the viewer's ability to follow the temporal flow, this approach makes little sense, since crucial key images, such as the photograph before construction begins, are left out for purely formal reasons, and thereby important information is lost (*Figure 4.2.3*). The same observations apply for the image series that were selected on the basis of uniform cloud structure or light situation

Figure 4.2.1
01.07.2010 / 23.08.2011 / 17.10.2012 / 07.11.2013 / 08.12.2014 / 02.02.2016 Regular time interval

Figure 4.2.2
30.07.2010 / 29.09.2010 / 14.04.2011 / 17.10.2012 / 04.04.2013 / 19.11.2015 Traceability of architectural change

Figure 4.2.3
24.11.2010 / 21.12.2010 / 14.04.2011 / 28.08.2013 / 13.01.2014 / 19.11.2015 Similar hue of the water surface
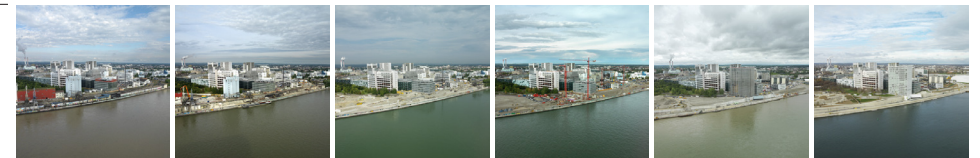
Figure 4.2.4
30.07.2010 / 17.09.2010 / 03.08.2011 / 25.09.2012 / 21.07.2014 / 19.11.2015 Similar lighting situation

at the construction site (*Figure 4.2.4*).

The experimental series just described make evident that an incremental gradation of construction stages according to visual criteria contributes more to the viewer's understanding the series as a sequence of events than does a regular temporal interval between photographing dates. In any case, this impression is disrupted in both series by the images' pronounced difference in color. But if the selection is made according to criteria of color, the series gains coherence only formally, while on the level of content, continuity is no longer legible.

The possibilities for a combination of different image series from the existing stock are thereby largely exhausted. In order to transfer the advantages of a unified color palette to an image series that conveys the changes due to construction in a manner that viewers can follow as well as possible, in a subsequent step, digital processing of the original image material was pursued.

Changes to the image material were employed as sparingly as possible in the following examinations, and only serve the goal of supporting recognizability of the temporal sequence. In a first attempt, the square images were cropped to horizontal format so that the distracting areas of the sky as well as the water were reduced in their area. The strip of land with the construction site now occupies a substantial part of the image surface and draws it to the center of the viewer's attention. However, with respect to the homogenous character of the image series, little has changed. Through the changed image cropping, the differentness of coloring and light situation are intensified in their effect; the result is a more difficult orientation in the sequence, which impedes to an even greater extent the legibility of the construction process (*Figure 4.3.1*).

If the areas of the sky and water are represented in grey scale, this impression is only slightly reduced. The varying brightness contrasts, cloud formations, and reflections of the buildings in the water's surface prevent the impression of a development that the series of six images would clearly define. In addition, the photographs have an unnatural and confusing appearance (*Figure 4.3.2*).

In order to unify the surroundings, for all images in the next series, the areas of the sky and water are replaced by an identical image element. The collaged element is chosen in such a way that its markings are as inconspicuous as possible, while a sky or water structure remains recognizable inorder to preserve an impression of the surroundings that is as authentic as possible.

But the unchanging pattern of the clouds now evokes the impression of a repetition; each image seems to be a copy of the preceding one. The stasis thus conveyed stands in stark contrast to the dynamism of a process of change – which, thanks to these measures, becomes recognizable to an extent in the images' central zone (*Figure 4.3.3*).

If sky and water are replaced by homogenous areas of color, as the next sequence shows, the effect of repetition disappears. The manipulation remains clearly recognizable and lends the images a certain unnaturalness. Above all, the manipulation seems to become especially evident in the area of the horizon line, since it differs in its location and the sharpness of its boundary from image to image, which, however, corresponds to the natural givens of the weather situation and also can be observed in the preceding series. At the same time, the viewer's gaze is now more attracted by the construction site, probably for the reason that it now appears more alive next to the artificially generated surfaces. This unification of the images has the result that the variance of coloring in the images' central area acquires weight. An adjustment of the images' color in the area of the land is necessary in order further to promote the continuity of the series (*Figure 4.3.4*).

Black-and-white photography is particularly widespread in fields of architectural documentation and is valued because of its minimalist appearance and its suitability for emphasizing forms. But such photographs require an ideal light situation, since the differentiation of single image elements

Figure 4.3.1
30.07.2010 / 17.09.2010 / 03.08.2011 / 25.09.2012 / 21.07.2014 / 19.11.2015 Cropped format

Figure 4.3.2
30.07.2010 / 17.09.2010 / 03.08.2011 / 25.09.2012 / 21.07.2014 / 19.11.2015 Assembly of greyscale and color photography

Figure 4.3.3
30.07.2010 / 17.09.2010 / 03.08.2011 / 25.09.2012 / 21.07.2014 / 19.11.2015 Assembly of identical sky and water surface troughout the whole series

Figure 4.3.4
30.07.2010 / 17.09.2010 / 03.08.2011 / 25.09.2012 / 21.07.2014 / 19.11.2015 Assembly of color plains replacing the surfaces of sky and water

Figure 4.3.5
30.07.2010 / 17.09.2010 / 03.08.2011 / 25.09.2012 / 21.07.2014 / 19.11.2015   Assembly of grey plains and black and white photography

is only possible by means of contrast of light and dark. The same series transformed into grey tones seems outdated and not vibrant enough. With this image processing, the problem of the images' deviating color spectrums is indeed eliminated; however, this occurs at the expense of the temporal understanding of the entire process. Different ranges of contrast additionally impair orientation in the image, since single elements are not set off from one another with equal force in all images (*Figure 4.3.5*).

If, as in the next attempt, the components of sky and river are covered with a transparent layer, the area of the construction site is separated from its spatial embedding. The boundary between the two areas enters the foreground and directs attention to the changing basic form of the construction site. When trees or other objects extend across this boundary, they

Figure 4.3.6
30.07.2010 / 17.09.2010 / 03.08.2011 / 25.09.2012 / 21.07.2014 / 19.11.2015 Sky and park surface covered with transparent surface

Figure 4.3.7
a 30.07.2010 / 17.09.2010 / 03.08.2011 / 25.09.2012 / 21.07.2014 / 19.11.2015 Construction area isolated

are intersected by a line. This lends the transparent layer a floating effect; the severed treetops seem disturbing and impair the view of the construction site – an aspect that has much less of an effect without this separation (*Figure 4.3.6*). These phenomena intensify when the construction site is entirely isolated. It loses its foundation, appears unreal and separated not only from its surroundings but also from the flow of time. The comparison from one stage of construction to the next becomes difficult since the reference to the surroundings as a stable, framing element is missing. This is an obvious manipulation that, despite being plainly evident, weakens trust in the reality reference of these images (*Figure 4.3.7*).

4.4 New Selection of Stages of Change

After possibilities for image processing were researched in the preceding experiments that promote homogeneity of the image sequence and direct attention to the area of the construction site, it becomes worthwhile to examine the composition of the image series in greater depth. This occurs in particular with respect to their legibility as a document of a continuous development.

In the first variation, the second photograph is replaced by an image with a later photographing date. This measure isolates the starting and concluding image from the middle section. The transitions from the first to the second image as well as from the fifth to the sixth seem abrupt, while the middle four images are connected through their processual appearance. In the first and last image, the impression arises of a static, completed urban district. However, in the middle part as well, not all intervals of change seem equal; the third photograph sticks out somewhat in comparison to the other images on account of its clearer structure. Nevertheless, a chronological sequence is legible (*Figure 4.4.2*).

If the initial image is left out, the construction process can be shown across five images; the whole sequence thereby appears more fluid. The images connect better through their uniform color palette when the first image with the red building is taken out. This measure occurs, however,

Figure 4.4.1
01.07.2010 / 29.09.2010 / 30.08.2011 / 25.09.2012 / 04.04.2013 / 19.11.2015   New selection of stages of change

Figure 4.4.2
01.07.2010 / 13.10.2010 / 30.08.2011 / 25.09.2012 / 04.04.2013 / 19.11.2015   New selection of stages of change

Figure 4.4.3
29.09.2010 / 13.10.2010 / 23.08.2011 / 04.04.2013 / 21.07.2014 / 19.11.2015   New selection of stages of change

Figure 4.4.4
01.07.2010 / 29.09.2010 / 13.10.2010 / 23.08.2011 / 25.09.2012 / 04.04.2013 / 21.07.2014 / 19.11.2015   New selection of stages of change

Figure 4.4.5
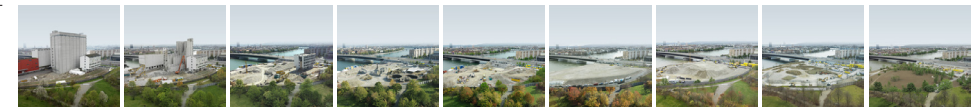15.04.2010 / 29.09.2010 / 23.08.2011 / 27.09.2011 / 01.06.2015 / 30.05.2016   New selection of stages of change
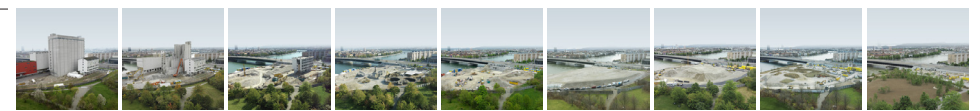
Figure 4.4.6
15.04.2010 / 29.09.2010 / 23.08.2011 / 27.09.2011 / 25.04.2012 / 05.12.2012 / 21.07.2014 / 19.11.2015 / 30.05.2016   New selection of stages of change

at the expense of documentary information. If the documentation as in this example begins in the midst of the construction process, the comparability of the initial situation with the end result is lost (*Figure 4.4.3*).

The expansion of the sequence to eight images can correct this deficiency. The transitions from one image to the next here seem more fluid since the difference between two neighboring photographs strikes the viewer as not as great. For example, the light blue grain silo to the left of center in the image forms a bridge from the first image to the second; the harbor cranes on the image's left side lead the gaze to the third image; after this, the prominent white building serves as a visual reference, and so forth (*Figure 4.4.4*).

For location B, nine images are necessary in order to enable the viewer to follow the increments of change from this perspective (*Figure 4.4.6*). Striking in this sequence is the sixth photograph, which shows a completely flat vacant area. The clear image structure, in its static impression, is similar to the first and last image in the sequence and, in the middle of the image series, has the effect of a premature end to the process. Seen purely in terms of content, this impression is correct: it corresponds to the course of events being interrupted by a stop work order. From a visual perspective, however, this image interrupts the continuity of the series by leaving the viewer in doubt as to the direction of viewing (sequence of observation). A third phenomenon thereby becomes evident that is significant in the assembling of an image series: the expectations for the content of a natural course of action, in this case, the piling up or excavation of a mound of dirt. Although the sequence of images is chronologically correct, the image seems to occupy the wrong position; the image to its immediate right seems like a step backward.

Opposing the first assumption as described in section 4.1, for the continuous documentation of a process of change based on the initial situation described, more than six images are needed.

The experimental series makes clear that orientation is enabled beyond image boundaries through visual references such as prominent buildings or color codes. The relationship of image parts that remain constant and parts that change contributes essentially to an understanding of a course of events. In order to build bridges from one image to the next, visual points of orientation are needed that do not change. The present image examples are structured in such a manner that the region in which the change occurs is embedded in a surrounding that is not affected by changes due to construction. A relatively stable frame is thereby produced that extends across the entire sequence and only looks different in the image due to natural influences, such as varying light conditions. Along with this embedding, in order to enable the viewer to follow the process, a mixture of changing and stable elements is necessary on the construction site, too, which accompany the viewer from one image to the next. The constant balance of these two components proves to be a condition that allows the increments in development to be perceived as equivalent across the whole series.

In addition, it becomes clear that the individual images are unequally good at promoting the impression of continuity in the series. Some of them interrupt the flow through their static appearance, showing a seemingly end-stage situation that excludes anything processual. This type of image shows clear structural divisions and seems organized. It contains few image elements; there are homogenous surfaces where the gaze can rest. Therefore, it is suited to signalize the beginning or the end of a process. Images with a greater quantity of smaller components, however, offer the eye more stimulus for movement and contain more diverse points of connection to other images. With this characteristic, they promote the flow of reading from one image to the next and support the processual effect of the series. It becomes appropriate to examine in a further experimental series whether these findings can be implemented in image processing in order to further influence the continuity of the series.

Figure 4.5.1
15.04.2010 / 25.04.2012 / 01.07.2011 / 27.09.2011 / 18.10. 2011 / 01.11.2011 / 10.11. 2010 / 02.02.2016 / 07.04.2015
Image selection according to the course of seasons

Figure 4.5.2
15.04.2010 / 29.09.2010 / 23.08.2011 / 27.09.2011 / 25.04.2012 / 05.12.2012 / 21.07.2014 / 19.11. 2015 / 30.05.2016
Image selection according to traceability of architectural change with assembly of seasons

Figure 4.5.3
15.04.2010 / 29.09.2010 / 23.08.2011 / 27.09.2011 / 25.04.2012 / 05.12.2012 / 21.07.2014 / 19.11. 2015 / 30.05.2016
Image selection according to traceability of architectural change with assembly of seasons

4.5 Image Processing, Round Two

Under point 4.4, the embedding of the construction site in the surrounding region is discussed as a stable component whose function, among others, is the framing of the whole series. The following examination raises the question of whether these image components that remain constant can be changed to such an extent that they act to support the representation of a continuous process.

A striking feature of location B is the framing by the wooded area in the lower region of the image. Its coloristic and structural change as a result of the seasons at first glance seems to distract from the real object of the documentation. However, if the arrangement of the photographs, without respect to their chronological sequence, follows the natural course of the seasons, then this disruption is transformed into an element that supports the course of events. Only upon closer observation does one notice the discrepancies in the sequence of stages in construction (*Figure 4.5.1*).

If the two series are synchronized using image processing, this irritation disappears. However, through the changed sectioning of the seasonal progression (autumn through summer), the supporting effect of the framing does not have as strong an effect in this example. Formal aspects such as the coloring of the trees or their shapes impede the recognizability of a continuous course of events (*Figure 4.5.2*). The combination is most successful in the subsequent example, where the progression of seasons ends with the conclusion of a cycle, in early spring. Irritations continue to arise at the boundary between the construction site and the foreground when the change of seasons is visible in the treetops.

The next attempt translates the discovered effect into a more abstract form. Areas of color in incremental gradation stand as symbols for the flow of time. With the progression of the construction process, the color of

Figure 4.5.4
01.07.2010 / 29.09.2010 / 23.08.2011 / 25.09.2012 / 04.04.2013 / 19.11.2015 Assembly of water surface with gradient color plains across the whole series

Figure 4.5.5
01.07.2010 / 29.09.2010 / 23.08.2011 / 25.09.2012 / 04.04.2013 / 19.11.2015 Assembly of sky surface across the whole series

the water changes. With this variation, the support seems more subtle. The change in color does not compete with the events at the construction site; however, the viewer is clearly led through the series. Unlike in the previous example, the intervention in the image material is revealed at first glance, without calling the believability of the images into question (*Figure 4.5.4*).

In the final attempt, the cloudy sky is drawn across the whole image series as a connecting element. It lends the images a surreal effect; at the height of the horizon line, the temporal mode of the images changes. In the area of the sky, all images share the same moment; only the white spaces between the images preserve the semblance of six images standing distinctly for themselves. The movement of the clouds can be read as a metaphor for the flow of time. With their markings they determine the order of the sequence clearly and fluidly. Below the horizon, each image shows a different temporal point in the course of the construction process. Despite this mixing, the two image areas do not lose a connection. While the upper area in the entire series can be read as a single image, the lower part has the effect of a regular sequence. These two impressions alternate during viewing and elicit a confusing attempt to analyze the authenticity of the views being shown (*Figure 4.5.5*).

5. Conclusion

In the preceding examination, parameters were sought that are definitive for the perception of a gradual development in a documentary image series. The dilemma between the communication of the concrete results of the construction activity and the representation of the process as a continuous sequence that viewers can follow visually cannot be resolved once and for all with this examination. Despite new questions that were thereby also raised for the conception of a long-duration photographic documentation, important guidelines for answering the main question could be found. In conclusion it can be stated that together with the composition of the steps

of transformation the homogeneity of the series with respect to its spectrum of forms and color palette plays a superordinate role.

Only the examination on the interplay of varying stages of development could be extended indefinitely. Meanwhile, however, it can be said that no rule can be determined for the temporal intervals that lie between the images of a successful sequence. Nevertheless, the investigation makes it clear that the vacancies between the images have an essential function as connecting elements. "Thus we see not only states in time, but by taking into consideration the intervals between the images also the productive temporal change and the irreducible extension of the transformation becomes visible."[13] To this extent, the search for visual criteria of gradation proves to bridge these gaps as relevant.

The continuity of change from one image to the next is decisive for the perception of an image series as a temporal sequence. This presupposes the comparability of the individual images. In order for change to be perceived, static reference objects, for example a prominent building, are necessary in order to ensure orientation in the image and to highlight the divergence between change and constancy. The perception of the magnitude of an increment in development is strongly connected to the juxtaposition of static and changing parts of the image. In a documentary image series, different levels of change can be differentiated. In the present example, the architectural redesign of the area under observation can be designated as the primary change that is to be communicated through the image series. Secondary by comparison are the deviations that are conditioned by the weather, the seasons, and different light situations.

In this context, different image characters can be differentiated. Some images seem inherently static; they show snapshots of states. They work in isolation as individual images and interrupt the continuity of a series through their static feeling (*Figure 4.4.6, image 6*). In other photographs, a dynamic/processual effect predominates, and others incorporate both characteristics in one image. Peter Wollen proposes a categorization of photographs under the headings "state," "event," and "process." For the successful communication of chains of narration, he envisions the combination of images from all three categories.[14] If his model is transferred to the examples discussed above, it can be observed that photographs that bring together the representation of states (embedding in the cityscape, static parts of the image) as well as of events (concrete events in the construction process) and processes (the construction process in general) are best able to represent temporal continuity in an image series.

To some extent related to this is the influencing of the series by viewers' expectations about content. An idea about the natural course of a process that is depicted – such as, in the present examples, the piling up or excavation of a mound of dirt or the progression of the seasons – make the chronological rightness of some series seem doubtful despite correct

13 Arno Schubbach, "Zur Darstellung von Zeit und die Zeit der Darstellung." In, *Philosophie des Bildes. Studia Philosophica Vol. 69/2010 Jahrbuch der schweizerischen philosophischen Gesellschaft.* ed. Anton Hügli, Cruzio Chiesa (Basel: Schwabe, 2010) 114 (translated here).

14 Peter Wollen, *Feuer und Eis. In, Theorie der Fotografie IV 1980-1995.* ed Hubertus von Amelunxen (München: Schirmer/Mosel, 2000), 357 (translated here).

numbering (*Figure 4.4.6*). This phenomenon of the irregular rhythm that in reality is characteristic of the course of action in urban development calls for other forms of representation that lie outside of the frame given here and that need particular attention.

In addition to deviations in the image structure, different color spectra make comparability more difficult and prevent a group of images from being perceived as a sequence. According to a study on the nature of archive images, documentary images should coincide with the color of our inner images.[15] Since most people do not record memories as high defini-tion shots, this is another possible explanation why strong color deviations in a picture series are perceived as disturbing. Especially in the area of secondary alteration processes, in this example in the areas of sky and water, abrupt color changes act as separating elements between the images. They draw attention from the architectural process of change. Gradual color changes, on the other hand, influence the sequence to a lesser degree, and may even be used as a means of assisting the process. (*Figure 4.5.3 / 4.5.4*)

In documentary practice, however, it is inevitable that images differ in precisely these aspects. Even a targeted image selection according to different criteria can do nothing to change this given. The adjustment of the image material through digital interventions offers possibilities of an im-proved legibility of the development over time. The assembling of the series thereby becomes largely independent from the weather situation, which determines the color atmosphere of a picture. This in turn enables a more flexible selection of individual stages of development. Through targeted retouching, distracting elements can be weakened in their effect or even employed to support the continuity in the series (see *Figures* 4.5.2-4.5.4). In the processing of documentary images, it should be noted that some interventions indeed promote the perception of the flow of time, but at the same time raise questions about their authenticity (Figure 4.3.7). In the context of digital images transferred to other media, the construction of a reality is spoken "by not only representing reality, but also shaping the view of reality."[16] However, if this balance is successfully produced, for example, through the clear declaration of the intervention that was made, digital reprocessing of image material is a legitimate as well as a promising means to promote the comprehensibility of a documentary image series. It is, if one refers to the statement of the study on archive images, perhaps even a tool to bring the documentation closer to the nature of the inner images of the eye-witnesses. Michael Ignatieff writes about the photographs of Magnum founders: "... their masterpieces have always been a fusion of art and docu-mentation, poetry and prose."[17]

15 Matthias Vogel, Ulrich Binder, Flavia Caviezel, *Das Menschenbild im Bildarchiv: Untersuchung zum visuellen Gedächtnis der Schweiz*: ein Forschungsprojekt der Hochschule für Gestaltung und Kunst Zürich, ICS/ith (Zürich: Limmat-Verlag, 2006) 107.

16 Ulrich Binder and Matthias Vogel, *Bilder leicht verschoben. Zur Veränderung der Fotografie in den Medien.* (Zürich: Limmatverlag, 2009), 11 (translated here).

17 *Magnum*. Ed. Magnum Photographers (London: Phaidon, 2000), 5.

References

Bate, D. (2009). *Photography: The Key Concepts*. New York.

Binder, U. and Vogel, M. (2009). *Bilder leicht verschoben. Zur Veränderung der Fotografie in den Medien*. Zürich.

van den Heuvel, M. (2005). Mirror of visual culture `Discussing Documentary,` in: Gierstberg, F. van den Heuvel, M. Scholten, H. and Verhoeven, M. (Ed.) *Documentary Now! Contemporary Strategies in Photography, Film and the Visual Arts*. Rotterdam.

Ignatieff, M., (2000). Einführung. In Magnum Photographers (Ed.), *Magnum*. London.

Kühn, K. and Adget, E. (1998). *Frühe Fotografien*. Evers, B. (Ed.), Berlin.

Olivier L. (2005). 'Documentary': Authority and Ambiguities. In Gierstberg, F. van den Heuvel, M. Scholten, H. and Verhoeven, M. (Ed.) *Documentary Now! Contemporary Strategies in Photography, Film and the Visual Arts*. Rotterdam. 64-73.

Schubbach, A. (2010). Zur Darstellung von Zeit und die Zeit der Darstellung. In Hügli, A. and Chiesa, C. (Ed.). *Philosophie des Bildes. Studia Philosophica* Vol. 69/2010 Jahrbuch der schweizerischen Philosophischen Gesellschaft. Basel.

Solomon-Godeau, A. (2003). Wer spricht so? Einige Fragen zur Dokumentarfotografie. In Wolf, H. (Ed.), *Diskurse der Fotografie. Fotokritik am Ende des fotografischen Zeitalters*, Frankfurt am Main. S. 53-74.

Sontag, S. (1980). *Über Fotografie*. Frankfurt am Main.

Talbot, W. H. F. and Harding, C. (2011). *The Pencil of Nature*. London. 1844 -1846

Vogel, M., Binder, U., Caviezel, F. (Eds.). (2006). *Das Menschenbild im Bildarchiv: Untersuchung zum visuellen Gedächtnis der Schweiz.* ein Forschungsprojekt der Hochschule für Gestaltung und Kunst Zürich, ICS/ith, Zürich.

Wollen, P. (2000). Feuer und Eis. In Von Amelunxen, H. (Ed.), *Theorie der Fotografie IV 1980-1995*. München.

A u t h o r

Susanne Käser has studied Visual Communication at the Institute of Visual Communication/The Basel School of Design, Academy of Art and Design Basel, University of Applied Sciences and Arts Northwestern Switzerland from 2002 to 2005. She has worked for design offices in Basel and Zurich and since 2005 also as an independent graphic designer. Since 2007, she has been responsible for the documentation work on the restructuring of the Novartis Campus in Basel *Novartis Campus Documentation*. From 2009 to 2011 she has studied visual communication and iconic research at the Institute of Visual Communication/The Basel School of Design, Academy of Art and Design Basel, University of Applied Sciences and Arts Northwestern Switzerland. Within the framework of her master thesis *The Image and the Sense of Touch*, Susanne Käser investigated the possibilities for a holistic way of documentation. From 2012 to 2014, she was responsible for the research project *Campus + new strategies for the documentation of urban change processes*. She is currently working as a mentor in the Bachelor Thesis process of the Institute of Visual Communication/The Basel School of Design, Academy of Art and Design Basel, supervises service projects and works on the development of research applications as well as on the research project *Visual Communication in participatory urban planning processes*.

The Image as Unstable Constellation:

Rethinking Darwin's Diagram

from the Perspective

of Practice-led Iconic Research

Paloma López Grüninger

The visual process is formed by a broad variety of choices that reach from material aspects, such as the selection of the tool or the support material, to a multiplicity of formal, organizational, and aesthetic decisions. The variance of possibilities is sheerly infinite. The knowledge about and the practical experience of these options are at the very core of a particular manner of looking at images, which can be described as a way of understanding them in respect to their potentiality. Under this perspective, images can no longer be seen as one indivisible and homogeneous entity, but as a flexible constellation resulting from individual choices. Through this approach, paired with the methodology of practice-led iconic research, questions about the process and the decisions that drove the image towards its final appearance are allowed to arise.

This article will show, using as an example the famous diagram that Charles Darwin drew in 1837 into his sketchbook, how a different understanding of images, can allow us to uncover new insights on the intrinsic meaning of the diagram itself.

keywords

practice-led iconic research
scientific Image
diagrams

caminante, no hay camino, se hace el camino al andar.[1]

Antonio Machado, 1912

Michael Renner describes practice-led iconic research as a methodology to gain knowledge about the power and meaning of images through image production itself (Renner 2011, p. 93). The articles presented in this volume show a variety of interesting approaches that involve this method. It implies the previous existence of a more or less specific research question and leads towards the generation of a multiplicity of visual examples. The careful description, analysis, comparison, and evaluation of these images allows us to approach the question posed through practice. Answers are found in a close and reiterative dialogue between the question formulated and the design process itself.

This method, as described in detail by Claire Reymond in this issue (Reymond 2017), proves particularly useful when the goal is to approach basic research questions regarding the power and meaning of images. Broad, general questions are addressed through a rich and varied process of image production and, subsequently, narrowed-down and specified by an iterative dialogue between reflection and design.

However, the benefits of the practice-led iconic research methodology can be queried, when applied to more particular and determined questions, as in the case of studying the power and meaning of historic imagery. In this case, the initial question is strongly related to a specific image or series of images, to the content they represent, and the context in which they originated. This will limit the generation of visual variants in a significant way, as it notably narrows down the range of possibilities.

This essay will show how this limitation can be overcome through the use of a mixed methodological approach. The methodology of practice-led iconic research is complemented by a close reading of the historical imagery based on a perspective derived directly from the practical experience of operating in the realm of the visual. Perceiving the image, not as a stable set of fixed relations, but understanding it as the result of a sheer infinite amount of possible variations, will allow approaching the images differently by drawing insights that from other perspectives would be more difficult, as a comparison with broadly accepted academic interpretations will show.

When images of whatever nature, from logical diagrams to artistic interpretations, are produced, they all share a common aspect: their visual process is formed by choices. The first decision is usually the selection of the physical material and leads towards a multiplicity of options that are at the designer's or artist's disposal. Should the image be impressed on a wall, on paper, on clay, or even be stored digitally in a computer? What is the format

that will hold the traces, what is its orientation? Where is the background to be positioned, and how should the body relate to it, nearby or far away from the support? What should the movements that will produce the image be like: small and precise, or engaging the whole body's energy to complete them? What tools should be used in order to create the images: subtle or bold, permanent or alterable? Is the process to be slow and careful or fast and furious? Are the shapes soft or hard, precise or fuzzy, dynamic or static? Are the colors contrasting or harmonic, vivid or calm? Is there a texture that adds dimension to the image? What feeling does the overall composition transmit? The variety of possibilities is simply infinite.

The reason for the decisions taken during the design process are varied as well: the designer's personal preferences, experience or previous knowledge, or technical and economic considerations, or collective, conventional, or traditional ways to do and see things. The final result is an image that may as well have looked different if at a certain point another decision had been taken. The process can be imagined as a walk, with every choice of direction and path contributing to the final result of the overall experience.

The practical experience of image generation leads towards the awareness that each position, each material, each color, and each shape may have been chosen differently, paired with the knowledge that each and every single one of those decisions contributes in a fundamental way to the overall meaning of the image. The final image may be perceived as stable, but only at first sight. It dissolves into one specific constellation that embraces all other possible appearances that may have originated through the decisions rejected during its formation process.

Understanding the potentiality of images, perceiving not only their actual state but also all other possibilities they might encompass, allows the researcher to ask questions about the image that could not have surfaced otherwise. This perspective – which emphasizes the processual character of all images – is at the very core of the practice-led iconic research methodology itself. It is based on this understanding of images that it becomes meaningful to use the generation of visual variants as a means of knowledge acquisition.

The following pages will take a careful and precise look at one single historic image and the comments and interpretations that have been associated with it. Comprehending the image in its potentiality will allow re-drawing, re-thinking, and re-structuring it; by doing so, alternative interpretations that so far have gone unperceived will be revealed.

1 "wanderer, there is no road, the road is made by walking." Fragment of a poem from the Spanish poet Antonio Machado, 1912.
Translation by Stanley Appelbaum (Machado 1998).

Opening the Bracket:

Darwin's Diagram from Notebook B, Page 36

During the summer of 1837, Charles Darwin drew a small diagram into his *Notebook B*, introduced by the words "I think" (*Figure 1*).[2] For decades, little attention had been paid to this specific page of his notes.[3] However, in the last 15 years, and particularly since the bicentennial of Darwin's birth and the 150th anniversary of the publication of his central work in 2009, it has become an element that is seldom passed over, either in any publication that addresses Darwin's theories in general, or in those dedicated to the history of the metaphorical concept of the "tree." Today it is generally considered the starting point of Darwin's evolutionary ideas (Voss 2007, p. 95).

Scholars such as Julia Voss and Horst Bredekamp have devoted their attention specifically to Darwin's images, as their goal is to learn more about the role that images play in the development of scientific thought (Voss 2007; Bredekamp 2005; Gruber 1974). However, most publications lack a precise examination of the meaning of the drawing itself. It is most often treated as a mere illustration of the origin of the concept of the "tree of life," while the meaning it may transmit is not dealt with specifically.

Recently, it has even become one of the main motifs of the souvenir market surrounding Darwin, decorating everything from T-shirts to cups, mouse pads and – ironically – notebooks themselves.[4] The attention to this little sketch has finally managed to jump from the academic world to the universe of mass consumption.

The diagram itself (*Figure 2*)[5] shows an irregularly branching line, which seems to grow in an organic and unpredictable manner in different directions (Choi 2009). The surrounding text and the fact that it was drawn into *Notebook B*, the first out of four notebooks that Darwin dedicated to the transmutation of species, leaves little doubt that the diagram reveals the pattern of biological diversity by showing the temporal development of a series of species, their variation, and eventual extinction.

By growing and branching, a series of different groups appear from the organic structure. The groups are denoted by a series of letters – *A* to *D* – positioned nearby them. The four resulting groups visualize different genera that developed from the original ancestor *1*.[6]

---

2   For the specific dating of Notebook B see Darwin 1987, 167.

3   It was first published with the integral transcription of Notebook B in 1960 (Barrett 1960).

4   The novelty of the motif was confirmed by an employee at Down House, home of Charles Darwin, in Downe, Kent, GB in April 2016.

5   While Darwin's written comments are taken into account in order to explain the relation between written and visual thought, they have been eliminated from Figure 2 in order to allow the viewer to concentrate on the shape and arrangement of the diagram itself. For the roles that Darwin attributed to the written and the visual medium, see Brink-Roby 2009.

6   "Thus between A. & B. immens gap of relation. C & B. the finest gradation, B & D rather greater distinction Thus genera would be formed.– bearing relation to ancient types.– " Darwin 1987, p.180.

Figure 2

Charles Darwin, diagram from Notebook B, page 36, 1837. Image cropped and isolated by P. López Grüninger.
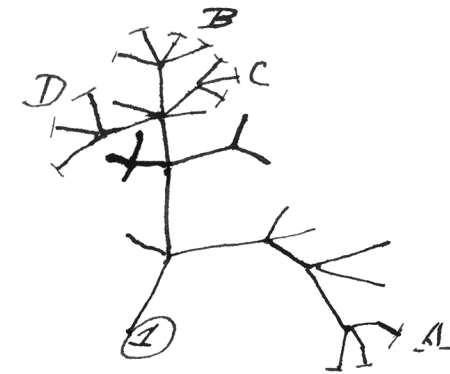
At first sight, everything seems to be taking place in the present. The image can be understood as an abstracted depiction of a leafless branch of a tree, where the ancestral twig splits into consecutive, slightly smaller elements. Even though it implies some kind of temporality – as the use of the metaphor of the tree always to a certain extent implies our knowledge about its growth – it can be perceived as a figure where all elements are simultaneously here in the present, where they share a common existence. So far, the image transmits us an idea of growth and diversification.

However, when carefully looking at the image, it can be observed that the final lines of the diagram may end in two different ways: abruptly, or with a small transverse line. This subtle code allows us to differentiate those species that are extinct without any descendent (abrupt ending) from those species that are still extant (recent species, indicated by a small transverse line). It is this subtle, practically imperceptible code that conveys an undeniable layer of temporality to the image. It divides what we see into a past and a present. By this perception, the image shows now not only growth and diversification, but also extinction: it visualizes the process of evolution in one view.

Once we start to look at the diagram from this perspective, even a third temporal state appears: the origin. The origin is given by the starting point designated *1*. It is the moment farthest behind in time, as all the descendants – the recent as well as the extinct ones – had to originate after its existence. The past is then to be understood as an undefined period of time between the origin and the present. It is represented by all those different descendants from *1* that varied enough to be considered independent species, but that became extinct without yielding descendants of their own.[7] A total of 12 of these are distributed across the diagram. The present is represented by the 13 descendants of *1* that still exist (the recent forms).[8] Figure 3 visualizes this temporal reading of the diagram.
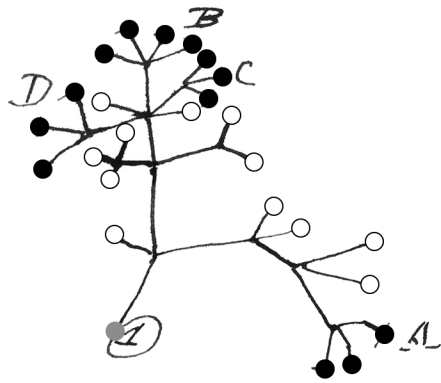
This seems to be the interpretation adopted by most scholars

---

7   For the sake of convenience, we will always speak here about "species" giving rise to other "species." However, Darwin's whole thought construct is rather scalable: every single ending point can be seen as a *variety* or as a *species*, or even as a *genus*, depending how many generations are supposed to have taken place between the starting point of the line and the ending point. (See also Darwin 2009, p. 120).

8   Voss 2007, pp. 69-70, p. 96 suggests Darwin may have been thinking about the thirteen species of finches from the Galapagos Islands that he had brought back from the H.M.S. Beagle expedition in 1836. Archibald, however, questions this hypothesis (Archibald 2014, p. 83).

Figure 3

Grey (1), indicates the ancestor (the origin); white dots, those extinct species with no offspring (the past); black dots, those descendants that still exist (the present).

Figures 4 and 5:

Twenty-five branches depart in all directions from a central stem *1*. The presence or absence of the small transverse stroke at the end of the line differentiates between recent and extinct species. In Figure 5, recent and extinct species are additionally differentiated by line-length.

today (Bredekamp 2005; Voss 2007; Pietsch 2012; Archibald 2014).[9] This can be perceived in the way they interpret the piece of text that follows directly beneath Darwin's drawing: " […] Thus genera would be formed.– bearing relation to ancient types.– with several extinct forms, for if each species *an ancient (1)* is capable of making, 13 recent forms.– Twelve of the contemporarys (sic) must have left no offspring at all, so as to keep number of species constant.– " (Darwin 1987, p. 180).[10]

Bredekamp interprets Darwin's commentary the following way: the "ancient species" relates to the "origin (*1*)" of the diagram. The "13 recent forms" refers to those lines with the little perpendicular trace at the end, and the "twelve contemporarys (sic) without offspring" relates to those twelve lines that end abruptly. He describes how twenty-five branches depart in all directions from a central stem *1*. As the number of 13 species would be stable, 12 species would have had to become extinct over time. In order to visualize this process, Darwin characterized the surviving species with horizontal strokes. Thirteen recent species would then be juxtaposed with twelve extinct ones.[11]

If we tried to illustrate Bredekamp's description without knowing Darwin's original, Figure 4 could be the result: one central trunk splits into 25 branches; 12 of them extinct, 13 still surviving. If we wanted to highlight

temporality in a more visual way, besides the subtle coding system of the transverse lines, we could, for example, prolong the length of those lines that symbolise species that survived until today (see Figure 5).

However, Bredekamp's interpretation leads to a certain fuzziness. Should the 12 extinct species be added together with the "central stem *1*," as he calls it, in order to equal the number 13 that should be equivalent to the 13 recent species? But how could this be possible, as the 12 extinct species must have existed at a later time than the common origin from which they descend? And if this addition should not be made, how is the correspondence between 12 and 13 supposed to be understood?

Julia Voss offers a more convincing explanation. She also opposes the 12 extinct species with the 13 recent ones, but she solves the numerical difference by considering the surplus among the survivors as the necessary element to trigger competition with a constant amount of resources.[12] This explanation makes sense, taking into account Darwin's evolutionary theory. But it is questionable whether it really explains the numerical difference in this specific example, as Darwin's comments in the surrounding pages make no reference to this phenomenon at all.

Shifting Perspectives:
(Re-)Tracing the Lines

Let us start over again, focusing this time on the drawing process itself, and imagine it from the perspective of the decisions that were taken during the creation of the diagram.

9   The first published integral transcription of Darwin's Notebook B by Paul H. Barrett in 1960 hinted through footnotes that there were 13 lines with a perpendicular stroke at the end and 12 without, connecting them in this way to Darwin's written comments (Barrett 1960, footnotes 17 and 18, p. 286). While the more recent transcription of Notebook B by David Kohn did not underline this fact (Darwin 1987, p. 180), it has now regained presence as the earlier transcription has been used for the online digital version of the notebooks (http://darwin-online.org.uk; last consulted 10.03.17).

10   Words in asterisks were inserted above the line by Darwin. The idea of the constant number of species, which he also expresses on the upper right side of the diagram in a bubble ("Case must be that one generation then should be as many living as now" Darwin 1987, p. 180) relates to Darwin's belief that speciations balance extinctions, resulting therefore in an approximately stable number of species over geologic time (Gruber 1974, p. 136-145). Archibald explains how this phenomenon is today considered to happen only under stable environmental conditions, while in times of mass extinctions, the balance "skews to extinction and then often back to speciation" (Archibald 2014, p. 83).

11   "Aus dem zentralen Stamm 1 gehen nach allen Richtungen 25 Verzweigungen ab. Da aber die Zahl von 13 Arten stabil sei, wären im Laufe der Geschichte insgesamt 12 ausgestorben. Um diesen Vorgang zu verdeutlichen, hat Darwin die überlebenden Arten an ihrem jeweiligen Ende durch Querstriche charakterisiert, […]. Diesen 13 Spezies stehen 12 abgestorbene Arten gegenüber […]." Bredekamp 2005, p. 25.

12   "Zählt man die auslaufenden und quer abgeschlossenen Striche nach, stehen zwölf ausgestorbenen Arten dreizehn lebende gegenüber. […] Entscheidend ist das Zahlenverhältnis. Nummerisch überlappen die dreizehn lebenden Arten die zwölf ausgestorbenen um eine weitere, die bei Konstanz der Ressourcen den Wettkampf produziert, den Darwin später den „struggle for existence" nennen wird." Voss 2007, pp. 96-97. The existing translation (Voss 2010) contains errors that make it unusable.

Some of the basic graphic choices seem to result from the specific context in which the diagram was created. The format, the quality of the paper and even the orientation were given, as Darwin drew the diagram into the same place where his verbalized thoughts on the transmutation of species also found expression: a little (170 x 97 mm) leather-bound notebook. As well, the medium with which he draws does not deviate from the one he used for his written ideas: both are translated into brown ink, apparently performed by the same pen.[13] The fact that Darwin embedded the image into this space seems to suggest that, for him, it was a tool to express and clarify his thoughts, similar to the way in which he used the written word.

When it came to giving graphic expression to his thoughts, however, he found freedom of choice: in determining the shape of the lines that constitute the diagram and the way they were organised on the two-dimensional space of the page. Darwin decided to use continuous, (mainly) straight lines, in a variety of lengths, and to organise them in an irregular manner on the drawing surface.

To draw a line by hand, as Darwin did, always implies a physical movement of the drawing tool, and a temporary extension that takes place between the specific moment when the hand lowers the tool to make it touch the paper until the hand lifts it again at a different position. It is easy, therefore, to associate the idea of change and time to a line.[14] As we have seen above, the lines of Darwin's diagram imply this idea of change and time, or more precisely, change *over* time, as well. However, in order to narrate the story of the temporal development that the diagram tells, we will have to begin at the point that Darwin himself labelled as *1*.

This starting point, the point at which the pen presumably touched the paper for the first time in order to commence the drawing,[15] represents, in Darwin's own description, "an ancient" species. The prolongation of this first point into a line that ascends slightly diagonally for less than 2 centimetres seems to visualise how this ancient species evolves over time, until it reaches a point where the line suddenly stops (*Figure 6*). Its ending point is simultaneously the starting point of three new lines that arise out of it. They spread in different directions: one towards the left side of the paper (the shortest one), one to the upper centre, and the third one, horizontally to the right (*Figure 7*). Their shared starting point seems to represent their common ancestor (one specific species), while the outspreading lines visualise through their spatial development and the growing distance between their ending points how, out of this common ancestor, a series of three distinct and independent species arises.[16] Now in this fragment, the length of the

13   David Kohn points out that all notes were made in brown ink, with later annotations in grey. For the pages discussed here, only one of the comments in the bubble – "To do this & to have many species in same genus (as is). REQUIRES extinction." – is distinct from the others on account of its ink color. Krohn in Darwin 1987, p. 167, p. 180.

14   For a more detailed analysis of what a line can mean, see López Grüninger 2015.

15   There is no proof that this was really the first line drawn by Darwin. Of course, it would be theoretically possible to start this same visualisation from any other point. However, from a drawing perspective, it would be quite a challenging task to start drawing a series of unrelated marks and then make them come together towards the end, without generating an oddly irregular structure. But it would also be conceptually quite demanding, as point 1 is the starting point of Darwin's narrative.

16   For the terminology used here, see footnote 12.
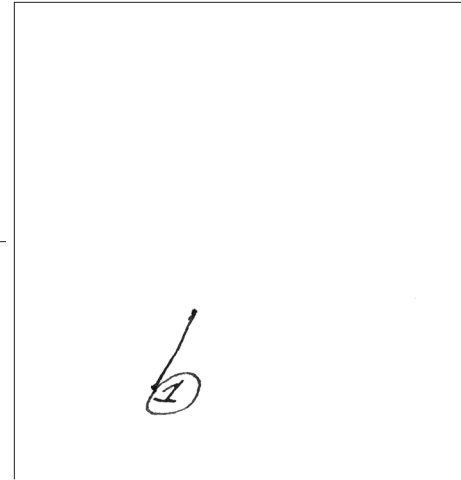
Figure 6

First line that opens the complex process described by the diagram.
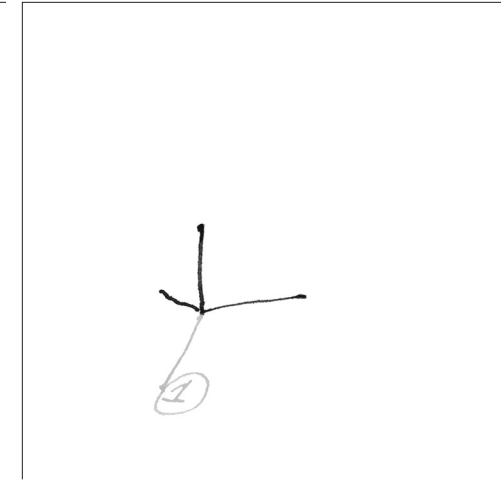
Figure 7

First branching situation that develops out of the ending point of the first line of the diagram.

line shows not only the time going by, but also the increasing variation that the three new species experience from their common origin, until they themselves can be defined clearly as three independent species when they arrive at their ending points.

If we repeat this procedure, we shall see that from two of the three lines in Figure 7, new bunches of lines arise (Figure 8). One of the three lines in Figure 7, the one moving towards the left (highlighted in Figure 9), seems to differ from the other two: there are no subsequent lines growing out of it.

Figures 8 and 9

Out of the three lines from Figure 7, two new branching situations develop. One of the three lines from Figure 7 generates no successive branching situation.
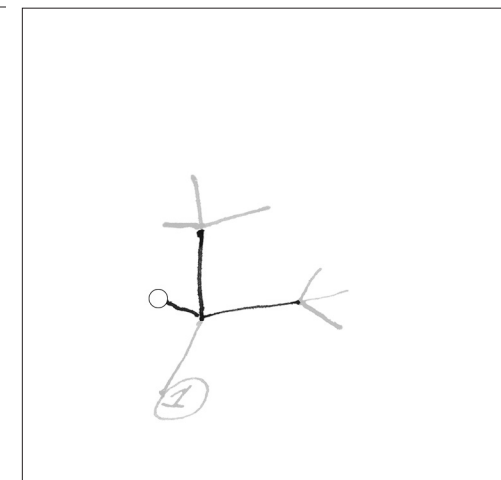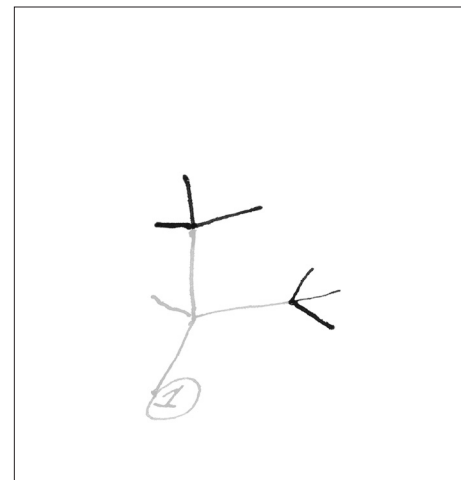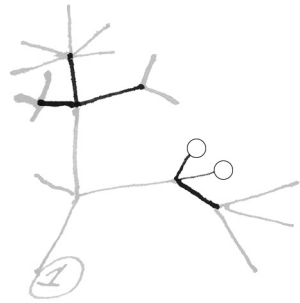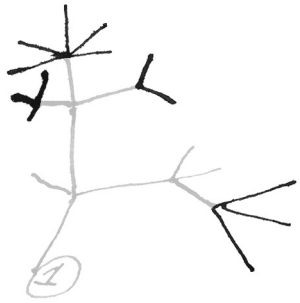
Figures 10 and 11

From the six lines in Figure 8, four new branching situations develop. Two of the six lines from Figure 8 generate no successive branching situation.

Figures 12 and 13

From the thirteen lines in Figure 10, only four develop new branching situations. Nine of the thirteen lines from Figure 10 generate no successive branching situation.
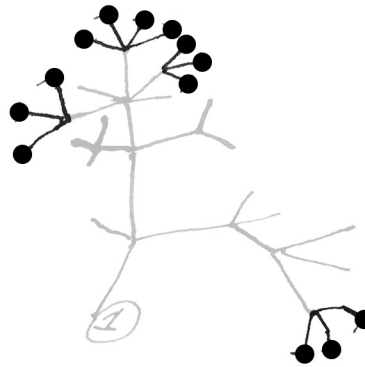
From the explanation in the previous section, we know that its ending point, by not being marked with a brief transverse trace, identifies it as a species that went extinct without giving rise to further descendants.

The situation is similar if we repeat this procedure two more times (Figures 9 and 10). In both cases, out of the original lines (six in Figure 8 and thirteen in Figure 9), only four branching points develop. All other lines are "dead ends": no descendants developed out of them (see them highlighted in Figures 11 and 13).
This leads us towards the following conclusions:
1.
All ending points of lines represent specific species. Some of them represent extinct species with no successors (the ending points of those 12 lines that end abruptly in the original diagram), some others represent recent forms (those 13 ending points that end with a transverse trace in the original diagram). What appears clearly now is that there is a third category of species: the extinct species *with* successors. They are represented by all those ending points that are simultaneously starting points of other lines: branching points, so to say.
2.
Each of these branching points represents a speciation event.[17] The diagram, therefore, shows us four speciation events leading towards **five consecutive generations of a diversification process**.[18] This interpretation seems con-

Figure 14:

All ending points of the thirteen lines of Figure 10 bear a small transverse line, and are therefore defined as recent species.

sistent with the fact that all recent species originate from the same previous generation (see them highlighted in Figure 14).[19]
3.
The lines in Darwin's diagram can be understood as an infinite sequence of dots, which, properly arranged, transform into a single line. While the starting and the ending points clearly visualise specific species of their own, the line can be seen as a countless succession of generations of variations that

17   The Oxford Dictionary defines "speciation" as "the formation of new and distinct species in the course of evolution." (Oxford Online Dictionary, consulted 10.03.17).

18   Darwin talks about generations when thinking about the constant number of species: "Case must be that one generation then should be as many living as now" (Darwin 1987, p. 180). However, his concept of generation is not to be confounded with generations in the sense of "a set of members of a family regarded as a single step or stage in descent" (Oxford Online Dictionary, consulted 10.03.17), as there are many generations needed in order to generate a noticeable difference between two forms.

19   It is debatable whether the diagram shows 5 or 6 generations, depending if the starting point of the very first line ought to be considered as already a generation itself. It seems plausible to assume that the opening line of the diagram has more of a signalling function, indicating the direction of the whole process it visualizes, than a specific narrative content.

unfold between those two points.[20]

However, to visualise speciation as a series of clearly defined lines that grow out of one specific point in time implies a **high level of abstraction**.[21] It is a similar phenomenon to what happens on a verbal level with the term "species" itself, as this concept does not delimit a certain magnitude, but has to be understood as an immense collective existence, which implies a significant variability among the individuals that compose it.[22] Darwin's abstraction even surpassed the level that this naming may imply, as he was not just reducing the multiplicity of the living population into one clear, homogeneous form when drawing a straight line, but was simultaneously assuming the transformation of the depicted species over time.

4.

The development of the branching points into independent lines visualizes, on the one hand, how the variation from this common ancestor increases until several clearly independent and different species evolve. But it also **codes resemblance** (closer or more remote relatedness that exists among the species of the new generation) **through distance.**[23] This allows Darwin to highlight a series of different groups (A, B, C, D), which he describes as genera,[24] whose existence is explained by the fact that all species belonging to one group share one common ancestor, which is not shared by those species belonging to another genus.

This also explains why, in the lower right corner, he abandons the use of consistently straight lines, and breaks them slightly, in order to ensure that the final points are still close enough to be identified as one single group (*A*).

If we reorganise the diagram spatially based on the succession of generations we have identified, a much more structured image appears (see Figure 15). But while the generations are now clearly visible, the random nature of the original diagram fades into the background.[25]

However, the reshaping of Darwin's diagram brings to the surface several surprising aspects. One is bound to realize that all current species have gone through an equal number of generations while developing out of the origin *1*. It would have been possible to design the diagram in another
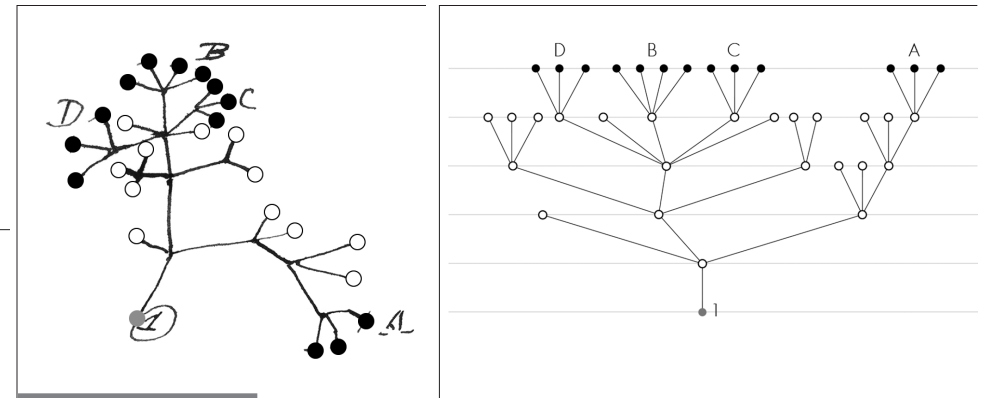
Figures 3 and 15

On the left, original diagram: black dots represent recent species, white dots represent extinct species with no offspring. On the right, black dots represent recent species, white dots represent extinct species, with or without living successors.

way – one where some of the recent species only went through two speciation events, for example, or one where some of the species from the recent generation would be extinct already (see Figures 16 and 17). But in the original drawing, even though we find extinct species without successors in every previous generation, no species make a jump towards the present without going through the corresponding number of generations.

Another interesting observation uncovered by Figure 15 is that the last two generations (the recent one and the preceding one) both feature 13 species. While in the upper one, all of the forms are still extant, in the lower one, all of them are extinct: 9 of them with no successor, 4 of them with successors (which gave rise to all 13 recent species in the later generation).

Figures 2 and 16

Left, the original arrangement of the transverse lines designating recent species. On the right side, the transverse lines have been interchanged with some of the abrupt endings. This diagram seems to show an identical situation to the original, as there are still 13 recent species and 12 extinct ones.
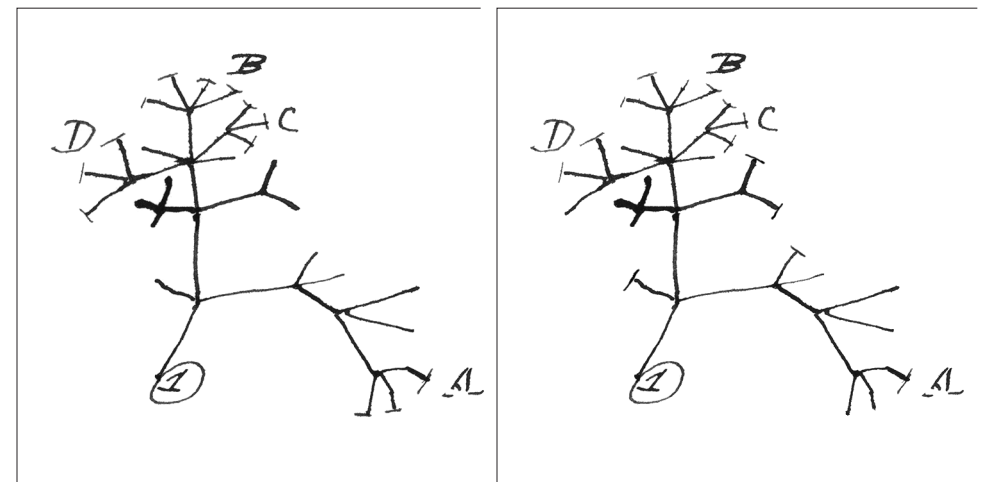
20   In fact, the diagram that will accompany the publication of Darwin's thoughts about twenty years later will have substituted the continuous line by the dotted line (see Figure 14). Voss convincingly relates this graphic choice to a drawing convention proceeding from the domain of Geology (Voss 2007, p. 126). Bredekamp, on the other hand, locates the source of inspiration for Darwin's visual language in Jean-Baptiste Lamarck's diagram from 1809 (Bredekamp 2005, p. 16).

21   It is worth analysing in detail the visual and conceptual consequences of simplifying graphically highly complex ideas. This has been done elsewhere, see López Grüninger, 2011, pp. 204-210.

22   The concept of "species" has been vividly discussed over time. For a detailed analysis of the concept in 19th century Biology see McOuat 1996. For a discussion of categorisation and its implications for the concept of species see Lakoff 1987, particularly pp. 185-195.

23   Darwin's own reading directions for his published diagram (Figure 18) suggests this interpretation as well: "Let A to L represent the species of a genus large in its own country; these species are supposed to resemble each other in unequal degrees, as is so generally the case in nature, and as is represented in the diagram by the letters standing at unequal distances." (Darwin 2009, p. 111). See López Grüninger 2011, p. 182-198 for further detail on the codification and interpretation of distance.

24   "Thus between A. & B. immens gap of relation. C & B. the finest gradation, B & D rather greater distinction Thus genera would be formed.– bearing relation to ancient types.– " Darwin 1987, p. 180.

25   For a detailed analysis of coding principles in qualitative diagrams, see López Grüninger 2011.
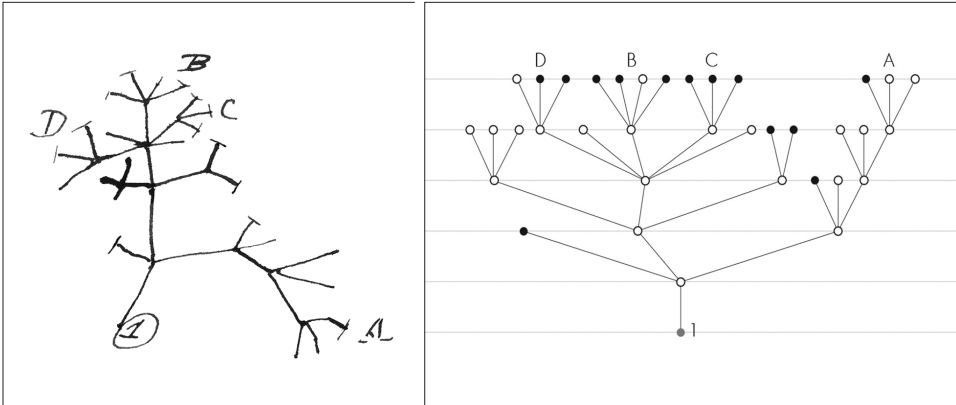
Figures 16 and 17

By reorganising Figures 16 and 17 into a diagram structured according to its generations, it becomes clearly visible that recent and extinct species alike are now distributed across the different generations.

This visualizes quite clearly what Darwin had in mind when he scribbled in the corner of the page, *"Case must be that one generation then should be as many living as now,"* referencing his idea about a constant number of species (Darwin 1987, p. 180).

If we look now at his comment, "[…] Thus genera would be formed. – bearing relation to ancient types. – with several extinct forms, for if each species *an ancient (1)* is capable of making, 13 recent forms. – Twelve of the contemporarys must have left no offspring at all, so as to keep number of species constant. –" (Darwin 1987, p. 180; words in asterisks were inserted above the line by Darwin) and relate it to the restructured image (Figure 15), a new plausible interpretation appears. The idea of "an ancient *1* [that] is capable of making 13 recent forms" is actually what the diagram itself depicts. The "twelve contemporarys" would then be real contemporaries of *"ancient species 1"* (that is, positioned on the same generation level as *1* itself). They would have gone extinct long ago without any recent successor (but would have generated at least 12 successors in the first generation, 10 successors in the second generation, and 7 in the third) in order to keep the number of species per generation at thirteen.

It is hard to believe that this numerical coincidence, both with respect to the common number of generations for all recent species as well as to the constant number of species for the last two generations, is purely random. It is more plausible that Darwin was very thoughtful when drawing the little sketch into his notebook.[26] The diagram seems to be a hybrid that combines in itself a visual/metaphoric approach and a more rational perspective. While it visualizes the idea of evolution as an organic, unpredictable, and unstructured process of variation and extinction, the image simultaneously includes – somehow hidden between its own lines – a very precise representation of the systematics that Darwin had imagined.

26   I do agree with Leslie Atzmon's description of this image as an "active thinking sketch." Nevertheless, while I am convinced that drawing played a crucial role for the development of Darwin's ideas, I am highly skeptical as to whether the process in any way resembled the "fuzzy process" she describes, where random lines allow giving rise to new thoughts (Atzmon 2015).

Closing the Brackets:
From Sketch to Print

Darwin never published his little diagram, nor any of the others he drew by hand between 1837 and 1868 into his notebooks (Archibald 2014, p. 80). When he finally decided to go public with his theory in 1859, one single image accompanied his book *On the origin of species by means of natural selection, or the preservation of favoured races in the struggle for life* (Figure 18). While today his diagram is often referred to as "Darwin's tree of life,"[27] he took great care to avoid giving a metaphoric title to the diagram himself.[28]

Figure 18

Diagram published in 1859 in Darwin's "On the Origin of Species".
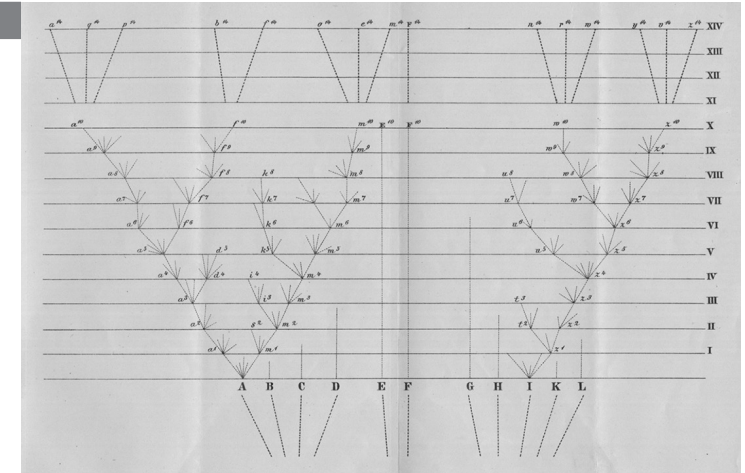
There is no doubt that the diagram bore great meaning for Darwin. In the letter he wrote to his publisher, he described it as an "odd looking affair, but is <u>indispensable</u> to show the nature of the very complex affinities of past & present animals."[29] Eight pages of the surrounding text are devoted exclusively to a detailed written explanation of the diagram, in which he supplies clear guidelines about how the process it depicts has to be understood (Darwin 1959, p. 111-121).

The structural similarities between the published diagram and the restructured diagram above (Figure 15) are striking. Figure 18 shows in detail the development from two original species (A and I), while their other

27   The term "Tree of Life" is applied as well to the printed diagram from 1859, as to Darwin's hand drawings. Gruber talks about Darwin's image of the "Tree of Nature"; while others, like Pietsch, refers to them in a more generic manner just as „trees". (Gruber 1974; Pietsch 2012; Lima 2014; Archibald 2014, among many others).

28   Darwin carefully avoided – as far as possible – all metaphoric terminology when describing the diagram in his book (Darwin 2009, p. 111-121). Even though he dedicated several pages to the elucidation of the tree metaphor, he did not establish any connection between the metaphor itself and the diagram (Darwin 2009, p. 123-124).

29   Letter from Charles Darwin to John Murray, 31 May 1859; "indispensable" is highlighted in the original. See Darwin Correspondence Project, http://www.darwinproject.ac.uk/letter/DCP-LETT-2465.xml Last consulted: 10.03.2017

contemporaries are not further specified, simply indicating that they were extinguished in the course of their evolution. As in the restructured diagram, no species jumps over two generations without offspring, and all recent species have undergone the same number of generations.

Of particular interest is the scalable dimension that he imagines for the structure. Depending on the number of generations that are supposed to exist between one line and another, it may show two ancestral species and how their variations develop over time, but it can also be understood as depicting the process on a broader scale, even visualizing the origin of several related families (Darwin 2009, pp. 119-120).

As already described in Figure 15, the structured version of his diagram forfeits the organically random overall character in favour of describing the systematics of his theory more clearly. Darwin has lately often been criticised for this decision (see for example Pörksen 1997). However, the explanations in the previous section may have shown that the specificities of the process that Darwin wanted to depict are hardly comprehensible when looking at the original sketch. He seems to have weighed both aspects, deciding on the version that would favour clear communication of the process.[30]

Most scholars seem to agree that Darwin was not a skilled drawer, an opinion which Darwin apparently shared. They usually apply this judgment to his diagrams as well (Bredekamp 2005; Archibald 2014).[31] It may be true that his abilities were limited when it came to depicting in a naturalistic way the new specimens he encountered. However, when designing these two diagrams, the thoughtfulness and awareness of the different levels of legibility and metaphoric qualities that he proved to have surpasses by far those qualities as demonstrated by many other, more "skilled" scientists (like Haeckel, for example) when dealing with the nuances of the visual.

Methodological Reflexion: Working On, With, and Around Images

The idea that the emergence of knowledge can be clearly traced is well known to be an illusion (Gruber 1974). The fact that "our knowledge-making practices are material enactments that contribute to, and are part of the phenomena we describe," as physicist Niels Bohr points out, may additionally call into question such an enterprise (Bohr, as cited in Barad 2007, p.

30   Nevertheless, he still seems a bit uncomfortable about the lost arbitrariness, as he observes: "But I must here remark that I do not suppose that the process ever goes on so regularly as is represented in the diagram, though in itself made somewhat irregular." (Darwin 2009, p. 114).

31   Bredekamp went so far as to imagine the origin of the printed diagram as result of copying and mirroring its structure from a pressed specimen of a coral Darwin had collected in 1834 (Bredekamp 2005, pp. 56-61). This hypothesis seems quite adventurous, however, when it is understood how carefully constructed even his sketchy diagram was.

247). Nevertheless, this final section will try to shed light on the process of how the divergent interpretation of Darwin's diagram presented in this article developed through different steps, as well as through different ways of interacting with images.

The conclusion that branching points represent extinct species with successors took place without the generation of any specific imagery, but through attentive work on the diagram itself and the explanations of its meaning proposed by different scholars. It was following the visual logic of the diagram itself through the probable steps of its origination that led to the divergent interpretation proposed here. Understanding the image as a process and not a homogeneous, static entity was unequivocally at the core of these insights. This accords with the approach postulated in the first section, in which understanding the potentiality of images – considering them as one of many possible results of a preceding decision process – was described as the central characteristic of practice-led iconic research.

As pointed out, no physical image generation was involved in the development of this conclusion, as the sequence of images that explain (above) the meaning of starting and ending points (Figures 6 to 14) were explicitly created for this article.[32] However, even without physical image-generation as specific part of the thinking process, the latter might still be considered a visual one in many ways.[33] Imagining the drawing process is nearly inconceivable without some degree of mental visualization, enabled only through previous practical experience drawing comparable structures.

The other central finding, the structure of the consecutive generations depicted by the diagram and its relation to the numerical references in Darwin's accompanying text, even though it is conceptually strongly connected to the previous finding, happened at a different moment in time. While working on the more general question about how diagrams codify and communicate meaning, a series of visual experiments were initiated that were meant to prove that Darwin's original spatial distribution, besides signifying similarity through proximity, more importantly generates an overall metaphoric association (López Grüninger 2011, p. 199-201).[34] The intention was to redesign the original diagram in such a way that it would lose its resemblance to an arbitrarily growing organism, and would instead evoke the idea of a structured, constant process, without changing any of the relationships of the original between starting, branching, and ending points. Also, the spatial sequence of all ending points (following them from the lower left corner over the top centre to the lower right part of the diagram) would be kept, as this organization is responsible for visualising similarity

32   Their function can therefore be described as "illustrations," as their unique goal is to enable (or at least support) the understanding of the reader. Cf. Pörksen 1997.

33   The nature of thinking and knowledge is much discussed in the domain of cognitive psychology. Several theories point towards a strong interconnection of spatio-visual and semantic constructs, which are thought to be activated simultaneously. Cf. e.g. Schnotz 2006.

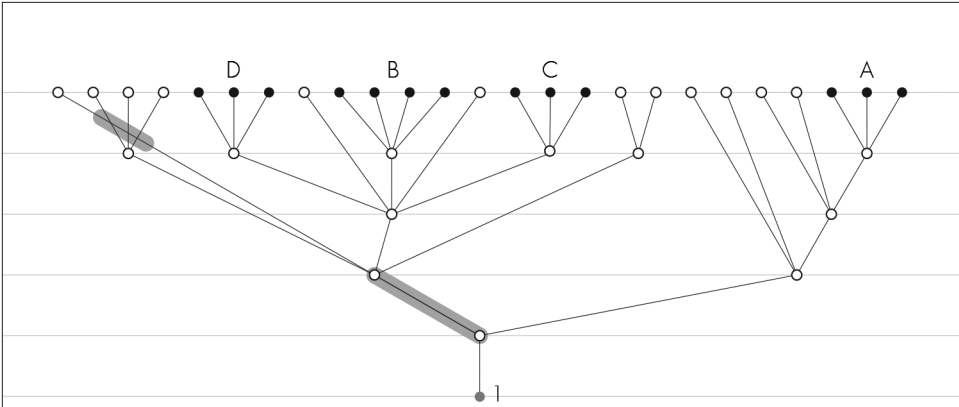34   Ultimately, other diagrams were used for this purpose.

Figure 19:

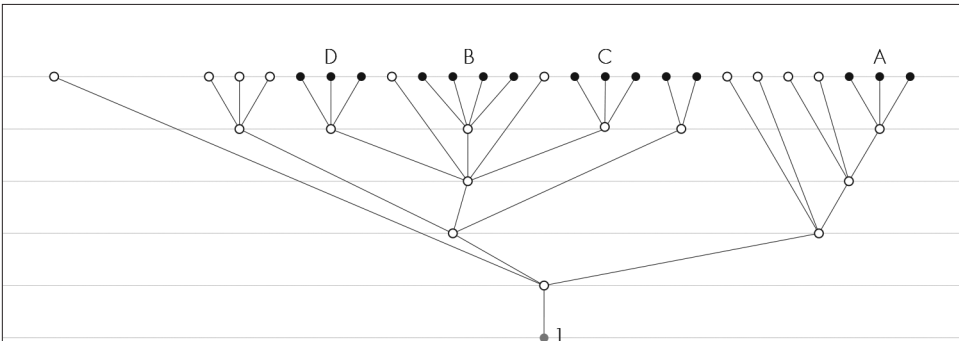First visual experiment. Grey color highlights overlapping lines.

Figure 20

Second visual experiment. Breaking the rule of equidistance among ending points.
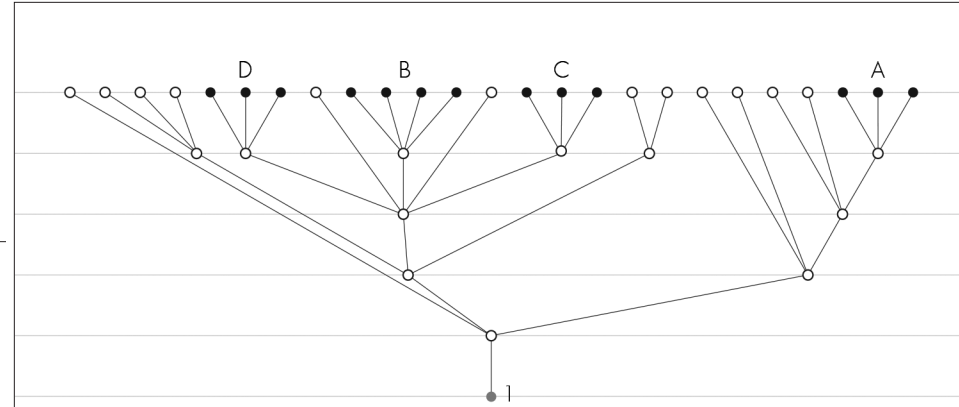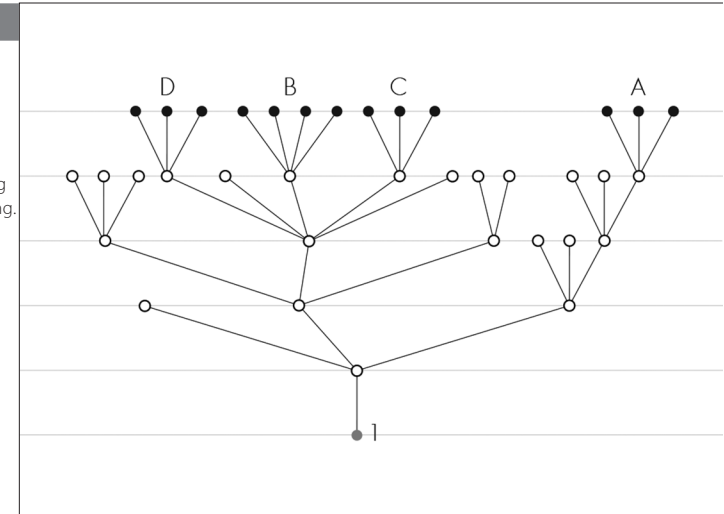
Figure 21

Third visual experiment. Breaking the rule of central positioning of the common antecedent. Still, the right branch of the diagram could not be resolved in a satisfactory way, due to those species that would jump over several generations.

Figure 22:

Fourth visual experiment. It was not possible to hold strictly to the rule of central positioning of the common antecedent in this version either; however, the resulting irregularities were less striking.

among the species of the resulting genera named *A, B, C,* and *D*.

In order to create a more equilibrated and symmetric version of the diagram to trigger a different association, a series of restrictive, self-imposed rules were set. All ending points (no matter if they were to show extinct species with no offspring or recent species) should be spread in a homogeneous and equidistant manner on one single line. Also, the common antecedent (the branching point) of a group of dots should always be positioned on the line of the previous generation, exactly at the centre of the horizontal space occupied by its offspring. And only straight lines should be used to transform the diagram. However, these apparently small changes in distribution resulted in unexpected graphic problems, as suddenly, overlapping lines started to render the image unreadable (Figure 19).

In order to ensure readability, and while staying faithful to the rule of straight lines, it was therefore unavoidable to choose between breaking the rule of equidistance among ending points (Figure 20) or to completely ignore the rule of central positioning of the common antecedent (Figure 21).

The resulting images were oddly irregular. Contemplating them

carefully, suddenly made clear that the number of generations gone through was constant for the recent species, but not for the extinct ones. A new image was created in response to this observation, restructuring the diagram from bottom to top instead, in order to ensure that no line would "jump" one generation without placing one descendant on it. Figure 15 was the result (see repeated below as Figure 22). It was only through this specific visual intervention that it became possible to *see* the constant number of species across the last two generations, and that the relations between Darwin's sketch and the printed diagram that accompanied his *On the Origin of Species* became evident.

The making of images played a central in for discovering the second set of conclusions. Their creation functioned by no means merely to provide visual proof for a specific finding, as was the case for the "illustra-

tions" described above. They even transcended their originally intended function, as they not only provided an answer to a pre-established hypothesis, but also, through processes of variation and transformation, enabled discovering a whole new perspective on the diagram that was not visible in the original.

Nevertheless, all the situations described here, whether entailing the development of visuals or not, share a common basis. All of them require the perception of the image as a flexible constellation. By not taking the image as an indivisible, integrated and completed whole, questions about the processes and decisions that directed it towards its final appearance are allowed to arise. This affords the possibility to gain insight into images in their characteristic complexity, and to learn about formal, structural, and medium-related implications. It is this aspect that represents the core of the practice-led iconic research method.

References

Archibald, J. David. 2014. *Aristotle's Ladder, Darwin's Tree. The Evolution of Visual Metaphors for Biological Order*. New York: Columbia University Press.

Atzmon, Leslie. 2015. "Intelligible Design: The Origin and Visualization of Species." *Communication Design* 3 (2): 142–56.

Barad, Karen. 2007. *Meeting the Universe Halfway. Quantum Physics and the Entanglement of Matter and Meaning*. Durham, London: Duke University Press.

Barrett, Paul H., ed. 1960. "A Transcription of Darwin's First Notebook on 'Transmutation of Species.'" *Bulletin of the Museum of Comparative Zoology* 122 (6): 247–96.

Boehm, Gottfried. 2007. *Wie Bilder Sinn erzeugen. Die Macht des Zeigens*. Berlin: University Press.

Bredekamp, Horst. 2005. *Darwins Korallen. Frühe Evolutionsmodelle und die Tradition der Naturgeschichte*. Berlin: Klaus Wagenbach.

Brink-Roby, Heather. 2009. "Natural Representation: Diagram and Text in Darwin's On the Origin of Species." *Victorian Studies*, Darwin and the Evolution of Victorian Studies, 51 (2): 247–73.

Choi, Tina Young. 2009. "Natural History's Hypothetical Moments: Narratives of Contingency in Victorian Culture." *Victorian Studies*, Darwin and the Evolution of Victorian Studies, 51 (2): 275–97.

Darwin, Charles. 1987. *Charles Darwin's Notebooks, 1836-1844. Geology, Transmutation of Species, Metaphysical Enquiries*. Edited by Paul H. Barrett, Peter J. Gautrey, Sandra Herbert, David Kohn, and Sidney Smith. Cambridge: University Press.

———. 2009. *On the Origin of Species by Means of Natural Selection, or, the Preservation of Favoured Races in the Struggle for Life*. London: Penguin Books.

Gruber, Howard E. 1974. *Darwin on Man. A Psychological Study of Scientific Creativity.* Chicago: University of Chicago Press.

———. 1988. "Darwin's 'Tree of Nature' and Other Images of Wide Scope." In *On Aesthetics in Science*, edited by Judith Wechsler, 120–40. Boston, Basel: Birkhäuser.

Lakoff, George. 1987. *Women, Fire, and Dangerous Things. What Categories Reveal about the Mind*. Chicago, London: The University of Chicago Press.

Lima, Manuel. 2014. *The Book of Trees. Visualizing Branches of Knowledge*. New York: Princeton Architectural Press.

López Grüninger, Paloma. 2011. *Diseño y Evaluación de Diagramas Cualitativos y su Aplicación al Análisis de Visualizaciones de la Clasificación Biológica*. Granada: Editorial de la Universidad de Granada.

———. 2015. "Defying the Limits of the Plane: Two-Dimensional Space and its Consequences in the Search for the Order of Nature." *Journal of Illustration* 2 (1): 51–73.

Machado, Antonio. 1998. *Campos de Castilla*. Madrid: Biblioteca Nueva.

McOuat, Gordon R. 1996. "Species, Rules and Meaning: The Politics of Language and the Ends of Definitions in 19th Century Natural History." *Studies in History and Philosophy of Science* 27 (4): 473–519.

Pietsch, Theodore W. 2012. *Trees of Life. A Visual History of Evolution*. Baltimore: The John Hopkins University Press.

Pörksen, Uwe. 1997. *Weltmarkt der Bilder. Eine Philosophie der Visiotype*. Stuttgart: Klett-Cotta.

Ragan, Mark A. 2009. "Trees and Networks Before and After Darwin." *Biology Direct* 4 (43).

Schnotz, Wolfgang. 2006. "Visuelles Lernen." In *Handwörterbuch Pädagogische Psychologie*, edited by Detlef H. Rost, 3rd ed., 853–59. Weinheim, Basel, Berlin: Beltz.

Voss, Julia. 2007. *Darwins Bilder. Ansichten der Evolutionstheorie 1837-1874.* Frankfurt am Main: Fischer Taschenbuch.

_____. 2010. *Darwin's Pictures. Views of Evolutionary Theory, 1837-1874.* New Haven, London: Yale University Press.

O n l i n e   R e s o u r c e s :

Darwin Online: http://darwin-online.org.uk

Darwin Correspondence Project: https://www.darwinproject.ac.uk/

Oxford Dictionary: https://en.oxforddictionaries.com

....

Image Credits

Figure 1

Charles Darwin, page 36 of *Notebook B*, 1937. Cambridge University Library, Dar. Ms. 121, Fol. 36.

Figure 2

Charles Darwin, drawing on page 36, *Notebook B*, 1937. Image cropped and isolated by P. López Grüninger.

Figure 3

Interventions on the original drawing from Charles Darwin by P. López Grüninger.

Figure 4 – 5

Diagrams by P. López Grüninger.

Figure 6 – 14

Interventions to the original drawing from Charles Darwin by P. López Grüninger.

Figure 15 – 17

Diagrams by P. López Grüninger.

Figure 18

Charles Darwin, diagram published in *On the Origin of Species by Means of Natural Selection.* London: John Murray, 1859. Cambridge University Library, CCA.24.19

Figure 19 – 22

Diagrams by P. López Grüninger.

A u t h o r

Paloma López Grüninger studied Fine Arts at the University of Granada, Spain, and Visual Communication at the Basel School of Design, Switzerland. Between 2005 and 2008, she was a member of the Graduate School "Image and Knowledge" of eikones – NCCR Iconic Criticism. Her dissertation, with which she obtained her PhD from the University of Granada in 2011, looks into non-quantitative visualizations, particularly historic and current tree-diagrams in the domain of biology, and the ways they construct and communicate their meaning. Her research interests are focused on information design and instructional design, by applying the methodology of practice-led iconic research in order to gain insights into the power and meaning of images through systematic image generation. Since 2012 she has been a lecturer at the Master of Arts in Visual Communication and Iconic Research at the Academy of Arts and Design Basel, Switzerland, and coordinates the program since 2013.

Figure 1

Charles Darwin, Notebook B, page 36, 1837.
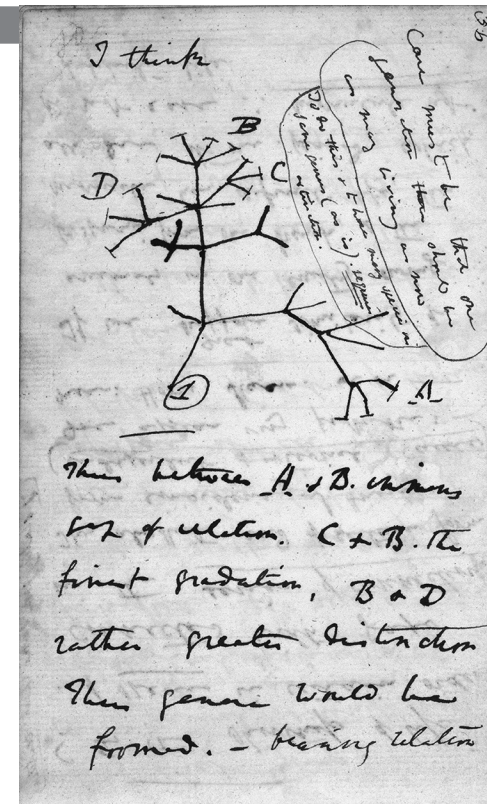
Premises for
Interaction between Images

Claire Reymond

When images are seen in pairs, the viewer seeks the perceivable features shared by the two images, to compare them. The aim of this process is to understand why they stand next to each other and also, if possible, to understand the images as a unity. Studies in the field of art history (see the method of 'comparative seeing') and psychology (as an example 'visual metaphors') investigate–in the field of image-juxtaposition–different aspects of this phenomenon. Nevertheless, the premises that are needed for images to be interpreted as belonging together have yet to be examined on the image-level. This study analyzes the basic conditions that should be given for image connection processes to occur and tries to answer the following question: "Which pictorial elements can be detected as premises for a relation between two images?". The investigation is an explorative study using the method of practice-led iconic research to detect the premises that allow connection processes between images to occur. The analysis documents the relevance of different image-features, as for example, the analogy of the directional positions within the images or the width of the stroke in line drawings. An eye-tracking study, that was conducted as a subsequent step, strengthens the findings of the practical research.

••
keywords

image-based research
meaning of images
design research methods
interaction processes between images

1 .   I n t r o d u c t i o n

Images are never perceived by a viewer in isolation; rather, they are practically always seen in a context. This manifests itself in various forms, whether it is the recipient's socio-culturally conditioned bank of experiences, or the short-term conditioning by visual impressions before an image is received, or the combination of individual images that are taken into view simultaneously – as when two posters are incidentally hanged next to each other on an advertisement board. It is evident that images interact with one another and this leads to a connection in the process of perception that generates meaning. Furthermore, it can reasonably be supposed that there are many patterns of interaction between images that alter the meaning of individual images in different ways. This study pursues the basic question of how a cohesion between two images can be recognized since such a connectedness can be understood as the fundamental condition for interaction. The focus of this examination involves which iconic/formal conditions for the perception of a connection between two images can be differentiated.

The study is based on findings about mechanisms of image connection in two disciplines: image studies, which concerns itself with the image as medium, and cognitive psychology, which focuses on the investigation of human processes of perception. In its method, the study is anchored in practice-led iconic research and, in a second step, gives an outlook on how the findings can be used as an originator of empirical research on perceptual processes.

An important instigator of the analytic approach to the question of configurations of images was provided by research in image theory whereby the image is considered not only in its singularity, but also in its multiplicity and plural configuration (Thürlemann 2013; Pratschke 2008). Felix Thürlemann and David Ganz edited the book *Das Bild im Plural* (The Image in Plural, Ganz Thürlemann 2010), in which various essays are published that consider artistic images in their multiple forms. Thürlemann describes "that the connection of multiple images possesses unique potentials of meaning that are not equivalent with those to which the image in the singular lays claim. As well, the meaning of complex configurations of images cannot be understood as the sum of the meaning of their constituents" (Thürlemann 2010, 8; translated here).

In the course of systematic art-historical examinations of recurring pictorial motifs, Aby Warburg assembled reproductions of artworks, advertisements, postage stamps, and press photographs in his *Mnemosyne Atlas*, in order thus to study the hidden connections of the images' motifs. He was interested in image models that can be observed from antiquity onward across different eras, and that repeatedly appear in new forms. The analytical potential of image configurations and image comparison is a central building block of the methodology of image theory that draws from art

history (Voll 1907; Wölflin 1915). The juxtaposition of images aims to arrive at a clear analysis of an image through certain formal parallels or differences. In art history, the method of "comparative seeing" (Bader Gaier Wolf 2010) describes the comparison of two images as a tool with the help of which the meaning of a single image can be recognized. Here, comparison serves the analysis of an image; the effects of this search for analogies or differences upon the juxtaposed images is not thematized.

The studies by Max Wertheimer, Wolfgang Köhler, and Kurt Koffka should be cited as early works in the field of perceptual research that founded gestalt theory at the beginning of the twentieth century and formulated various "gestalt laws." Gestalt laws follow the thesis that "the whole is more than the sum of its parts," and indicates that perception can be described as a process of joining individual parts into an experienced totality. According to this, individual lines, colors, and forms are not seen separately; instead, these are assembled into unified sense-generating entities and perceived as differentiated against a spatial context. "The consolidation occurs in such a way that the wholes that emerge are favored in some way against other conceivable arrangements, so that the simplest, most unified, . . . closed, . . . symmetrical, . . . similar structural wholes emerge" (Metzger 1954, 108ff; translated here). To prove their theory, which is based on experimental research, the gestalt psychologists compose simple visual forms that allow the viewer to experience the particular laws at a single glance. Some more recent works in the field of cognitive psychology consider pairs of images under the aspect of visual metaphor. Bipin Indurkhya and Amitash Ojha examine the influence of similarities between photographs on the possibility to connect two images into a whole metaphorically (Indurkhya Ojha 2013). The work of Teresa-Maria Hloucal observes the influence of emotionally charged image material on pictures of forests and fields presented later. With this work, she demonstrates a temporally displaced potential influence between images (Hloucal 2010).

2 .   M e t h o d   o f   P r a c t i c e - l e d
I c o n i c   R e s e a r c h

Starting from the theory of gestalt psychology, Rudolf Arnheim developed it further and used it as a method and an explanatory model for his work in the field of art research. Likely his most significant work, *Art and Visual Perception*, expresses criticism of contemporary perceptual habits. Arnheim observes a considerable impairment of human visual faculties and advises us to understand things with our senses again and to take in the world by means of the eyes: "The inborn capacity to understand through the eyes has been put to sleep and must be reawakened. This is best accomplished

by handling pencils, brushes, chisels, and perhaps cameras" (Arnheim 1974, 1). With this statement, Arnheim can be understood as a pioneer of practical image studies, in which the approach of 'practice-led iconic research' (Renner 2010) can be located. The method devised by Michael Renner assumes that through the production of images, knowledge about this medium can be gained that is not achievable through language. The contribution presented here employs the method of image production as an "acquisition of knowledge about images through their genesis." The design process shows that the genesis of an image is marked by a constant alternation between reflection in the area of conscious thought and design actions beyond what can be consciously controlled. Pre-conscious knowledge guides action and simultaneously enables, as the result of this action, an insight that can, in turn, be verbalized and analyzed explicitly (Brandes Erlhoff Schemmann 2009, 88 ff; Grave Schubbach 2012). This interaction makes it possible, in the course of producing an image, to arrive at insights that are not possible on a purely theoretical level, in verbal discourse.

The method of 'practice-led iconic research' contains different phases of analysis. The formulation of a definite and precise question describes the starting point of the research. Following that, different images, where the formulated question is addressed, are generated. From these images, the one that offers the best-required qualifications to analyze the research-problem, is then selected to take the analysis further. One image parameter after the other is extracted to be evaluated regarding its influence on the meaning of the image and the research question. As a consequence, a large number of images are made that differ in only one precise influencing variable at a time such as angle, size, perspective, stroke-thickness, color-shade, etc. while keeping the rest of the image constant. The differences need to be precise, clearly discernable and the change of one parameter has to increase or decrease gradually. The aesthetic qualities of the images are not relevant in this setting: the single image functions as an object of investigation and is regarded according to its potential to show a certain image property. The production of images is one of the three fundamental phases of the process. Arranging the produced artifacts in different sequences is the second elemental part of the procedure. For this practice, it is inevitable that the images are physically existent (printed out individually) and that they can be seen simultaneously. Ordering, categorizing the images through differentiating groupings in which the analyzed factor increases or decreases, changing the sequence, rearranging the images according to another aspect is the crucial phase of the process because it allows different, hidden image properties to become visible. The third part of the method is the comparison of the images. The act of relating the images in the series allows detecting what effect a defined parameter has on the meaning of the image. The process of image production is often an act that is done by the researcher alone. Arranging, comparing, and questioning the images,

however, is made in cooperation with other experts. Shared discussions and contemplations of image-series allow developing a precise and accurate judgment about relevant images-parameters and their influence on the meaning of an image.

In this process, the designer is the researcher and the first subject that perceives and evaluates the images at the same time. In different ways, this can be challenging. Although the aspect of subjectivity remains, the essence of the method must be found in the images themselves. The answer to the research question lies in the comparison of the produced images that allows every onlooker to question him or herself and to decide, whether he or she agrees with the author's argument or not. The experiments can be evaluated by everyone and the insights of the analysis can move swiftly from the author's personal experience to a knowledge shared by others.

3. Experimental Setup and Production of Image Material

As an initial setting in the present study, two images were repeatedly placed side by side. Each time, two reduced line drawings bounded by a square frame (10 x 10 cm) were placed on an A4 sheet of paper. All the lines of the drawings have the same thickness of 0.3 pt, the frame 0.25 pt. The image on the left shows a drawing of a dandelion that is visibly in the seed stage; on the right, the image varies. The image on the left is kept constant to be able to make the changes in the conditions of connection observable in comparison with other pairs of images. The depiction of a dandelion was chosen because of its mostly neutral connotation but apart from this plays no essential role for the thesis of this study; a picture of another object could lead to the same conclusions or ones that take these further. The use of forms drawn with the computer enables, on the one hand, to form the pictures in a constant way and, on the other hand, to be able to vary specific aspects intentionally. As was shown in a previous analysis on image interaction (Reymond 2013), the use of photographic images makes it difficult to analyze specific parameters of image relationships because of the uncontrollable amount of influences like narrative, emotional reaction to subject and color, personal connotation, etc. It is also complicated to depict inexistent objects or to vary distinct aspects of one artifact. For that reason, it was attempted to create an as neutral image as possible that still has a recognizable meaning but to exclude confounding variables like color, texture, shade, spatiality, surface, and background. Against this backdrop, the present analysis concerning the premises for a connection between two images examines five specific characteristics of the line drawing on the right and asks, for which

pair of images it is possible to recognize the form in the square on the right as a continuation of the drawing on the left. In which pairs of images can the lines of the image on the right be seen as a stem form and thus, can a connection between the two images be perceived? The following, practical analyses of the pictures show five series of tests concerning possible prem-ises of connection. The series are built on one another in the sense that the findings gained from the preceding examinations are included in the new series and are established as a new constant. The analysis was conducted using the three phases of 'practice-led iconic research,' image production, categorization, and comparison, as described above.

Although knowing that the interpretation of an image is influ-enced by several aspects regarding the viewer (his/her age, education, cognitive ability, emotional state, etc.), the context in which the image is seen, and the purpose of the image itself (is it a decorative element, a sci-entific visualization, or does it have to provoke action?) the aim of the study is to exclude those facets and to look at pictorial mechanisms on a very basic level. According to that, the research presented is examining elemen-tary representation factors that encourage a connection between images. Five formal image characteristics like line thickness, line characteristic or orientation of the image where chosen to be shown in this exploration. The last experiment on 'Botanical Correctness' can be seen as an exception to that focus. For reasons of length, neither all the analyzed parameters nor all the image pairs of a series have been shown here. Those pairs are shown in which the formal examinations can be seen most clearly.

4. Connections Between Images

A review of the state of research shows that patterns of interaction between images (and between individual elements within images) can be recognized. Upon closer observation, it is possible to assign these to various categories of connection between images. In the following, to exemplify the great diversity of types of connection, three fundamental ones are demonstrated.

4.1 Connection by Formal Similarity

The clearest and most intuitive level of connection is given through a formal analogy in the image pair. Are there vectors of form or movement that can be recognized in both pictures? The intuitive search for similarities or dif-ferences between pictures involves a process of seeing and comparing, as can also be found in the art-historical method of picture comparison (Bader Gaier Falk 2010). The unprompted search for correspondences during the viewing of two neighboring images allows it to be inferred that the process of comparison is a spontaneous course of action in the recipient. Even if the semantic statements of the two objects do not relate, there exists a visual connection between the images. This purely formal congruence of the two

Figure 1
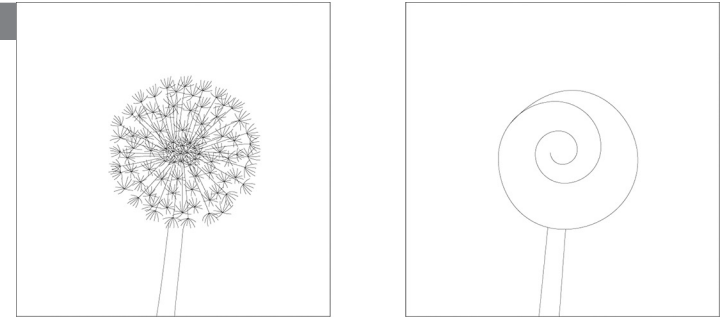
Figure 2
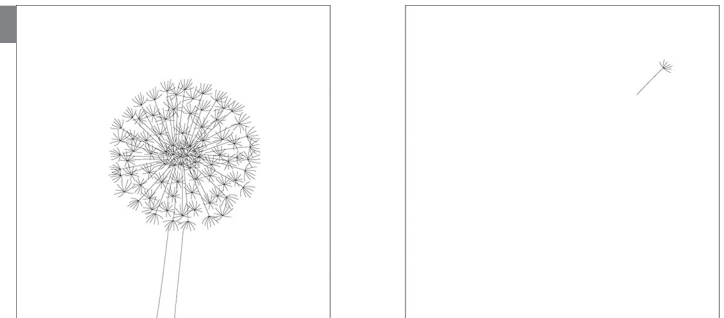
depicted objects can effect a blending of the meanings of the individual images. Such a shift is expressed, for example, in the form of the viewer's wondering how a furry/hairy sweetness feels on the tongue (Figure 1).

4.2 Linkage by Narration

Another possibility for assigning meaning to a connection between images can be summarized with the term "narration." This includes image configura-tions that imply a before/after situation or function through the construc-tion of a story. In the example presented here, the viewer is prompted to imagine two temporally successive situations (Figure 2). The picture on the right suggests, by depicting a single seed, that it has separated from the plant on the left and is being carried away by the wind. The two pictures show two semantically related objects in a temporal relation.

4.3 Semantic Connection

Along with the formal similarity of the depicted objects, a connection between two images can also arise if the objects that can be seen in them belong to the same family of significance. The alignment of a formal cor-respondence does not succeed, and the viewer is obliged to build another bridge between the images. In contrast to the purely formal structure of connection suggested above (Figure 1), a linkage through the meaning of the image uses the construction of mental models (Wenninger 2001, 49) in

Figure 3
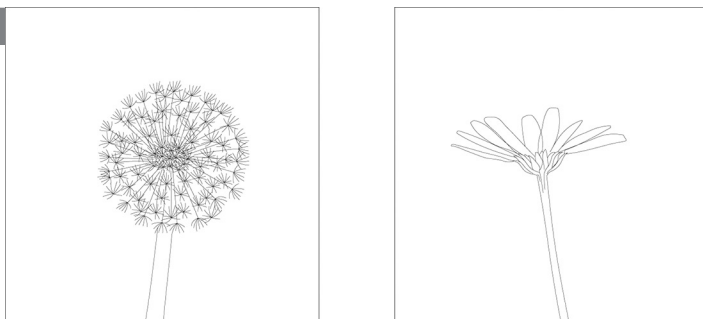
order to be able to recognize a shared context of meaning between the depicted objects (Figure 3). As could be observed in an earlier study on typologies of image connection, such possibilities of connection are only activated if those located on a purely formal level do not succeed (Reymond 2013).

5. A Differentiation of Formal Preconditions Conducive to a Connection Between Images

As was illustrated in several examples, the possibilities for linkage between images are many. But the fundamental question remains open as to what the pictorial conditions must be so that such a connection becomes perceivable for the viewer. As was previously stated, many studies in the field of image theory and the cognitive sciences concern themselves with various forms of linkage between images. Among them, similarity is regarded as an important factor in connection. But it remains largely unspecified which aspects of analogy are responsible for a linkage. This contribution places the focus on an examination of formal possibilities of connection through image practice, and pursues the question, "which formal premises for a connection between two images can be differentiated?"

5.1 Orientation

The examination on the premises of connections between images begins with the fundamental question of the role of the orientation of the drawing within the picture format. Does the orientation and position within the frame of the form on the right play a role, or is this aspect irrelevant for the possibilities of a connection between the images?

Figures 4, 5, and 6 show, in the image on the right, different orientations and positions of two parallel lines within a frame. In Figure 5, the 45° orientation of the lines largely disallows a connection to be made with the drawing of the plant. Instead, the diagonal lines merge with the lines of the frame, and together they form an abstract, geometric form that has no similarity with the plant image. With a horizontal orientation of the drawing on the right, as in Figure 4, the two images likewise remain unconnected. The vertical orientation of the parallel lines in Figure 6 most readily enable

Figure 4
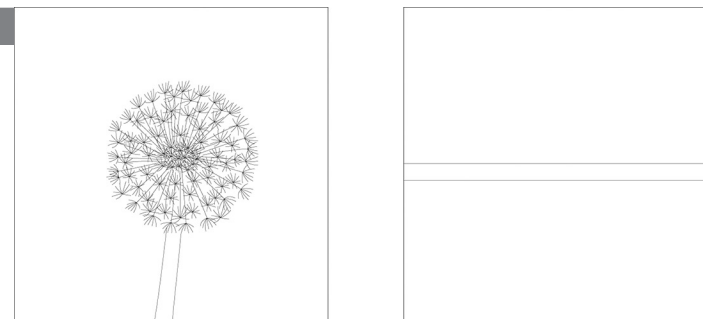
Figure 5
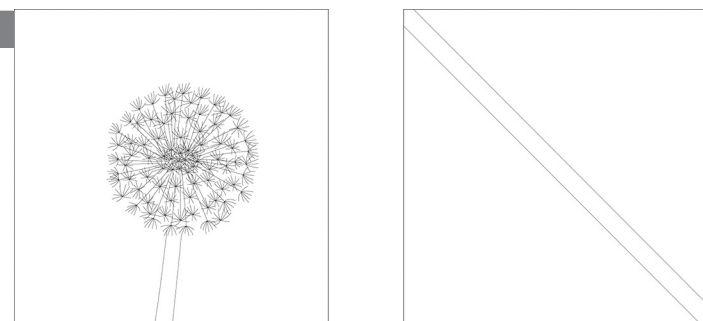
Figure 6
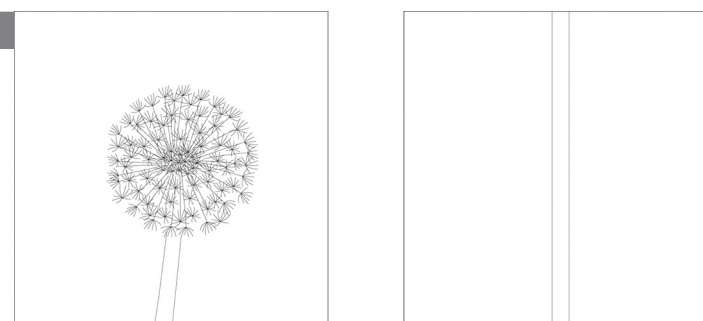
a connection in the form of a stem-like extension of the plant, but here, too, the symmetry of the square stands in the way of a clear connection.

Building on the assumption that the analogy of vectors of movement within the two images plays a role, image pairs were created that show a similar direction of forms. Two of them, Figures 7 and 8, in comparison to Figure 6, reflect the relevance of a similar orientation of objects within the images. If the vectors of movement of the two drawings are identical, this significantly increases the capacity for connection between the two images. Whether the two parallel lines in the image on the right appear at the same location as the dandelion stem in the image on the left plays a subordinate role. These findings go along with the concept of SOA (Symmetric Object
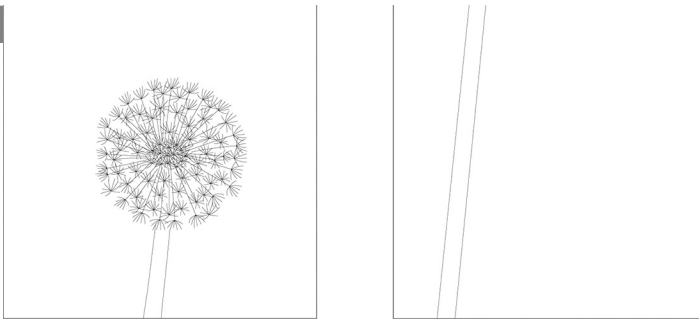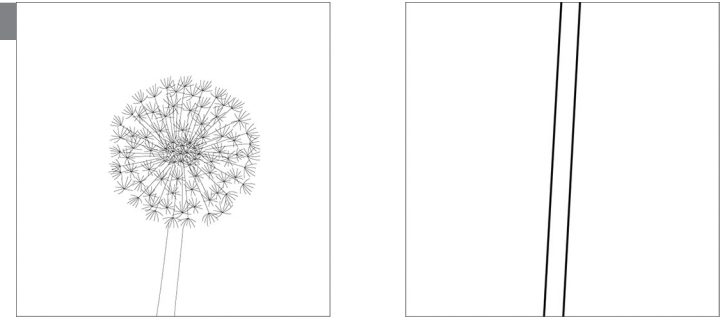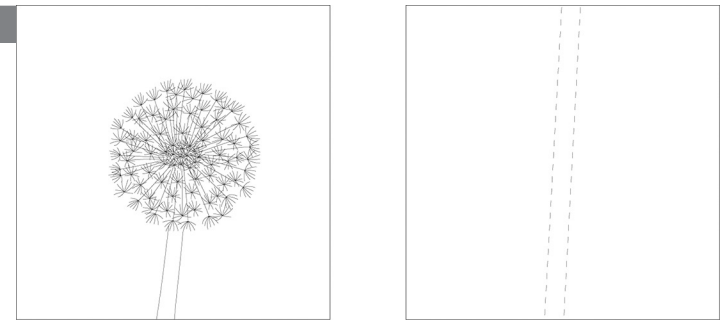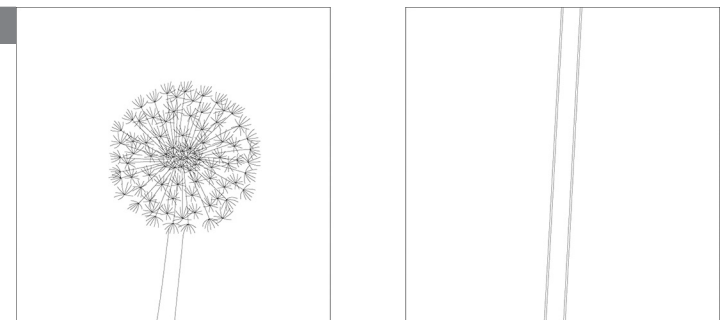
Figure 7

Figure 8

Alignment) (Schilperoord 2009), that describes the similarity of image vectors to be the basis of metaphorical connections between two objects within an image.

In observing this series of image pairs, it becomes clear that a similar orientation of the objects in the images is conducive to a connection. A contrary or distinctly different orientation significantly impedes a connection. This is of interest insofar as the distance between the two lines in the image on the right remains identical to the space between the lines in the image on the left and that's why the form on the right can readily be interpreted as a section of the dandelion stem. A fundamental analogy of the forms can be recognized – even with an orientation of the objects that does not correspond (Figure 6). The more exact the congruence of the orientation, the clearer the connection.

5.2 L i n e

The examinations of a line aim to examine the prerequisites for connection between images that can be attributed to the characteristics of a line. Under examination are the quality of the line and change in the line trajectory.

5.2.1 Line Quality

The series on the character of lines observes the effect of different types of lines under the aspect of possibilities for connection between the two

Figure 9

Figure 10

Figure 11

images. Under examination are point strength, regular interruptions, and doubling of the line.

The lines of the form on the right in Figure 9 cannot be made to resonate with the image on the left side. The difference of 0.9 pt line thickness is too dominant and gives the two lines an otherness that is too great for a connection between the drawings to be recognized. The attempt to make the line even thinner than 0.1 pt yielded no results worth mentioning. The regular interruption in the lines on the right side led, as with Figure 10, to a decreased connectability of the two pictures. It therefore could be reasonably supposed that a doubling of the line would also impede correspondence between the pictures. As Figure 11 shows, however, this is not the case. In precise terms, it can be asserted that it is not the manner of line or
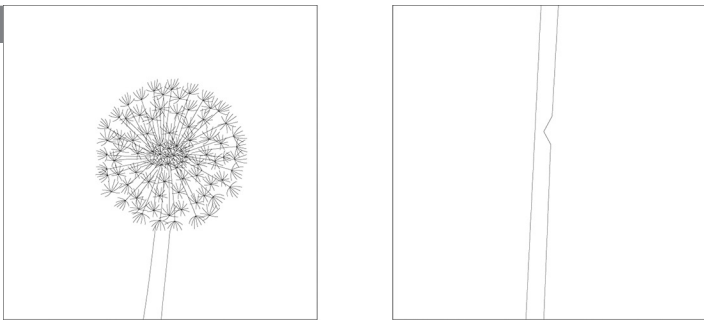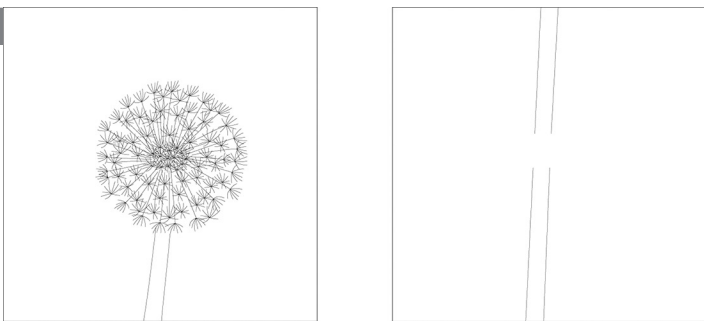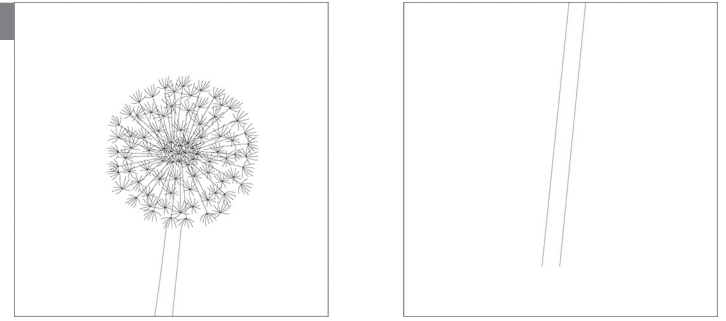
Figure 12
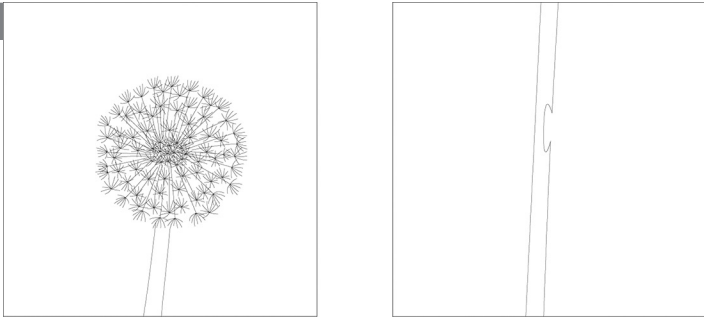
Figure 13
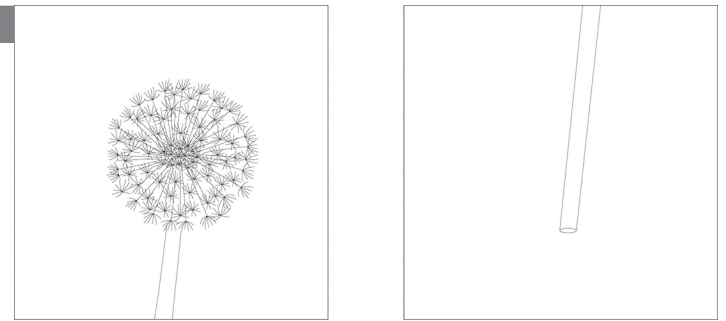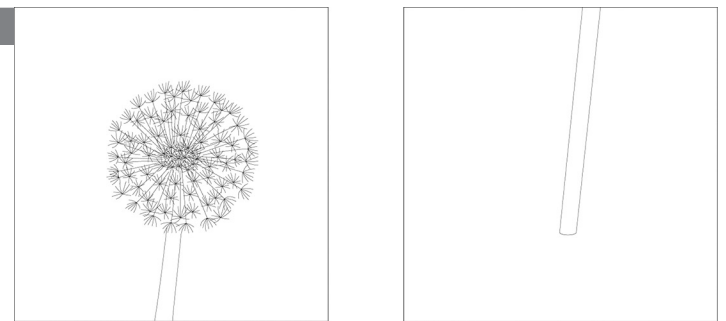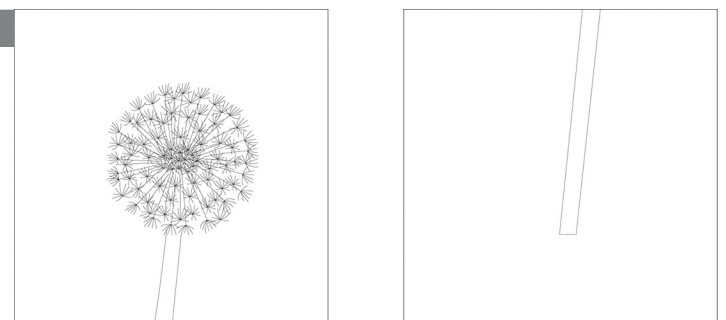

Figure 14

Figure 15

Figure 16

Figure 17

Figure 18

its thickness that plays the essential role; rather, the grey scale value of the line in the image on the right must agree with that in the image on the left. It is interesting to note that the corresponding orientation and also an equal distance between the two lines that ought to be able to suggest a section of the plant stem cannot make up for an incoherence in the grey-scale value.

5.2.2 Changes and Interruptions in the Lines

In the next step, the orientation, the line width, and the identical distance between the two lines are kept constant and the stem-like form the image on the right is examined further. The series observes various disruptions in the stem form in the image on the right (Figures 12, 13, and 14).

In the examination of these pairs of images, it becomes obvious that an "unnatural" indentation or even interruption of the stem form is largely tolerated and does not significantly impair the perception of the stem. A more interesting aspect reveals itself: if the form on the right side can be clearly recognized as a stem form and if it otherwise agrees (for example in orientation, line width) with the image on the left, then non-corresponding and unnatural line trajectories within the form are tolerated or even overlooked in order to be able to perceive a signifying whole in the neighboring images.

In assessing these examinations, it becomes clear that with respect to the character of the drawing line, the tolerance for a different grey-scale value is quite low; but this is not the case when the two lines that suggest a plant stem display an unnatural interruption that occurs only once.

5.3 Termination of the Form Inside the Frame

The following series observes different situations in which the two lines in the image on the right end inside the frame.

Figure 15 presents the situation in which the two parallel lines end in the lower third of the frame without a visible termination. In Figures 16, 17, and 18, the lines end differently in each case. In these four termina-tions of form, differences in perception are revealed that are relevant in the process of a linkage of images. In that Figures 16 and 17 involve a curved termination and thereby suggest a three-dimensionality of the form, they can be categorized as a continuation of the plant in the picture on the left. Noteworthy differences arise in the comparison between Figures 15 and 18: the form that is terminated with a straight line at the bottom prevents the recognition of a three-dimensional form, whereas the form that is left open allows the possibility for such an interpretation to remain open in the space. From these observations, two tendencies may be noted: on the one hand, it is significant for the connection between the two images being examined here that the illusion of spatiality remains intact. On the other hand, it can be observed that an undefined end of the form leaves the perception of three-dimensionality open, which the rectilinear termination, as can be seen in Figure 18, prevents.

5.4 The Lower and Upper Part of the Form

In order to continue to investigate the aspect of form tolerance, in the fol-lowing image series attention is devoted to the places in the picture on the right where the form is bounded by the frame.

While the Figures shown above (series 4.3) suggest the termination of the form on the right within the format, in Figure 19 the lower termina-tion of the form is directed out of the format and is taken in an unrealistic direction. Here, again, the tolerance of a signifying connection is observable. In the above experiments, it became evident that the illusion of a spatiality must be preserved and that this can also be recognized when the form has no termination and thus remains in the realm of the possible. With the ex-
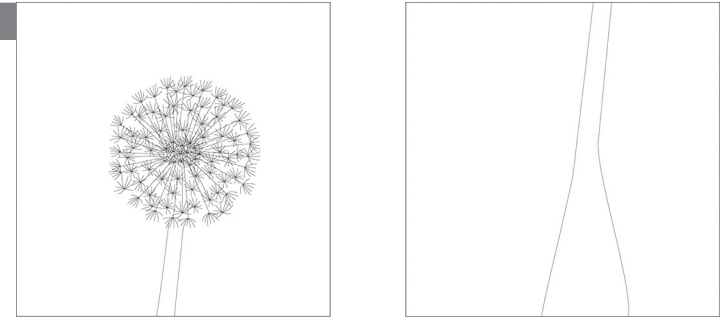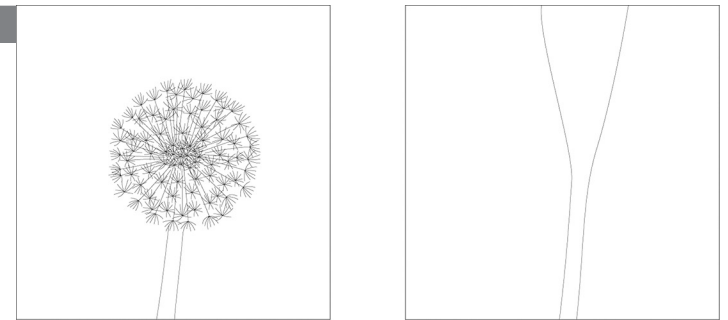
Figure 19

Figure 20

aminations of series 4.4, an initial assumption can, therefore, be that the low-er termination of the form plays no relevant role, provided that it remains in the realm of the ambivalent and suggests a spatiality. Accordingly, in Figure 19 it is highly conceivable that the lower part of the plant in the image on the left displays a widening of the stem.

The situation is totally different when the widening is located in the upper part of the form. Figure 20 shows the same right-hand form as Figure 19, except rotated 180°. In an instant, the possibility of a connection between the two images is extinguished: the recognition of a continuation of the plant underneath is not possible. If unification by means of a similar quality of the form in the upper area of the image is possible, the result is a perceivable shared context between the images (Figure 19). If the right-hand form ends distinctly wider than the beginning of the left-hand image, a linkage is prevented (Figure 20).

5.5 Botanical Correctness

Following on the results of the previous examinations, the experiments were now taken in another direction. If the previous analyses remained in the realm of the formal, the question is now raised as to how the insights thus acquired affect the realm of the botanically correct. As was previously recognized, simple formal aspects such as orientation, the perception of three-dimensionality, and the grey-scale value of lines play a fundamental role in the perception of a connection between images, in this case, two line
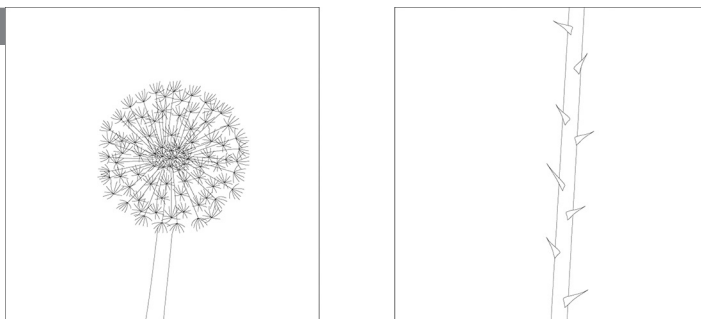
Figure 21

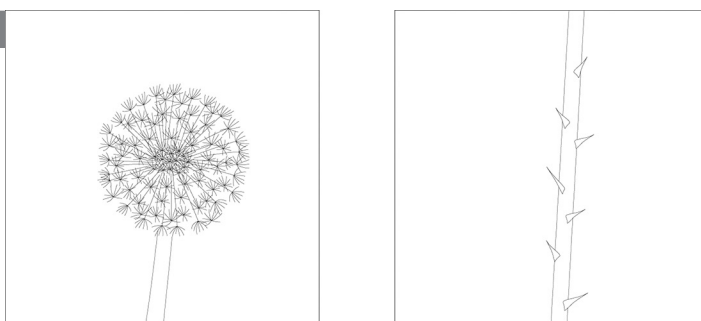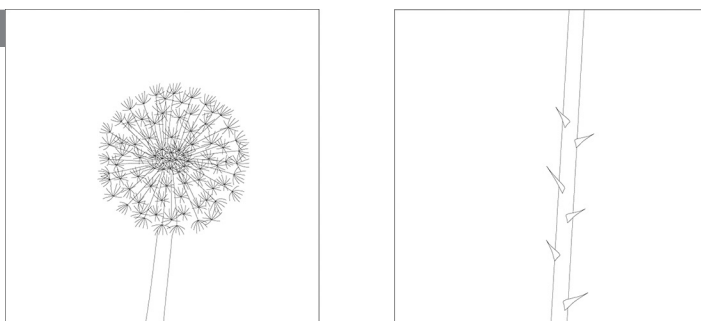**Figure 22**

Figure 23

Figure 24

Figure 25

drawings. But how do these aspects behave when the connection extends beyond the purely formal and touches on a factor of content? In other words, how do formal aspects behave with respect to botanical aspects? In order to be able to observe this, situations were created that make use of the formal premises that had been ascertained but simultaneously suggest a botanically incorrect situation.

Figure 21 shows, on the right side, a thorny section of the stem. The drawing makes use of all previously determined specifications that seem necessary to be conducive to a connection between images. The line thickness of the images is identical; the orientation of the stem form corresponds; the illusion of a three-dimensionality can be recognized in a comparable
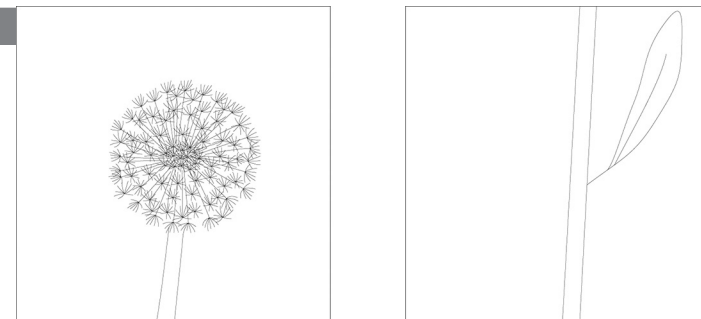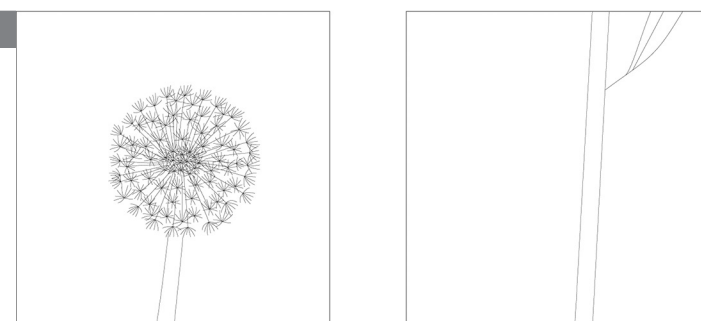
way in both images. Only the knowledge that a dandelion does not have thorns speaks against a connection between the images. The two drawings of Figure 21 nevertheless suggest a connection, and the assumption is possible that both drawings are part of the same plant.

Figures 22 and 23 observe this aspect further by moving the initiation of thorns further toward the bottom. The lower down it goes, the more easily a perceivable connection between the two pictures seems to be achieved. It becomes clear yet again how important the termination at the top of the drawing on the right is. If it is formally coherent with the stem form of the dandelion in the drawing on the left, an agreement between the two images can be perceived – even if this is not possible from a botanical point of view.

Figure 24 observes this matter from another perspective using a plant form that is unnatural for a dandelion. Here, the same phenomenon can be recognized as also became visible in the previous examinations with the thorny stem: if the upper end of the form is correct and consistent with the lower end of the dandelion drawing, a connection can be recognized. Unlike with the thorns on the stem of the experiment above, the stem in Figure 25 is only different through the slender attachment of a leaf. The connectability thereby seems even easier. Here, the fact that the leaf that is cut off by the format does not appear in the image on the left – and therefore a seamless transition is not possible – does not seem disruptive. Instead, a section that is not visible between the two images is assumed.

6 .   Q u a l i f i c a t i o n s

The present study enables a first impression into inter-image processes and shows differentiable conditions that enable mechanisms of connection between images, knowing that only a small number of image parameters have been observed here. Additional iconic characteristics were considered in the frame of the study – for example, the distance between the lines in the picture on the right, also the parallelism of the two lines or the flatness and three-dimensionality of the depiction – which however were not illustrated here. The present observations allow inferences to be made that go beyond the scope here, for instance, what an important influence color could have on possible connections between images. During the study, new questions likewise became visible: for example, whether the premises under examination here are valid for all types of connection. If one assumes differentiable mechanisms of image linking as are sketched in section 4, the question is raised as to which prerequisites a connection requires that arises because of a mental construct. It can be supposed that the presence of formal analogies likely prevent a connection by a mental construct since this subliminal connection possibility inhibits a cognitively more demanding action.

The present study involves an artificially created situation that explicitly seeks, or even forces, a connection between the images that would not be encountered in this way in reality. Most often, images that coincidentally appear side by side differ from one another in many respects. Image technology, image structure, coloration, etc., frequently show no analogy whatsoever. And nevertheless, surprising connections repeatedly arise due to simple, formal iconic factors. Therefore, this examination creates a frame to make iconic mechanisms visible on an iconic level, which, in an applied situation – such as two pictures appearing in a two-page spread of a textbook or in browser windows that are open simultaneously – and therefore, a much more complex composition, cannot be discovered. The strength and the influence of combined aspects of images upon the mutual influence of image meaning becomes observable in an artificial constellation in which the mechanisms are changed individually and can be compared.

It must be said in qualification that in an experimental setting, where the images (here, the simple line drawings) present the translation of a real object into an illustration, formal pictorial characteristics can appear more dominant than botanical correctness. In such a context it is conceivable that visually recognizable aspects of the image are weighted more strongly than those that elicit a cognitive processing action. Priming also plays a role. If, in the study, the question is repeatedly raised as to whether a part of the dandelion or a stem-like form can be recognized in the picture on the right, it becomes easier to see it this way over time.

7 .   E y e - T r a c k i n g   S t u d y

The study in iconic practice that is presented here has an explorative character, which searches for fundamental mechanisms of connection between images and analyzes them using the methodology of 'practice-led iconic research.' By means of this approach, image phenomena are discovered that are generally not yet verbally graspable. Building on the insights of the practical examinations, hypotheses can be formulated as a starting point for further research.

The subjectivity of the observations in the context of practice-led iconic examinations remains an important factor that is subject to controversial discussion. In a situation in which the pictorial experiments are analyzed by the person performing the study, the question about subjectivity remains and cannot be excluded. The present practical study makes no claim to objectivity, but rather encourages the viewer to test the presented pictorial mechanisms on him or herself, to experience and question them in a similar way as can be practiced when looking at the "gestalt laws" formulated by Max Wertheimer and his colleagues (see above).

An objectivization of the results of the practice-led iconic analysis can be attempted through empirical study with test subjects. Based on the results of the presented practice-led work, different hypotheses could be posited for a consequential study, of which an outline is presented here as an example: "If an analogy of directional vectors exists between the images, a connection between the images becomes visible" (H1) and "The upper end of the target image has to match with the corresponding part of the initial image to make a linkage between the images perceivable" (H2) can be described as two different hypotheses. In a pre-test using eye-tracking, 12 test subjects – 6 experts (students at the FHNW Academy of Art and Design) and 6 novices (students at the Department of Psychology, University of Basel) were shown a selection of the image pairs shown above. The description of the study was adapted to the context of this article and does not follow the guidelines that are standard in psychological publications. It is meant as an outlook on how empirical study could be done based on the practical results. With a sample size of 12 subjects, no statistically significant results are expected, and the collected data was therefore descriptively examined.

7.1 Procedure of the Pilot Survey

The test subjects were asked to sit in front of the test monitor in the laboratory.[1] After a process of validation and calibration, a greeting text on the screen informed the participants about the task and procedure of the study. Each of the stimuli consisted of a pair of images shown above with which

1   These analyses were done in the eye tracking laboratory in the Department of Cognitive Psychology, University of Basel.

Figure 26

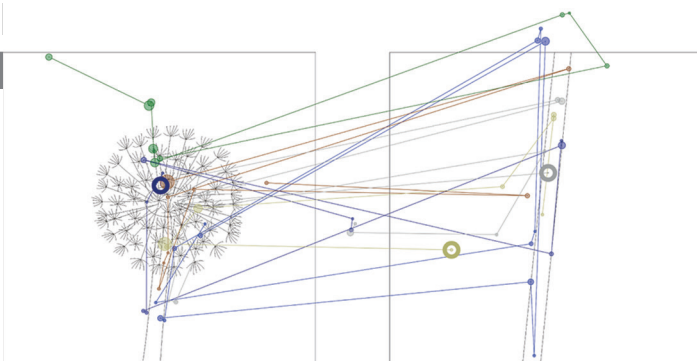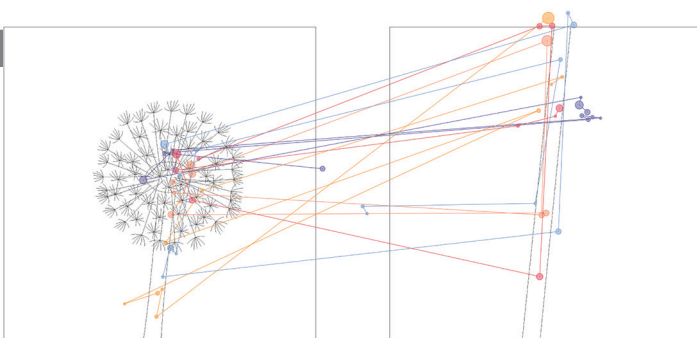saccade recording in response to a stimulus on hypothesis H1, novice group.

Figure 27

saccade recording in response to a stimulus on hypothesis H1, expert group.

the test subjects were individually presented, at random, for 5 seconds. After each viewing, the subjects were asked to state on a binary scale (yes/no) whether they perceived the two drawings as part of a single image or not. After the question was answered, the next stimulus appeared.

7.2 Results of the Eye-Tracking Pre-Study

The eye movements when looking at the stimuli for testing the analogy of directional vectors (H1) depicts that the test subjects particularly scrutinized the orientation of the form in the image on the right to make the decision as to whether the two images could be considered to belong together or not. (see *Figures* 26 and 27).

The fixations on the stimulus for the testing of correspondence of the upper end (H2) show that the test subjects particularly scrutinized the area at the upper edge of the picture where the form is cut off by the frame. Here, the data from both groups (novices and experts) are represented together (Figure 28).

Visual similarities are processed at an early stage of perception before the test subjects become aware of them. These perceived similarities are lost in the course of further processing or are submerged under conceptual associations. However, the early stages of processing influence

Figure 28

fixation on a stimulus for the testing of the hypothesis on the upper end (H2).

eye movements, which the acquisition of eye-tracking data for the study of these processes confirms (Handerson & Hollingworth, 1999; Indurkhya & Ojha, 2013). The recording of eye movements enables the acquisition of visually simply accessible data and its transference into quantitative data. An examination of the descriptive data shown here assists the supposition of the rightness of both hypotheses. A statistical evaluation of the values was not carried out on the pre-test.

The question of whether the test subjects feel that the image pairs belong together could also be tested by means of a questionnaire. But analysis through eye tracking additionally enables the acquisition of data about specific areas of scrutiny within the images and the placing of these in connection with the connectability of the two images that the participants perceived.[2]

8. Conclusion

In the preceding practice-led study, it was asked whether formal preconditions for a connection between images can be differentiated. This question can be answered clearly in the affirmative, and first premises can be presented by category. Similarity is an important factor with respect to a perceivable connection between images: similar vectors of movement within the images are an essential conducive factor; as well, identical grey-scale values of the lines and the ability to perceive the same spatiality in the two images are of significance for a connection. The elements of linkage are simple, basic image characteristics, and they generate a powerful connection between two separate images through similarity. Formal mechanisms of connection by means of similarity were already observed by Rudolf Arnheim: "Any aspect of percepts – shape, brightness, color, spatial location, movement, etc. – can cause grouping by similarity. A general principle to be kept in mind is that although all things are different in some respects and similar in others, comparisons make sense only when they proceed from a common base. . . . Comparisons, connections, and separations will not be made between

2   An exhaustive description of the setting and the results is not provided within the scope of this publication as the pre-test is meant to illustrate a possible continuation of the practical study but has not yet been constructed as an empirical study jet.

unrelated things, but only when the setup as a whole suggests a sufficient basis (Arnheim 1974, 79). Expanding upon Arnheim's fundamental observations, the present study demonstrates that formal similarities operate not only within single images, but also beyond their boundaries, inducing a connection between elements of neighboring images. If, in his experiments, Arnheim was able to prove that a similar orientation or analogous form groups objects within an image, in this present study a further effect of analogy becomes evident: not only is it able to bring different objects in different pictures into mutual connection; the grouping because of a similarity also has an effect on the meaning of the picture. Formal correspondence can have the result that one image connects with another, neighboring or remembered image, and by means of this linkage a different meaning is ascribed to the images. Two different processes may be distinguished: on a purely visual level, a connection between the images is made on account of similarities. Once such a connection exists, the second process begins, building on the first: the change of the image's meaning. This mechanism is particularly conspicuous if the first image has an undefinable or ambiguous statement. The forms on the right side of the first three test series (4.1-4.4) – two parallel lines – are open and only receive a clear attribution through the connection to the image on the left. The ambivalence of the right-hand image is resolved through the connection to the left-hand image. In the last test series on botanical correctness (4.5), another aspect becomes evident: here, if there is a correspondence of formal aspects – the orientation of the form within the format or the line strength of the two drawings is identical – a connection between the images becomes perceptible. Although the viewer knows from experience that a dandelion does not have thorns, it is possible for him or her to recognize the two drawings as different sections of the same plant. Here, it becomes demonstrable that, on account of formal analogies, natural laws can be "overlooked" and "erased." An ambivalence between knowledge and perception is provoked. Pictorial characteristics such as line strength or vectors of movement within the images are indeed very simple, but they have the power to upstage botanical laws and assign a new meaning to an image that fits the formal circumstances. A connection between pictures can thus easily be generated through the similarity of specific iconic elements. Once a linkage exists, a change in an image's meaning becomes possible. If the idea is taken further that a connection between two images is possible by simple means and that, through linkage, a change in a picture's meaning can be achieved, it becomes evident how easily an ambivalent image can be manipulated in its meaning, and what influence is thereby granted to line strength and the vectors of movement within the image.

In Figures 19 and 20, another mechanism of perception can be observed. While it is easily possible to perceive the two images in Figure 19 as a whole, this is not the case in the connection between the images in

Figure 20. Why not? The theory of embodiment, which was developed by Mark Johnson and George Lakoff, offers an explanation here: "An embodied view of meaning looks for the origins and structures of meaning in the organic activities of embodied creatures in interaction with their changing environments. It sees meaning and all our higher functioning as growing out of and shaped by our abilities to perceive things, manipulate objects, move our bodies in space, and evaluate our situation." (Johnson 2007, 11ff). Accordingly, the human capacity to recognize meaning in the environment is located deep in a person's own bodily experience with the surrounding world. The orientation of the human body in space leads to a fundamental understanding that growth is experienced as a process with a vertical elongation upward and that the head of an organism subject to this mechanism is located at the upper end. Building on this, it becomes understandable that the image on the left marks the upper termination of the two images and the one on the right marks the lower. Another item of knowledge anchored in a person's interaction with his or her own sphere of experience is that the upper termination of growing organisms, as a rule, become narrower at the top. So, to be able to interpret the form on the right as a stem, it cannot become wider toward the top, since it then would neither fit together with the lower termination of the image on the left, nor would it correspond with the natural organic laws of growth. However, it is strange that botanical correctness in series 4.5 is circumvented to enable an adequate connection, whereas in Figure 20, deeply rooted knowledge about fundamental natural forms and mechanisms makes it impossible to connect the two images into a whole. It is possible that here the difference between knowledge rooted in the body and knowledge that is cognitively learned is making itself shown: corporeal knowledge that is built through interaction with the environment and that suggests that growth must follow naturally conditioned laws is absolutely fundamental and unavoidable. However, the learned and more specific knowledge that a dandelion has no thorns can be ignored for the sake of a corresponding composition.

The methodology of 'practice-led iconic research' allows us to answer questions arising from an applied field but is also qualified for research on image perception in general. The study that was presented here is situated in the field of iconic research and was designed to approach the question of how images interact. The findings may be directly applicable to image production, but they primarily encourage designers to question how they place images in books, magazines, or in an exhibition context and to look at the effect those decisions have on the meaning of an image.

R e f e r e n c e s

Rudolf Arnheim, *Art and Visual Perception. A Psychology of the Creative Eye*, Berkeley 1974.

Lena Bader, Martin Gaier, Falk Wolf, (Ed.): *Vergleichendes Sehen*, München 2010.

Anique Bosschaert, Valentie en tekst-beeldcongruentie in kranten. Hoe de keuze voor, het begrip, de herinnering, de geloofwaardigheid en de waardering van krantenartikelen word beeinvloed, Amsterdam 2014.

Uta Brandes, Michael Erlhoff, Nadine Schemmann, Designtheorie und Designforschung, München 2009.

David Ganz, Felix Thürlemann (Ed.): Das Bild im Plural. Mehrteilige Bildformen zwischen Mittelalter und Gegenwart, Berlin 2010.

Stephanie Geise, Katharina Lobinger (Ed.) Visual Framing. Perspektiven und Herausforderungen der Visuellen Kommunikationsforschung, Köln 2013.

Johannes Grave, Arno Schubbach, Zug um Zug – Vergangenheit im Bild, in: Peter Geimer, Michael Hagner (ed.), Nachleben und Rekonstruktion. Vergangenheit im Bild, München 2012, S. 71 - 92.

John M. Handerson, Andrew Hollingworth, High-level scene perception, in: Anual Review of Psychology, 50, 1999, 243-271.

Hloucal, Teresa-Maria, Kontextabhängigkeit visueller Wahrnehmung: Der Einfluss der aktuellen Befindlichkeit auf die Wahrnehmung neutraler Stimuli in free-viewing-tasks; eine Eyetrackingstudie, Dissertation, Osnabrück 2010.

Bipin Indurkhya, Amitash Ojha, An Empirical Study on the Role of Perceptual Similarity in Visual Metaphors and Creativity, in: Metaphor and Symbol, 28:4, 2013, 233-253.

Mark Johnson, The Meaning oft he Body. Aesthetics of Human Understanding, Chicago 2007.

Wolfgang Metzger, Psychologie. Die Entwicklung ihrer Grundannahmen seit der Einführung des Experiments, Darmstadt 1954.

Margarete Pratschke, Bildanordnungen, in: Horst Bredekamp, Birgit Schneider, Vera Dünkel (ed.), Das Technische Bild. Kompendium zu einer Stilgeschichte technischer Bilder, Berlin 2008, S. 116 -119.

Michael Renner, Practice-led Iconic Research, in: *diid, disegno industriale industrial design* Rdesignpress, 41, 2010, S. 76 - 82.

Claire Reymond, Bild und Bild. Eine Untersuchung zwischenbildlicher Prozesse, in: Medienpädagogik. Zeitschrift für Theorie und Praxis der Medienbildung, Themenheft 23, 2013.

Lulu Rodriguez, Daniela V. Dimitrova, The levels of visual framing, in Journal of Visual Literacy, Volume 30, Number 1, 2011, 48 - 65.

Joost Schilperoord, Alfons Maes, Heleen Ferdinandusse, Perceptual and Conceptual Visual Rhetoric: The Case of Symmetric Object Alignment, in: Metaphor and Symbol 24, 2009.

Felix Thürlemann, Zur Einführung. Singular und Plural der Bilder. Mehrteilige Bildformen zwischen Mittelalter und Gegenwart, in: David Ganz, Felix Thürlemann (Ed.), Das Bild im Plural, Berlin 2010, S. 7- 38.

Felix Thürlemann, Mehr als ein Bild. Für eine Kunstgeschichte des hyperimage, München 2013.

Karl Voll, Vergleichende Gemäldestudien, München 1907.

Gerd Wenninger (Red.), Lexikon der Psychologie in fünf Bänden, Heidelberg/ Berlin 2001, Bd. 3, S. 49.

Heinrich Wölfflin, Kunstgeschichtliche Grundbegriffe. Das Problem der Stilentwicklung in der neuen Kunst, Basel/Stuttgart 1985.

A u t h o r

Claire Reymond graduated form the Basel School of Design in 2000 and worked thereafter as a designer at different agencies as well as a self-employed graphic designer in a design collective. From 2005 to 2010 she studied Psychology with a special focus on visual perception at the University of Basel and completed her studies with a Master's Degree in Visual Communication and Iconic Research at the FHNW Academy of Art and Design in 2012. Her Master's Thesis focused on the investigation of image-interaction processes applying the method of 'practice-led iconic research.' Claire Reymond currently works as a researcher on different research projects in the field of image perception at the Visual Communication Institute at the FHNW Academy of Art and Design as well as at the Faculty of Psychology at the University of Basel, where she writes her PhD on image-perception processes.

Making Things Visible:

Visual Strategies for the Representation of Objects in Collections

Michael Hübner

Design collections today collect cultural and aesthetic knowledge embodied in a vast number of objects. Except for exhibitions and collection visits one can only access the objects through reference systems, registries and catalogues. These forms of representation mostly rely on textual description and standardized photography. The hypothesis of this article is, that by this means only a very limited impression of objects of aesthetic value can be conveyed. But their significance arises precisely from the interplay of their formal appearance, materiality, proportions, function, use, context, and history. How to get an idea of, for example, the sensory qualities of a chair without being confronted with it on a physical level? This article presents a practice-led investigation on different visual strategies for representing objects and their effects on the perception of the latter. How and what kind of knowledge can be gained? Series of photographs as well as hand and digital drawings alternate with reflexive observation thus formulating diverse findings and opening up further perspectives not only for the practice of object collection.

1 . I n t r o d u c t i o n

Collections of objects manifest the intellectual cultures of our society. They are bases for research and societal discourse. In addition, collections of objects document artistic and cultural practices; thus they embody not only knowledge of the natural sciences but also of culture and aesthetics. Today, these collections are generally only partially accessible. On the one hand, a reason for this is often the large number of objects they contain. On the other hand, conservation measures may require exclusion of the public, for example, if the objects need to be protected from light, touch, or theft. Physical access is thus reserved for a small number of specialists. Such objects are only shown to a larger audience in exhibitions and publications.

Therefore, in working with objects in collections, registries and catalogues are used. These reference systems are based on abstract, linguistic classifications. Keywords and textual descriptions are intended to provide us with information about the objects. If images are used for the objects' representation, they are subject to the strict regulation of the textual structure and are rarely able to develop their own logic. In publication formats, pictorial language is likewise severely restricted and is based on standardized schemata.

Especially in the case of collections with an aesthetic focus, the systems of management and presentation that are standard today give meager indication of the sensory qualities of the individual objects. But the significance of design objects, for example, arises precisely from the interplay of their formal appearance, materiality, proportions, function, use, context, and history.

Until this time, there have been insufficient strategies to make objects and collections visually accessible in their various manifestations. It is argued here that certain characteristics of objects and their interaction are inadequately grasped in linguistic form or in standardized object photography; however, they can be reproduced through appropriate iconic strategies. Which representation methods are considered, and what information do they convey about the objects? This question could be asked from a general point of view. However the field of collection – especially of design objects – is chosen as a practical frame for this investigation as it displays the need for visual strategies and their advantages for practical application particularly well. This approach will be pursued in a practice-led examination.

2 . S t a t e o f t h e A r t

2.1 Systems of Reference and Representation in Collections and Museums

2.1.1 Digitalization

The ongoing development of information technologies has also significantly changed the daily operations of museums and collections. Whereas before digitalization, card catalogues and analog registries served to provide information and assist in the organization of collection objects, current practice relies on digital databases. The significance of digitalization for the accessibility of archives and collections is aptly described by the historian Peter Conway: "It is becoming increasingly clear that if information from analog sources is not readily available in digital form, it simply does not exist from the perspective of the vast majority of potential users."[1] As a specialist for the digitalization and conservation of archives, he is mainly talking about photographs and documents. However, his statement can be transferred to collections of objects. If an object is not adequately documented and the documentation is not available digitally, it cannot be considered in a scholarly context.

It is striking that digital applications, like their analogue precursors, are very strongly informed by categorization systems, classifications,[2] descriptive texts, and data. Images are integrated but have a marginal function. The possibility to enlarge the representation in an image exists in most systems, but one can rarely view multiple images simultaneously. In addition, there is often no provision for a comparative viewing of objects.

2.1.2 Photography of Objects in Museums and Collections

In his manual on the photography of objects, science historian Michael Markert describes very clearly how objects should be photographed. Statements such as "choose a high f-number (such as 5 or 8) so that the object as much as possible remains in sharp focus at a distance" or "pale objects=>black ground; dark objects=>white ground" allow one to infer the forms of representation that are felt to be ideal: avoidance of shadow, invariance of light effect and perspective, homogenous background, avoidance of reflections on objects, high light/dark contrast between background and object, sharpness of focus at a distance, similar image sizes when objects have different dimensions. Moreover, there are particular image typologies that determine the majority of object photographs: image of the object

1   Conway, Paul: "Digital transformations and the archival nature of surrogates." In: *Archival Science.* March 2015, Volume 15, Issue 1, Dordrecht 2014. P. 52.

2   Künstliche Begriffssysteme zur standardisierten Einordnung von Objekten. Siehe beispielsweise: Trachsler, Walter: Systematik kulturhistorischer Sachguter: eine Klassifikation nach Funktionsgruppen zum Gebrauch in Museen und Sammlungen, Bern / Stuttgart 1981.

extracted from the background without any shadow; image of the object with a homogenous, neutral background and casting a slight shadow; detail image. It is observable that the described image typologies are used for the representation of a large majority of collection objects, no matter what kind. Hence, while Markert is talking about objects for biology instruction, the aesthetic of representation associated with his remarks can likewise be found in the photography of objects from the fields of design and culture.

However, these guidelines greatly restrict the potential of visual representations. The attempt to represent objects in a unified manner is made at the expense of objects' individual qualities. The unique features and characteristics of a single object recede. Moreover, it should be asked in general whether the cited guidelines make sense. For example, shadow can be an effective means to make three-dimensional forms appreciable. Likewise, reflections on the surface of an object are quite revealing with respect to materiality and haptics. Another problem of representation is the communication of dimensions of scale. Since a collection often contains objects that differ quite pronouncedly in size, a small object is represented greatly enlarged and a large object, greatly reduced. However, size is an essential characteristic, and a visual communication of relationships of scale would be highly relevant. These initial assumptions are the starting point for the following examinations.

2.1.3 Publication Formats

The described marginal role of the image as opposed to the text is continued in publication formats. Today, these are mainly divided into printed and digital forms of publication. In online galleries of collections, the images and information presented are generally taken directly from collection databases. Even if only a selected portion of information is made accessible in this way, and the website presentation generally places more weight on representation in images, the mode of working with database systems and the standardized pictorial language nevertheless has a determining influence on most formats. In printed media, too, this aesthetic carries through, although here, often more attention is paid to the selection and juxtaposition of images. Nevertheless, a scholarly understanding prevails that textual information is clearly preferred and value is placed on a supposed "objectivity" of images.

2.2 The Need for Forms of Visual Representation and Interaction

If Conway's implicit claim to substitute the museum object by a medial representation is taken as the starting point, it becomes clear that only certain aspects of objects are reproduced through the systems and forms of representation that are common today. This is particularly apparent in the

case of collections with a focus on cultural history, design, or art. Aesthetic characteristics and qualities and their interactions, as are particularly crucial in these collections, are reflected in the objects' representation either minimally or not at all. This has the consequence that, with the means in use until now, only a restricted image of a collection object is accessible to scholars or to the public. Need for action is acutely evident here.

Design collections emerged alongside art collections; the two types have developed in tandem for a long time now and have become a focus of public attention. This brings with it the need to question current collection practice and to develop new strategies of visual representation for this field. For industrial design objects, it is also the case that they are often produced in series that are based on one design. Objects of a series are thus inflected not only by their individual characteristics, such as traces of use, but also by a concept that functions in an overarching way. The present examination, therefore, takes the field of the design object as its focus.

2.3 Aesthetic Objects and Their Perception

Especially with regard to aesthetic objects, descriptions in words can provide only inadequate access. Martin Seel describes them as follows: "Objects are aesthetic that in their manifestation differ more or less radically from their look, sound, or feel as can be determined in words. They are given to us through the senses in an exceptional way; they are grasped by us through the senses in an exceptional way."[3] He accurately describes how we are unable to verbalize certain characteristics. But Seel remains vague in the differentiation of aesthetic and non-aesthetic objects. Elsewhere he remarks that we "react aesthetically to everything that is somehow present to our senses – or else we don't."[4]

It is much more promising to look for this difference in the manner of perception: "To take something in, in its manifestation, for the sake of its manifestation – that is the burning point of aesthetic perception, to which each instance of its execution is directed, however else it may also proceed."[5] Hence, in an object's manifestation, more happens than language can convey since language always functions through a step of generalization. It is only thus that words can be determined that are universally understandable. This is why it is also so difficult to represent an individual object using language. Images, however, can reproduce an object very precisely and directly in its manifestation and can communicate exact information about it.

3   Seel, Martin: Äshetik des Erscheinens, Frankfurt a.M. 2003, p. 43 (translated here).

4   Ibid., p. 64.

5   Ibid., p. 49.

Findings from image theory and applied image studies show the untapped potential that images possess for the generation and communication of knowledge:[6] for example, with respect to sensory experiences, aesthetic qualities, and impressions of scale relationships or affinities of form.

2.4 Non-Photographic Representations

The potential of non-photographic representations becomes apparent when one examines methods of scientific representation before the nineteenth century. Before the idea of objectivity in science took hold, which remains in effect today, focus was placed on *creative* "fidelity to nature," as Peter Gallison writes: "Truth to nature was associated with a set of practices – practices involving massive artistic and scientific intervention by a natural philosopher whose genius vouchsafed the validity of the move to idealize and correct the unreliable appearances of the given." [7] If Gallison describes a collapse of the roles of scientist and artist in the natural philosopher, this was often a fruitful though at times also difficult collaboration between the two professions. [8] Omar Nasim in *Observing by Hand* discusses the process of familiarization:[9] an artist becomes familiar with an object By drawing it repeatedly. Repetition thereby also serves analysis, the reduction of errors in the representation. This approach is pursued in the following experiments. In some cases, this familiarization process also influences the forms of representation of the objects.

3. Questions

Through practice-led iconic research, the potential of images for the documentation and dissemination of objects in collections, particularly in the field of design, will be studied. The objective is to develop visual strategies of representation and to expose their effect with regard to the perception of objects. Which forms of representation prove to be successful with respect to which aspects of the object? Which design decisions seem to affect the object's manifestation in the image?

On a second level, the importance of representation strategies as epistemic practices will be discussed. The project attempts to show that by

6   On the logic of the image, see: Gottfried Boehm: *Wie Bilder Sinn erzeugen. Die Macht des Zeigens.* Berlin 2007; Martina Heßler, Dieter Mensch (eds.): *Logik des Bildlichen, Zur Kritik der ikonischen Vernunft,* Bielefeld 2009.

7   Gallison, Peter: "Judgment against Objectivity," in Jones, Caroline A.; Gallison, Peter (eds.): Picturing Science Producing Art. New York / London 1998. P. 329

8   Pamela H. Smith examines the relationship of drawer and scientist. Smith, Pamela H.: *The Body of the Artisan: Art and Experience in the Scientific Revolution,* Chicago: University of Chicago Press 2004.

9   Nasim, Omar: "Observing by Hand." In: *Rheinsprung 11 - Zeitschrift für Bildkritik,* Basel 2012. P.66 – 78.

representing an object, for example by drawing it, one gains knowledge of the object itself. Based on this hypothesis, potentials and possibilities for the practice of collection are discussed in the concluding section.

4. Practical Work

4.1 Method

Since the questions under investigation predominantly concern applied work that serves to represent objects with images in the context of a collection, it is logical to approach the subject through practice-led research. Successive image series of sample visualizations of objects are made and are compared with each other. Reflexive observation accompanies image production and is intertwined with it. Thus, later image series build upon the findings and impressions from earlier image experiments. In this way, practice is interwoven with theoretical reflection. A permeability of implicit and explicit knowledge is the goal with this method. The very nature of practical knowledge is its lack of describability. "we can know more than we can tell." writes the English-Hungarian philosopher Michael Polanyi in his work *The Tacit Dimension*[10]. To be able to build up a reflection based on the mutual influence of practical and theoretical knowledge requires a closeness between the person generating images and the one analyzing them, which can never be fully achieved. The practice-led research and the scrutinizing analysis are thereby carried out by the same person, the author of this contribution. Image viewing and inference thus coincide in this process and therefore are also not strictly separated in the text. A transferability of results can therefore not immediately be assumed; however, this approach provides a view into the design process, which distinguishes itself from an empirical approach to research by its closeness and motivation. Different and more detailed ideas can therefore be expected. To lend an example form Michael Polanyi: It is impossible to replace the practical knowledge of riding a bicycle by a theoretical understanding of the process[11]. Therefore a cyclist can very likely give a more authentic and detailed discussion of the influence of balance and body movement on course of the bicycle than a person just watching them.

The project was accompanied by a series of presentations and consultations were the different states of the experiments and findings were discussed with a qualified audience. The empirical investigation of the outcome can be the subject a future project but shall not be part of this paper.

10   Polanyi, Michael: *The Tacit Dimension,* Chicago: University of Chicago Press 1966, p. 4.

11   Polanyi, Michael: *Personal Knowledge. Towards a Post-Critical Philosophy,* New York/Evanston: Harper & Row, p. 49.

The inclusion of design practice in the analysis of the subject locates this examination in the field of applied image studies. Through work with images and objects, knowledge is achieved about how images work and how they generate knowledge. The examination thus also makes a contribution to the discourse on the development of new forms for the manipulation of knowledge, in which word and image, theory and practice engage in a vital dialogue.

In the following, different guidelines/parameters are stated pursuant to which the experiments were carried out. These guidelines are the result of various preliminary examinations and courses of thought. They serve to make the results as plausible as possible, to enable a transferability into the field of application, and to restrict the frame of the examination to a practical scope.

4.2 Selection of Objects for Depiction

The experiment series was carried out on the basis of two example objects from the field of design that seemed the most suitable after initial examinations with multiple objects.

The first object, which will be designated "object A," is a model by Panton at a scale of 1:6. In its completed design, the Panton chair is an icon of the 1960s and is characterized by its curving form. "It was the first chair in design history to have no back legs and be moulded in one piece entirely out of plastic."[12]

Size: 86 x 40 x 83 mm
Material: black plastic
Weight: 82 g

The second object presented for comparison is an instance of the Aluflex chair, designed by Armin Wirth for Stollinger and Sons. This object is designated as "object B" in the following. The extremely light and delicate chair was designed so that many could be made to fit in auditoriums and lecture halls. Through a folding mechanism, the seat can be raised to an upright position, minimizing the storage space required for multiple chairs.

Size: 510 x 500 x 833 mm
Material: aluminum and laminated plywood, beech veneer
Weight: 3 kg

The selection of objects was made according to particular concerns. The objects needed to be comparable, thus to display various similarities and differences. They are marked by a distinct aesthetic or design quality. The objects are made from different materials with specific characteristics.

The model of the Panton chair poses a representation problem. The

dimension of the model is difficult to convey in a photograph (as opposed to the original), without relying on aids such as the provision of a scale or comparison objects. In contrast, object B, the Aluflex chair, has dimensions that are normal for a chair. The comparative representability of these two different sizes will be examined.

The form of the objects differs considerably despite the underlying concept of the chair. The amorphous form of object A poses particular challenges for representation methods, whereas with object B, the construction has to be communicated.

The two objects are characterized not primarily through their coloring, but rather through form, materiality, dimension, and function. Color is therefore not observed in the foreground of this experiment series, to limit the experiments to a practicable scale. It should be emphasized, however, that color is indeed an essential factor in the appearance and depiction of objects. It cannot be ignored in practice and is a major area for possible further examinations.

5. Experiment Series

The series of images discussed in the following are a small selection of the depictions that were produced. The experiments were purposely kept simple to examine basic effects.

5.1 Hand Drawings

With hand drawing (using various tools), a classical approach to object representation was to be examined. Hand drawing is one of the most ancient techniques of image production and is characterized by a direct, intuitive interplay of seeing, reflection, representation, and internalization through memory.

5.1.1 Analytical Drawing

After first quick sketches, it was initially attempted to represent both objects in their different aspects as exactly as possible in a pencil drawing (Figures 1.1-1.3). For this purpose, a perspectival framework was drawn first, in which the drawing of the objects was constructed. This type of drawing occurs in alternation between observation and reconstruction, whereby observation primarily serves the comprehension of proportions (object A) and manner of construction (object B). Accordingly, the drawings are reconstructions of the objects in pre-drawn perspectival grids. This can be read from an uncompleted drawing (Figure 1.2). Here the object seems not yet completed, as in an intermediate stage of construction.
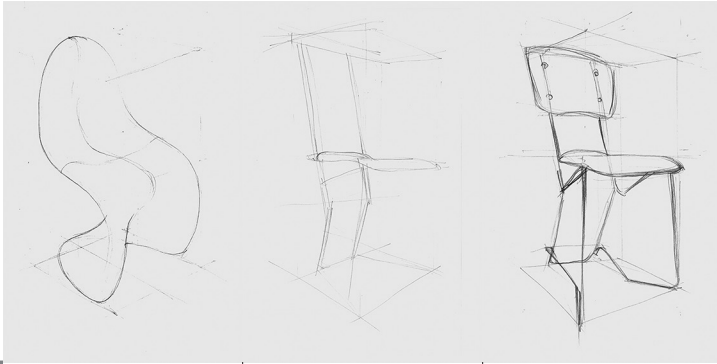
Figures 1.1 - 1.3

Knowledge increases with every attempt at representation. Errors result from a deficiency in observation. Thus Figure 1.3 shows that it was not recognized that the frame of object B is connected at the rear edge of the seat. But this is important for the chair, since (1) the rotating mechanism for folding up the seat is located at this connection and (2) it thereby becomes clear that the frame of the chair consists of two bent aluminum tubes. Later (Figure 4.3), these details were understood and given particular emphasis.

....

5.1.2 Free Drawing

Subsequently, drawings of object A were produced based on the flowing movement of the hand (Figures 2.1, 2.2). The form was approached by means of the repeated drawing of curved lines. This manner of representation was inspired by the object itself. The Panton chair is made from just one single curved surface and thus is difficult to represent comprehensively with an outline. The drawings thus represent the search for a line that best describes the trajectory of the form and the object. The animation in the form becomes especially apparent here. One would not arrive at a comparable representation of the dynamism in the object with the medium of photography.

Figures 2.1 - 2.2

....

5.1.3

Then followed drawings restricted to one line (Figures 3.1-3.4). They represent the edges of the curved surface of object A, which was thereby aptly
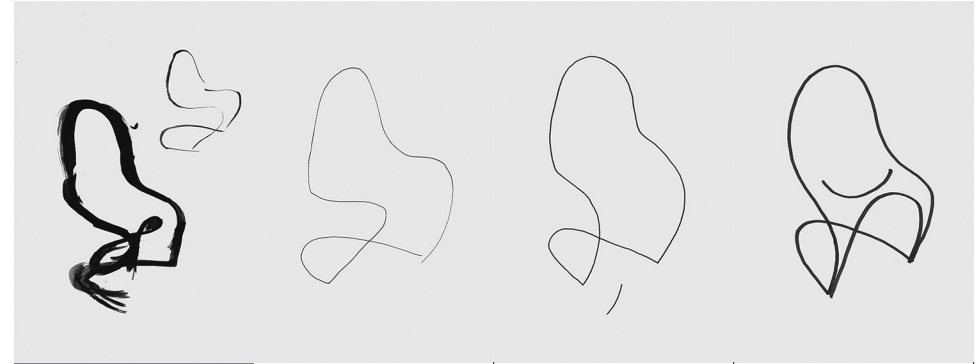
Figures 3.1 - 3.4

described in its underlying principle. No matter what distortion the line is subject to, the object remains clearly recognizable. Reduction in the course of representation brings forward the object's fundamental formal characteristics. Prerequisite for this representation is the reasoned selection of characteristics to be represented and to be ignored. A comparable reduction is not possible in photography. In this series as well, an advantage of drawing becomes evident.

....

5.1.4 Drawing from Memory

In drawing from memory (Figures 4.1-4.4), the striking elements of the object are reproduced in intensified form. The screw heads of object B were emphasized in each instance. From this, the assumption is made that these elements could have a particular significance for the appearance of the object. The organic forms of the back and seat are particularly striking. In Figure 4.4, the two surfaces suffice to convey an idea of the chair. Here as well, the means of graphic reduction has an effect. In this series, memory takes on the task of selection. Important elements for the appearance of the chair can be read from the representation.

Figures 4.1 - 4.4

....
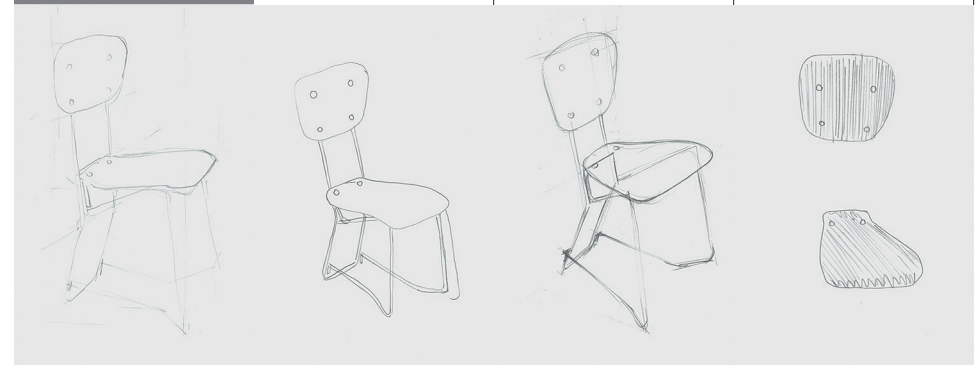
5.1.5 Side View

Then, objects A and B were represented in different views. Figures 5.1-5.4 show side views. In Figures 5.2 and 5.3, arrows were inserted in order to
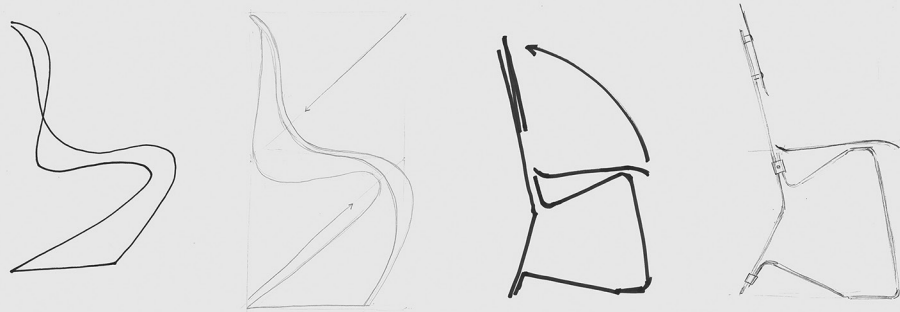
Figures 5.1 - 5.4

point out tensions in the form. In Figure 5.2, the arrows indicate two basic directions of deformation that characterize object A. In Figure 5.3, the arrow refers to the movement of the seat by means of a folding mechanism. In both cases, the side view is particularly well suited to highlighting formal principles and modes of construction (Figure 5.4). Drawing offers many similar possibilities for making functional relationships evident simply and quickly, for example with arrows, plans, and elevations.

....

5.1.6 Focus on Surface and Reflections

Object A is characterized above all by its reflective surface. This was to be examined in a series of hand drawings with pencil and brush. First, the attempt was made to represent the object as exactly as possible in its reflections with the pencil (Figure 6.1). This attempt proved to be very labor-intensive and not very successful. Here, photography seems to be a more adequate medium of representation. The subsequent attempt was restricted to bounding areas of light and dark with lines, as zones. However, it is unclear what the drawing conveys. By means of brush and ink, the reflections could be captured and examined better.

Figures 6.1 - 6.4
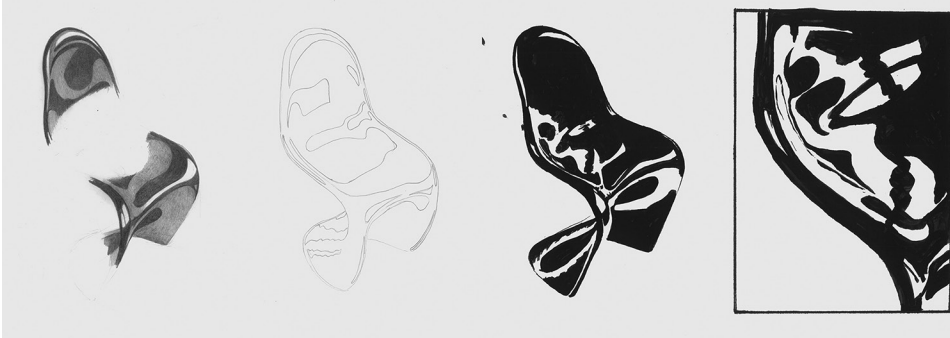
5.2 Digital Photography

Next, photography was studied as a representation method. Preliminary studies show that photography has been one of the customary forms within

Figures 7.1 - 7.4

collection practice since the end of the nineteenth century.[13] The goal of the project, however, is to examine the potential of forms of representation that have experienced little use until now. Therefore, the examinations in the area of photography are kept brief in this project. One area of investigation was the manipulation of documentary photographs. Both objects were photographed under different conditions with a digital camera in the studio and were digitally reworked.

....

5.2.1 Shadows

A white background and studio lighting were used. Through different light situations, different shadow effects could be evoked. Thus, very long shadows could be generated, or shadows could be suppressed to a minimum. Through manipulation, so-called "extracted" object images could be generated, in which the background and thus the surroundings are erased. The object thus appears separated from any spatial context. This is a favorite means of representation in object photography. Among other functions, it serves to connect the object better with the layout context or to enable adjusting the background color to different requirements.

In comparison of different shadow situations of extracted images, the relevance of shadows for the comprehension of an object becomes evident. In Figure 7.1, the shadow does not connect immediately to the bottom edge of object A. It is thereby shown that the object's edge does not touch the floor entirely. The viewer can conclude from this that the object is not a functional chair. It would wobble and would not be comfortable. In the extracted photograph without shadows (Figure 7.2), this information is missing. In the case of object B, the shadow shows a construction detail from another perspective (Figure 7.3). It likewise shows that the object lies flat on the floor at the front bottom edge of the lower part of the frame. In the further trajectory of the shadow, the connection of the front frame tube to the back tube is again represented. This information is also missing in the extracted depiction (Figure 7.4).

It is conceivable that additional details that are not visible from

....

13   In 1853, Roger Fenton (1819 – 1869) became the first official photographer of the British Museum in London. See Hannavy, John:

Encyclopedia of nineteenth-century photography. 1 London: Routledge. 2008, p. 528.

Figures 8.1 - 8.2

a single perspective can be shown through the casting of shadow. The shadow becomes a picture within a picture. At the same time, through it, a spatial surrounding is demarcated, and a certain lighting is implied. Herein lies an advantage of photography that, however, is ignored in standard object documentation. Often, shadows are suppressed as much as possible, and their informative quality is thereby disregarded.

....

5.2.2 Light

In Figure 8.1 and Figure 8.2, different light situations were induced. These resulted in different types of reflections on object A. The reflections are clearly bounded and flowing. This indicates a glossy, homogenous surface. In observation, it becomes perceptible how the object must feel. Glossy objects are often associated with a cold surface. The depictions thus also say something about the perceived surface temperature.

In Figure 8.1, the reflections are finer and more segmented, while in Figure 8.2 they are larger and more unified. If one compares the two depictions with one another, a different perception of the object's size becomes evident. In Figure 8.1 the object appears large, like a chair with normal dimensions. In Figure 8.2 the object seems smaller and more compact, which more faithfully reflects its real dimensions. The assumption that we see fewer reflections on smaller objects and more reflections that are more detailed on larger objects is transferred to the photograph.

Light and its reflection have a very substantial influence on the perception of surfaces, form, and dimensions.

....

5.2.3 Background

The method of extraction allows the background of an image to be adjusted easily through manipulation. An attempt was then made to negate the contrast between object color and background color (Figures 9.1-9.4). Object A shows a unified coloring; the background becomes black. In the case of object B, it was decided to adjust the background to an average tone of the chair's surfaces.

It can be observed that in Figure 9.2, the background merges with object A. The form of the object can no longer be followed. Instead, the reflections come into the foreground. The materiality and the flowing forms are

Figures 9.1 - 9.4

perceived more intensely. In Figure 9.4, the grain of the chair seat and backrest of object B come forward. The screw heads come forward, although the object itself was not manipulated here and only the background was altered.

The materiality of the object is expressed much more strongly than in a standard photographic depiction. The behavior of the surface in the light and haptic impressions are perceived more intensely when the form in general moves into the background.

...

5.2.4 Size

Both objects were photographed with the same camera position, lighting, and objective setting. In the comparison, the dimensions of the objects are reproduced exactly. One can get a good sense of the size difference. In Figure 10.1, however, it is difficult to recognize object A as such in its form. It is too small, and also the reflections are not placed in such a manner that the form becomes tangible.

Although this representation serves in the comparison of the objects' size, the object itself becomes not comprehensible. The unified lighting and zoom settings prevent a clear recognition of the object.
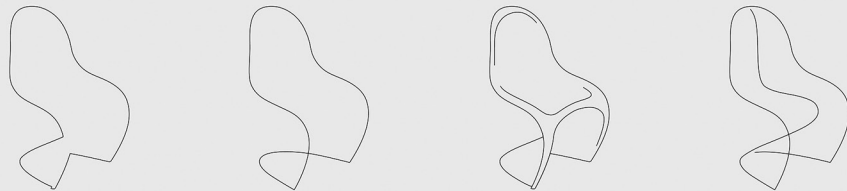
Photography does not seem to suit this pictorial strategy. Digital drawings, through their reduction, are much more precise and legible when the objective is to highlight relationships of size and function. This impression resulted from the following series.
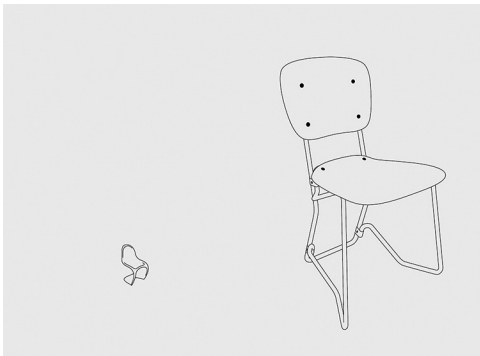
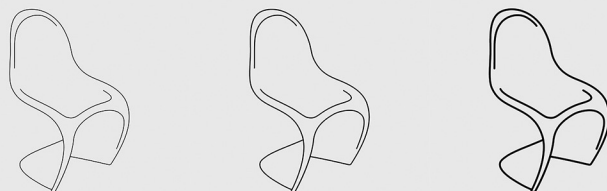Figures 10.1 - 10.2
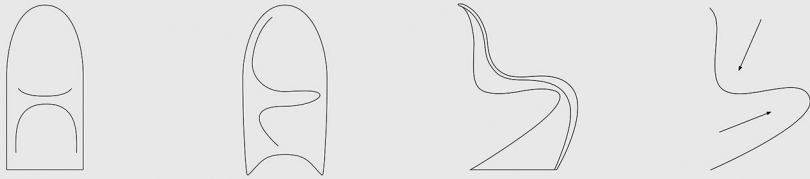
Figures 11.1 - 11.4

Figures 12.1 - 12.4

Figures 13.1 - 13.2

Figures 14.1 - 14.3

5.3 Digital Drawing

The findings from the experiments with hand drawing and photography formed the starting point for the third representation method that was applied. Digital drawings were made by means of graphics software. The experience that was gained in hand drawing contributed to these render-ings. Digital drawings have the potential for a very exact depiction of partial aspects. Through reduction, highly legible schematic representations can be produced. The possibility for correction and adjustment makes this form of representation interesting.

Digital vector drawing is based on the fundamental principle of a line defined by vectors that are assigned characteristics such as color and strength or that can be provided with a pattern.

5.3.1 Line Representation – Views

The attempt was begun to represent the objects in different views. It quickly became clear that some views are more useful for the comprehension of the object than others. In a frontal view, the form and design quality of object A is virtually not appreciable at all (Figure 11.1, 11.2). In a side view, the object is described much more precisely (Figure 11.3). Through the reduction in representation, an essential design principle is revealed, namely, the S-shaped sweep of the form (Figure 11.4).

The form is shown much more clearly in the perspectival repre-sentation. Where the outer contour still seems to portray an abstract form (Figure 12.1), the demarcation of the object's edges as well as the inscription of the object's concavities can describe the object more accurately. A combi-nation of multiple views conveys the object's form best (12.4).

Digital drawing is well suited for the representation of design principles. Through generalization, the typology of an object is reproduced and not a single object.

5.3.2 Size

In analogy to the attempt to represent the size relationship of the two ob-jects directly in a photograph, the digital drawings were scaled (Figures 13.1 and 13.2). This attempt proved to be essentially more successful. The line strength of the drawings can be adjusted so that the drawing is appreciable in small representations as well.
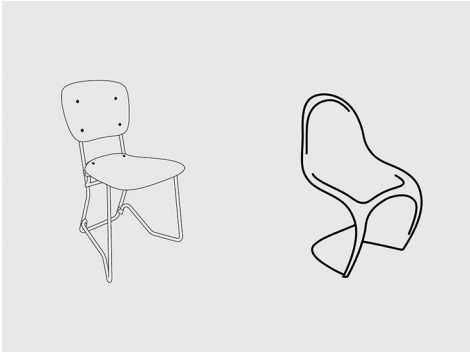
5.3.3 Line Representation – Line Strength

After a series of further attempts, the line strength of the representation was varied. Starting from a perspectival view in a hairline rendering, the line strength continuously increases in Figures 14.1-14.3 and Figures 15.1-15.3.
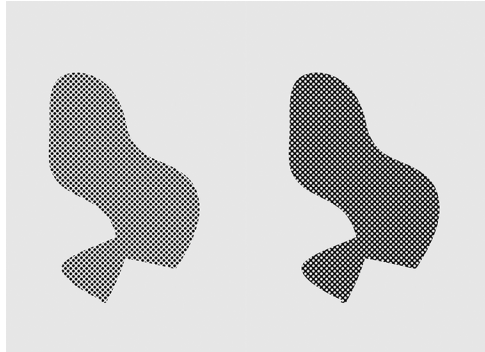
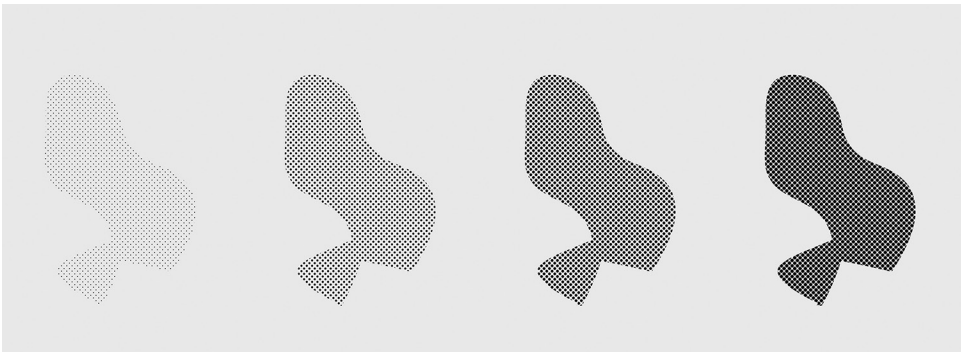Especially in a comparison of multiple depictions, the perception
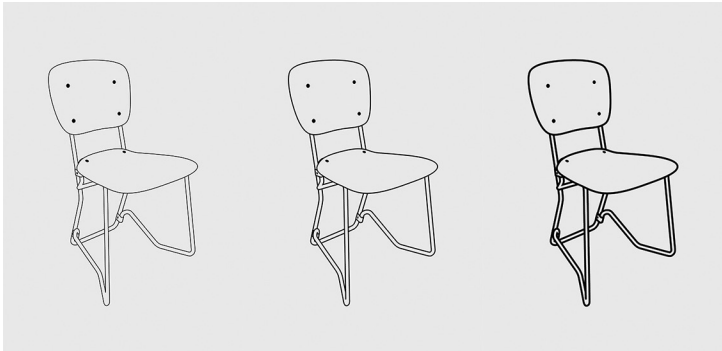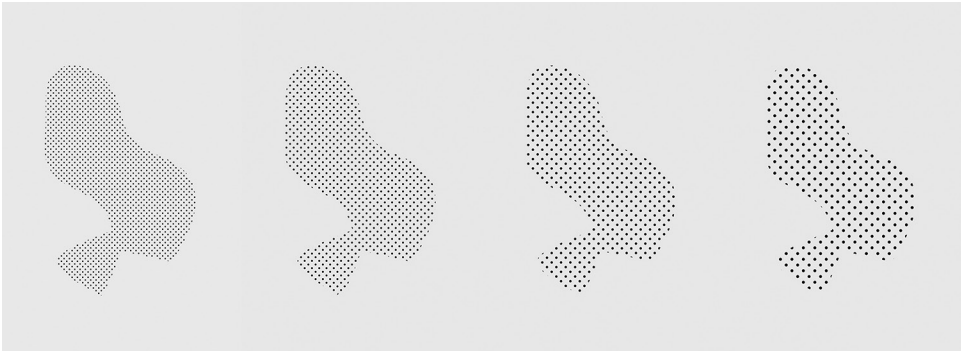
Figures 15.1 - 15.3

Figures 16.1 - 16.2

Figures 17.1 - 17.2

Figures 18.1 - 18.4

Figures 19.1 - 19.4

Figures 20.1 - 20.3

of the object's size changes. The greater the line strength in the depiction, the smaller the object seems to be. A similar visual differentiation occurs as in the photographic experiments on the type of reflection (Figures 8.1, 8.2). In the juxtaposition of Figures 16.1 and 16.2, the difference in size between the two objects is only represented through line strength. The relationship of scale from object A to object B is approximately 1:6. This effect is palpable; however, object A is emphasized more strongly through the greater line strength.

### 5.3.4 Filling Methods – Matrix

Initially, different matrices were employed. The comparison of Figure 17.1 and Figure 17.2 shows that a background filling and a negative dot matrix are two design elements that influence one another mutually and affect the perception of the object. In Figure 17.1, the object is represented only by the dot matrix. In Figure 17.2, however, the black surface seems to define the object. The effect of the negative matrix is less significant. Therefore, the following experiments were limited to the use of positive matrices without background.

5.3.5 Filling Methods – Dot Matrix

The first series with variations of dot matrices (Figures 18.1-18.4) examines the effect of a dot matrix filling whereby the dot size increases. The matrix grows increasingly dense. The relationship of white space to black surface tips with Figure 18.3. With increasing dot size the impression of a unified surface, and thus of a continuous object, seemingly grows stronger. However, a flatness is apparent.

With a simple scaling of the dot matrix in which the dots but also the space between them expands, this effect is not apparent (Figures 19.1-19.4). The object dissolves. At the same time, however, it moves closer to the viewer. This has the result that one perceives the object in Figure 19.1 as larger than that in Figure 19.4.
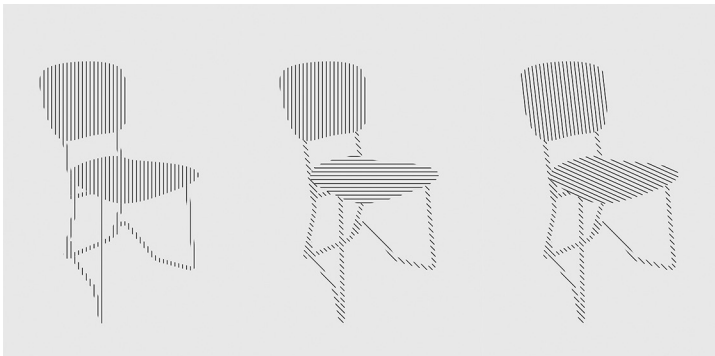
Figures 20.1, 20.2, and 20.3 show different modulations of a dot matrix, from the uniform, "organized" arrangement, to a "dynamic" arrangement in which the distribution is random but the spaces between the dots stay as equal as possible, all the way to a completely free "scattered" arrange-
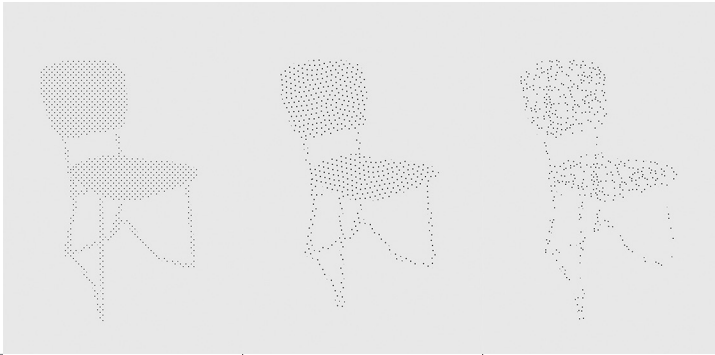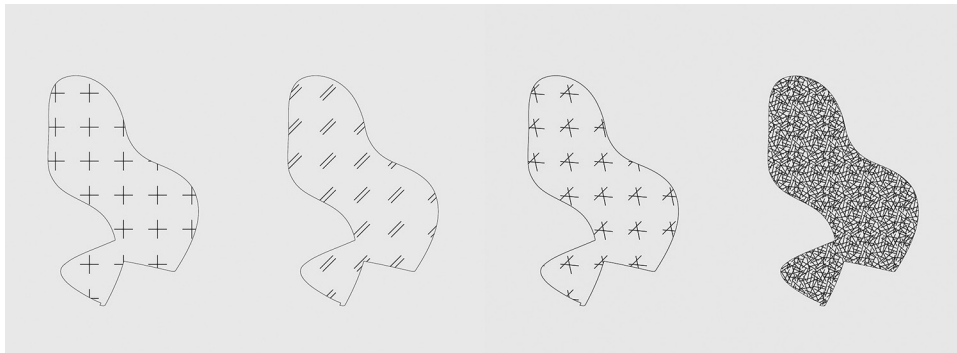
Figures 21.1 - 21.3
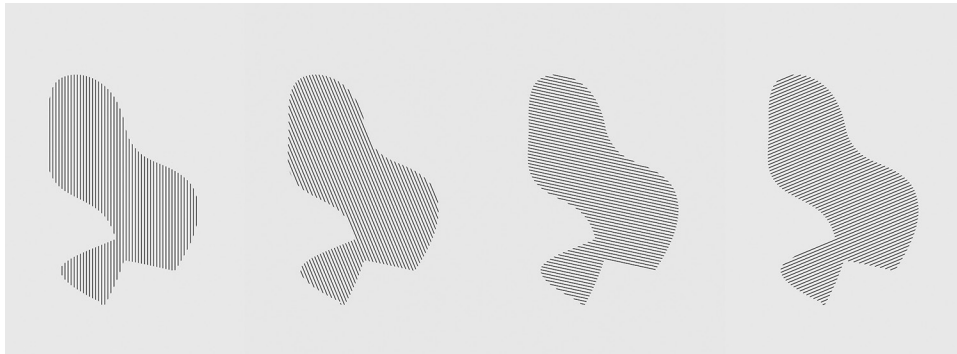
Figures 22.1 - 22.4

Figures 23.1 - 23.3

Figures 24.1 - 24.4

ment of dots. Although the patterning was applied according to simple, non-spatial parameters, different impressions of spatiality are evident. The organized dot arrangement seems flat, as expected. With a "dynamic" arrangement the surface still holds together but permits the interpretation of a concavity. With the scattered arrangement, the surface dissolves; only a feeling of spatiality in the sense of a swarm remains. The transference of the pattern to object B (Figures 21.1-22.3) yields comparable impressions.

5.3.6 Filling Methods – Line Matrix

In the use of a line matrix, a relevant aspect seems to be the rotation with which the matrix is applied. Figures 22.1-22.4 examine these questions. The matrix was continually rotated. In Figure 22.1, the line matrix makes a completely flat impression. However, the perception of a spatial situation increases with increasing rotation. The alignment of this angle with the perspective of the original representation probably gives rise to this effect (Figures 22.3, 22.4).

The combination of different orientations of line patterns was examined using object B. Since this object consists of two different materials, it made sense to mark the boundary between them in this manner. In the comparison of Figure 23.1 to Figure 23.2 and 23.3, it is likewise apparent that the rotation of the matrix supports a perspectival perception.

5.3.7 Filling Methods – Various Patternings

Along with dot and line matrices, other filling methods were also examined. These patterns are based on a basic repeating motif. This basic motif was varied and employed in different aspects. The possibilities for variation in this field are huge. The Figures (Figures 24.1-24.4) only show a very small section of the possibilities. But it becomes evident that the pattern does influence spatial perception. If the basic motif seems highly organized, in other words, if the basic forms are oriented to one another at a single angle or a right angle, a flat impression arises (Figures 24.1, 24.2). If multiple angles, all the way to a random-seeming combination of many angles, are employed, a spatial perception becomes apparent (Figures 24.3, 24.4).

The compatibility with multiple perspectival lines of flight and not only one direction here seems to be the determiner of whether a spatial effect can be interpreted or not. In addition, impressions of surfaces and materiality are generated. In Figures 24.1 and 24.2, an association is made with a smooth surface, whereas Figures 24.3 and 24.4 allow a prickly surface to be assumed.
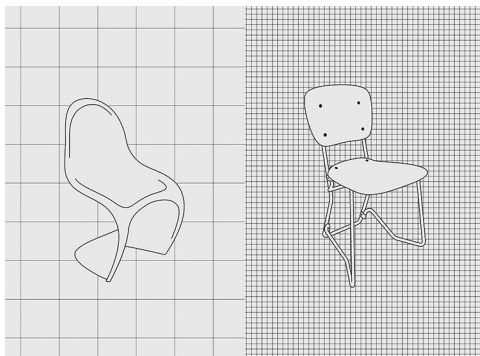
5.3.8 Background

Finally, the effect of the background in digital drawing was studied (Figures
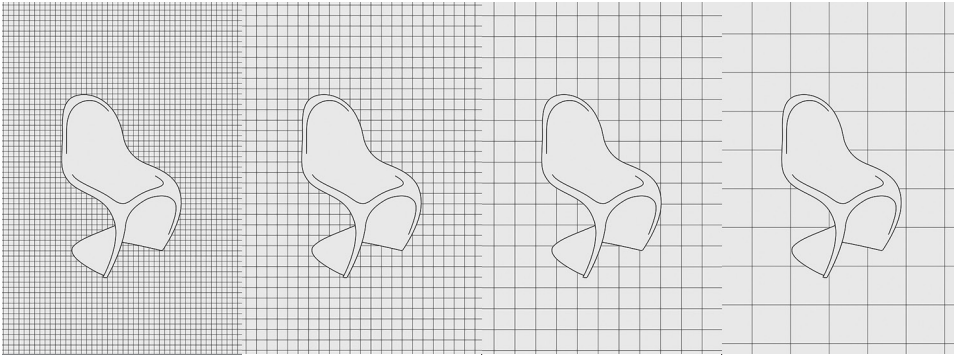
Figures 25.1 - 25.4
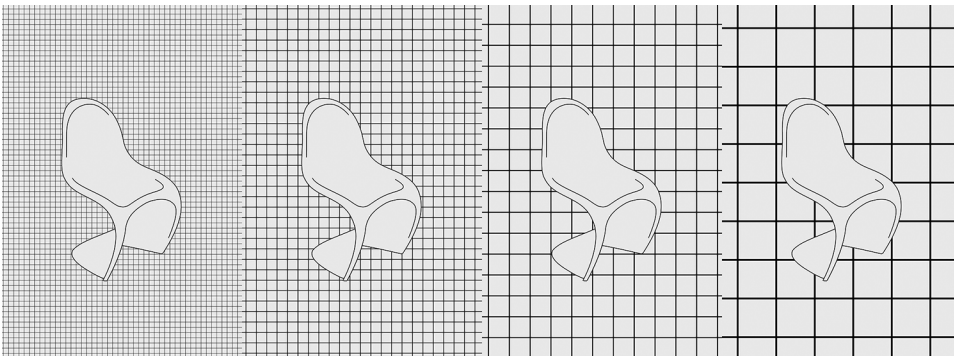
Figures 26.1 - 26.4

Figures 27.1 - 27.2

25.1-27.2). For this purpose, a variable square grid was used, which appeared in the background of a uniform line drawing of the object.

Figures 25.1-25.4 show a grid that grows larger while the line strength remains constant. Here, the impression immediately arises of a changing perception of size. The object seems to get smaller with increasing distance between the lines. This impression intensifies when the line strength of the grid is simultaneously increased – in other words–it is proportionally enlarged (Figures 26.1-26.4). However, here the grid begins to take greater significance than the object. It protrudes into the foreground.

In Figure 27.1 and 27.2, the two objects were placed side by side.

The dimension of the grid was calibrated to the effective scale relationship of the two objects. Object A, in fact, appears smaller than object B.

6. Findings

Findings that emerge from specific design decisions were intentionally included in the preceding observations. It can be stated that the techniques applied are suited to the representation of the objects' different characteristics, on the one hand; however, they also lead to different conclusions.

6.1 Hand Drawing

Hand drawing proved to be a good means for studying the object. Apart from the picture that is created as a result, the person who performs the representation acquires knowledge about the form, the surface, the characteristics, and the details. Here, what Omar Nasim describes as "familiarization" occurs: "The familiarization that takes place at this personal, visceral, and haptic level, therefore, acquaints one (even in the process involved in the making of one sketch) with what is being seen, with how to draw what is being seen, and with an object's known, unknown, and challenging features. But it is also especially the repeated drawing of an object that contributes to an observer's familiarity."[14]

In representation by means of hand drawing, errors do not fail to be made. In the course of repetition, an awareness of these errors gradually becomes evident and they are corrected. This process is undoubtedly a part of familiarization. It becomes particularly apparent that, through hand drawing, one acquires a feeling for the salient forms and those that are critical for the manifestation of an object. The drawings from memory and free drawings support these statements.

Through this study of the object by means of drawing, knowledge about the representability of the object is acquired. The drawer repeatedly develops new strategies for representing particular aspects in an appreciable way. This leads to more precise images that communicate clearer impressions of the object to the viewer and allow inferences to be made about important formal characteristics.

6.2 Photography

The previously described development of personal acquaintance with the object through hand drawing does not occur in photography in the same way. One indeed engages with the object, but there are other aspects that

14   Nasim, Omar W.: Observing by Hand, in: Rheinsprung 11 – Zeitschrift für Bildkritik, eikones 2012, S. 73.

Figures 28.1 - 28.4

enter the foreground. Thus, it is in the nature of the technique that the light is observed most precisely. The findings about the role and effect of shadow can be afforded a particular quality. On the object itself, it describes surfaces, haptics, and forms. Like a shadow cast on the ground, it can even function as a "picture in a picture" and integrate views of the object from different perspectives into the image.

Nevertheless, we also always perceive the object in a photograph in a certain situation: in a particular surrounding, for example, the photo studio, under specific conditions. But what can be assumed to be a detracting characteristic, however, supports Martin Seel's concept of "manifestation" [Erscheinen]: "What is important here is not the capturing of individual qualities of the object, but rather, their interplay taking place here and now (in this lighting, from this point of view or this change of points of view)." 15 An individual object with its characteristics is always represented. Underlying concepts, such as for the products of industrial design, go into the background. Photography makes it difficult to elucidate relationships of construction or function. Here, the advantage lies with drawing, whether produced by analog or digital means.

6.3 Digital Drawing

Digital drawing is first of all connected with a distance from the object. It lacks the immediacy of hand drawing, since between observation and the generation of a drawing, an additional interpreting entity – the program – is installed. It interprets the drawer's input and converts it into a vector graphic. The digital drawing of an Aluflex chair appears more as a concept ("the" Aluflex chair) than as the representation of a unique object (a particular Aluflex chair). The same thing occurs with the model of the Panton chair. It can be conveyed through contrast that this is a smaller version of the Panton chair, but it is difficult to describe an individual object by means of a digital drawing.

At first sight, this finding seems to contraindicate use in a collection context. Precisely here, it is important that this or that individual object with its characteristics is the focus. In the collection field of design, however, another aspect is also involved. A design object in most cases is an object

15   Seel, Martin: Ästhetik des Erscheinens, Frankfurt a.M. 2003, P. 54 – 55.

1 9 8

of serial production. There is an underlying schema that manifests itself in multiple objects. There is "the" Aluflex chair, whereby not a particular chair is necessarily intended, but rather the model of the chair. Here, digital drawing in its capacity for generalization can communicate the concept of the chair in the representation, as the juxtaposition from Figures 28.1 - 28.4 shows. Figure 28.1 appears incomplete. Is the seat missing? The manipulated photograph (Figure 28.2) also seems strange. Is this an image of a chair with an unusual backrest? Figures 28.3 and 28.4, however, are read automatically as abstracting representations of functional sequences. Meanwhile, Figure 11.4 shows that along with functions, underlying design principles can also be visualized.

A simple line drawing is often denied the ability to convey spatial impressions. However, the experiment series show almost universally that a corporeality can be conveyed using the simplest graphic means, such as a grid, the line trajectory, and line strength.

However, a digital drawing remains reduced and simple. Like letters of the alphabet, it can be strongly scaled and distorted and nevertheless remain legible. This robustness distinguishes it from photographs.

7 .   C o n c l u s i o n ;

L o o k i n g   A h e a d

These experiments can be regarded as a starting point. On the one hand, it is possible to continue them with other techniques and other objects. On the other hand, it would be interesting to analyze a viewing of the images by disinterested persons.

The findings described here show that photography is not the only method of representation that can be helpful in a collection context in order to convey information about an object. At the same time, it becomes evident that every form of representation has its own advantages. Accordingly, much more about an object can be communicated visually in a combination of techniques. Each technique, in turn, offers a multitude of different design decisions with which particular communicative advantages are associated. There is not either "object photography" as one mode or "drawing" as another. The combination of multiple techniques and images thus yields an exceptional potential. But how this combination could look, and in what medium the representations might come together, is open and could, in turn, become the object of study.

These observations underscore the knowledge acquisition about an object that occurs during its representation. The drawer/photographer acquires knowledge about the object during its representation by acquiring knowledge about the representation of the object. In other words, the

199

process of the development of knowledge about the object coincides with the development of knowledge about the representability of the object. This results in an invitation to (re-) integrate image-generating practices such as drawing, photographing, or other operation in the range of scientific methods. For the exemplary field of collection practices, one conclusion is that the visual representation should be a much more fundamental part of cataloging, referencing and showing objects than it has been until now. Particular insights would be gained on the question why and how certain elements of an object influence the overall appearance it. This could result in a refined view of the objects by collectors, researchers and subsequently also a broader audience. The generated images would be used as means of access and communication.

While a total collapse of artistic and scholarly practice into a single person is not the intended suggestion here, a close collaboration of designer and collector does promise a fundamental gain in knowledge. This prompt will serve as the closing point of the contribution at the same time as it reveals a new question: what forms of knowledge would result from such a visual collection practice, and how would the spaces look in which such knowledge is negotiated?

References

Boehm, G. (2007). *Wie Bilder Sinn erzeugen. Die Macht des Zeigens.* Berlin: Berlin University Press.

Conway, P. (2014). *Digital transformations and the archival nature of surrogates*, in: *Archival Science,* Volume 15, Issue 1 (March 2015), Dordrecht: Springer Science+Business Media.

Gallison, P. (1998). *Judgment against Objectivity*, in: Jones, C. A. / Gallison, P. (eds.). (1998) *Picturing Science Producing Art*. New York / London: Routledge, pp. 327 – 359.

Hannavy, J. (2005). *Encyclopedia of nineteenth-century photography*. New York / London: Routledge.

Heßler, M. / Mersch, D. (eds.). (2009). *Logik des Bildlichen, Zur Kritik der ikonischen Vernunft,* Bielefeld: transcript.

Nasim, O. (2012). *Observing by Hand* In: *Rheinsprung 11 - Zeitschrift für Bildkritik,* Vol. 3, Basel: eikones NFS Bildkritik, pp. 66 – 78.

Polanyi, M. (1964). *Personal Knowledge. Towards a Post-Critical Philosophy,* New York / Evanston: Harper & Row.

Polanyi, M. (1966). *The Tacit Dimension,* Chicago: University of Chicago Press.

Seel, M. (2003). Äshetik *des Erscheinens,* Frankfurt a. M.: suhrkamp.

Smith, P. H. (2004). *The Body of the Artisan: Art and Experience in the Scientific Revolution,* Chicago: University of Chicago Press.

Trachsler, W. (1981). *Systematik kulturhistorischer Sachguter: eine Klassifikation nach Funktionsgruppen zum Gebrauch in Museen und Sammlungen*, Bern / Stuttgart: Haupt.

Author

Michael Hübner was born in 1983, Leipzig, Germany. He studied Integrated Design at the University of Applied Sciences in Dessau, Germany. After his graduation he gained experience in design agencies in Paris and Berlin. In 2009 he came to Basel, Switzerland obtaining a Master of Arts in the newly established program of Visual Communication and Iconic Research at the Academy of Art and Design HGK FHNW in cooperation with the NCCR Iconic Criticism at the University of Basel. For their graduation project "Displays in Dialogue – The Exhibition and the Book" he and the curator Lena Friedli organized a series of shows with joint publications to discuss the relationship between the publication format and the exhibition space in contemporary art. Until September 2016 he worked as scientific assistant with the Institute of Visual Communication, developing exhibitions, lecture series, research projects and publications. Since 2011 he has continued to work as a graphic designer. With Tina Braun he founded Studio HübnerBraun focusing on graphic design and visual identities.