# X-ray Aesthetics

## Radiographic Vision in *The Magic Mountain* and *Painting, Photography, Film*

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Master's Thesis Presented at The Department of Philosophy, Classics, History of Art and Ideas
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UNIVERSITY OF OSLO
June 2021

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# Abstract

In 1895, the physicist Wilhelm Conrad Röntgen discovered a new kind of rays and called it X-rays. Like light rays, the X-rays blackened photographic plates. At this point, the marks left behind by the rays on the gelatin silver coated plates were hardly identifiable. When Röntgen laid his hand on the plate while exposing it to the X-rays, however, a recognizable image emerged: the skeleton hand. Afterwards there was no turning back, the image-making potential of the X-rays was utilized in medicine, entertainment culture, and at the customs control. Yet, the radiographic image remained obscure in many ways. It distorts and blurs its subject in ways that complicate interpretation. The aesthetic properties of radiographs are twofold: at once exposing and concealing. This master's thesis argues that X-ray imagery hold a unique position, where it paradoxically both is understood as a technologically enhanced vision, an extension of the eye, but also as an inverted vision unrelated to eyesight that repels and distorts, reversing the relation between viewer and viewed.

I take this paradox as a starting point when approaching my research material, two books: Thomas Mann's novel *The Magic Mountain* (1924) and László Moholy-Nagy's "New Vision" manifesto, and Bauhaus textbook *Painting, Photography, Film* (1925). X-ray images and machines are part of the novels plot, while they are appropriated into and discussed theoretically in the Bauhaus-book. When X-rays become a literary and artistic motif and device, their twofold nature is no longer — as it is in medicine — an obstacle, but rather an opportunity to embark on questions of the limits and nature of perception.

## Acknowledgements

First and foremost, I want to thank my supervisor Pasi Väliaho for his encouragement and guidance.

I also want to thank *Deutsches Röntgenmuseum Remscheid-Lennep* for welcoming me and letting me look through their archives. Even though this master's thesis ended up looking more at how X-ray images were presented in the context of art and literature, than radiography as such, the opportunity to experience physical X-ray plates, and copies from the time I'm writing about was invaluable.

My friends Maria Qvale, Johanne Edvarda Brandtzæg Slaatta, and Håvard Lunde Helgesen read through drafts and gave me treasured feedback and well-aimed comments.

I owe a thank to my mother Anne-Kjersti Lenander for listening to the verbal, everlasting, formation of often clouded thoughts on X-rays.

Finally, I thank Johannes Brinkmann and Annette B. Page for proofreading.

# Contents

# 1 Introduction

## 1.1 Accidental Similarities and Lab Logic

Two entirely unrelated images will serve as an introduction to the topic of this master's thesis. They have originated under quite different circumstances, for different purposes and within separate disciplines. Nevertheless, they are similar in many ways. The first image [*Fig.* 1], is an X-ray made by Wilhelm Conrad Röntgen on December 20th, 1895. The second one [*Fig.* 2], named *Collage of Squares Arranged According to the Laws of Chance*, is a collage made by Dada-artist Hans Arp some time during 1916 or 1917. The X-ray is a glass negative (approximately 20 cm high and 15 cm wide). Its gelatin silver coating is evenly darkened by the X-rays it was exposed to, except for a roundish framing towards the edges of the plate and some lighter gray square shaped forms, six in total, towards the middle. Arp's collage (48,5 cm x 34,6 cm) is, by contrast, made of a cardboard and paper. But, like Röntgen's X-ray, the subject is also squares in hues of grey (now fifteen instead of six). The edges of the paper squares are torn and consequently, rougher than in those in the X-ray. In both pictures, none of the squares are tilted or overlapping. Rather, they are lying beside each other: the ones in the X-ray in a quite orderly grid pattern and the paper ones in a slightly less orderly grid.

The visual resemblances between the two images are striking. Nevertheless, their likeness is not our main concern here. Their grid-like structure and sifts in saturation, are not the product of deliberate design, but rather the coincidentally similar outcome of two unrelated experiments so-called "accidental similarities".[1] While Arp's collage (reportedly)[2] is the result of a chance dropping of the paper squares, Röntgen's X-ray is a test of different substances' penetrability to X-rays. Both images were made with an openness regarding result. The aim of Röntgen's plate was to record chemistry, light, and penetrability.[3] Arp's collage correspondingly recorded the effect of gravity upon paper.

Rather than applying conscious observation, and careful composition, the approach used here is one of "disregard". What the two pictures under discussion here have in common (besides their matching appearances) is, that they are not concerned with "looks" at all; they

[1] Vera Dünkel writes in *The Technical Imag*e, about the juxtaposing and comparative visual analysis of scientific images. She points out pros (that they sharpen the eye) and cons ("accidental similarities"), and writes: "A particular challenge is posed by comparison of artistic and non-artistic images and the investigations of migrating imagery that diffuses through various disciplines." Dünkel, "Comparing Images", 17.
[2] It seems unlikely that the squares by chance hit the surface with almost identical spacing and without overlapping each other. As noted by Margaret Iversen: "The collages are so perfectly composed, however, that they call into question how scrupulous he was about relinquishing control and fixing the chance result". Iversen, "The Aesthetics of Chance", 19.
[3] See, Schmidt, "1895: Freud/ Röntgen".

both reject the eye as a primary source of knowledge. In exchange, they depend on means of recording, that neither involves an observer nor a camera lens.

### 1.2 Topic, Material, Research Questions

Like the unexpected match between Arp's collage and Röntgen's radiograph, this master's thesis positions itself in the intersection of technical images (early X-rays) and artistic work (a novel and a Bauhaus-book). Rather than juxtaposing the two fields, as in the case above, I examine circumstances where radiographic imagery and technology are transferred into and described in an art and literary discourse. When considering how X-ray images are included and conceptualized within art contexts at the beginning of the twentieth century, a certain irony emerges. On one hand, radiography is a technology of vision (and hence, of control), which expands the reach of the human eye, exposing to it the unexplored territories of the living body's interior. On the other hand, paradoxically, it is so radically different from the world rendered by human vision, that it inevitably challenges it. Rooted in this paradox, radiography appears to offer artists a way of maneuvering the gray zones of visual mastery. The presence of radiography in the modernist art and literary discourse, hence, often indicates a fundamental skepticism regarding one's own perception. On that account, I wish to look at how X-rays are included in discussions about the limits of visibility (and hence, of human knowledge). Still, when approaching the topic described above — that is to say, the role of X-rays within a modernist art and literature discourse — it is crucial to know what one is looking for: radiography as a diagnostic tool, as entertainment, as a natural phenomenon or as fantasy. All the mentioned versions of radiography will play a part in this thesis and hopefully, it will also become clear how these different uses and conceptions evoke a range of diverse connotations and meanings.

The standard narrative of X-rays images is the following: after X-ray photography (radiology) was invented in 1895, it made a previously hidden visual territory accessible. X-rays exposed the inner secrets of the human body: It could reveal fractures, bullets and pregnancy, or much feared diseases such as tuberculosis and cancer. X-rays would uncover concealed objects outside the human body as well. The X-ray machine would, for example, easily detect a liquor bottle, a gun or jewelry in a suitcase at customs. It could even distinguish natural diamonds from fake ones. Radiography initiates a guessing game where one does not know the answer until one has exposed it to X-rays: Is it broken? Is there a need for another filling in the tooth? The excitement concerning what the radiological examination may give away typically overshadows the interest in the radiograph's material qualities; in

most cases these qualities may be described as some rather dubious and dull grayish contours, slightly resembling a body part. The meaning of these shapes is usually then made clear by the physician, explaining that: «the shadow here is the root canal treatment we did last year» or something of that sort. The X-ray medium's prosaic wrapping — its material properties, *how* it shows rather than *what* it shows — goes unnoticed.

However, to take notice of the "wrapping" is exactly what I want to do in what follows. My master's thesis will focus on the material base of radiography and will look at the radiographic image from a technological and an aesthetic point of view — the *how* in the radiograph. It will pay attention to the materiality and composition of the radiographic pictures (the printed X-ray and the fluoroscopy), as well as the setup and technology of the machines producing them. To a certain degree, I want to question in what ways this *how* does affect the *what*. How does the materiality and composition of the radiograph/ fluoroscopy etcetera affect the way their content is being perceived?

I will not make an attempt at writing a (media)aesthetics of the X-ray merely by examining actual radiographs. Rather I'm interested in finding out how the X-ray image was perceived and conceptualized in the discourses surrounding the then still young visual medium. Primarily, the thesis will be a study (and partly comparison) of two books: Thomas Mann's novel *The Magic Mountain* (1924) and László Moholy-Nagy's textbook in New Vision-photography *Painting, Photography, Film* (1925).[4] The selected material also indicates a limitation of the time and place that is the scope of this thesis. Both books were published during the Weimar Republic period and just one year apart. There are X-rays appearing in both works. *The Magic Mountain* is staged in a sanatorium for TB patients, where radiology (both the pictures and the machines) is a natural part of the medical equipment. The X-rays are produced in the sanatorium's own X-ray laboratory, and small wallet-size copies are kept, compared, and exchanged among the guests. In Moholy-Nagy's book, *Painting, Photography, Film*, X-rays are both mentioned in the written manifesto/essay part and as printed reproductions (five in total) side by side with paintings, photographs, photograms, and collages, some of which are Moholy-Nagy's own, and some not. I am interested in these two books in question, because they both present serious attempts at formulating an aesthetic that incudes modern technology. Both works acknowledge the

[4] For the *Magic Mountain*, I am mainly referring to: Mann, *The Magic Mountain,* trans. Woods (New York, London, Toronto: Alfred A. Knopf, 2005), and Mann, *Der Zauberberg* (Frankfurt am Main: S. Fischer Verlag, 2013). For *Painting, Photography, Film*, I have generally been working with a facsimile of the 1927 edition: Moholy-Nagy, *Malerei, Fotografie, Film* (Berlin: Gebr. Mann Verlag, 2000). But my English translations are from: Moholy-Nagy, *Painting, Photography, Film*, trans. Seligman (London: Lund Humphries, 1969).

changed conditions of being in a technologically advanced world of experience, where humans interact with, perceive, and exist in the world through various media such as photography, film, gramophone, telegraph and — not to mention — X-rays. I like to think that both *Painting, Photography, Film* and *The Magic Mountain* can be read as contributions to the research of media aesthetics, as both works are, more or less explicitly, directing [their] attention towards the materiality and the technology of the communication» and they are «concerned about the medium's significance for how something appears».[5] This is why *Painting, Photography, Film* and *The Magic Mountain* are interesting to this project (separately and when compared). They both — however in different manners — are trying to figure out a general aesthetics of modern technology. Also, beyond the specific case of the X-ray. These two works show attentiveness towards the material qualities of technology: radiography's physical presence and how it is perceived, and possibly how the X-ray imagery itself may perceive. In this thesis, I will examine the ways in which these two books may give form to a kind of aesthetics/poetics of the X-ray, and I will pose the following questions: How is the aesthetic of X-ray technology described in Thomas Mann's novel *The Magic Mountain* and in László Moholy-Nagy's "New Vision" manifesto *Painting, Photography, Film*? What do *Painting, Photography, Film* and *The Magic Mountain* have to say about how the X-ray shapes human and non-human perception in the early twentieth century?[6]

### 1.3 Outline

This thesis is divided into three separate chapters. The first chapter will be a theoretical essay that investigates the conditions for visibility, invisibility, and gazes in X-rays. Here I wish to show how an X-ray typically not only makes matter transparent to the eye, makes the invisible visible (as theory often believes), but in addition alienates the depicted object, and eventually conceals as much as it reveals.[7] The X-ray breaks with the tradition of the one-

[5] "retter oppmerksomhet mot formidlingens materialitet og teknologi" og "er opptatt av mediets betydning for hvordan noe fremstår." Hausken, *Medieestetikk* (Oslo: Scandinavian Academic Press, 2009), 9.
[6] When I first started working on the topic of X-rays and modernism, Marit Grøtta's article "Fotografi og følelser", about portrait photography, and how it in Proust's *À la recherche du temps perdu* is linked to affect, was key for realizing how I could approach my manifold material (Early radiography, visual art, media theory, and a novel). Grøtta's article demonstrated to me how I, in fact, was not forced to look at the X-rays as "steps" on the way towards the ultimate goal of interpreting the artworks or the novel. My approach has accordingly been to look at what Grøtta calls the intimate conections between art, technology and perception within modernism ("Det er slik det etableres intime forbindelser mellom kunst, teknologi og sansning i modernismen, [...]"). I have let my analysis go in both directions simultaneously, letting the works of art say something about radiography, as well as looking at the X-rays to say something about the art/literature. Grøtta, "Fotografi og følelser", 122.
[7] My argument will be supported mainly in to works: Dünkel, *Röntgenblick und Schattenbild* (Emsdetten, Berlin: Edition Imorde, 2016) and Geimer, *Inadvertent Images*, trans. Jackson (Chicago: The University of Chicago Press, 2018).

point, linear perspective found in painting and camera photography. Accordingly, it also breaks with the notion of an independent human subjectivity, for which the linear perspective has proven a strong metaphor. The X-ray does not simply entail an expansion of human knowledge about the world, a further widening of an already powerful field of vision; it also embodies for a *nonhuman* kind of vision, which can disrupt and challenge exactly the above mentioned stable, all-knowing subjectivity. A main theoretical viewpoint in this thesis, from which I describe how radiography challenges the individual, subjective human standpoint, is borrowed from Joanna Zylinska's book *Nonhuman Photography.*[8]

In the second and third chapters, I will apply the understanding of nonhuman radiographic vision (what I will call "plate view") gained from the discussion in the first chapter, in a (partly comparative) analysis of my main research material, the two books *The Magic Mountain* and *Painting, Photography, Film*. Although the X-ray images in both books are unquestionably described as valuable for scientific purposes, and applauded for their exposing qualities, this is hardly the only (or even main) way they are perceived. In both works, the X-rays are portrayed as rather obscure and indefinable. In *The Magic Mountain,* their content is described as confusing and abstract, and often the X-ray pictures discussed are open to more than one interpretation at the time. Something similar can be seen in *Painting, Photography, Film*. For instance, one of the printed X-rays – showing the cross section of a conch — bears the caption: "In Licht umgesetzte Materie",[9] emphasizing the pictures' form and means of production, rather than its iconography. This is further amplified by the fact that the radiograph is placed next to a fully abstract "kameralose Aufnahme" (a photographic exposure made without a camera), a so-called *photogram* (inviting the reader to make a comparison).[10]

In both books there is a white male subject observer in the center of the narrative. (more explicitly so in *The Magic Mountain* and less explicitly in *Painting, Photography, Film).* Both books can be read, in part, as attempts at reformulating that subject's position in the experienced word, its being. So, in addition to the main purpose of the analysis — to look at how the X-rays are described as aesthetic experience — a secondary objective will be to look at the encounters these subjects have with radiography. As mentioned above, I choose to interpret the X-ray imagery and machines as examples of what Zylinska has called

[8] Zylinska, *Nonhuman Photography.*
[9] Moholy-Nagy, *Painting, Photography, Film*, 68.
[10] Ibid., 69.

“nonhuman photography”, with an agenda of their own, counterbalancing (and at times seemingly undermining) the human subject.

# 2 From Freak Photograph to Penetrating X-ray Vision (And Back Again)

"Photographie à travers les corps" — photography through bodies — is the heading of an ad in the magazine *La Nature* from 1897. [Fig. 3] It advertises the French photographer Radiguet's X-ray laboratory, a place where you could get your X-ray taken or watch a demonstration of the new and exciting technology.[11] The small black and white ad has its text centered to the middle. To the left, there is a drawing of a human skeleton, white on a black background. To the right, there is a big white "X," echoing the white skeleton. The Radiguet ad sums up some of the most widespread ideas about radiography in the first years after its invention in 1895, ideas which still persist today. The title, "Photographie à travers les corps," a widespread nickname for X-rays in France at that time, reveals how radiography was comprehended — as a variation of traditional photography, but with an additional "see-through-effect". The skeleton to the left is also a typical recurring image in relation to X-rays — an iconographical trope, as it were. The ad further tells us that the basic qualities associated with radiography at the turn of the nineteenth century were first transparency and, second, the ability to depict skeletons. As a symbol of death, the X-rayed skeleton contributed to the association of radiography to the spirit world. An association further elaborated by the way in which the skeleton was depicted — as a shadow.

There was, as follows, another nickname for X-rays, too, namely the German "Schattenbilder" (shadow images). In contrast to the French term "Photographie à travers les corps," "Schattenbilder," sounds less exposing. On the contrary, it sounds like something obscure and uncanny, as if it conceals more than it reveals. These two nicknames - "photography through bodies" and "shadow images," indicate two quite different approaches to the nature of radiography — the first is all about what is made visible, about exposure and transparency. Its goal is total surveillance over the inner mechanism of the human body and the penetration of solid matters.[12] The second outlook is more shadowy. The "Schattenbilder" approach is, in contrast to what one could call "the transparent photography approach," characterized by blur, ambiguity and unfamiliarity. It's more sublime than rational — giving rise to unsettling amazement. Accordingly, radiography evokes feelings of horror on two

[11] For a discussion about Radiguet's laboratory, see, Dünkel, *Röntgenblick und Schattenbild* (Emsdetten, Berlin: Edition Imorde, 2016), 36-54.
[12] See, Cartwright, *Screening the Body* (Minneapolis: University of Minnesota Press, 1995), 23 and note 6, 174.

levels: both an iconographical one (the skeleton) and on a pre-iconographical one (as shadow projection).

This chapter aims to provide an introduction to the various versions of X-ray vision. The two names for radiographs discussed above will serve as my guidelines: Transparent photography versus shadow image. The two names may stand for the wide span of both understandings, both metaphorical and literal, of radiographic vision. How does radiography see?[13] The former of the two names represents radiography as a prosthesis for the human eye, a technologically enhanced vision which penetrates the living body, or parcels at the customs, which scans and controls. The second name — "Schattenbilder" — will, in the following, be represented in everything concerning X-ray vision that challenges the first understanding: the distortions, the confusions, and the nonhuman manifestations it also takes.

## 2.1 Let There Be Light: The Genesis of Radiography

I wish to start with the beginning, radiography in its formational stage. The origin story of the X-ray occurred in the course of 8 weeks from October to December in 1895, when Wilhelm Conrad Röntgen discovered a new kind of ray and used it to make images. The question is what these images looked like and what qualities they incorporated.

More in detail, the story goes like this: At the end of October, in a small laboratory at the university of Würzburg, Röntgen set up his apparatus to do experiments with cathode rays in vacuum tubes.[14] On November 8, Röntgen darkened the laboratory and covered his Hittorf-Crookes' tube with some black paper. When he let a high-tension current pass through the vacuum tube, a fluorescent screen — laying on the table some distance away — lit up. This incident was reportedly the first sign of the, until then, unknown X-ray. Next, Röntgen placed a variety of different objects between the Crookes' tube and the fluorescent screen. Using a book as a barrier, he observed that the fluorescents persisted, although slightly duller. Afterward, he did the same with other heavier materials, such as glass and metals, while lead was the only material that blocked the rays completely. The first radiograph was, accordingly, not a fixed image, but a fleeting one. In a next step, Röntgen exchanged the screen for a photographic plate, on which he made a permanent record of the shadow projection. [15] And when the X-rays eventually were fixed, they were probably just a black trace left behind by

[13] Implicit here lies also a doubt concerning weather this even is a purposeful question to ask. Because does radiography really "see"? See, Turvey "Can the Camera See? Mimesis in Man with the Movie Camera"
[14] Glasser, *Wilhelm Conrad Röntgen* (San Francisco: Norman Publishing, 1993), 1-15.
[15] Dünkel, *Röntgenblick und Schattenbild* (Emsdetten, Berlin: Edition Imorde, 2016), 13.

the rays on the photographic plate — an image that had more in common with Malevich's "Black Square" than with the skeleton in Radiguet's ad described above.

The penetrability test X-ray [Fig. 1] discussed in the introduction was among the first radiographs that Röntgen made. There is nothing in the image that reveals what the shapes are. This information is, however, found on a positive copy of the same plate [Fig. 4]. Next to each one of the samples, Röntgen has written the name of the material: Aluminum, calcite 1 and 2, quartz 1 and 2, and glass. If it was not for the text naming the squares, they could just as well have been anything else — such as gray cardboard boxes stacked on top of each other. What is most striking about this X-ray, however, is not what it looks like, but rather that it does not really look like anything at all — in this sense, it is non-figurative, abstract. Hence, the first radiograph had a highly ambivalent status: not depicting anything recognizable. Rather, it oscillated between the roles of representation and mere artifact.[16]

Röntgen's sample X-ray is so unfamiliar to us that it might not even be taken for a picture at all. Illustratively, a somewhat similar radiograph was, in fact, made years earlier without being recognized as a representative picture. In 1890, a physicist at the University of Pennsylvania in Philadelphia, A. W. Goodspeed, observed a phenomenon that he later realized must have been X-rays.[17] The story is actually also quite similar to that above, of Röntgen inventing the X-ray. One evening, Goodspeed and his friend W. N. Jennings were photographing electric sparks. After they were done, Goodspeed demonstrated some Crookes' tubes to Jennings. A number of photographic plates, which they had used earlier for the experiments with the sparks, were laying nearby. The next day, as Jennings developed the plates, a strange picture emerged [Fig. 5]. In addition to the expected "sparks" were two unexpected circular shapes. To quote Glasser: "No one could explain this curious effect, and the plates were put aside with other freak photographs and forgotten."[18] Only after Röntgen had brought the X-rays to fame, Goodspeed understood what the image probably was. Even then, it was not easy to define what the two "very mysterious discs" were.[19] Foremost because, in contrast to Röntgen's mineral samples, there is no corresponding and explanatory text.[20] Years later, the circular shapes were identified as ordinary coins that had been laying

[16] Ibid. See also Geimer, *Inadvertent Images* (Chicago: The University of Chicago Press, 2013), 10.
[17] Glasser, *Wilhelm Conrad Röntgen* (San Francisco: Norman Publishing, 1993), 222-8.
[18] Ibid., 223.
[19] Geimer, *Inadvertent Images* (Chicago: The University of Chicago Press, 2013), 60. Geimer quotes Goodspeed.
[20] Dünkel points out how the radiographs often are unintelligible until explained by additional text. She further shows that regular photography also can take on a similar role as the written caption when X-ray images are juxtaposed with them. One does not see what is "made visible" (for example the content of a purse) without either a photograph of a purse or a text saying "purse with coins". See, *Röntgenblick und Schattenbild*, 93—95.

on the photographic plate in the laboratory. Before they were assumed to be coins, they were seen as abstract forms.[21] Goodspeed's accidental X-ray became representative — a picture correlating with human vision — years after it was made when receiving new information as a consequence of Röntgen's invention.

What both these examples, Röntgen's mineral X-ray as well as Goodspeed's accidental X-ray of coins, illustrates, is how the first X-rays were nothing like glimpses of a hitherto "unseen" or hidden reality.[22] The world was not solid one day and up in the air the next. Rather, the first X-rays were oscillating between fact and mere artifact, and between the figurative (aluminum, glass, coins, etc.) and non-figurative (circular shapes, square shapes). When the story about the "discovery" of the X-rays is told, it is often, like in Dam's report, presented as a sudden realization — yesterday matter was solid — today it's transparent. What a closer look at the genesis of the medium shows, however, is that radiography was not at all understood as a "photographie à travers les corps" at its point of discovery Goodspeed's error radiograph testifies that the very first X-ray was not even understood as a picture.

### 2.2 Exposure and "Dance Macabre": Radiography as Transparent Photography

How then, did radiographs end up being understood as a technology of representation, as an advanced form of photography? How did abstract forms become a surveillant, penetrating, all knowing, X-ray vision? At one point during the referred-to weeks of his research on the X-rays, in December 1895, Röntgen made a radiograph showing two dark gray vertical stripes on a slightly lighter gray surface that darkens towards the edges of the exposure [Fig. 6].[23] At the right edge, there is a small disk-shaped silhouette in an even darker hue. As Vera Dünkel points out, this radiograph is, in contrast to the others in the same series, not accompanied by an explanatory text. Accordingly, it remains enigmatic.[24] In Röntgen's preliminary report, however, the picture is described as "the profile of a door."[25] [Fig. 7] He explains how the

[21] On Goodspeed's radiograph, see Geimer, *Inadvertent Images* (Chicago: The University of Chicago Press, 2013), 60; Dünkel, *Röntgenblick und Schattenbild* (Emsdetten, Berlin: Edition Imorde, 2016), 12-13; Glasser, *Wilhelm Conrad Röntgen* (San Francisco: Norman Publishing, 1993), 122-8.
[22] The question of "invention" is interesting, but beyond my scope here. In his book *Inadvertent Images*, Peter Geimer brings up an anecdote about William Crookes, who went back to the store with blackened photographic plates after having been working on cathode-rays. As Geimer notes: "it was impossible to tell straightaway whether photographic plates presented discoveries or contaminations, the stuff that Nobel Prizes are made of or a potential warranty case." (61). Such stories challenge the humanist narrative of invention as the outcome of a singular human genius. In her book *Nonhuman Photography*, Joanna Zylinska, inspired by Vilém Flusser, for example, writes that: "self-contained human intentionality and sovereign human agency may be too limited to describe the emergence of specific technological processes at a particular moment in time." Zylinska, *Nonhuman Photography*, 64.
[23] Dünkel, *Röntgenblick und Schattenbild* (Emsdetten, Berlin: Edition Imorde, 2016), 29.
[24] Ibid.
[25] ibid.

photographic plate was placed on one side of the laboratory's door and the rest of the apparatus on the other. Dünkel comments how the image might be traced back to an ancient dream of being able to look through doors,[26] a dream that alludes to the idea of radiography as a technology of (penetrating) vision. What becomes evident with a single glance at the result, however, is that the medium of radiography fails in fulfilling this fantasy. There is no room behind the door.[27] The only information the picture gives us is the wooden door's ability to resist the rays — its degree of penetrability. Yet, one might just as well ask whether the door X-ray is a failed attempt. Was Röntgen that interested in transparency at all? He might have been more curious about the density of the wood than the space behind it.

Media theoretician Gunnar Schmidt comes up with a distinction that seems useful for the investigation of radiographic vision in the present chapter. He differentiates between "the medical approach" to radiography on the one hand and "the physicist approach" on the other.[28] According to Schmidt, physicists like Röntgen, are interested in "processes, currents and energies," while medical practitioners are interested in tangible reality (anatomy), in sight (the ability to look at anatomy). He concludes that Röntgen was not really interested in looking through or into things. Even though he was a passionate amateur photographer and made "photographs" with the new rays of different objects, he was barely interested in "penetrating vision" (Durchblick).[29] Röntgen's object of research were the traces, spots and marks left behind by invisible currents and processes, manifested as the blackening of the photographic plate. What we, accordingly, see in the radiograph of the laboratory's door, is what Schmidt chooses to present as the physicist's approach — an approach that concentrates on currents, processes and energies.[30] Only when medical practitioners started using the X-rays to look into bodies did radiography became linked to the notion of a "penetrating vision." The second outlook on radiography, what can be called "the medical approach," has nevertheless become far more widespread than the physicist one. X-rays used in medicine are what most people are familiar with. They have experienced it as a medical tool, as patients at their dentist's or if they fell and broke a leg or an arm.

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[26] "Was Röntgen sich von der Durchleuchtung der Labortür erhofft hat, ist nicht bekannt, gleichwohl scheint die Wahl dieses Aufbaus auf einen uralten Wunschtraum zu rekurrieren, durch Türen und Bretterwände hindurchschauen zu können." Ibid.
[27] ibid.
[28] Schmidt compares the two 1895 events — Röntgen discovering the X-rays and Freud analyzing a dream for the first time. Schmidt, "1895: Freud/Röntgen", 167-176.
[29] „Röntgen war, auch wenn er leidenschaftlicher Amateurfotograf war und mit den neuen Strahlen von unterschiedlichen Gegenständen Aufnahmen gemacht hat, kaum am Durchblick interessiert." Ibid., 169.
[30] Ibid.

Radiography understood in a medical context, becomes both a penetrating vision and transparency effect photography. As Susan Sontag writes in *Illness as Metaphor,* "the X-rays […] permit one, often for the first time, to see one's insides — to become transparent to oneself".[31] As a tool of diagnosis within the context of medicine this is exactly the way radiography is perceived. Within this field, the X-rays' main task is to make the body's exterior transparent — to remove its skin and flesh, and as a result, expose the inside of the body to the physician's "medical gaze". Such a view of X-rays presents the radiographic image — fixated on a plate or fleeting in the fluoroscopy — as a prothesis for human vision, specifically; the physician's vision becomes the "medical gaze."[32] As Lisa Cartwright notes, the technologically enhanced X-ray vision, "renders visible parts of the living body that were previously considered to be too interiorized, too minute, or too private to be seen by the researchers' unaided eye."[33] The medical view of X-rays (as one among many other medical imaging technologies) must be understood within a larger enlightenment and positivist project, where the devices — such as the X-ray machine — supplement the researcher's perceptual powers, expanding their "epistemological domain into previously uncharted territories."[34] And since the medical context became the main area where the X-rays were used, the medical science's notion of new medium as a sort of transparent photography, also became the conventional way of understanding it.

The medical understanding described above is further supported by how X-rays are portrayed in popular culture, by what one can call the "media fantasies" of radiography. Film historian Yuri Tsivian gives examples of such "media fantasies" in his article "Media Fantasies and Penetrating Vision».[35] In entertainment culture, the X-ray machine has become a prothesis for human vision that only makes it better, gifting the ability to penetrate matter, diagnose diseases, spy into sealed parcels or undress women — in other words — making the invisible visible. When film historian Yuri Tsivian, gives examples of what such 'media fantasies' are, he brings up both the fantasy of "penetrating vision", and also what he calls "the death spectacle."[36] Days after Röntgen handed over his report, the news of his discovery

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[31] Sontag, *Illness as Metaphor and Aids and Its Metaphors* (London: Penguin Books, 1991), 12.
[32] Technology as prothesis: f.ex. Zylinska 61
[33] Cartwright, *Screening the Body* (Minneapolis: University of Minnesota Press, 1995), 23.
[34] Ibid., 23.
[35] Yuri Tsivian stresses the division between "media as such" and so-called "media fantasies": "Media fantasies" are the beliefs and fears surrounding the new media in for example the popular press. It is, according to Tsivian, "an apt term for the many statements, metaphors and hypothesis" surrounding the early X-rays. Tsivian emphasizes the fact that he looks at the "media fantasies", not the real media. the idea of what an X-ray is and the materiality of radiography — i.e., the apparatus, the photographic plate, the process of exposure — is not the same thing. Tsivian, "Media Fantasies and Penetrating Vision", 82.
[36] Ibid., 81-4.

was printed in newspapers. The New York magazine *Electrical Engineer* published this report:

> Professor Routgen (*sic*) of Würzbourg has discovered a light which, for the purpose of photography, will penetrate wood, flesh and most other organic substances. The professor has succeeded in photographing metal weights which were in a closed wooden case, also a man's hand, which shows only the bones.[37]

Typically, the newspapers reported on the image of the weights in the wooden box [Fig. 8] and the human hand [Fig. 9] — emphasizing the fact that the picture was taken from a living person and not from a skeleton. A widely circulated story tells that Bertha Röntgen — Wilhelm Conrad Röntgen's wife and the person to witch the hand above belongs — reportedly said that she "saw her own grave" when the mentioned radiograph was showed to her. Her association was the first of many to come. Radiography was recurringly connected to death via the skeleton trope.

What becomes obvious from the many reports is, however, that the exact nature of the new rays remained uncertain.[38] How exactly did the technology work? There was also some uncertainty regarding what the new rays were able to do. One paper, for example, reported that diagrams had been X-rayed, successfully, into students' brains during a lecture.[39] The penetrating X-ray vision — either as an occult or as a medical phenomenon — enables one to see *more* and almost never *less*.

### 2.3 The Chicken, but not the Egg

The above-described notion of radiography, as an exposing, transparency-effect photography, seems almost too remarkable to be true. Do X-rays always penetrate matter and make solid objects transparent? Certainly, the notion of radiography as penetrating vision, may be challenged. The two scholars I now will turn to, Vera Dünkel and Peter Geimer, have both shown how the transparency and clarity of X-ray images are actually rather unstable qualities. What at first may seem like the stronghold of intelligibility can as easily become ambiguous, treasonous, and confusing. Both Dünkel and Geimer pay as much attention to what an X-ray does *not* visualize, as to what it exposes. I will use their close analysis of actual radiographs to get an account of what other aesthetic properties X-rays may possess, than "transparency".

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[37] Glasser, Wilhelm Conrad Röntgen (San Francisco: Norman Publishing, 1993), 199.
[38] Ibid., 199-205.
[39] Such stories also gave rise to widespread beliefs in the employment of X-rays in occult practices. X-rays were thought to be linked both to spirit photography and soul photography. Ibid., 204.

In her book *Röntgenblick und Schattenbild*, Dünkel distances herself from the penetrating vision-view on X-rays, emphasizing "shadow image"-qualities instead. More often than not, the early X-rays she looks at are quite abstract and difficult to interpret. The second chapter in Vera Dünkel's book, which is representative of her overall approach to radiography, partly overlaps with Glasser's report about the critical weeks between November 8 and December 28, 1895, when Röntgen worked on the X-rays. But, where Glasser pays attention to the narrative and the heroic work of the scientist, Dünkel pays more attention to the pictures that were produced during the same period of time.[40] Similarly to Schmidt, she concludes that the object of Röntgen's study was not *insides* but rather penetrability. Röntgen was not aiming at inventing a new fabulous machine of vision that would penetrate opaque surfaces and make reality transparent to the human eye. He was simply trying to elaborate to what degree the different materials would resist the rays. His object of research was the slight difference in shades of gray between mineral samples.[41] The images that were the product of his research were two-dimensional abstract forms. They were not necessarily easy to interpret, and sometimes it is even hard to figure out their subject: "like how the play of shadows produce (both) most similar representations (ähnlichste Abbilder) and surprising estrangements, the aesthetic of early X-rays oscillates between the concrete and the abstract."[42] Summing up Dünkel's point, one may say that radiographs are as blurry and abstract as what they are exposing.

Furthermore, Dünkel shows that, in addition to expanding vision, radiography reduces what is seen. Throughout her book, Dünkel shows that when something is exposed, something else is always simultaneously concealed, too. She argues that when photographers, physicists or doctors were demonstrating the different capacities of the X-rays in the first decades after Röntgen's discovery, they deliberately chose objects that were rewarding towards the medium of radiography. Examples of such objects could be glasses or keys in wooden cases, wallets with coins [Fig. 10], flat animals such as frogs and fish [See Fig. 17], or the as above mentioned much used human hand.[43] All these objects shared one specific quality: their insides had a lower degree of penetrability to the X-rays than their outsides.

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[40] Dünkel is concentrating on three aspects in the story of origin narrated above: firstly, that the new and unknown revealed itself as *traces* (Spuren), secondly on the two mediums he used to make the rays visible (the fluorescent screen and the photographic plate) and third, question what the *Forschungsgegenstand* (Object of research/Material) that Röntgen was looking for, aided by these mediums, was. Dünkel, *Röntgenblick und Schattenbild Dünkel, Röntgenblick und Schattenbild* (Emsdetten, Berlin: Edition Imorde, 2016), 16.

[41] Dünkel also writes about "Graustufen" (grayscales) in X-ray images. Ibid., 149.

[42] „Wie das Spiel mit Schatten ähnlichste Abbilder und überraschendste Verfremdungen hervorbringt, bewegt sich auch die Ästhetik der Röntgenbilder zwischen Konkretion und Abstraktion." Ibid., 31.

[43] Ibid., 89-100.

Consequently, the rays were able to make the outside seem transparent. Another important trait was that the objects were somewhat flat and had a recognizable form when cast as a shadow.

In an illustrating analysis of two juxtaposed plates, Dünkel shows how the effect of transparency disappears when the depicted object does not fulfill these requirements. In Charles-Eduard Guillaume's 1896 treatise on X-rays, *Les rayons x et la photographie à travers les corps*, plate number three [Fig. 11] presents two radiographs. The first one shows the typical collection of X-ray-friendly objects such as glasses, a key, needles and a nib. The second radiograph shows a chicken egg. The corresponding text tells us that the egg contains a chicken soon to hatch. Even so, due to the chicken bones' higher degree of penetrability, they are undetectable through the "very resistant" eggshell.[44] The comparison of the two radiographs shows that the claimed translucency is less stable than first assumed. The technology's ability to expose insides depends on a row of factors — factors which the human body incidentally fulfills.[45]

In his book *Inadvertent Images* (Bilder aus Versehen), Peter Geimer expresses a similar critique of the supposed transparency of X-rays as Dünkel does. In one chapter, Geimer looks at the term "photography of the invisible" (a term used for X-rays as well as other technologies of vision such as Maray's chronophotography) and argues that the distinction between "visible" and "invisible" seems overly rigid. According to Geimer, there was an idea within scientific discourse (in particular during the nineteenth and the early twentieth centuries) that what was invisible could become visible. Geimer shows, throughout the chapter, that a "Photography of the invisible" does not suddenly make visible something that was previously invisible. He asks: "what exactly does it mean to say that something "invisible" has become "visible" in the photographic image? What happens in the several stages between initial invisibility and eventually visibility?"[46]

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[44] Ibid., 98-99.

[45] In early examples of radiography, there was no standard for whether an X-ray should be a positive (black shadow on white ground) or negative (white shadow on black ground). Often, as for example in Eder and Valenta's atlas of 15 X-ray plates from 1896, the negative copies and positive copies would appear side by side. In contrast to a regular photography, the difference is not significant for the image's correspondence to 'reality'. What does this fact say about radiography's rendering of the world? As pointed out by Vera Dünkel in, the making of positives might have been a way of connecting the X-rays to photography. In Eder and Valenta's atlas, however, the positives and negatives are seemingly treated equally. Both methods had their advantages and disadvantages. The inconsistency shows how the representation of the world given by an X-ray is so fundamentally different from 'natural vision' that it does not even make sense to say that one of the two modes, the positive or the negative, is closer to representing reality than the other. One could scarcely say the same thing about a negative copy of a photograph. Ibid., 74 and 54.

[46] Geimer, *Inadvertent Images*, trans. Jackson (Chicago: The University of Chicago Press, 2018), 143.

So what exactly is this so-called "photography of the invisible"? First, photography of the invisible does not make sense without being compared to conventional "photography of the visible." While conventional photography only renders what people have already seen with their natural vision, a "photography of the invisible," in contrast, renders what has not yet been seen, as well as serving as proof that these invisible phenomena exist. The classic example of this is Marey's chronophotography of a running horse. In the case of Röntgen and other physicists, the photographic plate became a kind of detector of invisible things — it made up for the inadequate human sense apparatus, giving rise to beliefs in "an utopian vision of total transparency."[47] The problem with such beliefs as Geimer sees it is that they describe the two sides of the above presented dichotomy (visible/invisible) in absolute terms: "the conspicuous manifestations of what had become visible and the utter darkness from which it had to be wrested."[48] Rather than being the perfect detector that makes the invisible visible, Geimer shows how the photographic plate often throws its users into confusion. It is often hard to tell, in the images produced, where the "real" ends and the "unreal" begins.

To exemplify his argument in a concrete example, Geimer refers to Guillame's X-ray and photograph of a parcel containing a watch [Fig. 12]. The parcel is a standard one, complete with address (Röntgen, Würzburg), a seal and postal stamp. The watch is a pocket watch with a chain. Of the two juxtaposed images, Geimer proposes that the photograph is the one that is more intelligible. One recognizes what is pictured in the photograph, but not what is pictured in the X-ray: "how exactly the chain is coiled up, which parts are closer, which further away, where the bottom edge of the picture is located relative to the object at the center — these are questions even viewers familiar with radiographic images cannot answer with certainty."[49] The radiograph needs explanation, the photograph explains itself. The radiograph resists interpretation, despite the set-up's "didactic layout" — that is to say, the thin permeable paper wrapping concealing the less permeable metal clock inside. While the picture above visualizes "the initial state of invisibility", the bottom one visualizes "a formidable act of revelation"[50]. The argument of the layout, that X-rays renders the invisible visible, depends on both the photograph and the X-ray. The radiograph alone, demonstrates little.

[47] Ibid., 142.
[48] Ibid., 147.
[49] Ibid., 152.
[50] Ibid.,154.

If one follows Dünkel and Geimer, the common tropes used to describe radiographs have proven to be unstable. The meaning of words like visible, invisible, transparent and opaque become elusive when applied to X-rays. Regular photography is not simply «photography of the visible», as little as X-rays are «photography of the invisible». When a radiographic picture makes something visible, it also — simultaneously — makes something else invisible. If, for example, a key inside a wooden box is made visible, the wooden box, on the other hand, becomes invisible. In both cases however, the visibility and invisibility are related to the object depicted in the picture. The key, as well as the wooden box, are the subject matter of the picture.

### 2.4 Plate View

Even though X-rays (sometimes) render their content matter transparent — as transparency-effect photography — the radiographic image itself may actually be described as less "transparent" than photographic images, and we will now investigate in which ways. The radiograph has its own transparency that has little to do with the transparency of its subjects. In its physical presence, the radiographic image — that is to say, the glass plate, the paper copy, or the fluorescent screen — also "appears" and "disappears" to their viewers. If one asks about the "X-ray vision" and whether radiography is a technology of vision, as I have asked in this chapter, one also needs to ask not only *what* radiography does "see" but also *how* it does it: What is the radiographic image like? What is the difference between the radiograph's "framing" of its content and that of other visual technologies, such as photography or classical painting?

In *De Pittura,* his famous treatise on painting and linear perspective, published in 1435, Leon Battista Alberti describes painting as an open window through which the observer can look. He writes: "Let me tell you what I do when I am painting. First of all, on the surface on which I am going to paint, I draw a rectangle of whatever size I want, which I regard as an open window through which the subject to be painted is seen."[51] To Alberti, the apparent transparency of the surface is one of the primary ideals of painted images. His window analogy establishes the picture as something we look *through* and *into* rather than *at*. Renaissance one-point linear perspectives rendered the surface transparent. In fact, the etymology of the word perspective is the Latin verb *perspicere* — "to look through".[52] When a picture constructed in one-point linear perspective — a painting or a photograph, hangs on

[51] Alberti, *On Painting*, (Lindon: Penguin Books, 2004), 54.
[52] Belting, *Florence and Baghdad*, (Cambridge, Mass: Belknap Press of Harvard University Press, 2011), 1-2.

the wall, it simulates transparency. It opens up a hole, enabling us to see through the solid walls of our houses and apartments, not unlike how one sees through the flesh of the human body in an X-ray.

One might assume that X-rays, reportedly being "transparent photography", should also have this ability to open up walls. But, as testified by Röntgen's X-ray of his laboratory door, this is not the case.[53] Due to its lack of perspective, «transparent photography» ironically is less able to produce the illusion of a transparent wall, letting us see through the two-dimensional surface, than a regular photograph hanging on it. If the photograph hanging on the wall imagined here is removed, however, the square of unbleached wallpaper we might expect to find behind it may very well serve as an analogy to the two-dimensional photosensitive recording found in X-rays. Below, I will take a closer look at this paradox, that the X-ray — which in the public imagination was believed to make matter transparent — at the same time shuts the transparent window of one-point linear perspective, and what implications it has for how we may understand "X-ray vision."

The word "perspective" indicates how a three-dimensional space is structured within a representation–typically a representation on a shallow or two-dimensional surface. In one-point linear perspective, space is structured along lines that are projected from a vanishing point on the horizon line. Regular photography reproduces mechanically a similar structuring of space as that of one-point linear perspective, thanks to the construction of the apparatus: With its single lens, through which the light must pass, and the two-dimensional photographic plate (or digital image sensor) onto which the light is projected. [54] Even though a "renaissance perspective" — technically speaking — is a device for painters to represent space on a flat surface, it may also be seen as a rhetorical device, as it structures the picture's content after the positioning of its viewer. Therefore, one-point linear perspective has been interpreted (first by Panofsky, and later by others) as a metaphor for the "world-view" of bourgeois humanism, which grants similar agency and priority to the subject. In *Downcast Eyes,* for example, Martin Jay looks at how what he calls the "scopic regime" of the enlightenment was challenged by 20th century scholars such as Merleau-Ponty and Lacan among others. He

[53] The "glass plate", on which X-rays usually were exposed, is of course transparent. The experience of the transparency of the glass material is for example described here in *The Magic Mountain*: "a little rectangle, which when held parallel to the ground was black, opaque, reflective surface, but when held up to the sky, grew light and revealed humanistic things: the transparent picture of a human body, […]" Mann, *The Magic Mountain,* trans. Woods (New York, London, Toronto: Alfred A. Knopf, 2005), 461-2.

[54] See for example, Barthes, in *Camera Lucida*, on the photographic referent's invisibility: "Whatever it grants to vision and whatever its manner, a photograph is always invisible: it is not what we see." And "The Photograph belongs to that class of laminated objects whose two leaves cannot be separated without destroying them both: the windowpane and the landscape," Barthes, *Camera Lucida* (New York: Hill and Wang, 1981), 6.

labels the visuality of one-point linear perspective, found in painting and the camera obscura, and later in photography and film, as “cartesian perspectivism”, implying that human knowledge may be founded on objective observation. [55] According to Jay, it denotes a valorization of a disembodied — or “angelic eye” — a valorization shared by modern science and Albertian art.[56] The history of perspective is tangled up with Cartesian dualism as well as with the success of the Florentine merchant class, in other words, with bourgeois, masculinist and capitalist ideology.[57] So, when radiography abandons linear perspective, it also leaves behind the visual regime that the one-point linear perspective for long has been associated with, that is to say, with renaissance humanism and enlightenment thought.

Radiography’s relationship to perspective — as well as the cartesian ideology it connotes — is, as we shall see, complicated. Maybe even more ambiguous than that of photography (which is a different and equally interesting discussion that we cannot enter here).[58] The question of “X-ray-perspective” is further complicated by the fact that the definition of perspective also can be quite tricky. Our definition of perspective (as the rendering of three-dimensional *space* on a two-dimensional *plane*) assumes what we call “space” in pictures — dimensions of height, width and depth as represented in two dimensions — is a constant phenomenon, that it is some kind of independent and neutral entity, which may be interpreted differently in different forms of perspective.

Hans Belting considers this issue in *Florence and Baghdad*. Instead of using the term “space,” Belting calls such phenomena in perspective pictures “gaze.” Because, while the term “space,” according to Belting, is ignorant about the observing body, his term “gaze,” by contrast, reveals that depicted spaces are generated only by the bodily activity of looking. What we see when we see representations of different kinds of spaces in pictures is, in fact, the physical act of looking. As noted by Belting, it is a paradox that representations in two

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[55] Jay, *Downcast Eyes* (Berkeley: University of California Press, 1993), 70.
[56] Ibid., 81.
[57] Ibid.
[58] Photography — that is to say, the kind made by the aid of a photographic camera — obtained an ambivalent status in regard to the connotations of perspective described above. As Jay writes, photography, "because of its rendering everlasting of the image cast by the camera obscura, it has often seemed, moreover, as if photography validated the perspectivalist scopic regime that was generally identified with vision itself after the Quattrocento. The camera eye, as monocular as that of the peephole, produced a frozen, disincarnated gaze on a scene comletely external to itself’ (page 127) But, he also recognizes that photography aslo, partly, discredited the camera obscura model, for example in the redering of "the optical unconcious" (page 132), and ends up, in copromize, describing it as a "way station" (page 139). Ibid. Jonathan Crary, likewise describes photography as a technology sort of inbetween, as a "relapse into the camera obscura mode" after the epistemological shift introduced by the stereoscope: “Photography defeated the stereoscope as a mode of visual consumption as well because it recreated and perpetuated the fiction that the “free” subject of the camera obscura was still viable.” Crary, *Techniques of the Observer* (Cambridge, Mass: MIT Press), 33.

dimensions still are called "space," because space in perspectival representations cannot be separated from the eye. While human vision functions in a bodily and spatial manner, perspective "symbolizes this gaze in two dimensions, using the picture screen as a symbol. Space in perception exists as space for the gaze."[59] Accordingly, the picture plane, structured in perspective, is not a depiction of "space", like Panofsky describes it in *Perspective as Symbolic Form*, but rather "a metaphor for the presence of an observer, who is constructed as a function of the picture." Therefore, it might make more sense to ask for the "X-ray gaze," than "X-ray perspective". Because what I am looking for here, is the "X-ray gaze" as a kind of embodied space — not for our body, however, but for the weird and unfamiliar body of the X-ray machine. So, following Belting, I wish to ask: Where does the space represented in X-rays place its viewer? What is the X-ray "gaze"?

Vera Dünkel describes how spatial renderings and viewpoints — that is to say, what Belting calls "gaze" — works in X-rays in detail, both in *Röntgenblick und Schattenbild*, and in an earlier article, "Das Auge der Radiographie".[60] In both cases, Dünkel uses a wall chart with a set of pictures taken by the French radiologist Radiguet [*Fig*. 13] as a point of departure for her discussion. The chart includes three images altogether, two photographs and one X-ray. The three images are all mounted as a sort of tableau on the cardboard background. A handwritten text, "penétration des métaux par les rayons Röntgen," informs us that what we are looking at in the largest picture is the penetration of metals by the use of X-rays. One can recognize coins, a wrench, and some other less identifiable square shapes. The two photographs placed beneath the X-ray are both smaller in size. They seem to show the same subject as the X-ray, but one is mirrored vertically by 180 degrees. However, what looks strange to Dünkel in Radiguet's tableau is that there are two photos instead of the usual single one. She refers to the text written under the photos in search of an explanation. The text tells us that the mirrored photo is taken from the side of the tube emitting the rays, while the other photo shows us the «side resting on the sensitive plate».[61] One photograph shows us the objects from above — the way we would usually see them — while the other photograph is taken from "underneath" — from the photosensitive plate's perspective. As Dünkel states: "Both photos consequently present views of the objects outer surface, while the X-ray renders the inside view."[62] According to Dünkel, the assembly of these three pictures reveal

[59] Belting, *Florence and Baghdad*, 15.
[60] Dünkel, *Röntgenblick und Schattenbild*, 50-53. See also, Dünkel, "Das Auge der Radiographie".
[61] "coté de l'ampoule e´mettant les rayons x" and "côté reposant sur la plaque sensible", Dünkel, *Röntgenblick und Schattenbild*, 53.
[62] „Beide Fotos präsentieren somit zwei Ansichten des Äußeren der Objecte, während das Röntgenbild ihre

Radiguet's understanding of the X-ray "gaze". First, it demonstrates how X-rays don't have front or back — like three-dimensional objects do when facing a viewer. Rather, it shows both sides simultaneously. Second, the assembly demonstrates which of these two "outer views" Radiguet thinks is closer to the "X-ray, inner view." Because the view from above is a mirror picture of the X-ray, the view from below is more similar. Dünkel argues accordingly that the view from below — "Untersicht" — is the view that for Radiguet is more true to the X-ray. One can therefore say that what the X-ray presents to us, the X-ray "gaze", is the object as seen from the viewpoint of the photographic plate. The things represented in the X-ray are consequently not seen from above (where we would stand), they are seen from behind or from below. So the X-ray "gaze" is not foremost the penetrating "medical gaze" of the doctor standing in front of or above the object he wishes to X-ray. The X-ray "gaze" is the object seen from the other side of the photosensitive plate. Needless to say, this is a radically different "gaze" compared to the kind you get in a conventional camera-based photograph or in Alberti's open window.

### 2.5 Disruptive Distortions

The radiographic "gaze", as discussed above, is a "plate-view" from the underside of the depicted object.[63] How does this perspectival shift (from an upright standing human viewer, to that of the photographic plate) manifest itself pictorially in the radiographic image? And what are the metaphorical/ideological implications of it?

As shadow projections, radiographs only render two-dimensional representations of their objects. As discussed previously, this doesn't really matter as long as what is being X-rayed is flat.[64] Because a flat object lying on a flat surface casts a shadow more or less identical to itself. The shadow of a paper clip still looks like a paper clip. However, if one wanted to X-ray a three-dimensional object, one would be facing some serious challenges. The shadows projected by X-rays are distorted in exactly the same way as regular shadows. Just in the same way as if one uses a flashlight to project the shadow of a hand onto a wall, the hand being close to the light source and far away from the wall, the hand easily turns into a great monster. The same is true for X-rays. If, for example, one wanted to X-ray a three-dimensional object, say a wooden box, the side of the box facing the X-ray tube would

Innenansicht wiedergibt." Ibid.

[63] From this point onwards, I will refer to the "gaze" in X-rays discussed in the previous section as "plate view", for clarity's sake.

[64] See chapter one page-page. Radiologists would in fact choose test objects due to their flatness. This explains the excess of frogs, purses, and human hands in early radiography.

become much bigger than the side resting on the photographic plate in the projected image. The X-ray "gaze" — taking the position of the photographic plate — inevitably «sees» what is closest as smaller than what is further away. This might seem obvious when laid out and explained, but when the radiograph later is removed from the sight of production, it starts playing tricks on its viewer. In the habit of looking at depictions of spaces generated by linear one-point perspective, we tend to assume that what is bigger in the picture is also closer to us.

An X-ray taken by Röntgen in 1895 [*Fig.* 8] may serve as an illustrating example here: we see three rows of geometric shapes; two rows of circles in different sizes and one row of squares, also in different sizes. The shapes are blurry towards the edges. A handwritten text informs us that what we are looking at is a "Gewichtsatz" — set of weights — classic equipment in a physics laboratory. What looks strange, though, is that Röntgen's geometrically shaped metal weights seem to be placed within some kind of three-dimensional space. It appears as if they were lying on the bottom of a box into which we are looking. Why do we apparently look into a three-dimensional room in what we know to be a two-dimensional shadow projection?

A illustration [*Fig.* 14] made by Swedish radiologist Gösta Forsell may help to explain this.[65]. The illustration explains how three-dimensional objects are rendered in X-rays. According to Forsell, X-rays are neither mirror images of the world (like a photograph) nor normal shadow silhouettes, strictly speaking. In the X-ray, in contrast to the silhouette, one is able to detect all the different layers of the object. The layers are, however, «stacked on top of each other, like drawings representing the different planes».[66] While a shadow projection cast by an opaque/solid object only would give a silhouette of the object's outer contours, the X-ray, on the other hand, also shows the objects three-dimensional structure, however in a distorted manner.

As shown in the illustration, the corners of the box that are facing the X-ray tube (*e* and *f*) are further apart than the corners closer to the photographic plate (*a* and *b*). The result, as seen in the illustrated radiograph, is somewhat similar to a room depicted in a one-point linear perspective. But what would have been the furthest wall in a painting, actually is the side of the box facing «us» (facing the plate, the viewpoint we take). Accordingly, what we see in Röntgen's X-rayed weight set is *not,* in fact, the view into an open box, but the box as

[65] Forsell's illustration is included in Solveig Jülich's book *Skuggor av sanning*, where it appears in a paragraph about the difference between X-rays and other photographic media. Jülich, *Skuggor av sanning* (Lindköpings universitet, 2002), 272.
[66] "centrala projectionsbilder och lämna öfver hverandra tecknade projectionsbilder of olika plan innan det Röntgenografiskt framstillade organet" Ibid., 271.

seen from the perspective of the photographic plate. From the photographic plates point of view, the side farther away becomes bigger than the closest one. What at first looked like the uncovered opening of a box or what Alberti might have called an open window is actually the bottom of the box pictured in an inverted perspective.[67]

To understand the ideological consequences of the described perspectival shift, I think it might be helpful to look at the way Jacques Lacan accounts for the phenomena of "anamorphosis" in his lectures on "the gaze."[68] "Anamorphosis" is an optical trick, commonly made for amusement. Anamorphic pictures are unintelligible until they are looked at from an askew angle or through special mirrors. Like the radiographic "plate-view" in Röntgen's weight set, anamorphic pictures are rendered along different lines and from a different vanishing point than the central linear one-point perspective found in classical paintings and (almost) in photography. Lacan's prime example of such phenomena is found in Hans Holbein's *The Ambassadors* [*Fig.* 15]. The 1533 painting is a double whole-figure portrait of two French diplomats, together with a collection of scientific instruments. In the bottom fourth of the otherwise intelligible depiction is an obscure oval shape. If and only if one looks at it while standing next to the painting rather than in front, it reveals itself as a human skull. In Lacan's analysis, he interprets the anamorphic skull as that which otherwise escapes human vision. While the rest of the painting displays a humanist and positivist narrative — "the period in which the subject emerged and geometrical optics was an object of research"[69] — the anamorphic skull, by contrast, represents what the rest of the painting annihilates: "the gaze of the other," that is to say, the look of someone else who sees the painting's beholder as their object.[70]

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[67] The geometry or "perspective" found in X-rays is actually quite similar to the phenomena called "reversed" or "inverted perspective". The reversed perspectives in Russian icons have been interpreted as an indication of the icon's agency over the viewer. The viewer is viewed by the icon, rather than viewing it. In this manner, the tables are turned: It reverses the relation of subject and object, making the viewing "subject" aware that he or she is also under observation — observed by the icon, by others, and ultimately by God.

[68] Here I want to make a remark on the term "gaze". In this master's thesis on radiographic vision and perception, there will necessarily be a lot of words describing all kinds of "vision", from eyesight to the machinic vision of the X-ray apparatus. A further complicating factor is that the term "gaze", often signifies, not neutral ways of seeing, but specific ones, such as in the term "male gaze" (Laura Mulvey) and "medical gaze" (Foucault). To avoid further confusion, I have translated Vera Dünkel's "Röntgenblick" to "X-ray vision", even though "the X-ray gaze" may be a more accurate description. In addition to the already motioned types of "gaze", we have Beltings term, which (as presented above) describes the symbolic representation of the viewer in perspective pictures. When Lacan uses the term "gaze", it is again not just a gaze, but the gaze of the other (*le regard*). To differentiate my own description of the distorted perspective in radiographs, I chose to call this effect "plate view". When I use "plate view" later in this text, it still corresponds to both Beting's and Lacan's "gaze".

[69] Lacan, *The Four Fundamental Concepts of Psycho-Analysis*. Trans. Alan Sheridan. (New York: W.W. Norton & Company, 1977), 88—89.

[70] Ibid., 84.

Like the anamorphic skull in Lacan's analysis, the X-ray distortions may remind us that the image we look at is not — in fact — a representation of our vision, but rather an example of another kind of vision — the vision of the other, not even another human being that we may identify with, but rather the eye of a mechanical agency, quite another vision — which may be called "plate view." Because, the "gaze" we see in the X-ray is space as it exists for the photographic plate. We are facing a nonhuman agent, a photographic consciousness different from our own. Rendered in a distorted manner, with much in common with so-called "reversed perspectives" and "anamorphosis," it confronts and repels its viewer in a Medusa-like fashion. The X-ray picture is, unlike regular photography where the light exposes the plate through an eye-like lens, deprived of the structuring, symbolic force of one-point linear perspective. Consequently, the "plate view" we encounter in an X-ray is neither that of recognition and identification nor of legible signs. It is rather the gaze of "the other," that is to say, in Lacanian terms: "the real." Even though X-ray perspective (plate view) is not identical with neither "anamorphosis" or "reversed perspective," technically speaking, the three phenomena have overlapping qualities. They all show objects in the world, rendered on a two-dimensional plane from a different viewpoint than that of the human observer. As a result, both Röntgen's distorted weight set and the anamorphic skull in Hans Holbein's "The Ambassadors" give their human viewers a glimpse of the world as it is without them — viewed from an agency that is different from their own.

### 2.6 Distortions in Disguise

Before moving on with my argument, I wish to note that the structure of the "plate view" discussed above is often overlooked or downplayed in practice. When X-ray vision is fantasized about in popular culture, for example, it is described as something quite other than Vera Dünkel's notion of "Untersicht." A common trait in all these fantasy versions of X-ray vision is that they ignore the lack of spatial depth in real X-ray imagery. For example, in a scene from the Hollywood film *Man with the X-ray Eyes*, the doctor protagonist is at a party. He suddenly realizes that his X-ray eyes enable him to see the woman he is dancing with naked. The swap to his X-ray vision is only distinguished from the other shots in the film, by the fact that the people depicted are naked, and by the addition of a blurry lens-like circular framing (ignoring the lack of lenses in radiographic imagery). The X-ray vision is imagined as something that originates in the eyes, but also as a sort of camera, due to the lens framing. The X-ray vision presented is, not surprisingly, also structured in a one-point linear perspective.

Similarly, in the cartoon reproduced in Yuri Tsivian's "Media Fantasies and Penetrating Vision" [*Fig.* 16], there is even a camera, operated by what looks like a faun, judging from his goat-legs. The camera is placed on one side of a door, while its object — a room with two skeleton lovers — is placed on the other side. The whole set-up implies that the radiograph taken has a one-point linear perspective as a product of the camera obscura, even though it is not part of the drawing. The fantasy version of X-ray vision, both as peepshow and as superpower, is, as a rule, dependent on the eye or a camera (like the one in Tsivian's cartoon). Therefore, it is difficult to gain a deeper understanding of how the vision "really" works in X-rays, by looking at how it is represented in popular culture.[71]

The "below view" or "plate view," however, has not only been ignored in cartoons and movies. Radiologists have been moderating the perspectival distortions in X-rays, too. When Gösta Forsell, the Swedish radiologist who made the illustration discussed above, presents the distorted renderings in X-rays, his agenda is to translate them into the regular experienced space (exemplified in the vertical view of the box seen in the second picture). The X-ray-view is portrayed as a distortion and as an obstacle to clarity and objectivity. When radiologists choose their subjects and set-up, they often do it in a way that — as far as possible — eliminates the distortions. Rather than displaying the particularities of the medium — such as the reversed perspective — the X-rays are disguised as regular photography.
An example of an X-ray disguised as photography is a plate in Eder's and Valenta's X-ray atlas, published in 1896.[72] [*Fig.* 17] In the X-ray in question, we see three white skeleton fish against a black background. Like the other plates in Eder and Valenta's atlas, it is very clear. There are no blurry edges (like the ones addressed by Forsell). There is also something about the subject that, despite the bony appearance of the fish, looks surprisingly normal. The only thing that separates the plate from a view into an aquarium is the fact that three fish are stripped to their bones by the X-rays. There are no other deformations. In *Röntgenblick und Schattenbild*, Vera Dünkel describes them like this:

> Auf einem Bild zweier Seefische aus Eder und Valentas Tafelatlas wurden die aus naturhistorischer Sammlung stammten Tierpräparate so angeordnet, dass sie in entgegengesetzte Richtungen zu schwimmen scheinen. Ihre nach hinten ausfransenden feinen Flossen und Gräten erzeugen den Eindruck einer fast fliegenden Dynamik. Die Tiere erscheinen wie im Augenblick ihres vor-begleitens vor einer Aquariumsscheibe festgehalten worden zu sein[73]

[71] However, one can of course get an understanding of the cultural meanings attributed to X-rays in society.
[72] About the atlas, see Dünkel, *Röntgenblisck und Schattenbild*, 70—87.
[73] Dünkel actually describes a different (but very similar) picture here, a positive copy with only two fish. See my translation: In a picture of two sea fish in the atlas of Eder and Valentas, the two animal preparations from a

What is important here is that Dünkel writes "placed in such a way" ("so angeordnet") and "appear to swim" ("zu schwimmen scheinen"). It implies that the scene we are witnessing is a staged one: the reason that there are no distortions here is because the fish are flat, which, correspondingly, is the reason that fish are the typical iconography of early X-rays. Also, the snapshot quality of the image is a deception. The fish are not caught in a frozen moment, as in a snap-shot photograph. They are actually exposed for a longer while (as is necessary in an X-ray), so the fish laid still because they were dead.[74] Well worth noticing here, is the fact that the radiograph is oriented vertically: the fish are being placed within a picture-space corresponding to a human, upright viewing situation, like a screen (or behind the glass window of an aquarium), while in reality, they are lying flat on the surface of the photographic plate. The total blackness of the "space" behind the fish, which actually is the blackness of the photosensitive plate, adds to the deceptiveness of the scene — it gives the impression of being an infinite space (for example the sea) behind the swimming fish. [75] Although radiographic vision, as seen in the case of Röntgen's weight set, is the distorted "gaze" of the photographic plate — a "plate view" — this is often softened in practice. The inverted perspective and "below view" are not necessarily seen by radiologists as immanent, but rather as faults that can (and should) be avoided. Consequently, the experience of "Untersicht" and reversed perspective is exchanged for a pseudo-Albertian window.[76] And it matters whether the fish in Eder and Valenta's X-ray is 're-verticalized', 're-spatialized', revitalized, because, as discussed above, one's perspective brings about a wide range of ideological, phenomenological, and even economical, implications. Unless they are staged, X-rays are not — in contrast to regular photography — caught up in the Cartesian visual regime,

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natural history collection were presented in such a way that they appeared to swim each in an opposite direction. Their fray and fine fins and fishbones produce an impression of an almost flying dynamic. The animals appear as if they were stopped in the very moment when passing behind the aquarium screen.Ibid., 101

[74] Eder and Valenta got the fish at the natural history museum in Vienna and that they were actually preserved in formaldehyde on glasses for years before they eventually were taken out to be X-rayed. They were also lying flat on the photographic plate. Not for a fleeting moment (as the image gives an impression of—simulating movement), but for the several minutes it took to expose them. Ibid.

[75] The black background here, becomes what Noam M. Elcott calls "black screens": "the invisible technology—and technology of invisibility. It's telling The same "dispositif" is applied to Marey's scientific experiments, and to stage illusions and cinematic and photography tricks. The blackness of the screen behind the fish here is accordingly a "dispositivf", an arrangement, that covers up the set-up of the exposure. The effect is enhanced viewers are already used to seeing photographs with white outlines on black background—as well as illusionistic skeleton dance shows at the phantasmagoria. With the illusionistic assistance of the "black screen", Eder and Valenta succeeds in creating a "skeumorph-effect"—they hide the unfamiliar attributes of the radiograph behind a familiar mock photograph. See Elcott, *Artificial Darkness* (Chicago: University of Chicago Press, 2016), 7-8.

[76] Off course there are no perspective lines in Eder and Valenta's fish X-ray. Still, I want to argue that the viewers, in habit of looking at photographs and paintings, imagines an infinite space in the blackness behind the fish.

nor in what Jonathan Crary calls “subjective vision” (still very much linked to a human bodily perception). So, what is it then? What is “X-ray vision”? What kind of “visual regime” does it belong to and what kind of metaphors does it give rise to?

### 2.7 Unseeing the Human Standpoint

If perspectives incorporate worldviews — as suggested by Erwin Panofsky (the linear one point being bourgeois humanism) — what kind of worldview does the inverted “plate view” connote? Rather than a technologically reinforced version of the immobile centered subject's vision (the “gaze” symbolized in linear one-point perspectives and in photographs) the radiographic “plate view” may, as described above, be understood as this centered subject’s counterpart: as the view of someone, or even, some*thing* else. In this sense, I think it may be useful to see X-ray vision, not as a prosthesis for human vision, or a human tool, but rather as an opposing mechanical existence.

This notion of the radiographic “plate view” borders on the understanding of photography offered by Joanna Zylinska in her book *Nonhuman Photography*.[77] She proposes that, instead of thinking about photography as something merely human — a human invention, used by humans, for human means — we must regard it as something non-human too. Influenced by the theories of Vilém Flusser, she sees technology as an “intrinsic correlation of forces between the human and the apparatus.”[78] For Zylinska, the “human” forms of photography are only one branch of a much broader phenomenon. She suggests that:

> human-driven photography — where an act of conscious looking through a viewfinder or, more frequently nowadays, at an LCD screen held at an arm’s length — is only one small part of what goes on in the field of photography, even though it is often made to stand for photography as such.[79]

The forms of photography which exceed the narrow definition of "human photography," are defined by Zylinska as “nonhuman photography.” Nonhuman photography is neither of, by, or for the human. Instead, it is “zoetic, life-giving, and world-making.”[80] She describes it as an ontological force — a way of being, which “transcends human-centered intentionality” and offers an “unseeing” and “unknowing” of the human standpoint.[81]

[77] Zylinska, *Nonhuman Photography*.
[78] Ibid., 61.
[79] Ibid., 64.
[80] Ibid., 20.
[81] Ibid., 29.

Taking Zylinska's notion of "nonhuman photography" into account, it seems that the distorted view of the photographic plate may very well offer such "unseeing" and "unknowing". According to Zylinska, there is much to gain from embracing the nonhuman photography. It may enable us to see beyond the humanist limitations of our current philosophies and worldviews.[82] It allows humans to "unsee themselves in their godlike positioning of both everywhere ad nowhere, and to become re-anchored and reattached again."[83] In this way, we might be able to approach ethical and political issues, for example climate change, in less self-focused ways.

Following Zylinska, we might say that radiography holds a double role: On the one hand, it is a technologically enhanced version of "the visual mastery and material dominance of the observer: it is like the eye of the slave owner glancing over his plantation or a general scanning of the battlefield only better."[84] On the other hand, as "nonhuman photography", it offers a possible departure from exactly this dominating way of observation.

## 2.8 Chapter Conclusion

When radiography was utilized (in medicine) and imagined (in the popular press), it became a sort of transparency-effect photography, a penetrating vision. In medicine, partly because of the human body's soft cover and solid core, radiography grants the physician a technologically enhanced version of the "medical gaze", objectifying and controlling the patient's body in its most intimate and hidden regions. In popular culture, this understanding of a "penetrating X-ray vision" was further endorsed, as it gave rise to media fantasies about X-ray eyes that would undress, spy or practice necromancy. This understanding of radiographic vision is closely related and associated to a human bodily perception. Radiographic vision is understood as a subjective, ocular, view of the world that is only distinguished from normal human vision (often exemplified in photographs juxtaposed with X-rays, such as in Guillaume's parcel [Fig. 12]) in its additional and improving transparency effect. This is apparent in how X-ray vision is illustrated with a one-point linear perspective in cartoons, such as the one reproduced in Tsivian's *Media Fantasies* [Fig. 16], and how they are presented by radiologists [Fig. 17].

Nevertheless, despite being imagined, understood, and even 'rigged' as "photographie traverse les corps", X-rays also hold some qualities that undermine and challenge this notion

[82] Ibid., 15.
[83] ibid.
[84] Ibid., 13.

of what X-ray vision is. As argued in this chapter, supported in the writings of Vera Dünkel and Peter Geimer, especially, the formal qualities of radiographs — the blur, the distortions and the ambiguities — often complicate interpretation and even mislead their observers. X-rays only become the penetrating vision described above when their subjects accommodate specific preconditions, such as being less penetrable on the outside than the inside (preconditions that the human body incidentally fulfills). Furthermore, the radiographic picture space is — in a rather unfamiliar manner — related to the construction known as 'inverted perspective' and to the phenomena of 'anamorphosis.' Pictorial forms which both repel habitual ways of looking and upsets the viewer's experience of foreground, middle distance and background. As illustrated in the distorted view into Röntgen's set of weights, the "gaze" that we see in X-rays is the projection of the object onto the photographic plate, seen from the plate's point of view. Lastly by linking this 'from below- plate-view', to Joanna Zylinska's notion of a 'nonhuman photography', we have suggested that radiographic vision, in addition to its controlling and subjecting manifestations, also may serve as a way out of subjective vision.

# *3* Hans Castorp's Analytical Pit: Radiography in *The Magic Mountain*

Thomas Mann's novel *Der Zauberberg* (1924), translated *The Magic Mountain* (1927), tells the story about Hans Castorp, who travels from his hometown Hamburg to a tuberculosis sanatorium in the Swiss alps to visit his cousin. His stay at the sanatorium was initially supposed to last only three weeks, but when a «moist spot» is detected in the protagonist's lungs, and he falls in love with one of the patients, he remains, eventually stays for seven years. Even though Castorp's earthly journey stops when he reaches the sanatorium, Berghof, he does not stagnate. When he "pauses" his career and life "down below", his spiritual journey begins. From humanism to romanticism, his intellectual journey via hedonism and spiritism and much more, is the novel's true storyline.

Throughout *The Magic Mountain*, X-rays are given a considerable amount of attention. The technology was standard medical equipment at TB-sanatoriums, like the fictional one, Berghof, where the novel is set. Since the main method for diagnosing TB at the time (the novel is set in the first two decades of the 20th century) was by taking an X-ray of the patient's thorax and identifying scar tissue in the lungs — visualized in the picture as shadows or spots — the fictional swiss sanatorium in the novel, Berghof, is equipped with its own X-ray laboratory. X-ray examinations and X-ray plates are as inevitable to the environment as the resecures, the advised daily stroll, or the fumigation of rooms with formalin whenever someone has died. In this sense, the X-rays contributes to the novel's realism, its foundation in real historical places and events. The patients are photographed in Bergdorf's X-ray laboratory and are diagnosed accordingly from the number of «spots», «shadows» and «strands» detected by the physicians in their thoraxes, together with other diagnostical methods such as the measuring of one's temperature and listening to «moist spots» with the aid of stethoscopes. As a natural part of the medical treatment of tubercular patients, the X-rays acquire an almost routine character.

Yet, as proposed by Sara Danius among others, *The Magic Mountain* does not solely treat modern technology (including radiography) as an effect of realism. It also thematizes (in form and content) how these technologies change the conditions of perception in modernity.[85]

[85] There are three contributions on technology (also X-ray technology) in Thomas Mann's The Magic Mountain that must be mentioned here: Danius, *The Senses of Modernism* (Ithaca, N.Y: Cornell University Press, 2002). Hörisch, "'Die Deutsche Seele up to Date': Sakramente Der Medientechnik Auf Dem Zauberberg." (Munich: W. Fink, 1989). and Winthrop-Young, "Magic Media Mountain." (Ithaca, N.Y.: Cornell University Press, 1997). All three texts are insightful and thorough. Some of the passages from the novel, and my interpretations of them may

In this sense, *The Magic Mountain* is not only a novel about disease, ideological schism, and love, but also about the media aesthetics the of new technologies in the early twentieth century.[86] On this account, I wish to ask if *The Magic Mountain* may formulate a media aesthetic of radiography: How are the technological and aesthetic qualities of radiography (the glass plates, the machines and the fluoroscopic screen) described in Thomas Mann's novel?

Nevertheless, as proposed in the introduction to this master's thesis, I also hope to say something about how radiography reshapes human and shapes nonhuman perception in the early twentieth century. Does Hans Castorp's encounters with radiographic images and technology change how he understands his own perception? A passage from the book describing the evening after Castorp's first X-ray experience may serve as an opening to this discussion:

> […] he lay back and lifted a hand to the sky, palm out, just as he had held it behind the fluorescent screen. But daylight had no effect on its living form, the stuff of it grew even darker and more opaque against the brightness and just its outer edge shone reddish. It was the living hand he was accustomed to seeing, washing, using — not the alien scaffold he had seen in the screen. The analytical pit he had seen open up before him that day had closed again.[87]

In this passage, it becomes clear that the experience of the radiographic vision — his hand as an "alien scaffold" (fermde Gerüst) in the fluoroscopy (Leuchtschirm) — had evoked an examination of the living hand (Lebenshand) that he took for granted before and was accustomed to. The alien view he encountered, a different kind of light that penetrated the surface of his skin, makes him look carefully at how the "daylight" only does so with the very outer edges, which does not become transparent but only "reddish". Accordingly, the experience gives rise to a perceptual split, between his own "human vision," and that of the vision offered in the fluoroscopy. Even though it says, in conclusion, that "the analytical pit" (die analytische Grube) he saw open has closed, this does not seem entirely true. Because, as the discussion in the previous chapter about the many different radiographic "gazes" showed, radiography may be seen (in addition to an extension and improvement of the eye's vision) as

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coincide with the scope, arguments and points of these three scholars. To review, compare and go into dialog with the three is beyond the capacity of this chapter, though this undoubtedly would be interesting.

[86] In addition to radiography, Hans Castorp encounters gramophone, film and color photography to motion a few.

[87] Mann, *The Magic Mountain*, 268. „Dann lag er und hob seine Hand gegen den Himmel, das Innere nach außen, so, wie er sie hinter den Leuchtschirm gehalten. Aber das Himmelslicht ließ ihre Lebensform unberührt, sogar noch dunkler und undurchsichtiger wurde ihr Stoff von seiner Helle, und nur ihre äußersten Umrisse zeigten sich rötlich durchleuchtet. Es war die Lebenshand, die er zu sehen, zu säuberen, zu benutzen gewohnt war — nicht jenes fremde Gerüst, das er im Schirme geblickt — , die analytische Grube, die er damals offen gesehen, hatte sich wieder geschlossen." Mann, *Der Zauberberg*, 304.

an encountering "plate-view" and *nonhuman* kind of vision that rather than relating to human perception, can disrupt and challenge it. I will let the "analytical pit" described in the passage above be my opening into the discussions to come about the human and nonhuman visualities of radiography in *The Magic Mountain*.

### 3.1 Memento Mori

To understand the nature of the so-called "analytical pit" that Hans Castorp has experienced, it is first appropriate to take a closer look at the event to which he is referring: the sight of his hand as a "fremdes Gerüst" (alien scaffold) in the screen of the fluoroscopy. The episode in question is found some pages earlier in the narration and earlier the same day in the storyline, in the subchapter: "My God, I see it!". At this point, Hans Castorp is still considered healthy (barely that is), joins his tubercular cousin, Joachim Ziemssen, on his regular check up in the X-ray laboratory. In the X-ray laboratory, Hans Castorp sees first Joachim's skeleton and then his own one through the screen of the fluoroscopy: a sight which makes the young man realize that he will die. The narrator comments that "he sees exactly what he should be expected to see, but which no man was ever intended to see and which he himself had never presumed he would be able to see: he saw his own grave".[88] One reason he should have expected it is the many links already established within the culture at the time, between death and X-rays. As mentioned in chapter one, already when Röntgen took the first radiograph of his wife, Bertha Röntgen's hand and showed it to her, she (supposedly) said that she saw her own death in it.[89] Death as a connotation of X-ray is, in other words, as old as the technology itself. Reading Castorp's description of his hand as seen through the screen, it is hard to miss the intertextuality between his reaction and that of Bertha Röntgen:

> Under that light, he saw the process of corruption anticipated, saw the flesh in which he moved decomposed, expunged, dissolved into airy nothingness — and inside was the delicately turned skeleton of his right hand and around the last joint of the ring finger, dangling black and loose, the signet ring his grandfather had bequeathed him: a hard thing, this ore with which man adorns a body predestined to melt away beneath it.90

Comparing the image of Bertha Röntgen's hand [Fig. 9] to this excerpt, every detail is fitting perfectly, down to the ring on the finger.[91] When Mann writes that Castorp sees his own death

[88] Mann, *The Magic Mountain*, 260.
[89] Jülich, *Skuggor av sanning*, 43.
[90] Mann, *The Magic Mountain*, 260.
[91] The rings that often can be seen on early radiographs also had a practical function: they demonstrated that metal was even less penetrable than the bones to the X-rays.

in the X-ray image of his hand, he is not merely paraphrasing earlier perceptions of the technology of radiography but also earlier personifications of death as a skeleton in art and visual culture. On an iconographical level, the skeleton inside the fluoroscopic screen *is*, in fact death.[92] The reference to the radiographic trope of death becomes even clearer when Castorp is watching his cousin Ziemssen through the fluoroscopy:

> With the floor vibrating under him and great forces crackling and blustering at play around him, Hans Castorp peered through the pale window, peered into the void of Joachim Ziemssen's skeleton. His breastbone merged with his spine into one dark, gristly column. […] He studied the spots and the lines, the blackish ruffles in the chest cavity, while his fellow viewer [Doctor Behrens] gazed tirelessly at Joachim's sepulchral form, his dry bones, his bare scaffolding, his gaunt *memento mori.*[93]

Castorp interprets his relative's skeleton rib cage as a *memento mori* — a reminder of death — as if deciphering a work of art and not a medical imaging technology. The lines between the merely aesthetic and the scientific are blurred. So, in addition to being a forewarning of future death as a diagnostic tool, allowing Doctor Behrens to detect the development of Ziemssen's disease, and predicting death with scientific certainty, the X-ray is also a "memento mori" in an iconographical and symbolic sense: like a skeleton trope. The X-ray technology in the novel as an up-to-date symbolism of death and the underworld is hard to miss. Death and the spirit world is further alluded to by what comes next. When Hans Castorp sees his cousin's skeleton in the fluoroscopy, he is reminded of a woman, an ancestor, "who was said to have been endowed or cursed with a troublesome talent that she had borne in all humility and that had cursed her to see anyone who would soon die as a skeleton".[94] Which, is exactly how he sees Joachim, aided by the X-rays. In this way, radiography is associated with death, but also with spiritism — as a medium between our world and the spirit world. As a device for the occult, this function of radiography is repeated later in the book too.

In the chapter "Highly questionable" (Fragewürdigstes), radiography is drawn into a séance. The episode takes place in the one physician, Dr. Krokowski's, office, located next to the X-ray laboratory.[95] Both rooms are placed in the basement of the sanatorium.[96] On the

[92] Dünkel, *Röntgenblick und Schattenbild*, 29.
[93] Mann, *The Magic Mountain*, 259.
[94] Ibid., 259.
[95] At one point the room is refered to as "Dr. Krokowski's analytical pit", echoing the term for the radiographic hand. Ibid., 251 and 436.
[96] The basement is like an underworld that Joachim and Castorp must "descend" down into. At one point Behrens even names them Castor and Pollux, the twins in roman mythology that were able to move between Mont Olympus and Hades. See Hörisch, "Deutsche Seele Up-to-Date", 21.

occasion in question, the office is darkened, "reduced to a dim red",[97] as to simulate a photographer's darkroom. The parallel between the two rooms, that of the séance and the X-ray laboratory, does not escape Hans Castorp either. The "darkness reminded him of the gloom in which they had gathered so piously in the X-ray room and of how they had first had to let darkness wash over their daylight eyes before they could "see."[98] Not surprisingly, then the spirit appears, just like the clairvoyant vision in the X-ray laboratory, in the form of light on a screen, not the fluoroscopy this time but a folding screen standing in a corner: "little flecks of white light, shifting points of concentrated energy that appeared repeatedly along the folding screen".[99] Before, the ghost — that of the now (as expected) deceased Joachim — materializes in front of it: "There […] where the red light was swallowed up in night that the eye could barely pierce, between the doctor's wide desk and the folding screen, there on the patient's chair turned toward the room […] — there sat Joachim".[100] In these two, parallel episodes — the "check-up" and the séance — radiography is established in the novel as a technology for communicating with, and "seeing" the dead, in line with already established media fantasies.[101]

"The analytical pit" to which Hans Castorp refers is that of a "memento mori" on a symbolic level: the notion that he will die. The skeleton (a symbol and clairvoyant vision) is the analytical pit (as in "grave") that Hans Castorp has seen open. This is what Hans Castorp *saw* inside the "analytical pit." With this still in mind, I also wish to argue that there might be more to it. The pit here does not only have to do with what he sees (the skeleton as a symbol of death), but also with *how* he sees it. The experience of his hand in the fluoroscopy was of a "fremdes Gerüst"[102]. "Alien" because it breaks with his habitual use of the hand, that he: "zu sehen, zu säubern, zu benutzen gewohnt war"[103]. Taking Peter Geimer's critique of the visible/invisible dichotomy in X-ray images into account here, one might point out that even though the skeleton hand is "the invisible made visible," something else unavoidably disappears. Just like the wrapping around Guillaime's parcel (discussed in the previous

[97] Ibid., 809.
[98] Ibid., 803.
[99] Ibid., 809.
[100] Ibid., 812.
[101] The X-ray technology is also alluded to in another way. In the middle of one séance, "Castorp quietly made a discovery of his own, which might be seen as evidence that the childish dark powers manifesting themselves here had paid him particular attention. Across his knees was an object, the "souvenir" that had frightened his uncle the day he had picked it up off his nephew's chest of drawers: the glass negative that revealed the portrait of Clawdia Chauchat's interior and that he, Hans Castorp, had most definitely not brought into the room. He put it in his pocket without any fuss." Ibid., 793.
[102] Mann, *Der Zauberberg*, 304.
[103] Ibid.

chapter) — Hans Castorp's "Lebenshand", the one he is used to, suddenly is not there anymore, exchanged for a "alien scaffold", it has become invisible. To make my point clearer, I will now do a closer reading of the other "invisibilities" in the description of Castorp and Joachim's visit to the laboratory.

### 3.2 Confusion

When Hans Castorp first enters the laboratory underworld, the attention of the narrator is not so much directed toward what he sees there, as to the fact that he actually cannot see: When Castorp entered the X-ray room, he "*saw nothing*, or only general outlines, in the artificial twilight."[104] What is described, then, is not what's inside the room which he just entered, but rather an inner recollection of what he left behind in the room which he came from — his love interest and desired object — Clawdia Chauchat:

> He could *still hear* Frau Chauchat's pleasant, opaque voice saying, 'What time is it … Someone just went in … That is unpleasant … ,' and the timbre of her voice caused a shudder of sweet excitement to pass up and down his back. He could *see* her knee outlined under her skirt, the back of her neck bent forward under the short, reddish-blond hairs that hung loose from the tucked-up braid, saw the neck bones sticking out — and the shredder passed over him again.[105]

What happens when Hans Castorp enters the darkened laboratory is that the sudden lack of visual impressions gives rise to a rich inner "slide show" (he can still *hear* her, and he can *see* her knee). The description comes remarkably close to the effect which Jonathan Crary describes in *Techniques of the Observer*, derived by him from the opening paragraphs of Goethes *Farbenlehre*, that is to say, the moment when Goethe abandons "the order of the camera obscura" by closing the hole in the wall where the light comes in, and consequently gives rise research on the inner physiological effects of "afterimages". The 'afterimages' in our case are the lingering impressions of the (lit) room he left that "hovers" before Hans Castorp's eyes as he enters the artificially darkened laboratory. [106] This effect of the darkroom in the novel, that the darkness and obscurity give rise to *inner* rather than *outer* impressions will be symptomatic for my investigation further down in the chapter. But first, what does Hans Castorp finally see and not see when he gets accustomed to the darkness of the laboratory?

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[104] My italics. Mann, *The Magic Mountain,* 254.
[105] My italics. Ibid., 254-5.
[106] Crary, *Techniques of the Observer*, 67-71.

First, he is confused about what kind of place he is in; "a photographer's studio, a darkroom, or an inventor's workshop and sorcerer's laboratory".[107] The space connotes the magic or the occult just as much as medicine and science. Second, there is, throughout the chapter, a contrast between how Behrens, the physician, describes the X-rays; «Illuminated anatomy, the triumph of the age» and what Hans Castorp sees "nothing recognizable": For example, when Joachim is placed behind the fluoroscopic screen, and the apparatus is turned on, Dr. Behrens exclaims: "Klares Bild!", before he goes on about the body's different organs. All the while, to Hans Castorp, the image is very fragmented and rather *unclear*. Behrens says: "Do you see the diaphragm? […] hilum […] adhesions…", while Hans Castorp is preoccupied with "something that looked like a sack, or maybe a deformed animal, visible behind the middle column, or mostly right of it from the viewers perspective. It expanded and contracted regularly, like some sort of flapping jellyfish". He does not realize what the *jellyfish* is before Behrens points at it and says: "Do you see his heart?", to which Hans Castorp replies: "My God, I see it!"[108] Here, and throughout the novel, the physician's technical terminology, and the practical utilization of the X-ray technology are contrasted with how Hans Castorp experiences it. While Doctor Behrens uses it to look inside Joachim's body, at his different organs, Castorp sees mostly abstract forms — something "unclear" and "fragmented". When he tries to comprehend what he is looking at, he reaches, not to anything human, but to an animal, a jellyfish. The irony plays on radiographic qualities which, as considered in chapter one, both Vera Dünkel and Peter Geimer have pointed to. Geimer describes how the radiographic images (among other photographic technologies "of the invisible") throws its viewers into confusion and that it often is hard to tell where the "real" ends and the "unreal" begins.[109] When this confusion is contrasted with the Behren's medical terminology and understanding of radiography, it undermines it.

Other natural forms are connoted later, when the X-ray machine is described for example, it is as a thunderstorm:

> Barely tamed for their purpose, these forces sought other outlets for their energy. Discharges exploded like gunshots. The gauges sizzled with blue light. Long sparks crackled along the wall. Somewhere a red light blinked, like a silent threatening eye, and a vial behind Joachim's back was filled with a green glow.[110]

[107] Mann, *The Magic Mountain*, 255.
[108] Ibid., 258-9.
[109] Geimer, *Inadvertent Images*, 147.
[110] Mann, *The Magic Mountain*, 256.

What happens here is that Hans Castorp experiences the effects of the X-ray machine as something quite close to Kant's description of the dynamic sublime, what one would call "the technological sublime".[111]

"The analytical pit" of the experience is not only the clairvoyant vision of a skeleton, symbolizing death — a well-known iconography that Hans Castorp was more than fit to decipher. The pit was also all the things he saw that he couldn't really comprehend — the ghostly apparitions on the threshold of his imagination. The effects of the apparatus — the darkness and the visual effects as well as the sounds — fits with a romantic notion of the sublime, beyond any human imagination. In both these cases, the person Hans Castorp is still somewhat untouched. I want to argue that his experience in the laboratory also somehow destabilizes his persona to a higher degree.

### 3.3 Hans Castorp's Identity is Stripped Away

Are there possibly any other analytical pits? To investigate this, I want to look closer at the "Lebenshand" that is made invisible in the fluoroscopy. This is the everyday "living" hand, to which Hans Castorp compares the X-rayed, skeleton one. In my discussion about the technicalities of radiography in the previous chapter, it became clear that what the X-ray "strips away" in the radiograph is the softer tissue of the body (or the less permeable materials in an object). The X-ray machine does not really "care" what is inside or outside — if the structures inside the object are less penetrable, they will be exposed, if they are more penetrable, they will not. When human or (some) animal bodies are involved, what disappears is the body's surface. So, what does this "surface" consist of in Hans Castorp's case? There is an accurate description of Hans Castorp's "softer surface" on the novel's very first pages as he sits in the train compartment on his way to Davos. Hans Castorp is: «very neat, very well dressed, sporting a little reddish-blond moustache in the middle of his sleepy, young, patrician face, looking for all the world like a young man on his way to a respectable place in life».[112]

In the beginning of the novel Hans Castorp has a profession (engineer), he has been promised a job (at a ship-building firm called Tunder and Wilms), and a stable identity, confidently founded in the bourgeois merchant upper class of his hometown Hamburg, in a world of British tweed, neatly monogrammed underwear, and yellow Macintoshes. The sight of ships under construction and "engineers, blueprints and pump-charts in hand", awakens a "warm sense of belonging" in him,

[111] See Danius, *Senses of Modernism*, 79—80.
[112] Ibid., 40.

> […] a feeling that reached its zenith, perhaps, on those occasions when he would join James Tienappel or his cousin Ziemssen […] in the pavilion on the Alster for a Sunday breakfast of warm rolls and smoked beef, washed down by a glass of old port, then lean back in his chain and puff devotedly on his cigar.[113]

Hans Castorp's identity is determined by the social class to which he belongs. It is the outer signifiers of this class — his clothes, his skin-color, his "his sleepy, young, patrician face" — that disappear in the X-ray. Thus, his whole identity suddenly falters. The X-ray images in *The Magic Mountain*, oppose a human look on other human beings — categorized by social codes of profession, class, and gender.[114] Following Zylinska in *Nonhuman Photography*, X-rays may be understood as a nonhuman counterpart to the photographic portrait. Instead of confirming bourgeois categories of identification, it challenges them.

But the X-ray challenges Castorp's old upper-class identity in another way, too, as a tool of diagnosis. In the chapter called *Encyclopedia*, the role and implications of X-rays as a tool of diagnosis are addressed. In the specific scene I want to look at, Castorp is confronted by Settembrini, an Italian intellectual and humanist, with his decision not to leave the sanatorium due to Behrens' diagnosis of TB from the X-ray analysis described above. In this scene, Settembrini compares Castorp's X-ray, which he keeps in his wallet, to an identification paper:

> "And the copy of your X-ray — have you received it?"
> "I did indeed receive it," Hans Castorp confirmed with importance. "Just recently. Here it is." and he reached for his inside breast pocket.
> "Ah, you carry it in your wallet. As a kind of identification, like a passport or a membership card. Very good. Let me see."[115]

Disguised in Settembrini's jokes, Mann points here to something significant when it comes to the X-ray image: that the radiograph has an indexical truth claim in relation to the depicted. In the case of tuberculosis, the disease is diagnosed through the detection of "knots", "strands" and "nodules" in the X-rayed chest cavity. If these abnormalities are detected, as they are in Castorp's case, the X-ray image also becomes what Settembrini calls a *membership card.* Due to the "shadows" on his little glass plate, Castorp changes from being a member of the "healthy club" at the sanatorium to becoming a member of the "sick club". The social status that comes with the degree of illness is portrayed in an amusing manner. From the very

[113] Ibid., 35.
[114] See Danius, *Senses of Modernism*, 66—71.
[115] Ibid., 254.

beginning of the novel, Castorp notices a certain hierarchy at the sanatorium; the sicker you are (the more shadowy the X-ray), the greater the reputation of the patient. Castorp's awareness of the hierarchy becomes evident when he later asks Settembrini, to compare their radiographs: "does your passport look worse?" and when Settembrini replies: "Yes, somewhat worse"[116] In the fictional setting of *The Magic Mountain*, the radiograph plays a role of evidence. As what Settembrini mockingly calls a "club membership", it places Castorp within the community of the sick and forces him to stay at Berghof.

### 3.4 Kinky X-rays

So, the bourgeois body of Hans Castorp is stripped of all outer signifiers, left only with an abstract outline, one that cannot reveal anything about his upbringing, his income, or his favorite English tweed. The only identity the X-ray image produces is his new "sick identity". There are, however, other identities at Berghof, besides Castorp's, that the radiographic image obscures, too. Particularly gender identities are challenged when depicted in the radiographs at Berghof. In *The Magic Mountain,* this androgyny-effect caused by radiography is not so much seen in the X-rays depicting Hans Castorp himself or that of Ziemssen's pounding heart in the fluoroscopy. It is most evident in an X-ray depicting Hans Castorp's love interest in the sanatorium — the catlike, "Kirghiz-eyed", unmannerly Clawdia Chauchat.

Hans Castorp falls in love with Madame Chauchat soon after he arrives at the sanatorium. She is a married woman from Dagestan, with a cat-like gait and bad manners. In short, she is a contrast to everything Castorp is familiar within the so-called "flatlands": She has an awful posture, "not like the women in Hans Castorp's social circle at home, who sat straight-backed at the table and turned only their heads to speak with pursed lips to gentlemen on either side",[117] her hands are "not particularly ladylike, not refined or well cared for, not in the way the ladies in young Hans Castorp's social circle cared for theirs.",[118] and most importantly — she is ill — not "some healthy little goose".[119] Her illness also gives her a certain amount of sexual liberty. She has her TB to thank that she may travel to Sanatoriums such as Berghof, away from her husband in Dagestan, and her marital duties. Castorp notices early on that she doesn't wear a wedding ring. When he asks the gossipy Frau Stöhr about it, she answers: "perhaps […] she finds it rather bourgeois to wear a wedding ring, just a plain

[116] Ibid., 254.
[117] Ibid., 147.
[118] Ibid., 89.
[119] Ibid., 246.

gold band […]. No, she's certainly too liberal for that."[120] And she adds that Chauchat, being at the peak of her beauty, probably wouldn't desire to "remind every gentleman to whom she gives her hand of her marital bonds."[121]

The person Chauchat and the radiography are intimately associated in *The Magic Mountain*. The entanglement happens in more than one way. First, Clawdia is described under what one can call a sexualized X-ray "male gaze". The first episode where she is subjected to this look is in the same chapter where Castorp himself is X-rayed, "My God, I see it!". As Castorp is waiting to enter the laboratory, he sees Madame Chauchat sitting across from him, also waiting for her appointment (this is also the sight that lingers after he enters the laboratory, as discussed before). The description of her body that follows focuse on her bony appearance and imagines what the same body would look like cleansed of its skin and flesh seen through Behrens' X-ray apparatuses:

> She was not leaning back now, but was bent forward, her forearms folding and resting on the thigh of the crossed leg, her back rounded and her shoulders hunched so that the bones of her neck stuck out — you could almost see her spinal column under the close-fitting sweater. Her breasts, which were not voluptuous and high-set like Marusya's, but the small breasts of a young girl, were pressed together from both sides. Suddenly Hans Castorp recalled that she was also here waiting to be X-rayed…[122]

In the description of Chauchat above, Mann mixes two different eroticizing views of the female body; the tubercular body and the X-rayed body. The passage also shows how these two images are closely intertwined with each other. The erotic connotation of the X-ray refers to the body sick with tuberculosis before the invention of the X-ray medium. Susan Sontag has an exemplary description of the sexualization of the tubercular female body in her essay *Illness as Metaphor.*[123] She argues that the disease of tuberculosis, already associated with the romantic movement and a sensitive soul during the nineteenth century, became a "look". "TB was thought to make the sufferer sexy", she writes. [124] The body type, as described by both Mann and Sontag, is the *femme fragile*: the "sensitive, passive people who are not quite life-loving enough to survive"[125]. Sontag's main examples of the tubercular look are "the pre-Raphaelite belles" and "Munch's hollow-eyed tubercular girls".[126] To reach the ideal sick-

[120] Ibid., 161.
[121] Ibid.
[122] Ibid., 254.
[123] Sontag, *Illness as Metaphor and Aids and Its Metaphors*, 27-37.
[124] Ibid., 26.
[125] Ibid.
[126] Ibid.

aesthetic body, you must either be dying or starve yourself to death. When reading Mann's description of Castorp peeking at Chauchat's collar bones and spinal column, it is easy to draw the line to Sontag's "tubercular look". However, what is more interesting, is how this external bony look is transferred to the internal X-ray image.

According to Lisa Cartwright in *Screening the Body*, the X-ray was inviting the sexualized gaze in from the very beginning.[127] The X-ray signifies the ultimate violation that defines subjectivity and identity, exposing the private interior to the "medical gaze." The kinkiness of looking under the clothes is only exaggerated in the X-ray image, allowing one to look "under the skin". The masculine, "penetrating vision" described in the episode in the waiting room, is no doubt a classic example of what Donna Haraway calls "the liberal, self-focused, masculinist 'I', who is supposedly in control of his own (world)view."[128] However, if one looks closer at the descriptions of actual radiographic imagery depicting Chauchat, this notion seems to be challenged.

### 3.5 Queer X-rays

In the novel's cast of characters, most who also serve as allegorical figures, Clawdia Chauchat represents eros and the East. She opposes the bourgeois society, in which Hans Castorp was raised.[129] But even as allegory, Clawdia Chauchat is not very clear cut. Her eroticism is not straightforward or easy to explain. In a way, Hans Castorp's interest in her comes as a surprise, both to himself and the reader. Even though Clawdia definitely fits in among the sexy sufferers described by Susan Sontag, with her skinny body and pale complexion, she is not only fragile. Clawdia, despite her feline connotations, also lacks a certain femininity. Her hands are broad, and her nails bitten. She usually wears a sweater — a piece of clothing common among the modern-day women known as "new women". In other words: Clawdia is a woman of the 20th century: she is modern. In a scene where Hans Castorp peeks at Chauchat's arms, barely visible through her transparent sleeves, it becomes clear that Castorp is ashamed of his interest in her: "was there any point in her wearing gossamer sleeves so that men would be curious about her body — about her diseased body? There was obviously no point in that whatsoever, and it was to be considered improper, to be forbidden." She also does not have children: "Oh, certainly not, no children. […] Presumably, she had been strictly forbidden to have any — and then, too, what sort of children would they have turned out to

[127] Cartwright, *Screening the Body*, See for example 156.
[128] Zyinska, *Nonhuman Photography*, 17.
[129] See Bauer, "Penetrating Desire".

be?"[130] Somehow, the disease also makes her interesting in a very different way: it makes her transcend traditional gender roles. Hans Castorp's love for her is not "reasonable", rather it is "forbidden", just like a childhood love of his, in a fellow pupil at school named Pribislav Hippe: "Because for a man to be interested in a sick woman was certainly no more reasonable than … well, than for Hans Castorp to have pursued his silent interest in Pribislav Hippe back then." A stupid comparison, a rather embarrassing memory." Rather than being "feminine" or "beautiful", Chauchat's greatest advantage seemingly is her likeness to this boy: «He stood there and watched her smile and talk, just as Pribislav Hippe had smiled and talked in the schoolyard years before, her mouth rather wide open and her slanting gray-green eyes above her strong cheek-bones narrowing to little slits. The effect was not "beautiful at all".[131] Somehow, these unconventionalities of Chauchat seem to be nurtured by the X-ray medium.

The love affair between Castorp and Chauchat reaches its zenith on Mardi Gras when Castorp borrows a pencil from her.[132] They speak informally in French and spend the night together (at least it is hinted at). On this occasion, Castorp receives her X-ray portrait: "his trophy, the macabre gift that he wore next to his heart."[133] The X-ray is then, on the remaining pages, pulled out of his pocket and admired on several occasions whenever Castorp wishes to think back at the motioned evening. It is:

> "[…] a little plate of glass in a narrow frame, which had to be held up to the light for him to see what was there: the portrait of Clawdia's interior, without a face, but revealing the organs of her upper body, delicately surrounded by the soft, ghostlike forms of her flesh."[134]

What is remarkable, however, is that the X-ray seems to represent both Castorp's love affairs, the boy Hippe and the woman Chauchat, simultaneously. For instance, at one point in the story, Castorp lies resting as he thinks about Hippe. He then, as in response to the memory:

> pulls from his breast pocket the glass memento that he kept in a heavy envelope he carried in his wallet — a little rectangle, which when held parallel to the ground was black, opaque, reflective surface, but when held up to the sky, grew light and revealed

[130] Mann, *The Magic Mountain*, 246.
[131] Ibid., 286.
[132] The explicitly phallic description of the pencil that Castorp "borrows" from Hippe, suggest that their relationship had erotic undercurrents: "He pulled a pencil from his pocket, in a silverplated holder with a ring you had to push up to make the reddish pencil emerge from its metal casing." (Mann, 144) When he years later again borrows a pencil—this time from Chauchat—the motif is repeated: "she […] picked the little pencil up by the tip, holding it between thumb and forefinger and waggling it back and forth." (Mann, 396) It is accordingly hinted, that Chauchat may have a "pencil" too. The exchange of the pencils tie Hippe and Clawdia together in the novel, so that they almost appear as one and the same person.
[133] Mann, *The Magic Mountain*, 421.
[134] Ibid., 414.

> humanistic things: the transparent picture of a human body, with rib cage, the outline of a heart, the curve of the diaphragm, the bellows of the lungs, plus scapulae and humeri, all surrounded by a pale, hazy halo, the flesh…[135]

At this point, the content of the X-ray is only described as "the transparent picture of a human body" — seemingly, he still thinks about Hippe when looking at it. Only at the end, when the narrator ads: "The flesh of which, against all reason, Hans Castorp had tasted on Mardi Gras. […]",[136] does it become clear who the "humanistic things" represent.[137] In *Screening the Body*, Lisa Cartwright notes very precisely how gender often is blurred in medical imagery:

> The X-rayed body, stripped of its overinscribed gender- and race-encoded epidermis and organs, is an apt figure both of the nightmare of eugenics, with its agenda of eradicating some body types, and for utopian fantasies of a social order no longer predicated on typologies on the organic body.[138]

These qualities of the X-ray — its stripping of the epidermis — allows Castorp to imagine his homosexual feelings for Hippe inside the picture of Chauchat. In many ways, the distinctions between the two of them disappear.

We have so far seen how social scanning is made impossible in the X-ray. Similarly, gender becomes indistinct. In the case of Chauchat's X-ray portrait, this seems to become an advantage because it allows Castorp to imagine Hippe inside the image of Chauchat. The X-ray transcends gender boundaries, as does Castorp's love. Both as queer and as "classless", "genderless", and "raceless" the X-ray destabilizes Hans Castorp's bourgeois identity.

### 3.6 Chauchat as a Cyborg Site

Until now, we have only looked at the content matter (skeletons/sublime effects) of the X-rays and how it wraps it up (without the intelligible surface). My aim in this chapter is also to move beyond these traits. In what other ways might the X-ray technology interfere with Hans Castorp's habitual perceptions? In what other ways can the experience in the X ray basement be an analytical pit?

In *Screening the body*, Lisa Cartwright draws a line from Donna Haraway's notion of the cyborg to microphotography. In one of the cases she looks at, two anatomists (Elliot Round Clark and Eleanor Linton) inserted an instrument for observing growth within the ears of their test animals (rabbits). After the insertions, the tissue of the ears grew within the

[135] Ibid.
[136] Ibid., 461-2.
[137] Mann, *The Magic Mountain*, 462
[138] Cartwright, *Screening the Body*, 107.

framing of the inserted device (which they called a "window"). Cartwright questions whether the "loss of [the] organic body" here should be lamented. Because "the embryonic life the Clarks generate in the rabbit may be a minor prehistoric tale in the narrative of reproductive engineering." Also, it might be read as "a prescient gesture toward postsexual modes of reproduction, and toward a body that goes beyond the dictates of ideologies of the natural and the organic?"[139] In this sense, the altered rabbit ears may be seen as what Cartwright calls "cyborg sites". Like the Cyborg "body", the flat, fragmented, unrecognizable bodies found in medical imagery challenge the illusion of a "unitary subject", she writes: "The organic body — the one decomposed, splayed, and reconfigured by the techniques I describe in this book — is the mythical Western humanist body, the full contained body of the unitary subject."[140] According to Cartwright, Haraway's cyborg can — contradictory — both be this unitary humanist subject "in its most exaggerated form" and "the transcendence of this body". This doubleness, that the cyborg can be both the apocalyptic sign of escalating domination and, at the same time "the regeneration of this monster as something other than our enemy, as perhaps our potentiality, in a post gender, post organic, post technophobic world"[141], finds a parallel in the medical images Lisa Cartwright looks at in her research. Can the fictional character of Madame Chauchat, when "decomposed" in the X-ray image", be described as a similar "site" in the novel of Thomas Mann? The case Cartwright refers to is a matter of generating life, which of course is not the case in the X-rays in *The Magic Mountain*, but still, I think the reading of medical imagery as "cyborg sites" might also have transfer value to my material. How may the X-ray contribute to establishing her as such a site?

In the passage discussed above, where Castorp lays and contemplates the X-ray, the gender of the portrayed person is blurred. However, other categories are unclear too: The narrator does not say that he picks up her "portrait" or that the X-ray "depicts her", rather it simply says that the glass plate: "revealed humanistic *things*"[142], only then, the description goes on to include the fragments of a (as noted still genderless) "human body", split into organs: "with rib cage, the outline of a heart, the curve of the diaphragm, the bellows of the lungs, plus scapulae and humeri", of which the last two, shoulder bone (scapulae) and upper arm (humeri) are named in Latin, so that only a learned reader would know what they are. What is blurred here, is not only the distinction between 'man' and 'woman', but a

[139] Ibid., 106.
[140] Ibid.
[141] Ibid.
[142] Mann, *The Magic Mountain*, 462.

transcendence of other categories too: especially, in the phrase, "revealed humanistic *things*", the distinction between "human" and "thing" is traversed.

In "Cyborg Manifesto", Haraway points out three divisions that the "cyborg" transcends the division between: human/animal, animal-human/machine and between physical/non-physical. The above passage reveals that at least the third of Haraway's three "crucial boundary breakdowns"[143] may be at stake in *The Magic Mountain*. However, the other two seem challenged as well. For example, on an earlier occasion, when Joachim and Castorp are invited into Dr. Behrens' private apartment, they look at a portrait Behrens has painted of Chauchat. Hans Castorp is at first not particularly impressed: "Frau Chauchat looked ten years older than she was — as it usually happens when amateurs try to capture character. There was too much red in the face, the nose was very badly drawn, the hair color was wrong, almost that of straw, the mouth was askew."[144] Luckily, "Hans Castorp was not at all that scrupulous about the issue of resemblance." He is still able to appreciate the painting, but first when he focuses on one single issue, on the detail of the skin. Over the next pages, in the conversation about the painting, Castorp's attention, so to say, zooms in on the painting, led on by Behrens' lecturing about human and nonhuman biology. At first, they talk about the whole picture, then they move on to the detail of the "epicanthic fold", a disenchanted technical term for Castorp's (racist) hang-up: Chauchat's so-called "Kirghiz-eyes", the skin fold over the upper eyelid.[145] Afterwards, still zooming in, they go on to discuss the skin in itself, and not just: "the horny and mucous layers of the outer skin"[146] but also under the surface, "the imagined reticular layer with its sebaceous glands, sweat glands, blood vessels, papillae. And beneath that […] the layer of fat, the upholstery, […] the foundation of fat cells…".[147] What happens here, is that the human body is viewed, as if seen through a microscope. When they take this perspective (as Castorp puts it: "regard nature from another viewpoint, the medical viewpoint"), what they get is exactly the body as "decomposed, splayed, and reconfigured", what Lisa Cartwright refers to as a "cyborgic site".

Also, what is striking, is how, on a microscopic level, the differences between animal and human become indistinct and unimportant, just like in Haraway's notion of the cyborg. The more into detail they go, discussing the human body on a microscopic level, the less

[143] Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991), 151.
[144] Ibid., 305.
[145] Mann, 306.
[146] Later, almost as if paraphrasing the doctor, describes Chauchat's skin as "grainy" — which can mean both the look of the skin as seen through the microscope and the grain if the photographic technology depicting it. Ibid., 308.
[147] Ibid.

distinguishable it becomes from other beings. At “cell level”, Behrens no longer talks about “the female form” or “humans”, he rather says “among lower animals” or “highly differentiated beings like you and me”.[148]

The scene above is, of course, a fantasy about microscopic technologies and not of X-rays, but unsurprisingly, the X-ray offers similar “glimpses” into a potential “post-gender, post-organic, post-technophobic world.” The “cyborglike” effect of the radiograph portrait of Chauchat, that Hans Castorp keeps, becomes striking in a scene where Castorp’s uncle, James Tienappel, a visitor from the “flatlands” stumbles upon the X-ray:

> One day he happened to notice a little plate of dark glass that Hans Castorp had placed atop his chest of drawers along with several other personal items by way of decoration for his tidy room; he picked it up from the little carved wooden stand on which it rested and, holding it up against the light, discovered it was a negative photograph. “What’s this?” Uncle James asked, still staring at it — and an honest question it was.[149]

Here, it is as if the zooming movement from the event above is reversed, going from abstraction towards figuration. At first, Tienappel only sees the picture as a plate of dark glass. Secondly, he realizes that it is a negative photograph. When he then moves on to the content of the photograph, he only sees the “cyborg”, the body as decomposed, splayed, and reconfigured: “The portrait had no head, it was the skeleton of a human torso inside a foggy halo of flesh.”[150] Only at the very end does he truly understand: “the torso of a woman, he realized.”[151]

In the previous chapter, we concluded that radiographic vision, in most cases, is understood as a "penetrating vision", that correlates to a subjective ocular vision (symbolized in one-point linear perspective). Nevertheless, we also saw how the above-described understanding was challenged by the fact that the structuring of radiographic picture space — imply what we called "plate-view" — that had common features with "inverted perspectives" and "anamorphosis". Even though *The Magic Mountain* never describe what we in chapter one called "plate-view" directly, it describes how the distortions rooted in it, cause curious interpretations (as when Castorp thinks that Ziemssen's heart is a Jellyfish) and further, especially in the passage above, where the uncle picks up Chauchat's portrait, the radiographs repels the viewer because of its alien appearance. The decomposed image seen in this plate —

[148] Ibid., 213.
[149] Ibid., 518.
[150] Ibid.
[151] Ibid.

what I following Cartwright has interpreted as a "cyborg site", is doubtless related to Zylinka's "nonhuman photography" and the "plate-view" described in chapter one. What the "little plate of dark glass" presents to uncle Tienappel is a glimpse into a different worldview, and simultaneously an "unseeing" and "unknowing" of his own.

Yet, even though the radiograph of Chauchat here becomes something related both to Donna Haraway's notion of the cyborg (a figure which braces with the "unitary humanist subject", as Cartwright puts it) and that it is further related to the reversed perspective and anamorphic "plate-view" (which breaks with the same subject by offering another viewpoint), one must not forget how radiography easily relapses into other, less *nonhuman*, understandings. As seen in this chapter, the radiography in *The Magic Mountain*, is equally often described as a device for control and domination — both as an extension of the physician's "medical gaze" and as examples of a sexualized "male gaze". In this sense, the two main versions of "radiographic vision" described in chapter one (the "penetrating vision" and the "plate-view") are entangled in *The Magic Mountain*. There is often, as in the scene in the laboratory where Dr. Behren's medical understanding is contrasted with Hans Castorp's confusion and misinterpretations, an oscillation between radiography as an extension of "human" perception and as a nonhuman challenge of it. In this way, the plurality of the radiographic vision becomes a literary device — displaying how the novel's characters see and do not see, how they achieve and lose control. In this manner, *The Magic Mountain* thematizes the gray zones of visual mastery in a time of rapid technological change.

# 4 Matter Transformed: Radiography in *Painting, Photography, Film*

In 1925, Bauhaus-Professor László Moholy-Nagy published a book called *Painting, Photography, Film* (Maleriei, Fotografie, Film). In this book, Moholy-Nagy tries to formulate his approach to and aspirations for "art" (which he prefers to call "creation," and which by no means is restricted to the traditional media of painting and sculpture, but also includes film, "light-composition," photography and more). He acknowledges that the conditions for artistic creation have changed in modernity and that artists have much to gain by keeping up with technological change. In this sense, *Painting, Photography, Film* is as much a media theoretical work — exploring human and machine perception — as an art theoretical one. Interestingly, X-ray technology and imagery play a notable part in the book. First, radiography is treated as a topic in the written essay, not as a mere curiosity, but as a form of photography closely related to his own photographic experimentations. Second, radiography appears as printed X-ray images, five in total, depicting humans and animals. In extension of this, I will ask in this chapter, whether *Painting, Photography, Film* possibly drafts some kind of (media)aesthetics of radiography — and if it does, what characterizes it?

As a survey of technological media, *Painting, Photography, Film* pays attention to how the new imaging, sound, and light technologies of modernity affect and interact with a human sensory apparatus. Moholy-Nagy believes that imaging technologies can benefit humanity by expanding what we perceive. He states, for example, that art should combine what he calls "known phenomena" with "yet unknown optical, acoustical, and other functional phenomena," and then in a next step may be absorbed in an "increasing abundance" by our functional apparatus.[152] This approach frequently echoes that of Joanna Zylinska, when she, on her part, suggests that embracing nonhuman vision (by means of photography), "will allow humans to see beyond their humanist limitations […], to unsee themselves, […] and become reanchored and reattached."[153] Moreover, Zylinska mentions Moholy-Nagy, as a pioneer of nonhuman photography, recognizing his "revolutionary spirit"[154] since he, among other avant-garde artists, "embraced the idea of the human becoming a camera to see better and to imagine a better world."[155] On this account, I also — in addition to the main question about the aesthetics of radiography — want to explore

[152] Moholy-Nagy, *Painting, Photography, Film*, 30.
[153] Zylinska, *Nonhuman Photography*, 15.
[154] Zylinska, "Nonhuman Photography", 12.
[155] Ibid., 11.

whether *Painting, Photography, Film* may be helpful with elaborating how X-ray images shaped human and nonhuman perception at that time.

### 4.1 Optical Hygiene

In art-historical literature, Hungarian-born artist László Moholy-Nagy (1895–1946) is often presented as the artist-engineer at the Bauhaus. He showed enthusiasm for new technologies and viewed art as an (almost clinical) therapy for the human sensory apparatus: "The hygiene of the optical, the health of the visible".[156] This matter-of-factly image was supported by his moderate way of dressing (one of the most widely reproduced photographs of him shows him in worker's overalls, as if he worked in industry and not at an art school). To put it briefly, Moholy-Nagy is generally perceived as a prosaic rationalist. When he was hired at Bauhaus in 1923, his more eccentric colleagues protested.[157] As they feared, rightfully, Moholy-Nagy exchanged "spirit" for "industry" in the school's curriculum.[158] Art historian Oliver A.I. Botar describes this technophile image precisely, when he states that: "[Moholy-Nagy] has been seen in the literature as a kind of positivist-mechanistic artist-engineer…."[159] Moholy-Nagy's "positivist aura" is further amplified by his lifelong migration from East to West — from a small village, Bácsborsod, in south-Hungary, to Budapest after WWI, to Berlin in 1919, to Bauhaus in Weimar in 1923, to London in 1935, and eventually to Chicago in 1937.[160]

While he was teaching at Bauhaus, Moholy-Nagy edited a book-series called *Bauhausbücher* (Bauhaus Books), together with his colleague Walter Gropius. The book series appeared between 1925 and 1930 with titles by, for example: Walter Gropius on international architecture, Oskar Schlemmer on theater at the Bauhaus, Piet Mondrian on new design, and Paul Klee with a book titled "Point, and Line to Plane".[161] *Painting, Photography, Film* (1925) was published as the eighth of fourteen books in total. Approximately one fourth of the book, the first 35 of a total of 139 pages, consist of a theoretical essay, that forms a genre-transcending mix of an artistic manifesto, a media theoretical survey, and a Bauhaus textbook. The rest of the book is primarily visual material: Photography, paintings,

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[156] Moholy-Nagy, *Painting, Photography, Film*, 38.
[157] Passuth, *Moholy-Nagy* (London: Thames and Hudson, 1985), 39-40.
[158] For example, in a wall-timeline of the Bauhaus, in the 2019-20 exhibition "Original Bauhaus" at the Bauhaus Archive in Berlin, one could read under the year 1922, that "Expressionist and esoteric spirit disappears: The orientation towards industry triggers conflicts with the supporters of a conception of free art, among the Johannes Itten. He therefore leaves the Bauhaus in spring 1923. His successor László Moholy-Nagy sees himself as an artist-engineer."
[159] Botar, "László Moholy-Nagy's New Vision and the Aestheticization of Scientific Photography in Weimar Germany", 527.
[160] Passuth, *Moholy-Nagy*, 10-74.
[161] On the Bauhaus Book series, see Passuth, *Moholy-Nagy,* 42-44.

photograms, microphotography, DADA-collages and radiography and much more. These images are Moholy-Nagy's own works, works by other artists, and photographs found in magazines. The last 15 pages of the book consist of a sketch for a film that was never realized: "Dynamik der Gross-Stadt" (Dynamic of the Metropolis). The image essay and the written essay address the same topics. As Moholy-Nagy writes: "I have placed the illustrative material separately following the text because continuity in the illustrations will make the problems raised in the text VISUALLY clear."[162] Rather than seeing the visual content as a mere illustration of the writings, one must see both as equally important. *Painting, Photography, Film* is generally seen as Moholy-Nagy's manifesto for his "New-Vision" aesthetics.[163] The thoughts he presents there — formulated in the early 1920s — did not change substantially afterwards, and they were repeated in his later publications until his death in 1946.[164]

In *Painting, Photography, Film*, Moholy-Nagy formulates his approach to and as well as his visions for, art, modern technology, and human perception in the highly stimulating environment of the early 1920s. From a Bauhaus-book, with an educational frame of reference, one might expect a book called *Painting, Photography, Film* — each art form separated by an enumerating comma — that it would treat the subjects listed in the title separately. But quite the contrary, Moholy-Nagy approaches the three as coexisting and interlinked phenomena. In other words, the scope of *Painting, Photography, Film,* reaches far beyond (and in the intersection of) the singular topics the book attends to, topics such as figurative and nonfigurative painting, film, photography, traffic, typography. *Painting, Photography, Film* is, in other words, not a traditional textbook, but rather a media theoretical piece of work, looking at human sensory stimuli under the conditions of modern technology and at and how these technologies may be used in ways that benefit the human sensory apparatus. Our interest here is, however, to look at how radiography fits into this overall agenda. In what context is it mentioned, and what kind of radiographs are the ones printed in the book?

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[162] Moholy-Nagy, *Painting, Photography, Film*, 45.
[163] Botar, "László Moholy-Nagy's New Vision and the Aestheticization of Scientific Photography in Weimar Germany", 529.
[164] *Von Material zur Architektur* (1929) (English edition: "The New Vision", 1930), *The New Vision* (1947), and *Vision in Motion* (1947). The last two were published posthumously. Cf. Botar, *Sensing the Future: Moholy-Nagy, Media and the Arts.* (Zürich: Lars Müller Publishers, 2014), 11.

## 4.2 Penetrated Bodies

The first two X-rays in *Painting, photography, Film* (that is to say, if one reads the book chronologically from cover to cover), appear on the double spread of page 66 and 67 [Fig.18]. To the left is a rather small negative copy of a radiograph picturing human hands, six in total. The radiograph thus repeats the recurring trope of the X-ray hand that first occurred in the X-ray of Bertha Röntgen and then also later (as discussed in the last chapter) in the X-ray laboratory in *The Magic Mountain*. What we see here are, however, not entire hands but fingers, cut off from the rest of the body by the framing. The twenty-four fingers in the picture form an almost decorative pattern — the white bones becoming beams in a circular halo around the picture's black center. This subject, of white hands framing a black "circle", is in a curious synchronicity repeated some twenty pages further into the *Painting, Photography, Film*, in a film still from Fritz Lang's "Dr. Mabuse", showing a table-turning séance. [Fig.19] The X-ray is hence linked to spiritism, just like in the "Fragwürdigstes"-episode in *The Magic Mountain* discussed in the previous chapter. In other words, the first X-ray that appears in the book follows an already well-established X-ray visuality. It has a common (if not the most common) subject and it plays on the "media fantasy" of radiography's bond to occult practices such as spiritism, and hence, death. Moreover, the decorative layout of the hands reveals that they were unlikely X-rayed for medical reasons. In fact, none of the five X-rays, included by Moholy-Nagy in *Painting, Photography, Film*, were taken for practical means, or at least so it seems. The two shells were taken by photographer J.B. Polak for a special edition of the Dutch journal *Wendungen* (1923), the X-ray with the six hands bears the caption "Aufnahmeproben" (photographic samples), as if to stress the fact that the author's interest here is more in the photographic process than in the motif of the hand. AGFA, which is listed as the source of the hand-X-ray, is a Belgian-German manufacturer of photographic film. Rather than "applied radiography", that is to say, X-rays used in medicine or at the customs, the radiographs in *Painting, Photography, Film* are radiography "put on display", radiographs illustrating the potential of the technology in books or in the press.

The X-ray on page 67, opposite from the hands, is another "stock radiograph". It is a positive copy displaying a frog. In the X-ray both the fine bones and the lighter flesh around them is visible. As noted in the first chapter, frogs were popular subjects among radiologists since the very beginning, thanks to their flatness and (as a result) clear outline.[165] In a caption

[165] On the use of frogs as test objects in radiography, see for example: Dünkel, *Röntgenblick und Schattenbild*, 96-97.

below the radiograph, Moholy-Nagy has written: “Penetration of the body with light is one of the greatest visual experiences.”[166] Both radiographs are classic examples of “Photographie à travers les corps”, that is to say, radiography understood as photography with a transparency effect. What these pictures display, emphasized by the caption, is the X-ray as the surveillant “penetrating vision”, which, as Lisa Cartwright notes: “expands the domain of human vision into previously uncharted territories”.[167] Read within this understanding of the radiographic vision, the appropriated X-rays in *Painting, Photography, Film* become illustrations to a positivist narrative of scientific imagery, a narrative that fits well with the idea of Moholy-Nagy as the “artist-engineer” at Bauhaus. But like in *The Magic Mountain*, this view on radiography also seems to be challenged.

Art historian A. I. Botar argues that when Moholy-Nagy includes scientific photography, such as X-rays, in his “New Vision” aesthetics, it is not necessarily an expression only of his well-known artist-engineer-mindset — adding a scientific touch to his media theoretical work and his art — it must also be understood as “biocentrism”, in brief, the notion that human beings cannot claim a privileged position over the rest of nature and that all life is equally important:[168] In the spread showing the radiograph of the frog beside that of the human hands, Botar sees a juxtaposing (and accordingly an equalization) of our skeletal structures and those of animals, as a demonstration of how humans are just one zoological species out of many.[169] “In fact, […] Moholy-Nagy’s worldview […] rejected anthropocentrism, and espoused a Monist, neo-Vitalist and ecological view of the world.”[170] When looking at material that is part of an art discourse, such as PPF, it is, according to Botar, easy to place the use of scientific photography as an indicator of positivist tendencies.[171] But, “rather than effecting a further separation from, dominance, or instrumentalization of nature […], Moholy-Nagy hoped that this vision [that is to say, his “New Vision” including scientific imagery] would both demonstrate our identity with nature and its technologies, and extend it beyond our biological capacities”[172] Botar uses the term “Biotechnik” — coined by the Austro-Hungarian botanist, microbiologist and natural and cultural philosopher Raoul Heinrich Francé — to describe Moholy-Nagy’s biocentric attitude

[166] Moholy-Nagy, *Painting, Photography, Film*. In the German: „Die Durchdringung des Körpers mit Licht ist eines der grösten Seherlebnisse.“ Moholy-Nagy, *Malerei, Fotografie, Film*, 67.
[167] Cartwright, *Screening the Body*, 23.
[168] Stevenson, "Biocentrism".
[169] Ibid., 532.
[170] Botar, "László Moholy-Nagy's New Vision and the Aestheticization of Scientific Photography in Weimar Germany.", 527.
[171] Ibid.
[172] Ibid.

toward technology. According to the notion of "Biotechnik", all human technologies are said to have their model in "Grundformen" (basic forms) already found in nature. Accordingly, the term allows artists such as Moholy-Nagy to fit modern technology with "their essentially nature-based attitudes"[173]. When Moholy-Nagy juxtaposes photographs of natural forms with those of human technologies, for example, on page 48-49, where a flock of birds are placed opposite from airplanes [Fig.20], Botar sees it as an inherent visual rhetoric of "biomechanics".[174] He suggests that Moholy-Nagy's Weltanschauung was a biologistic one, and that "his interest in this wider range of imaging technologies was rooted in the biocentric tradition of scientific imagery as a signifier of the harmony and beauty of nature."[175] — a tradition where the human was seen as a part of a larger cosmic harmony. This also applies to the radiographs in the book.

### 4.3 Two Couches Translated into Light

On the four pages following the spread with the frog and the hands, another two X-rays appear (pages 68 and 70) [Fig.21 and Fig.22]. These are also zoological, both picturing conches, one view from the side and the other one from above. As pointed out by Botar, the radiographic shells are taken by photographer J. B. Polak and borrowed from the organicist art journal *Wendungen*, from the issue known as the "Schelpennummer" — the shell issue (no. 8/9). The same special issue inspired a number of other artists and architects. The conches must, according to Botar, just like the X-rays on the pages before, be understood within a biocentric context. Also, they are the quasi-religious affirmation of a higher order in nature, transcendence expressed through the repetition of forms (such as the spiral) in the very small (the X-rayed conch), as well as in at a cosmic scale (for example in the photograph of a galaxy, page 63). When Moholy-Nagy appropriates the radiographs from the "Schelpennummer" it is because they are "rooted in the moral and aesthetic appreciation of nature typical of Monism."[176]

With the last of the five X-rays picturing a bird [Fig.27], one can conclude, following Botar, that the X-rays that Moholy-Nagy chose to print in *Painting, Photography, Film*, have a "biocentric," and in a sense an anti-humanist iconography. The pictures decentralize the human species and degrade human mechanics to a natural force. However, the way in which

[173] Ibid., 529.
[174] Ibid., 529.
[175] Ibid., 531.
[176] Botar, "László Moholy-Nagy's New Vision and the Aestheticization of Scientific Photography in Weimar Germany.", 532.

anti-humanist tendencies are manifested for now is still only on a symbolic level. The radiographs may have a nonhuman content, without being "nonhuman photography" in the way Zylinska sees it. In what other ways may the radiographs in *Painting, Photography, Film* be examples of nonhuman, or anti-humanist photography? To answer this question, we must turn from the *what* to the *how*.

When conches are X-rayed, the visual effect is very different from the appearance of the frog and hands in the previous spread, for example. They don't have any permeable outer wrapping or a harder, exposable core, rather they consist of layers of the same thin and hard shell all through. The way the shell's structure turns out in the radiographs is baffling. Against the black–negative-copy — background, the lighter shadow of the conches appears as hazy outlines. It does not look solid at all, rather more like smoke from a cigarette or ink poured into water. The seemingly transformed state of the conch, is further enhanced by Moholy-Nagy's remark in the caption: "Matter translated into light" (In Licht umgesetzte Materie).[177] Moholy-Nagy's artistic ideals — what one also could call his "aesthetics" — are often referred to as "New Vision". The term "New Vision" derives from English title, *The New Vision: From Material to Architecture* (published 1932), of his 1929 Bauhaus-book *Von Material zu Architektur*, where Moholy-Nagy further elaborates on the theories also present in *Painting, Photography, Film*, but it has ended up labelling Moholy-Nagy's experimental ideas in general, as well as similar ideas among like-minded artists in the same period. What was Moholy-Nagy's so-called "New Vision"?

In a short essay with the industrial-sounding heading "Production-Reproduction", published in the Dutch avant-garde journal *De Stijl* in 1922 Moholy-Nagy formulates an early proposal for what would later be repeated in next to all his following writings: That, to meet the (essentially biological) human need for new sensations — new visions, artists must use technologies to *produce* new and hitherto unknown visions, sounds or sensations. These "new relations", as Moholy-Nagy calls them, cannot be achieved by using technologies and art forms to *reproduce* the world as we already know it (already known sensations): "reproduction (reiteration of already existing relations) can be regarded for the most part as mere virtuosity".[178] To achieve this, one does not have to invent new "productive" apparatuses. Moholy-Nagy proposes that the instruments, "so far only used for *reproductive* purposes", can be turned into *productive* ones as well.[179] He suggests, for example, that the

[177] Moholy-Nagy, *Malerei, Fotografie, Film*, 68.
[178] Moholy-Nagy, *Painting, photography, film*, 30. See also Moholy-Nagy in: Passuth, *Moholy-Nagy*, 289-90.
[179] Ibid.

photographic camera — so far only used at a secondary level, "in order to fix (reproduce) single objects"[180] — must be reevaluated. The artist must focus less on the camera and more on the "silver bromide plate positioned at [its] rear".[181] The artist must utilize the plate's sensitivity to light and "record various light phenomena".[182]

Such an attitude toward the photographic plate — as a sort of detector of various light phenomena — is strikingly similar to that of scientists such as Röntgen. The parallel to scientific research hasn't escaped Moholy-Nagy either. He writes, in line with this: "The primary condition for such work is laboratory experiments".[183] He further states that radiography, together with telescopic recordings of stars, are interesting preliminary stages to his own "productive" laboratory experiments. Radiography is, in other words, part of Moholy-Nagy's New-Vision aesthetics from the very beginning. X-rays are there, right in the center of what becomes his doctrine: That instead of reproducing the world as we know it, we must strive to find and create *new,* unseen or unheard experiences. So, when the conches appear in *Painting, Photography, Film,* it is not primarily as "conches" — the *reproduction* of something recognizable — but as the hitherto unexperienced sight of "matter translated into light".

### 4.4 Twin Technologies: Radiograph and Photogram

The media aesthetics of radiography as put forth in *Painting, Photography, Film*, can only be understood if one looks at how the X-rays are included in the book's overall layout, in how they are placed within the visual rhetoric of the image essay. Bearing this in mind, the X-rays are not only linked to the notion of "productive photography" in the written essay. The same idea is articulated visually in the image essay. The two conches discussed above do not come alone, they are placed on two different, subsequent spreads, each matched up with a photogram. [Fig.21 and Fig.22] What does this gesture of visual rhetoric tell us about the aesthetics of radiography in *Painting, Photography, Film*?

In the photograms, or "camera-less" photographs, as Moholy-Nagy also calls them, he has abandoned the camera and made pictures only by the means of light and chemistry. That is to say, he has done exactly what he proposed to do in the written essay by creating a "productive" nonrepresentational photography. The technique he has used is actually quite

[180] Ibid., 290.
[181] Ibid., 289.
[182] He suggests that reproductive sensations can be made with gramophone records as well, by scratching into the disc. Ibid. 290.
[183] Ibid., 289.

straightforward, since it skips most steps in the photographic process. While in regular photography, one first needs to expose the film inside the camera, then fixate the image chemically, before eventually making a paper copy in the darkroom, camera-less photography is much simpler. Here, only the last step taking place in the darkroom, is necessary: First one chooses which objects to depict. These were in in Moholy-Nagy's case often mirrors, glass plates, sheets of paper or metal tools, that is to say materials with various light reflecting potentials rather than interesting outlines. Second, the chosen objects are laid directly on the photosensitive paper (alternatively held or mounted above it). Last, the paper is exposed to light. The shadows cast by the objects remain as white silhouettes on the blackened paper, just like the white bones appear in negative X-rays. The visual result of such a process is, in Moholy-Nagy's case, something quite close to an abstract photography. With their soft fades between hues of white, black and gray, and hazy outlines, they are more atmospheric, than mechanic.

The two photograms that are matched up with the conches on pages 68-71 are both, like the X-rays, negative copies with lighter outlines on a blackened paper. Both bear the caption "Kameralose Aufnahme" (camera-less photograph). The first of the two, which is printed opposite from the side view-conch, additionally has a short description: "Contrasting relationships between black and white with the finest transitions of gray". It pictures a white spiral-shape (repeating that of the X-ray on the next page) against the black background. The spiral is "drawn" with a line that fluctuates between the very thin and the slightly thicker. In what looks like the background, a rectangular plane tilted slantwise is tinted by a dark gray that is a nuance lighter than the rest of the background. Furthermore, just visible in the upper fourth of the picture, there are some geometric shapes. By closer inspection, they come across as letters - an "O" and an "M" mirrored by a "W". Considering who made the artwork, it must be the spelling of "MO" in Moholy, i.e., a signature.

The photogram on page 71 gives a more cluttered first impression than the one on page 69. Where the last one had a spiral composition, this one is structured along a slightly tilted vertical axis. In this sense, this photogram echoes the composition of lengthwise X-rayed conch on page 68, rather than the one on the page opposite from it. A lighter beam-like plane is centered to the middle of the photogram, internally broken up between many lighter and darker rectangular shapes and the white shadow outline of what looks like lace or wire mesh. The vertically oriented shape in the middle is surrounded by a black background (except from a one lighter plane in the upper right corner of the composition).

According to art historian Herbert Molderings, the photograms, such as those discussed above, are visualizing a world, where neither measurement nor mathematics count, where all rational systems are suspended. To Molderings, the photograms, rather than by the cool rationality of positivism, are characterized by "a magical opacity".[184] It seems paradoxical that the penetrating vision offered by the X-rays — the latest invention of imaging technology, which allow us to see what we never before have witnessed, the "photographie travers les corps" — is juxtaposed (in a visual gesture of comparison) to such nonrepresentative and abstract pictures as these two photograms. The radiographs are, in this manner, analogized to a kind of photography that disregards human-like perception. I therefore want to suggest, that the key to the ways in which the X-rays in *Painting, Photography, Film* manifest nonhuman vision might be to look at how the radiographs are juxtaposed with photograms on these two spreads [Fig. 21] and [Fig. 22]. The two types of photography are, with this gesture, presented as twin technologies. In a rhetoric of comparison, the message of the two spreads must be understood here as "look how similar they are" Hence, in addition to the above mentioned remark on how X-rays must be seen as predecessors to the photogram, radiography and camera-less photography are here analogized visually.

### 4.5 The Mechanical, Exact, Unique, and Correct Distortion is Fixed

What happens to our understanding of the X-rays when they are juxtaposed with such abstract, non-Euclidian, and non-transparent imagery? When the X-rays are associated with Moholy-Nagy's own photograms in this manner, they are also inviting a certain reading. Photograms were, both in Moholy-Nagy's New-Vison aesthetics and among other artists, seen as a visual expression challenging the regular (camera-made) photographs and paintings structured by one-point linear perspective. What is interesting to us here, then, is not only how the two technologies are brought together on these pages, but also how they together break with other "optic regimes" presented in the book. That is to say, the images that Moholy-Nagy refers to as *reproductive*. What does the *reproductive*, that he is critical of, look like? On one page 47 [Fig.23], Moholy-Nagy has reproduced a photograph by Stieglitz, showing a street. The picture is conservative, with a recognizable subject and a view of it that corresponds to a human upright position. Next to the picture, Moholy-Nagy writes: "[…] photography misunderstood. The Photographer has become a painter instead of using his

[184]Molderings, "Lichtjahre Eines Lebens", 16.

camera photographically".[185] With a further gesture, he has tilted the photograph vertically, ignoring the way in which it is oriented toward the reader.[186] The act may be understood as if Moholy-Nagy forces the Stiegliz-photograph into the nonhuman.

What we here may call "Photography understood", by contrast — the *productive* — is the kind found on the pages discussed above, in the photograms and X-rays. Rather than reproducing "human optics", the camera-less techniques follow "optical laws different from those of our eyes".[187] While the distortions caused by the "plate-view" of radiographic vision were downplayed by radiologists, the distortions found in the twin-technology of the photogram were emphasized by Moholy-Nagy, as well as by his fellow avant-garde artists. Moholy-Nagy was, in fact, by no means the only artist who worked with camera-less photography in the 1920s. The technique of the photogram was almost a "trend" picked up by several artists from different branches of the European avant-garde movements simultaneously. First and most notable were Dada-artist and later Neue Sachlichkeit-member Christian Schad and surrealist photographer Man Ray, alongside Moholy-Nagy himself. When looking at the discourse surrounding these avant-garde photograms, "perspective" or "optics" is a recurring theme.

Peter Geimer writes about Man Ray's photograms (the so-called Rayographs), in the above discussed chapter "Visible/Invisible". In his analysis of one Rayograph [Fig. 24], depicting a bottle and a funnel, the lack of perspective (or any traditional sense of depth) in avant-garde photograms becomes obvious. In Geimer's description of the motioned rayograph, he emphasizes on how the objects depicted in it, seemingly disappear. He sees the following:

> The chemical bottle stands upright, and the reflexes in the glass lend it semblance of depth. The funnel seems to stick up somewhere behind the bottle, its volume taking up the top left third of the picture to the edges, and it would presumably tip over were it not for the prop that appears to barely prevent the whole precarious composition from collapsing.[188]

What Geimer is demonstrating here, without spelling it out directly, however, is how the art historian's usual linguistic tools for describing pictures become deficient when faced with the rayograph. Geimer effectively describes Man Ray's photogram as if it were a traditional still life painting hanging on the wall. Assuming a vertical positioning, he presupposes that the

[185] Moholy-Nagy, *Painting, Photography, Film*, 49.
[186] Moholy-Nagy, Malerei, Fotografie, Film, 47.
[187] Ibid., 32.
[188] Geimer, *Inadvertent Images*, trans. Jackson (Chicago: The University of Chicago Press, 2018), 161.

bottle in Man Ray's rayograph "stands upright". Further assuming a homogenous three-dimensional space within the picture, he describes how the bottle's "volume" takes up the third left of the picture. The funnel "sticks up somewhere behind" it. It does not tip over, because it is being supported by the prop. Applying the tools of visual analysis, Geimer is trying to sort out the different planes foreground, middle ground and background. But, this is in vain. The rayograph continuously resists these categories. The inadequacy of the art historian's tools is further demonstrated in the last part of Geimer's description:

> Closer inspection, however, once again shows the objects to be located on very different planes. The putative strut appears in vigorously drawn outlines, whereas the handle of the funnel disintegrates into an ethereal haze that would probably elude an attempt to grasp it. More photographic fog spreads in the bottom part of the picture, where we would expect to see a stable surface on which the object stand.[189]

When accounting for the picture's bottom half — where you would expect to find some kind of a foundation on which "the whole precarious composition", as he calls it, may rest — he finds no such thing, only photographic fog. So, the bottle that to begin with was described as "standing upright", suddenly is not standing after all.

What collapses here — in Geimer's demonstrative visual analysis as well as in the photogram in general — is the traditional picture space. In a photogram, like in an X-ray, there is no use in speaking about bottom/top, background/foreground or in front of and behind. In X-rays, as in photograms, there are simply no such thing as "foreground", because the term only makes sense when applied to a picture space that renders in three-dimensions. In a photogram (or an X-ray), by contrast, "our gaze wavers between the semblance of physical objects and the manifest flatness of the paper on which they appear".[190]

The transcendence of "cartesian perspectivism" in photograms is also apparent in Tristan Tzara's short essay, "La photographie a l'envers" (Photography inside out).[191] The text accompanied Man Ray's photograms, the so-called rayographs, in the portfolio *Champs Déliceux* (1922). Tzara states in this text, that the photogram is able to render the world in ways that the regular photo cannot. The inverted space, found in photograms (and X-rays), is not disapproved of by Tzara — but rather celebrated:

> No longer does an object, by crossing the trajectories of its outer edges within the iris, project a badly inverted image on the surface. The photographer has invented a new

[189] Ibid.
[190] Ibid., 160.
[191] Tzara, "Photography Upside Down".

> method: he presents to space an image that exceeds it, and the air, with its clenched fists and superior intelligence, seizes it and holds it next to its heart.[192]

In Man Ray's rayographs, the trajectories springing from the object's outer edges no longer get lost in the iris — that is to say, in the human eye. What he describes here, at the beginning of the text, is nothing else than Alberti's pyramid of vision. It is space structured along vanishing lines that meet in the vanishing point. In the rayographs, where one-point linear perspective is rejected together with the camera, no "badly inverted" (which must be understood ironically) image is projected on the surface. Instead, what we get is: "The mechanical, exact, unique, and correct distortion [that] is fixed, smooth, and filtered like a mane of hair through a comb of light."[193] Tzara clearly celebrates the photogram's anti-perspectival appearance. To Tzara, the photogram is representation freed from the eye and the one-point linear perspective imitating it.[194]

When the radiographs are juxtaposed and analogized to Moholy-Nagy's own photograms, on the spreads 68-71, they are at the same time linked to a specific "worldview" and attitude toward photographic and realistic representation. The maxim of the avant-garde photogram, seemingly shared by all the different artists that adopted the technique in the early 1920s, was that the reversed, nonhuman "plate-view" was more desirable than the view of the human eye.

### 4.6 Exchange of Glances

It is tempting to interpret the juxtaposing of the X-rays and the photograms on the above discussed pages as a crystal-clear celebration of the "plate view", and hence of nonhuman vision. But, keeping in mind that the frog on the page 66 was subjected to a "penetrating X-ray vision", it is necessary to take a closer look at the ambiguous collection of different "gazes" — human and nonhuman — that are exchanged within the work *Painting, Photography, Film.* One scholar who has considered the ambiguous perspectives in Moholy-Nagy's art is Devin Fore, whom I now will turn to. In the book chapter "The Myth Reversed" he examines Moholy-Nagy's relationship to a linear perspective.[195]

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[192] Ibid., 4. See also German Translation by Walter Benjamin: *Das Fotogramm* page 52-56 Tysk: „Nun ist's nicht mehr der Gegenstand, der die äußersten Enden seiner Flugbahn in der Iris vertauscht und sich fehlerhaft auf die Oberfläche projiziert."

[193] Ibid., 5-6.

[194] Similarly, Jean Cocteau writes about Man Ray's rayographs: "In the past, Daguerre and then Nadar liberated painting. […] You have liberated painting once again. *But backwards*." My italics. Cocteu, "An Open Letter to M. Man Ray." 2

[195] Fore, *Realism after Modernism* (Cambridge, Mass: MIT Press, 2012), 22-74.

Fore points out how Moholy-Nagy is seen, in the literature, as a “middle-man of the avant-garde”, a dilettante member of the “derriére-garde”.[196] He further shows how this non-committal attitude is evident in how Moholy-Nagy treats perspective: Moholy-Nagy is negotiating between the destruction and preservation of linear perspective — that is to say, between the avantgarde's radical fantasy of “a truly subject-less mode of perception”[197] and the “the optical corollary of the centered bourgeois ego”.[198] According to Fore, Moholy-Nagy chooses a third "middle way" by putting other "grammars of vision" to use that neither subscribe to the antihumanism of modernist abstraction, nor to the humanism of linear perspective.[199] The result is a plurality of perspective systems: When Moholy-Nagy works with photography, he forces us, as stated by Fore, to look *at* rather than *through p*erspective. He chooses oblique angles (achieving an effect close to anamorphosis), turning the camera obscura against itself. In Moholy-Nagy's photomontages, Fore argues also that Moholy-Nagy is [searching] for a new visual logic to depict the experience of non-Euclidian space, which neither is a linear perspective, nor its determinate negation (dada). A logic that he finds in the “para-perspectival language” of *reverse perspective*.[200]

As Fore shows, the phenomenon known as reversed perspective was a part of critical discourse in the 1920s, especially in Russia. In “A. and Pangeometry”, El Lissitzky, for example, lists it together with renaissance one-point linear perspective and explains (fairly) that; "[either] the tip of the visual pyramid lies in our eyes — therefore in front of the object — or is on the horizon — behind the object. The former concept was chosen by the East and the latter by the West".[201] Hence, with the introduction of reversed perspective in Moholy-Nagy's art in the 1920s, it must be understood as an equal validation in the diversity of gazes. This openness to the plurality of viewpoints is quite different from Tzara's celebration of the lacking perspective above. Fore only links the notion of reversed perspectives to Moholy-Nagy's photomontages (Such as "City lights") [Fig. 25] where reversed perspective lines are upsetting the relations of foreground, middle ground and background.

But the *dispositif* of reversed perspective may, as argued in chapter one, very well describe the distortions we get in X-rays, what Vera Dünkel calls "Untersicht" — "where the point of view" just as in Moholy-Nagy's photomontages is localized inside the picture, rather

[196] Ibid., 21.
[197] Ibid. 26.
[198] Ibid., 25.
[199] Ibid., 26.
[200] Ibid., 49.
[201] Quoting El Lissitzky. Ibid., 50.

than the observers. The same applies to the equally "camera-less" and, hence, plate-viewing photograms. It is tempting to think that when Lissitzky, in 1924, one year before he wrote "A, and Pangeometry", made a photogram for a Pelikan ink advertisement, he was well aware that the square block glass bottle of the ink pot was projected onto the photosensitive plate, in a silhouette resembling that of a cube drawn in reversed perspective. [Fig. 26] Like in Röntgen's weight set, the side of the ink pot that rests on the photographic plate has the clearest outline. The other side that is visible in the photogram — the one facing the plate in a 90-degree angle when the bottle was exposed — grows blurrier and larger the farther away from the bottom/foreground one that it gets. Because of the glass bottle's transparency, the advertisement is one of the clearest examples of how artists exhibited the distortive qualities of the "plate gaze" in photograms. These are the exact same distortions that were eliminated in X-rays by professional radiologists (for example in Eder and Valenta's above discussed fish radiograph).

Taking Fore's argument into account, one may understand Moholy-Nagy's inclusion of X-rays, as well as their relation to the photograms in the book, in this way: Not as "a truly 'subject-less mode' of perception" (exemplified by Fore in a Dada collage by Raul Hausmann), but rather as a *dispositif* for a cognition different from that of the linear perspective (which imply the centered bourgeois ego). The radiographic distorted "plate-view" appears in *Painting, Photography, Film*, not in a black and white opposition to "human vision" (as seen in for example Stieglitz's "street view") but next to it, within a plurality of perspectives — human and nonhuman. In addition to the X-rays, photographs and photograms already discussed above, there are additional microscopic and astronomical visions too. This plurality of gazes must — however — not be misunderstood as some kind of utopian glimpse into a world were "a complex assemblage of perception in which various organic and machinic agents come together […]."[202] Rather, it is more like a human subject's struggle to negotiate his own position (and point of view) in modernity. That is to say, not only a world of modern technology, but also one gender and class upheaval. The way this struggle manifests itself within shifting gazes may be illustrated by the last of the five X-rays in *Painting, Photography, Film*, the X-rayed chicken on page 135, and this radiograph's reappearance in the photomontage "Huhn bleibt Huhn", made in 1925, the same year as *Painting, Photography, Film* was published.

[202] Zyinska, *Nonhuman Photography*, 14.

### 4.7 An Ambiguous Bird

The last of the five X-rays included in *Painting Photography Film* appear on one of the last pages of the book (page 135) in the film script "Dynamik der Gross-Stadt".[203] [Fig. 27] The script is about fourteen pages long. It is, as Moholy-Nagy writes a: "sketch for a film also typefoto"[204] — it is a film, but it is also a demonstration of how Moholy's own font, known as "Typofoto", may be used to represent things like "optische Tempogliederung" (optical arrangement of tempo) and "optische Aktion" (optical action),[205] in addition to their other functions as text. Accordingly, the fourteen pages in question, are not a manuscript for a film in any traditional sense, but rather an optical firework.[206] As Moholy-Nagy writes: "The intention of the film 'Dynamic of the Metropolis' is not to teach, nor to moralize, nor to tell a story; its effect is meant to be visual, purely visual"[207] He further states that the film gives "Raumzeitliche Ereignisse" (experiences of space-time) and "brings the viewer actively into the dynamic of the city".[208] In practice, this is done by juxtaposing images (photographs, collages, drawings directly added on the film strips, photograms) text, and signs going both vertically and horizontally.

The radiograph, a (not that usual) positive copy, with a black outline on a white background, is framed not by one, but by two contrasting rectangles: the inner one white and the outer one thick and black (since the scene here is supposed to be imagined as a scene in a film, the black framing might help us imagine the blackened movie theatre around the flickering white screen). The radiograph shows the dark skeleton outline of a bird. It has a long slender neck, and short stout-looking wings, the legs are bigger and more heavily built. The bird's skeleton is only just visible, surrounded by the lighter grey shadow of the flesh. It lays in an awkward position, its wings and legs spread out. The posture reveals that this is by no means a living bird, but rather a dead one.

In the list of illustrations used for "Dynamik der Gross-Stadt" in the of *Painting, Photography, Film*, the X-ray bird on page 135 is credited to the film manufacturer AGFA, just like the X-rayed hands discussed previously, and identified as a "Huhn" (a chicken).[209] But the text above it within the script only says: "A cadaver swims in the water, very

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[203] About imagined cinema and photograms, see Elcott: Into the dark chamber
[204] Moholy-Nagy, *Painting, Photography, Film*, 122.
[205] Moholy-Nagy, *Malerei, Fotografie, Film*, 121.
[206] Footnote on film scripts, cf. Elcott
[207] Moholy-Nagy, *Painting, Photography, Film*, 122. In Moholy-Nagy, *Malerei, Fotografie, Film*, 120: "Der Film „Dynamik der Groß-Stadt" will weder lehren, noch moralisieren, noch erzählen; er möchte visuell, nur visuell wirken."
[208] Ibid., 122.
[209] Ibid., 141.

slowly".[210] The radiograph is, accordingly, connected here to an iconography of death, echoing the metaphors of the X-rays present in *The Magic Mountain*. The film shot we imagine is a horrific one, with dead bodies floating down river, fit for a mafia movie. The "typophoto" below the X-ray also tells us that this spine-chilling scene — accompanied by the sound of a thundering waterfall — is one of the film's last ones, only followed by "Military. March-march", and "Glass of water. In motion".[211]

Like the X-rays in *The Magic Mountain,* the X-ray here acquires a symbolic function, connoting death, in addition to just being an appropriation of scientific imagery. It is tempting to argue that the effect of the "cadaver", here — like in Thomas Mann's novel — is just as much a result of the X-ray's "media aesthetics" as its subject (the skeleton). The bird, with its awkward pose and shadowy, distorted outline also takes on a function similar to that of Holbein's anamorphic skull, offering "unseeing" and "unknowing" of the human point of view. It is an up-to-date anamorphic *memento mori*.

Curiously, the X-ray bird from the script of "Dynamik der Gross-Stadt" reappears in another of Moholy's works from 1925, a photomontage titled "Once a Chicken, always a Chicken" (Huhn bleibt Huhn). [Fig. 28] The collage is made up of magazine cut-outs (photography) and drawings, in addition to the previously discussed "chicken". Also, it is written "Filmplakat" on its back, suggesting that it may be the sketch for another (unfulfilled) Film project. The different elements do not fill up the entire bottom sheet, but rather placed — slightly off center — in an uncluttered composition, allowing the white of the paper to shine through. The composition as a triangular shape: The left flank is dominated by a big white and bluish egg that the X-rayed bird is glued on top of so that they overlap. In the top of the composition, in what might be regarded as the background, one sees more, smaller sized eggs and in between them newly hatched chickens. Apparently jumping out of the flock of chicken is a short- and dark-haired woman dressed in athletic clothing (shorts and a jersey shirt). Behind her, there is another woman, this one also casually and practically dressed hitting an invisible ball with a baseball bat. To the right, in what may be called the foreground, there is a third woman — this one also short haired and athletically dressed, in what looks like a tennis outfit. She is in the middle of a leap/jump, her legs are stretched out and her right hand extended, grasping what looks like a stick (supposedly the shaft of a racket or a relay baton). The woman to the right is attached to the X-rayed bird by many thin yellow lines drawn onto the collages. The lines spring out of the ends of their respective limbs, two out of each —

[210] Ibid., 137.
[211] Ibid.

wiring them together. Like the spread with the X-rayed hands and the frog (pages 68-69), lines are drawn (this time literally) between the human form and that of an animal. In the latter case, according to Botar, it had a positive ring to it — of the human reconnecting with nature. Here, in contrast, it appears to have a quite different meaning. It may easily be interpreted as a degrading gesture aimed at the athletically dressed women in the cut-out photographs. The lines imply that the sporty women in the collage have something in common with the anamorphic bird from the last scene in "Dynamik der Gross-Stadt", a suggestion further amplified in the title: "Once a chicken, always a chicken".[212]

The women here must be understood as so-called "New Women". They break with traditional gender roles, both because of their unisex clothing and since they are participating in sports. The theme of sporty, boyish women reappears, cloaked in a similar misogynist aura, in *The Magic Mountain* also, for example, in the disagreeable Hermine Kleefeld, who appears at lunch in woolen trousers, "and after the meal she would loll about, knees spread wide, in one of the wicker chairs in the lobby".[213] The three women in the collage undoubtedly have a sort of aggressiveness to them, with their progressive jumping and striking, not to mention their traversing of traditional gender roles. In her book *Picturing Modernism*, art historian Eleanor Hight shows how the female aggressiveness seen in "Once a Chicken, always a Chicken", is a common theme in Moholy-Nagy's art. His attitudes, as represented in this photomontage (as well as in others), are in conflict and ambiguous. According to Hight, Moholy-Nagy is using images of the New Woman as an athlete in ways that pictures independent women as a threat to men. To Hight, the photomontage displays a crisis of modernity, "in which women's liberation could simultaneously be seen as a sign of progress and a constant threat to society."[214] Without paying special attention to the X-ray medium depicting the chicken, Hight interprets the juxtaposing of it and the "New Woman" as alluding their fertility and sexual liberty.[215]

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[212] This English title is given by Moholy-Nagy himself, when he includes the photomontage in question in his later book *Vision in Motion*. Even so, art historian Eleanor Hight introduces another translation, "Chick, remains a Chick", in her later analysis of the photomontage. In contrast to Moholy-Nagy's own translation, Hight's title preserve the gendered meaning of "Huhn". See Botar, "László Moholy-Nagy's New Vision and the Aestheticization of Scientific Photography in Weimar Germany", 549.

[213] Mann, *The Magic Mountain*, 560.

[214] Hight, *Picturing Modernism* (Cambridge, Mass: MIT Press, 1995), 165.

[215] In *Vision in Motion* (1947) the collage reappears under the title "Once a Chicken, Always a Chicken", bearing the caption: "Visual manuscript for a film so that all of its scenes can be visualized at once". The photomontage is followed by a written version of the film script to a film that was never realized (pages 285-8): The script describes a highly surrealist scenario in which the "protagonist", a masked man, is chased by eggs in a modern city backdrop of streets, cars, trams, shops, apartments and cafés—"is the 'man' a cinema actor? are the eggs girls?" (285) One of the eggs hatches into a young, fresh, and bright woman, who resume to the "man hunt", wearing a bridal vail. After an exhausting chase, and the masked man's persistent resistance, the couple is

I want to suggest here that the X-ray, furthermore, in addition to the sexist comparison of liberated women to a laying hen, does something else: It exposes the inner reality of the New Women as "just women". Moholy-Nagy plays on ideas about X-rays that have been there from the beginning. In *Röntgenblick und Schattenbild*, Vera Dünkel describes how X-rays are comprehended to hold a truth value, that also exceeds that of regular photography. For example, X-rays were used to detect fake stones in jewelry.[216] The X-ray in Moholy-Nagy's photomontage does something similar. Reassuringly, it plays the role as the revealer of these sport playing women's true essence: Despite the New Woman-wrapping, the women here are, have been, and will always be, just women, because: "Once a Chicken, always a Chicken". In this sense the X-ray in the photomontage plays the role of a perfect "penetrating vision." It exposes the skeleton; it sexualizes and controls (as revealer of truth). However — as we have seen by now — the bird also, probably implies a challenge to the described dominant masculinist X-ray "gaze."

As expected, there are some details in the photomontage that are inconsistent with the interpretation above. Like the radiograph described in *The Magic Mountain*, depicting Clawdia Chauchat's torso (an X-ray that proved to be sexualizing, but simultaneously obscure), I think that the X-rayed bird may be open to more than one interpretation. First, it (literally) links the human woman in the foreground to the nonhuman X-rayed animal, blurring at least one of Donna Haraway's requests for a "cyborg". Secondly, it is quite hard to tell, without the information provided in the title, that the bird is a chicken and consequently of female sex.[217] As if he was aware of the fact, Moholy-Nagy made a second version of this collage — a photocopy — on which he printed the title with large red letters, one "Huhn" hovering over the chicken and the other one over the "new-woman", leaving little to the viewers imagination.

As seen throughout this thesis, the radiographic image oscillates between a (still human-like) vision, with the ability to penetrate matter, and other less human, undermining

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married, and soon finds themselves surrounded by dirty children, before they finally divorce and the girl is turned back into an egg, hatched by a china hen. Moholy-Nagy, *Vision in Motion* (Chicago: Paul Theobald, 1947), 285.

[216] Dünkel looks at a plate from "Tableau Radiguet" that shows an X-ray and a photograph of the same necklace, but with a slight difference. While all the stones look the same in the photograph, some are white, and others are black in the radiograph. Hence, the X-ray reveals something that remains hidden in the photography, the fact that some of the stones in the necklace are fake. While real diamonds are permeable to X-rays, and hence white (it is a positive copy), the fake stones are less permeable and black. See Dünkel, *Röntgenblick und Schattenbild*, 48-52.

[217] This point may be illustrated by the fact that Botar, in his article reffers to the bird in the collage here as "an X-rayed swan". See Botar, "László Moholy-Nagy's New Vision and the Aestheticization of Scientific Photography in Weimar Germany", 550.

visions. As a manifestation of "plate-view", and with it the effects of anamorphosis and repelling reverse perspectives, the X-ray of a bird acquires a further function. In addition to being an obvious example of an extended “male-gaze”, however, with blurry details and plenty ambiguities, it also, in fact, challenges the dominating "gaze" of the nominative male subject associated with one-point linear perspective. In the midst of the sexist scenario of the photomontage, thematizing the threat of the "New-Woman", the radiograph actually puts the viewer (him-/or herself) on view. In this sense this artwork exemplifies the plurality of gazes present in Moholy-Nagy's work, that Devin Fore writes about. In *Huhn bleibt Huhn*, the radiograph, accordingly, becomes a tool for negotiating the gray zones of visual mastery.

# 5 Conclusion

This master's thesis has opened with a comparison of a technical image and a collage, Röntgen's radiographic sample test, and Jean Arp's *Collage of Squares Arranged According to the Laws of Chance*. I have pointed out how both images reject the eye as a primary source of knowledge since they depend neither on a camera nor on an observer. The images with their strategy of disregard also discredit human agency. The juxtaposition of these images could easily have served as an introduction to an analysis that only looked at the shared radical fantasy of a truly "subject-less" mode of perception in avant-garde art and in science. What has become evident throughout, however, is that X-ray images incorporate many different viewpoints, and often contradictory ones. As a prosthesis for the human eye, granting it the ability to penetrate matter, radiography is the exposing vision of the customs control, the dissecting "medical gaze", not to mention a stripping "male gaze". As a "cameraless" photography, however, radiographic perception lacks the structuring symbolic force of the one-point linear perspective. As a consequence, it offers what we have called a "plate-view".

In the introduction, I asked how the aesthetic of X-ray technology is described in Thomas Mann's novel *The Magic Mountain*, and in László Moholy-Nagy's "New Vision" manifesto *Painting, Photography, Film.* In both books, radiography is understood as an extension of human vision. At the fictional sanatorium, Berghof, the main function of radiography is as a medical imaging technology. It allows Dr. Behrens to look inside Hans Castorp's body and diagnose him with TB. X-ray technology in *The Magic Mountain* is, as Dr. Behrens calls it, "Lichtanatomie" (light anatomy)[218], a term that is echoed in the image caption below the X-rayed frog in *Painting, Photography, Film*, formulated "Die Durchdringung des Körpers mit Licht"[219] (The penetration of the body with light). Both books are thus in line with the understanding of radiography as a device for looking inside otherwise opaque bodies, a penetrating vision. And not only for medical purposes. In *The Magic Mountain,* the notion of radiography as "penetrating" is further elaborated — when it is blended with Hans Castorp's desires and it becomes a technologically enhanced "male-gaze".

Yet, the described notion of X-ray vision is also challenged and undermined. Even though the radiographs' function in the fictional narrative of Thomas Mann's novel is

[218] Mann, *Der Zauberberg*, 299.
[219] Moholy-Nagy, *Malerei, Fotografie, Film*, 67.

medical, their function as a literary device is something else. The X-ray images in *The Magic Mountain* are, more often than not, undermining the described controlling "medical gaze" and subjecting "male gaze". What I, in chapter one, choose to call "plate view", is never described straightforwardly in *The Magic Mountain*, but its manifestations in the pictures as ambiguity, distortion and blur are clear enough. This occurs, for example, when Hans Castorp misinterprets the X-rayed heart of his cousin as a flapping jellyfish and when gender is blurred in Clawdia Chauchat's X-ray portrait. In *Painting, Photography, Film,* on the other hand, the "plate-view" is dealt with more directly. Moholy-Nagy draws attention to it when he juxtaposes the two conch X-rays with his own "photography without camera" — the abstract photograms. With this gesture of visual rhetoric, he alludes to the blurry, ambiguous, and nonfigurative in the radiographs. "Penetration of the body with light"[220] becomes "matter translated into light".[221]

My question for this master's thesis has not only been how to describe and understand radiographic aesthetics, but also how X-ray technology in *Painting, Photography, Film* and *The Magic Mountain* shape human and non-human perception in the early twentieth century. In other words, one might question whether X-ray vision, or X-ray perception, is more human or nonhuman? Are the radiographic images discussed in this thesis an extension of human perception, a tool for human vision, or an encountering nonhuman consciousness? Maybe, one can even expect here that the radiographic perception would mark a clean break with everything human. Often, X-ray imagery, quite rightly, offers a "transcendence of human-centered intentionality", what Zylinska calls an "unseeing" and "unknowing" of the human standpoint.[222] One example for this is the scene where the distorted and decomposed portrait of Chauchat is picked up by Hans Castorp's — in consequence horrorstruck — uncle. Another example is Moholy-Nagy's repeated devaluation of mimetic photography and "our optical instrument, the eye"[223]. What the material has shown throughout, however, is that the radiography in the two books expresses rapidly shifting viewpoints, rather than a singular "human" or "nonhuman" vision. As illustrated in Devin Fore's argument, the X-ray vision in *Painting, Photography, Film* displays and thematizes the plurality of perspectives as a result of technological modernity. A parallel may be seen in Thomas Mann's novel in Hans Castorp's encounter with radiography, which opened his "analytical pit" and destabilized his

[220] Ibid.
[221] Moholy-Nagy, *Painting, Photography, Film*, 68.
[222] Zylinka, *Nonhuman Photography*, 29.
[223] Moholy-Nagy, *Painting, Photography, Film*, 28.

human, white, male, Western and bourgeois (still *privileged*) viewpoint. When he is confronted by the alien radiographic perception, Hans Castorp's previously stable worldview is exchanged for a new-found fragile one.

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# Illustrations

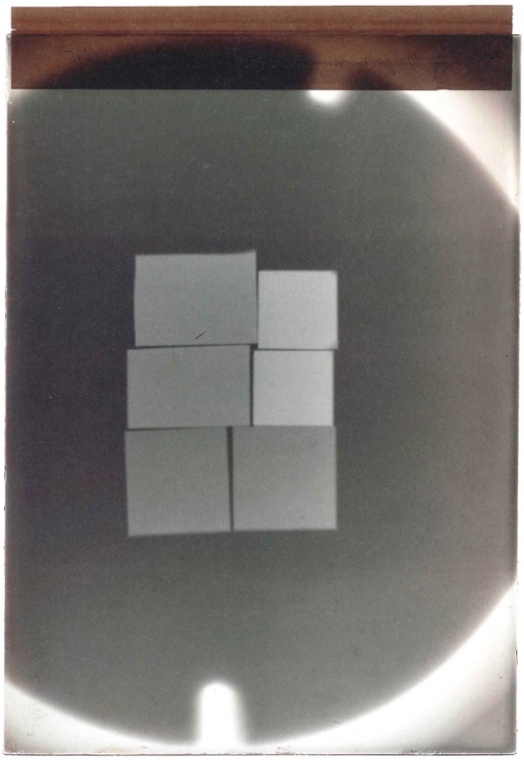


Fig. 1 W. C. Röntgen: Tests of Aluminum, Calcite, Quartz, and Glass, Negative plate, 1895. Radiograph (Glass negative), 18,7 cm x 12,8 cm. From: Vera Dünkel. *Röntgenblick und Schattebild. Genese Und Ästhetik Einer Neuen Art Von Bildern*. Emsdetten, Berlin: Edition Imorde, 2016, p. 202.

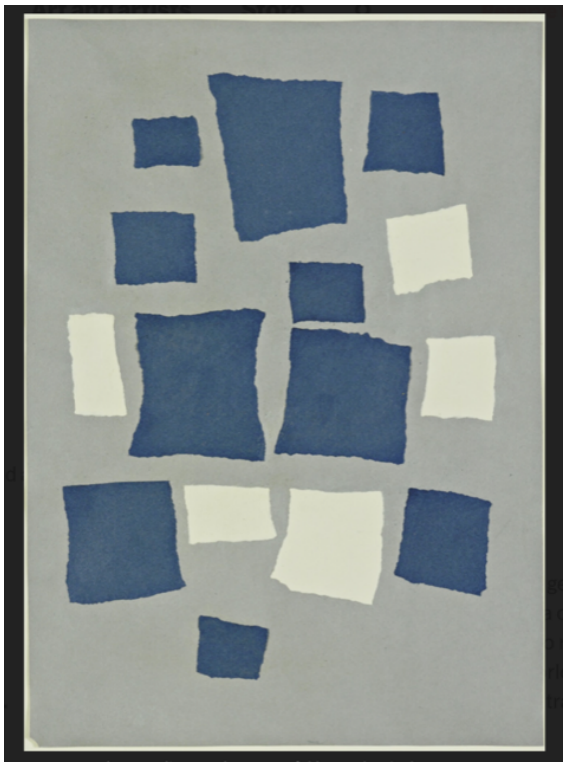


Fig. 2 Jean (Hans) Arp: *Untitled (Collage with Squares Arranged accprding to the Law of Chance,* 1916–17. Torn-and-pasted paper and colored paper on colored paper, 48,5 cm x 34,6 cm. From: MoMA's collection and homepage. <https://www.moma.org/collection/works/37013> Downloaded: 20.06.2021.

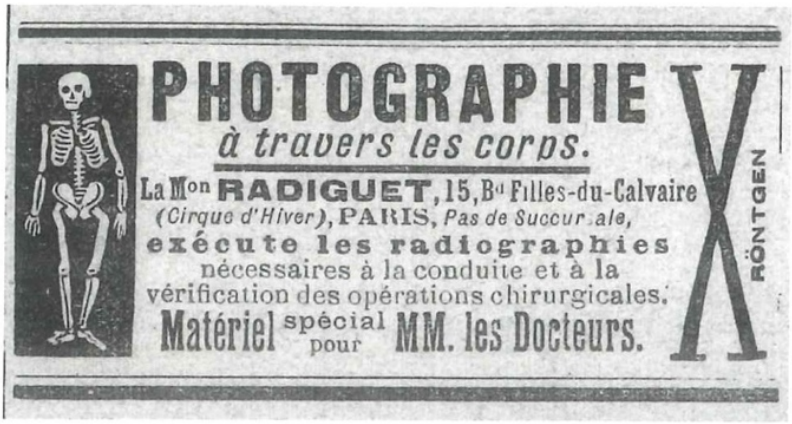



Fig. 3 Advertisement for Radiguet's business, printed in the journal *La Nature*, 1897. From: Vera Dünkel. *Röntgenblick und Schattebild. Genese Und Ästhetik Einer Neuen Art Von Bildern*. Emsdetten, Berlin: Edition Imorde, 2016, p. 40.

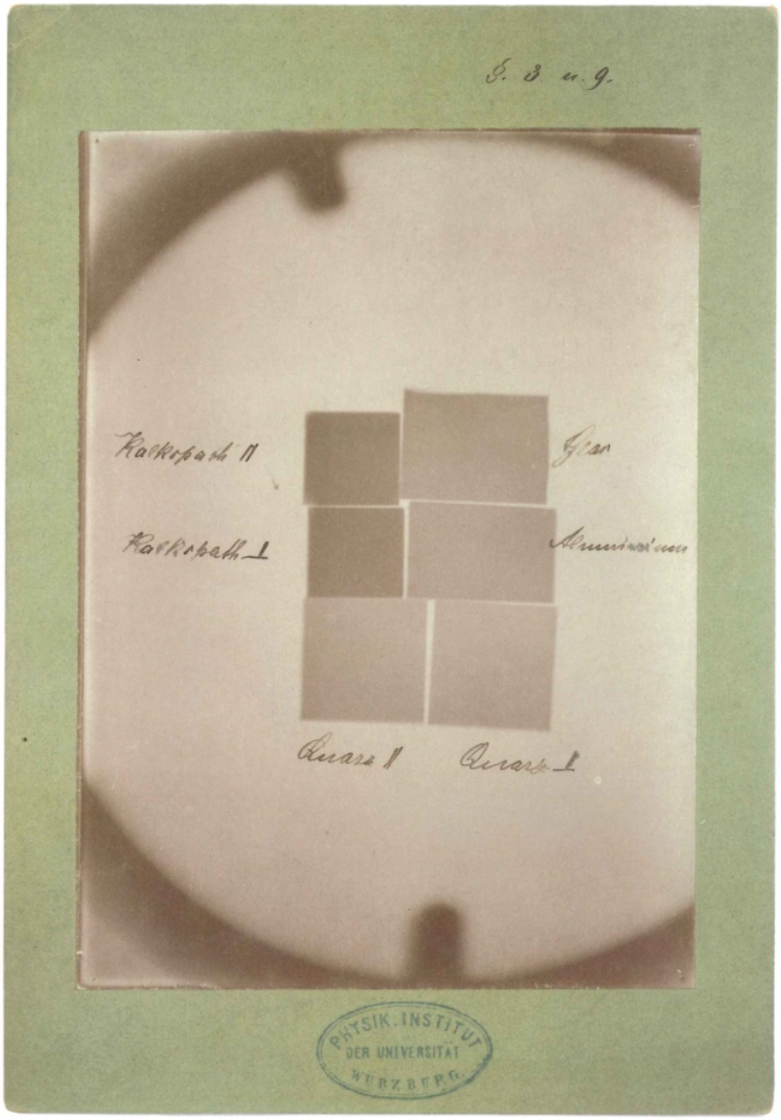



Fig. 4 W. C. Röntgen: Tests of Aluminum, Calcite, Quartz, and Glass, 1895. Radiograph (positive copy on cardboard), 23,1 cm x 16 cm. From: Vera Dünkel. *Röntgenblick und Schattebild. Genese Und Ästhetik Einer Neuen Art Von Bildern*. Emsdetten, Berlin: Edition Imorde, 2016, p. 203.

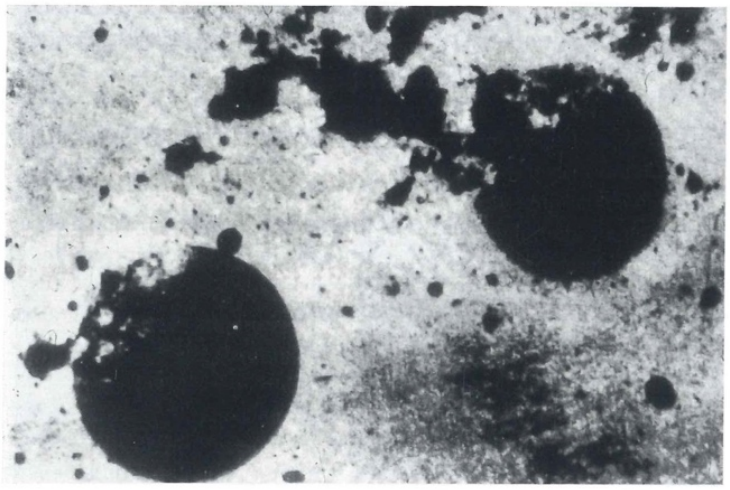


Fig. 5 Arthur Goodspeed: “The Röntgen Phenomena,” 1892. From: Peter Geimer. *Inadvertent Images: A History of Photographic Apparitions*. Chicago: The University of Chicago Press, 2018, p. 60.

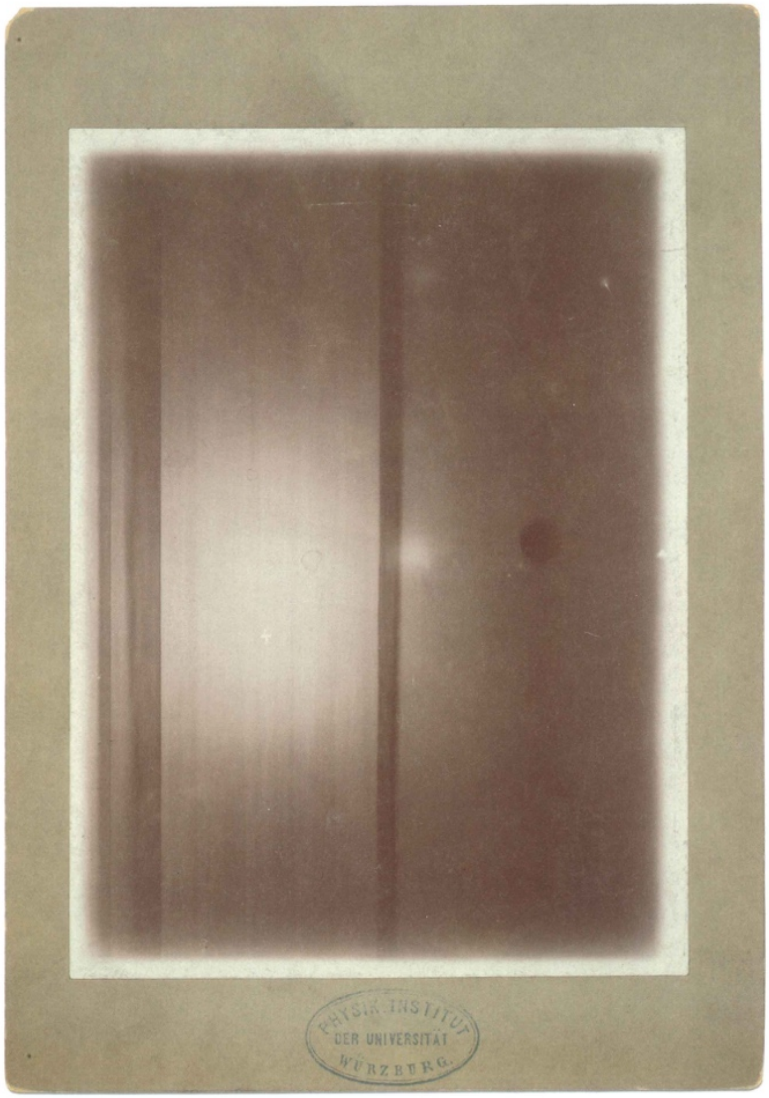



Fig. 6 W. C. Röntgen: Laboratory door, 1895. Radiograph (positive copy on cardboard), 22,9 cm x 15.9 cm. From: Vera Dünkel. *Röntgenblick und Schattebild. Genese Und Ästhetik Einer Neuen Art Von Bildern*. Emsdetten, Berlin: Edition Imorde, 2016, p. 207.

Fig. 7 Photography of the laboratory door, 1895. My photograph of paper copy in the archive of *Deutsches Röntgenmuseum*.

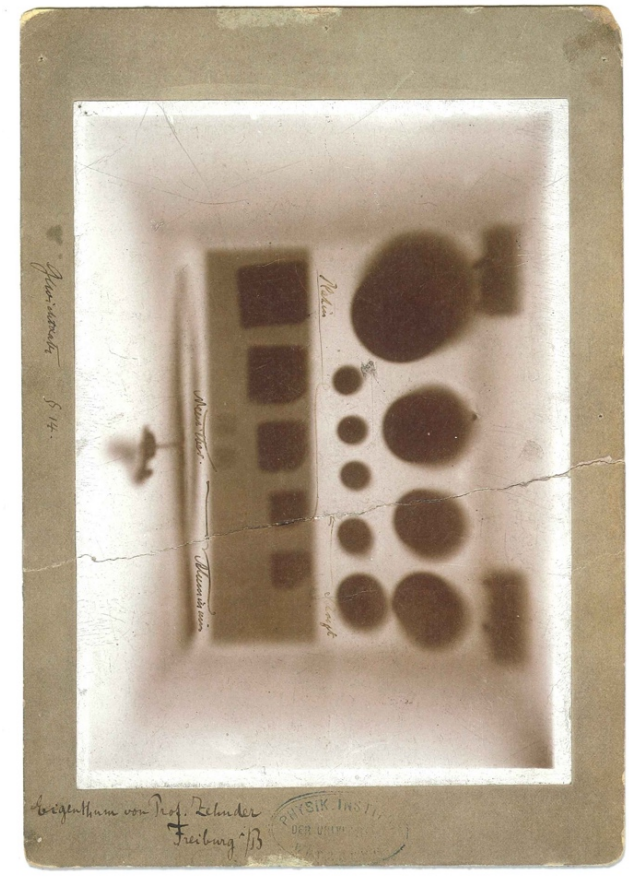


Fig. 8 W. C. Röntgen: Set of Weights, 1895. Radiograph (positive copy on cardboard), 22,5 cm x 15,7 cm. From: Vera Dünkel. *Röntgenblick und Schattebild. Genese Und Ästhetik Einer Neuen Art Von Bildern*. Emsdetten, Berlin: Edition Imorde, 2016, p. 206.


Fig. 9 W. C. Röntgen: Bertha Röntgen's hand, with ring, 1895. Radiograph (positive copy on cardboard), 22,9 cm x 16 cm. From: Vera Dünkel. *Röntgenblick und Schattebild. Genese Und Ästhetik Einer Neuen Art Von Bildern*. Emsdetten, Berlin: Edition Imorde, 2016, p. 208.

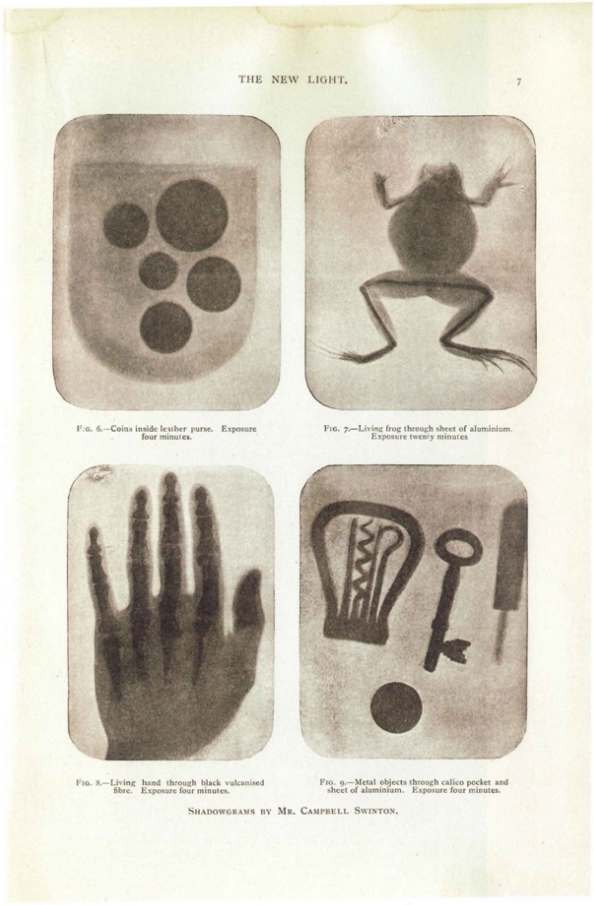



Fig. 10 Coins inside leather purse, living frog, living hand, metal objects printed in the journal *The Process*, 1896. From: Vera Dünkel. *Röntgenblick und Schattebild. Genese Und Ästhetik Einer Neuen Art Von Bildern*. Emsdetten, Berlin: Edition Imorde, 2016, p. 206.

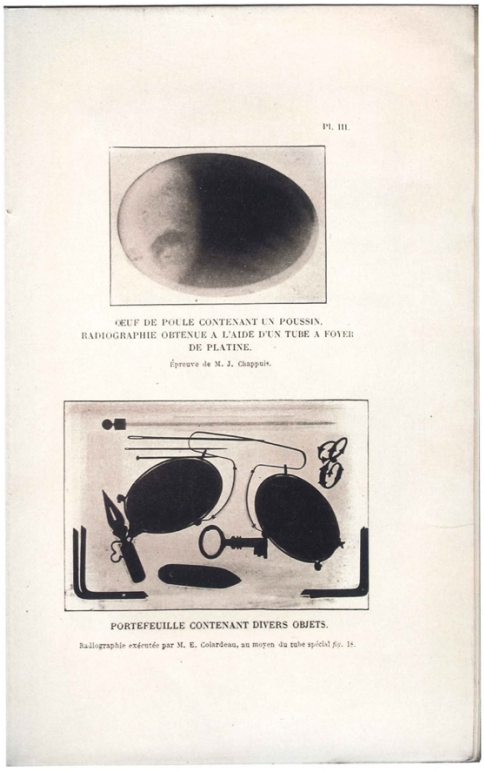



Fig. 11 Plate from Guillaume's *Les rayons* x (second edition, 1896) showing wallet with different objects and egg with chicken ready to hatch. From: Vera Dünkel. *Röntgenblick und Schattebild. Genese Und Ästhetik Einer Neuen Art Von Bildern*. Emsdetten, Berlin: Edition Imorde, 2016, p. 241

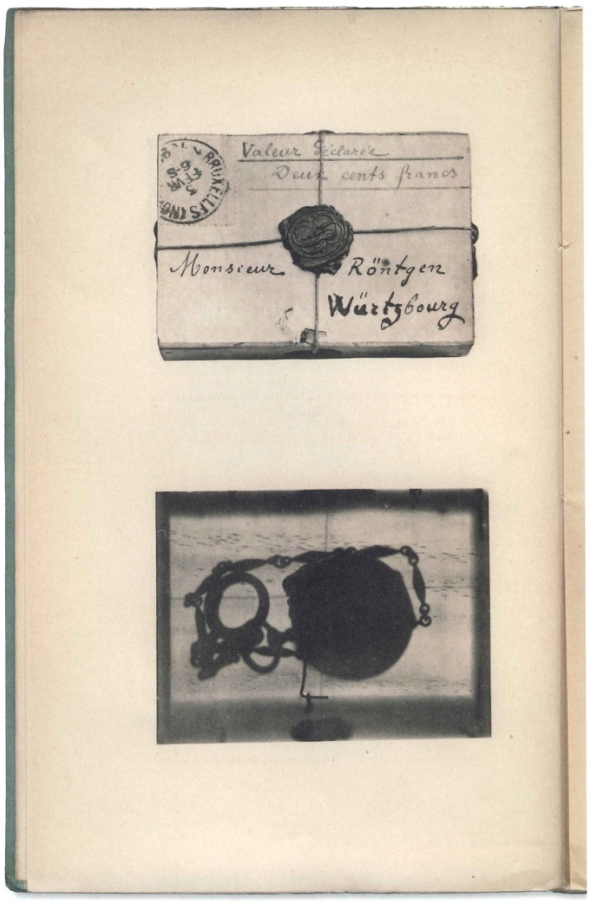



Fig. 12 Plate from Guillaume's *Les rayons* x (first edition, 1896) Juxtaposed radiograph and photograph of a parcel containing a watch. From: Vera Dünkel. *Röntgenblick und Schattebild. Genese Und Ästhetik Einer Neuen Art Von Bildern*. Emsdetten, Berlin: Edition Imorde, 2016, p. 242.

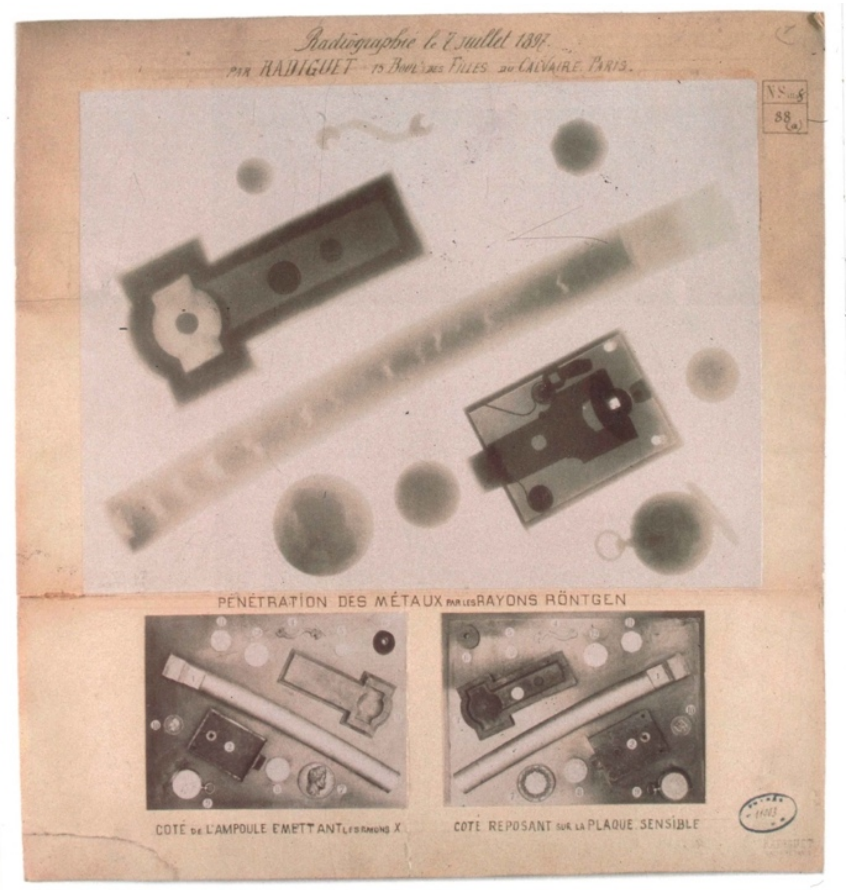



Fig. 13 Arthur Radiguet: Tableau explaining the perpetration of metals with X-rays, 1897. One radiograph (positive copy) and two photographs mounted on cardboard, 48 x 45,5 cm. From: Vera Dünkel. *Röntgenblick und Schattebild. Genese Und Ästhetik Einer Neuen Art Von Bildern*. Emsdetten, Berlin: Edition Imorde, 2016, p. 216.

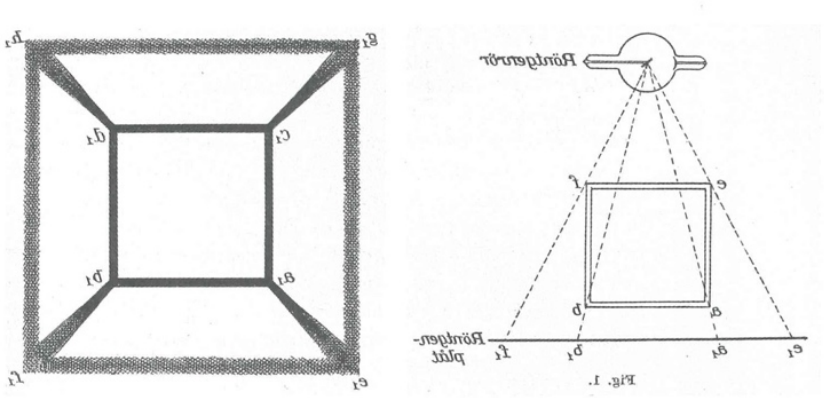


Fig. 14 Left: Illustration in horizontal view showing the taking of an X-ray, with the X-ray tube, a cube being exposed, and a photographic plate. Right: Illustration of how the three-dimensional X-rayed cube is projected in the two-dimensional radiograph. The illustrations were originally published in Gösta Forsell's "Röntgenbild", *Nordisk Familjebok*, 1916. From: Solveig Jülich. *Skuggor Av Sanning: Tidig Svensk Radiologi Och Visuell Kultur*. Linköping: Tema teknik och social förändring Lindköpings universitet, 2002, p. 272.

Fig. 15 Hans Holbein: *The Ambassadors,* 1533. Oil on oak, 207 x 209,5 cm. From: Artstor. <https://library-artstor-org.ezproxy.uio.no/#/asset/ANGLIG_10313766667> Downloaded: 14.06.2021.

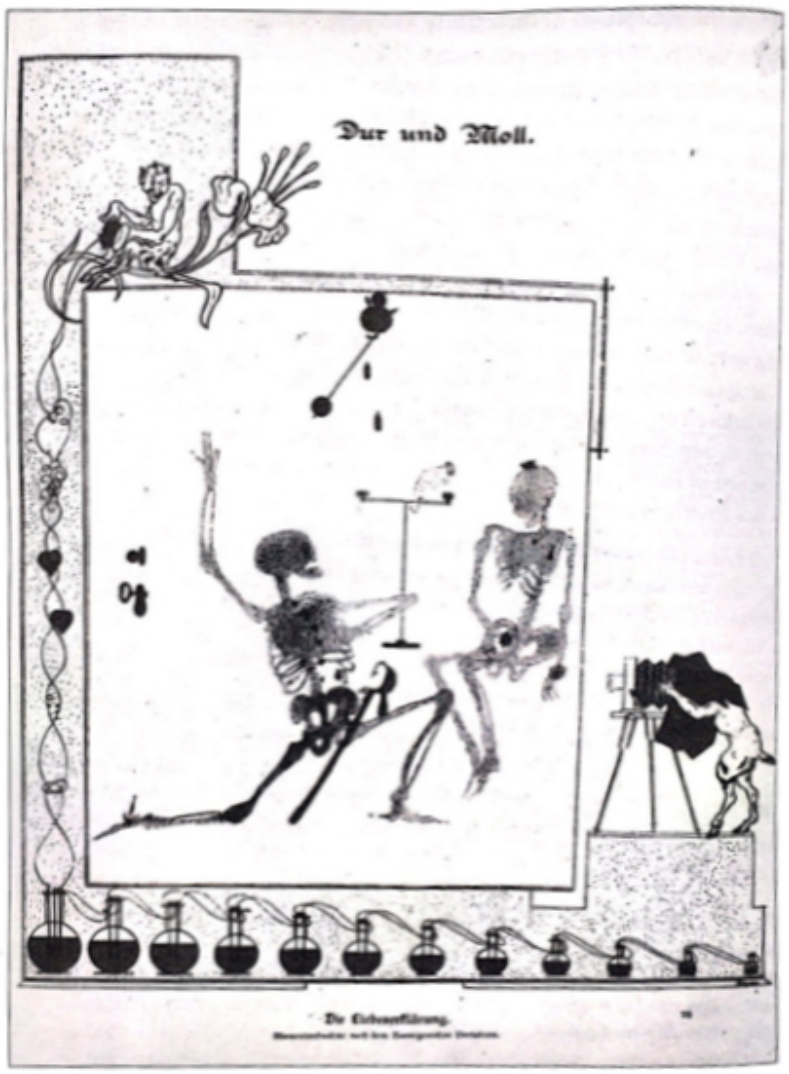
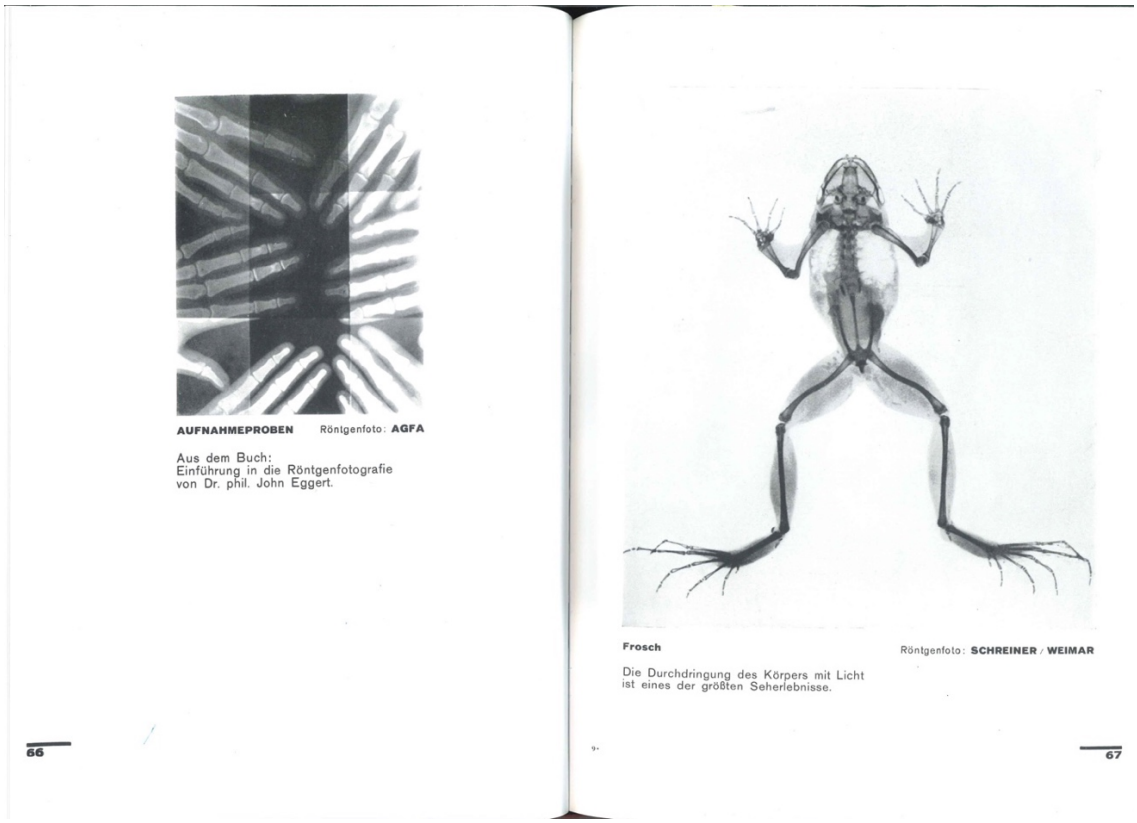



Fig. 16: Cartoon from: Tsivian, "Media Fantasies and Penetrating Vision" (California: Stanford University Press, 1996), 88.


Fig. 17 Zwei Goldfische und ein Seefisch, 1896. In Eder and Valenta's Atlas. My photograph of the page, from the archive of *Deutsches Röntgenmuseum*.



AUFNAHMEPROBEN Röntgenfoto: AGFA

Aus dem Buch:
Einführung in die Röntgenfotografie
von Dr. phil. John Eggert.

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Frosch Röntgenfoto: SCHREINER / WEIMAR

Die Durchdringung des Körpers mit Licht
ist eines der größten Seherlebnisse.

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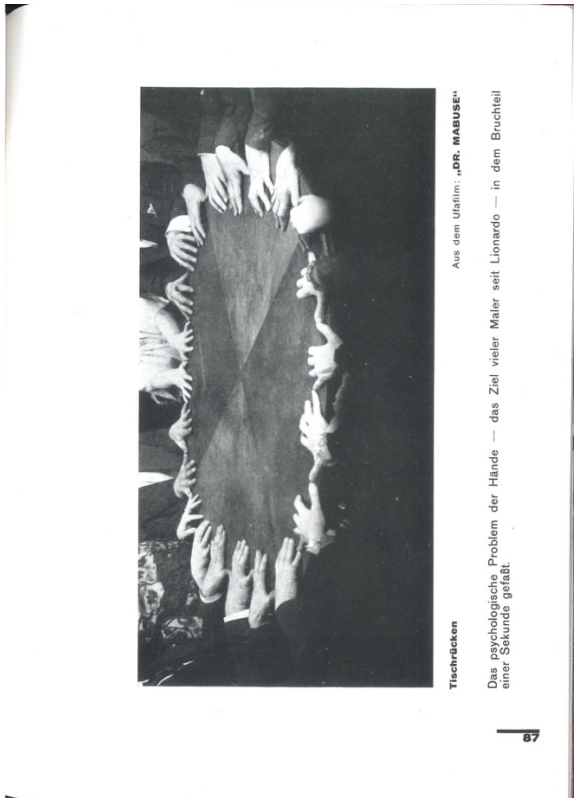
Fig. 18 From: László Moholy-Nagy. *Malerei, Fotografie, Film*. Berlin: Gebr. Mann Verlag, 2000, p. 66–67.



Tischrücken Aus dem Ufafilm: „DR. MABUSE"

Das psychologische Problem der Hände — das Ziel vieler Maler seit Lionardo — in dem Bruchteil einer Sekunde gefaßt.

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Fig. 19 From: László Moholy-Nagy. *Malerei, Fotografie, Film*. Berlin: Gebr. Mann Verlag, 2000, p. 87.


Fig. 20 From: László Moholy-Nagy. *Malerei, Fotografie, Film*. Berlin: Gebr. Mann Verlag, 2000, p. 48–49.

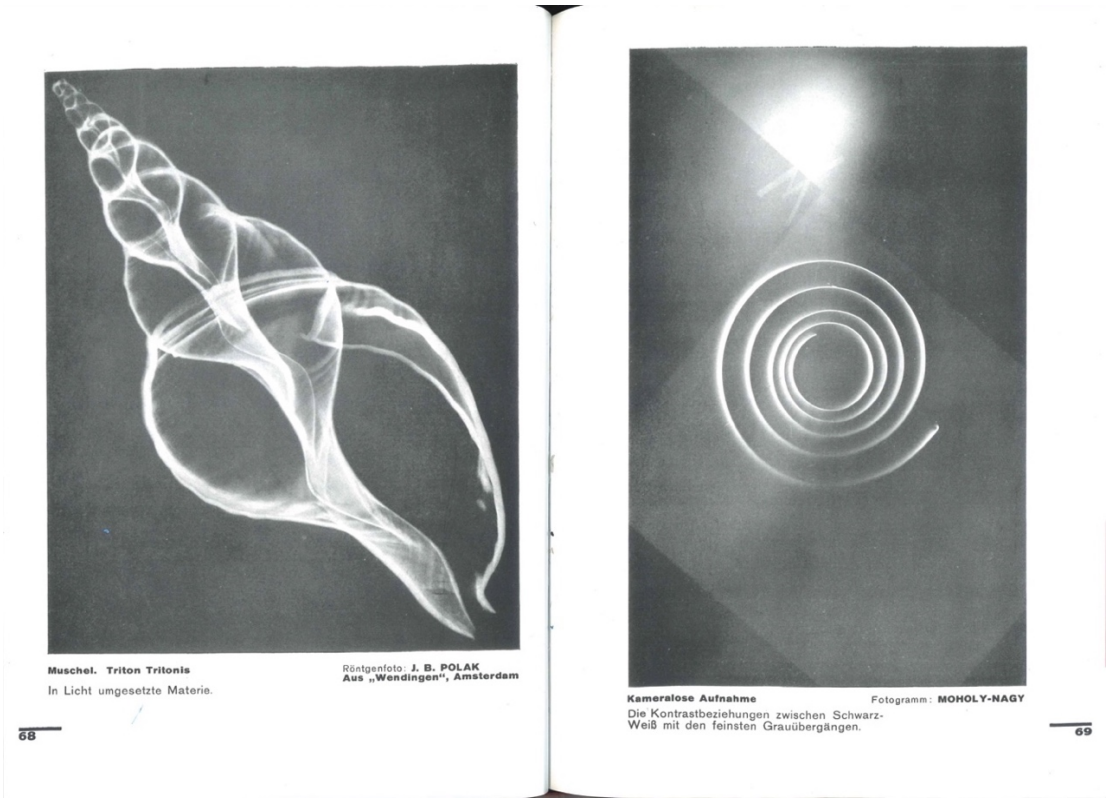


Fig. 21 From: László Moholy-Nagy. *Malerei, Fotografie, Film*. Berlin: Gebr. Mann Verlag, 2000, p. 68–69.

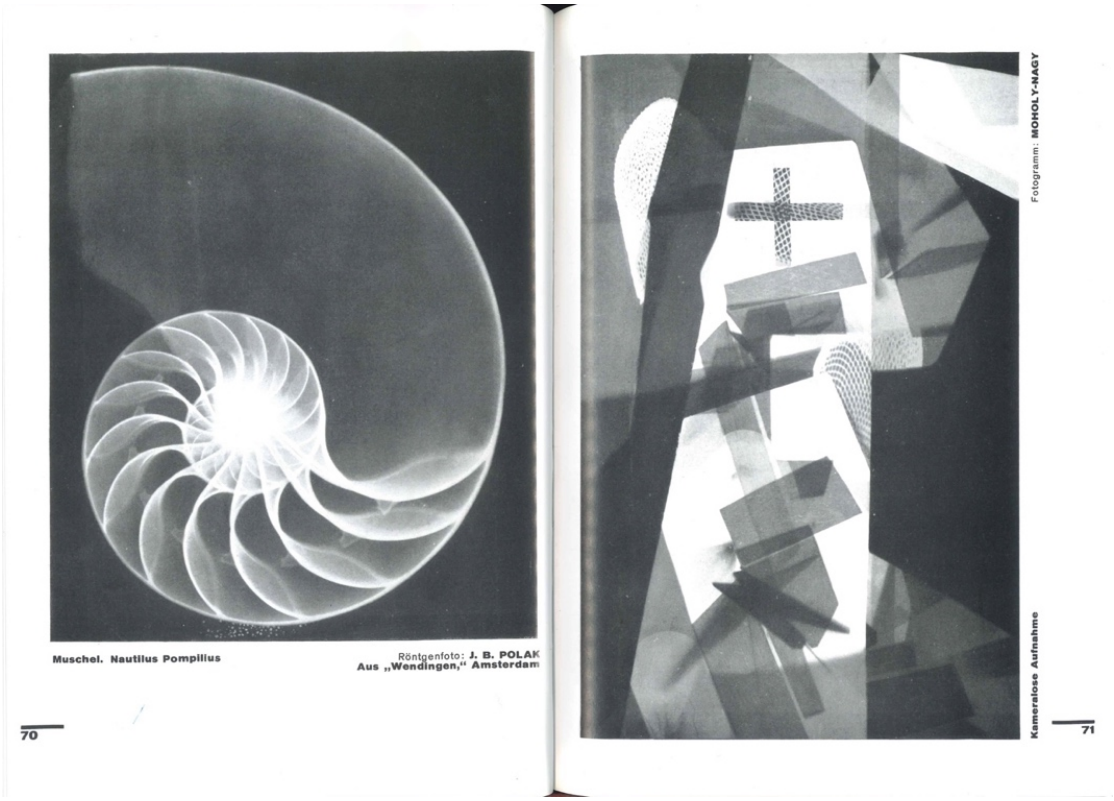


Fig. 22 From: László Moholy-Nagy. *Malerei, Fotografie, Film*. Berlin: Gebr. Mann Verlag, 2000, p. 70–71.

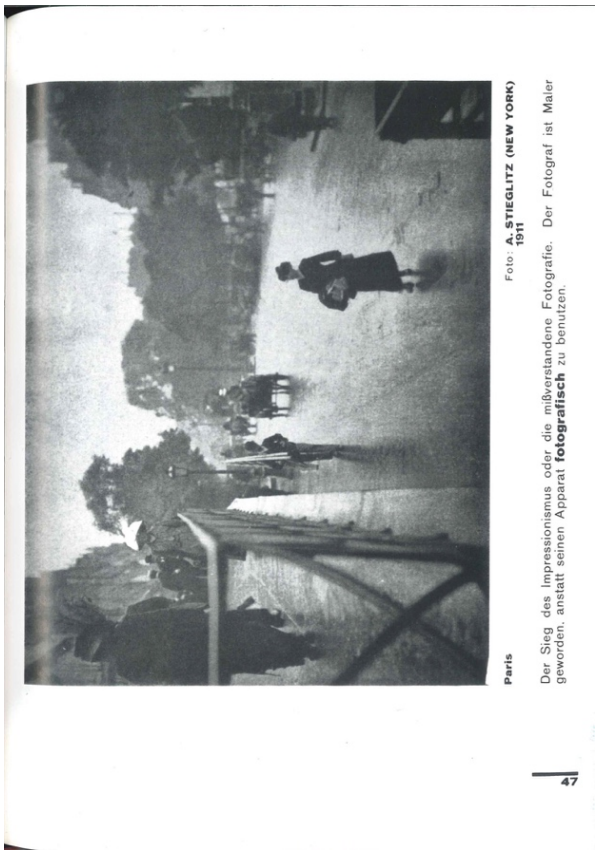


Fig. 23. From: László Moholy-Nagy. *Malerei, Fotografie, Film*. Berlin: Gebr. Mann Verlag, 2000, p. 47.

Fig. 24: Man Ray: photogram. From: Peter Geimer. *Inadvertent Images: A History of Photographic Apparitions*. Chicago: The University of Chicago Press, 2018, p. 161.

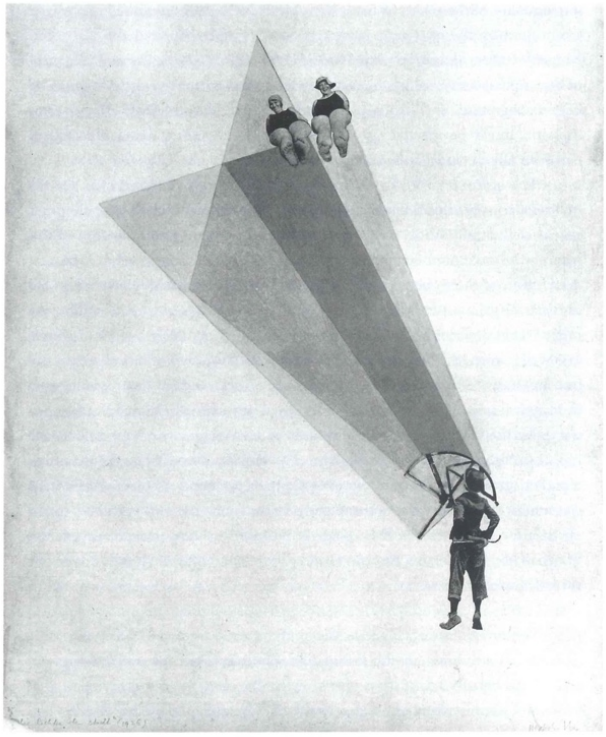

Fig. 25: László Moholy-Nagy: *City Lights*, 1926. From: Devin Fore. *Realism after Modernism: The Rehumanization of Art and Literature*. Cambridge, Mass: MIT Press, 2012, p. 57.


Fig. 26: El Lissitzky: Pelikan Tinte. Photograph, 1924. The Museum of Fine Arts, Houston, museum purchase funded by the Caroline Wiess Law Accessions Endowment Fund, The Manfred Heiting Collection. From: Artstor. <https://library-artstor-org.ezproxy.uio.no/asset/AWSS35953_35953_28311050> Downloaded: 20.06.2021.

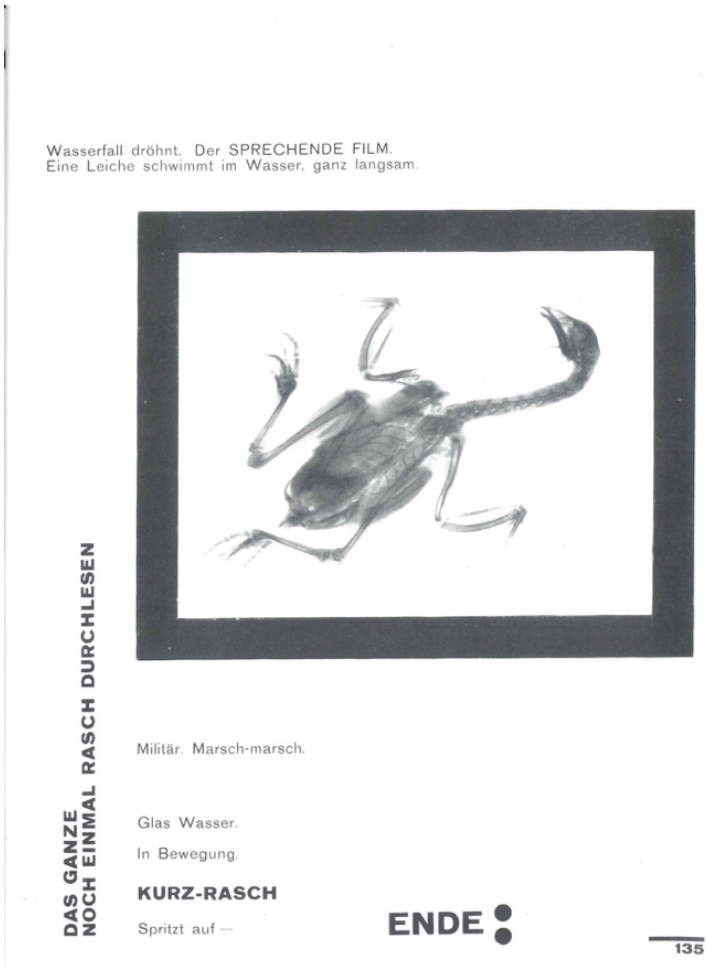


Fig. 27: Scann. From: László Moholy-Nagy. *Malerei, Fotografie, Film*. Berlin: Gebr. Mann Verlag, 2000, p. 135.

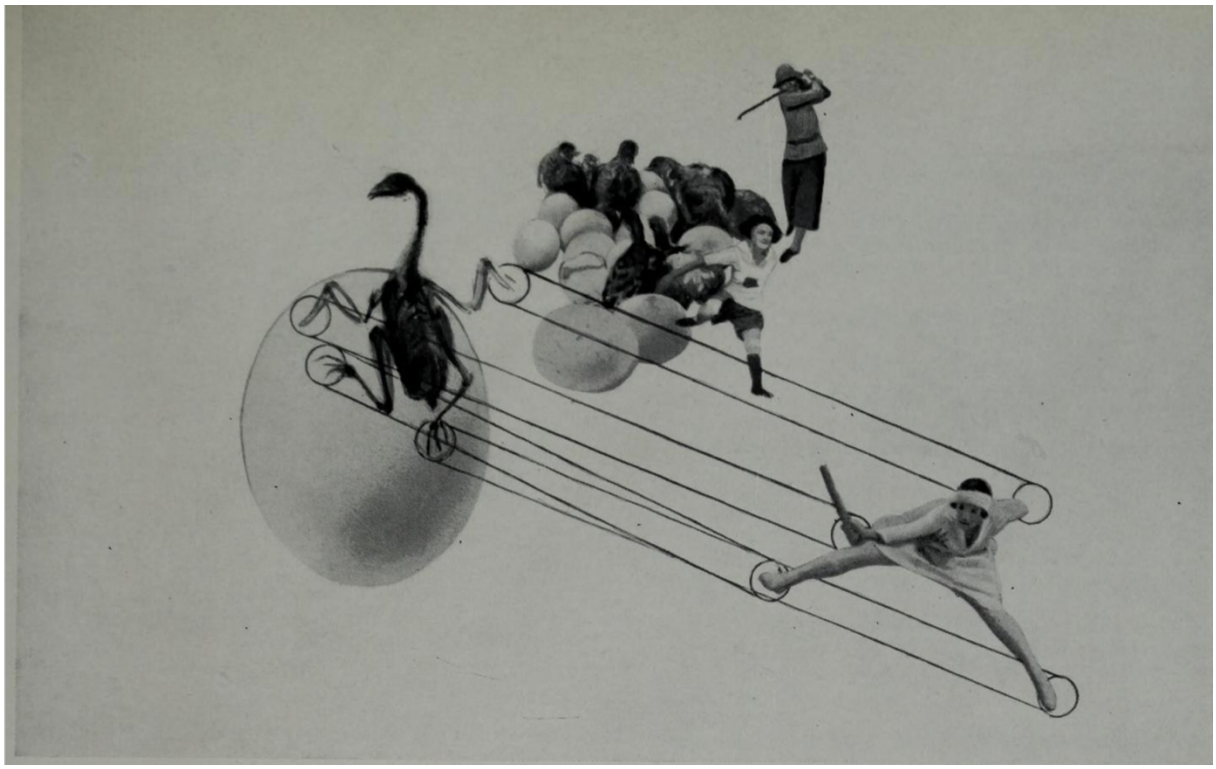

Fig. 28: "Once a Chicken, Always a Chicken" (1925) From: Moholy-Nagy, László. *Vision in Motion*. (Chicago: Paul Theobald, 1947), 285.