

# Alpine Topographies of Loss: On the Media Temporality of Glaciers

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## Abstract

Arguing that the materiality of Alpine glaciers was linked to notions of emergency and greed long before discussions of anthropogenic climate change, this article focuses, on the one hand, on complex tempor(e)alities of glaciers, and, on the other hand, on the question of how they and the fact of their disappearance become aesthetic. Of particular interest are thus not only the historical bodies of knowledge trying to make sense of glaciers in various ways but also artistic projects that reflect upon their vanishing during what has come to be known as the Anthropocene. To that end, the article first looks at the local knowledge about Alpine glaciers at the time around 1850, now considered the tipping point of global glacier mass balance. Based on three case studies, the article then discusses the different ways and dimensions in which glaciers of the European Alps are *becoming media* and how techniques of surveying and mapping transformed them into rationalized objects of scientific interest, increasingly devoid of agency. Countering the hegemonic view of glaciers as pervasive yet remote icons of climate change and symbolic thermometers of a planet in crisis, a more complex perspective is presented, building on recent discussions in media studies.

## Keywords

glaciers, Alps, climate change, deep time, geology of media, topography, Anthropocene

In the face of climate emergency and other ecological crises, media and cultural studies have increasingly opened up to ecological questions, discussing the dimension of deep time as one

of the major categories of an aesthetics of the Anthropocene. In his book, *A Geology of Media*, which was pioneering for the media studies variant of a broader *geological turn*, Jussi Parikka pleaded to draw attention to how, on the one hand, media technology places us in a cognitive, practical, and affective relationship to the earth and thus enables us to observe, measure, and control its processes. On the other hand, he reminds us to take the geophysical materialities of mediation into account. Building on this approach, this paper examines the complex materialities and temporalities of glaciers in their function as “natural ‘media’ of historical topographies” (Elsaesser). Like the media technologies in the narrower sense that Wolfgang Ernst discusses, glaciers have their own “tempor(e)ality” that also leads to “almost traumatic irritations of the human sense of time” (“Tempor(e)alities” 144). Thus, this article asks how glaciers and the fact of their disappearance become aesthetic in a double sense, or, put differently, how glaciers are *becoming media* (Vogl).

Of particular interest in this context are not only the historical bodies of knowledge trying to make sense of glaciers in various ways (be it Western scientific or local indigenous knowledge) but also artistic projects that reflect upon their vanishing during what has come to be known as the Anthropocene. Such artistic reflections are particularly insightful when they transcend the traditional stories of modern adventurers in a threatened and menacing wilderness (as shown, for example, in the film *Chasing Ice*) or the simplistic staging of the melting glaciers as symbolic thermometers of a planet in crisis (Carey et al.). There is a rich body of research in media studies and environmental humanities to draw from for this article. Recent studies have dealt, for example, with the cryopolitics of a melting world (Radin and Kowal), with ice as a medium of materialized weather (Randerson) or as an arctic archive (Frank and Jakobsen), and, of course, with representations of vanishing glaciers in the visual

culture of the Anthropocene (Schneider, “Zeit im Bild”; Garrard and Carey). The performative dimension of melting ice has been studied (Reiss) as well as its specific soundscapes and the way these are employed by artists like Katie Paterson to bring climate change closer to our quotidian experience (Parikka 70).

While most of this research focuses on the Polar Regions, this article will restrict its perspective to the European Alps. Although more than 99% of the earth’s ice is stored in the ice sheets of Greenland and Antarctica, and the melting of Central European glaciers does not immediately threaten to raise sea levels, the Alps were the region where glaciology as a scientific sub-discipline of geology was established and where scientists first conceived of glaciers as materialized “streams of time” (Forbes 22). Thus, I will first look at the situated knowledge about Alpine glaciers at the time around 1850, now considered the tipping point of global glacier mass balance. Then, I will discuss various ways and dimensions in which glaciers are *becoming media* and how techniques of surveying and mapping transformed them into rationalized objects of scientific interest. After being regarded as efficacious geomorphological actors for a long time, glaciers are discussed more recently as devoid of agency and as simple gauges for global warming. Concluding, I will look at British photographer and media artist Dan Holdsworth’s project *Continuous Topography* that, as I will argue, provides an alternative perspective.

### **Once Upon a Time, the Legend Goes, There Were No Glaciers Anywhere**

For his *Naturansichten aus den Alpen* (*Nature Views from the Alps*, 1851), German travel writer Johann Georg Kohl collected the accumulated knowledge of his time about the Alps, including local legends and myths. As the most widespread of these myths, he describes the tale of a ‘golden age’ when there were no glaciers, and even the highest mountain slopes were

lined with fertile green meadows (317). The publication of Kohl's book coincides with the first photographic evidence of the Alpine glaciers and the beginning of another golden age: in the 1850s, Alpinism recasts the mountain peaks as a fashionable sporting destination. Most importantly, however, the period around 1850 marks the last peak of the expansion of the Alpine glaciers and the end of the so-called Little Ice Age. During this relatively cold period, the advance of the region's glaciers repeatedly threatened higher-lying settlements and pastures and sometimes resulted in dramatic flooding.

Despite their crucial role in regional water supply, the European glaciers were considered eerie and inhospitable places for many centuries. Before they became the object first of scientific and then touristic interest in the 18th and 19th century, respectively, people avoided them whenever they could. Local Christian belief once equated them with Purgatory: trapped in the eternal ice, the densely packed souls of dead sinners wait in agony for their redemption while the stream of their freezing tears lets the ice masses grow steadily. Local knowledge thus linked the materiality of glaciers to emergency and crisis even when the idea of global warming might have seemed more than welcome. In the tales collected by Kohl, the ice masses' unstoppable growth represents a heavenly punishment for greed and hubris of the Alps' inhabitants. In 1678, the Fiescher Valley residents made a vow to Pope Innocent XI to hold an annual procession and pray for the retreat of the Great Aletsch Glacier. In 2010, after an urgent petition, Pope Benedict XVI finally gave them official permission to rededicate their ritual and instead ask for rapid regrowth of the now acutely endangered ice formation. By 2000, the Alpine glaciers had lost more than half of their 1850 size, and the decline has been accelerating for most of the remaining glaciers ever since. Depending on the calculation model, we can expect the Alps to be mostly ice-free by the end of this century—a notion that no

longer evokes any associations of a golden age but represents the worst-case scenario of unabated global warming.

Today, scientists explain the decline of the Alpine glaciers beginning in the 1850s with anthropogenic influences: the enormous amounts of coal burned during Europe's rapid industrialization resulted in a thin layer of black carbon on the ice and snow. This dark layer reduced the surface reflectivity, causing an accelerated melting. The end of the cold period of the Little Ice Age would, therefore, have been noticeable as a loss of ice mass only much later (Painter et al.). Even in the supposedly absolute "remoteness from life" that Georg Simmel still found in the high Alpine "landscape of the glacier" around 1900 (181), nature is thus materially so intimately entangled with culture that the binary separation has lost its usefulness.

Today, endangered Alpine glaciers are often wrapped in white geotextiles to protect them from the sun during the summer. This way, the ice formations are literally clothed with another anthropogenic layer, an artificial thick skin to foster resilience. The once sublime appearance of the majestic glaciers that painters like John Ruskin and William Turner tried to capture has given way to the Alpine ecosystem's emblematic vulnerability. In the last few years, the glacier canvas has become a popular motif in artistic practices addressing global warming. Douglas Mandry's *Monuments*, probably the most interesting of these projects, employs the used geotextile itself as a canvas (see fig. 1) onto which he lithographs found photographs of Alpine glaciers from the late 19th century when the idealized Alps became a destination for mass tourism. The images thus date from precisely the time when the glaciers became a spectacle photographed countless times, which contributed to the decline that is not yet visible in the photographs but whose progress the material on which they are printed shall

prevent. Hence, Mandry's *Monuments* are fetish objects *par excellence*, simultaneously indicating a loss that has already happened and promising protection against that very loss (Metz).

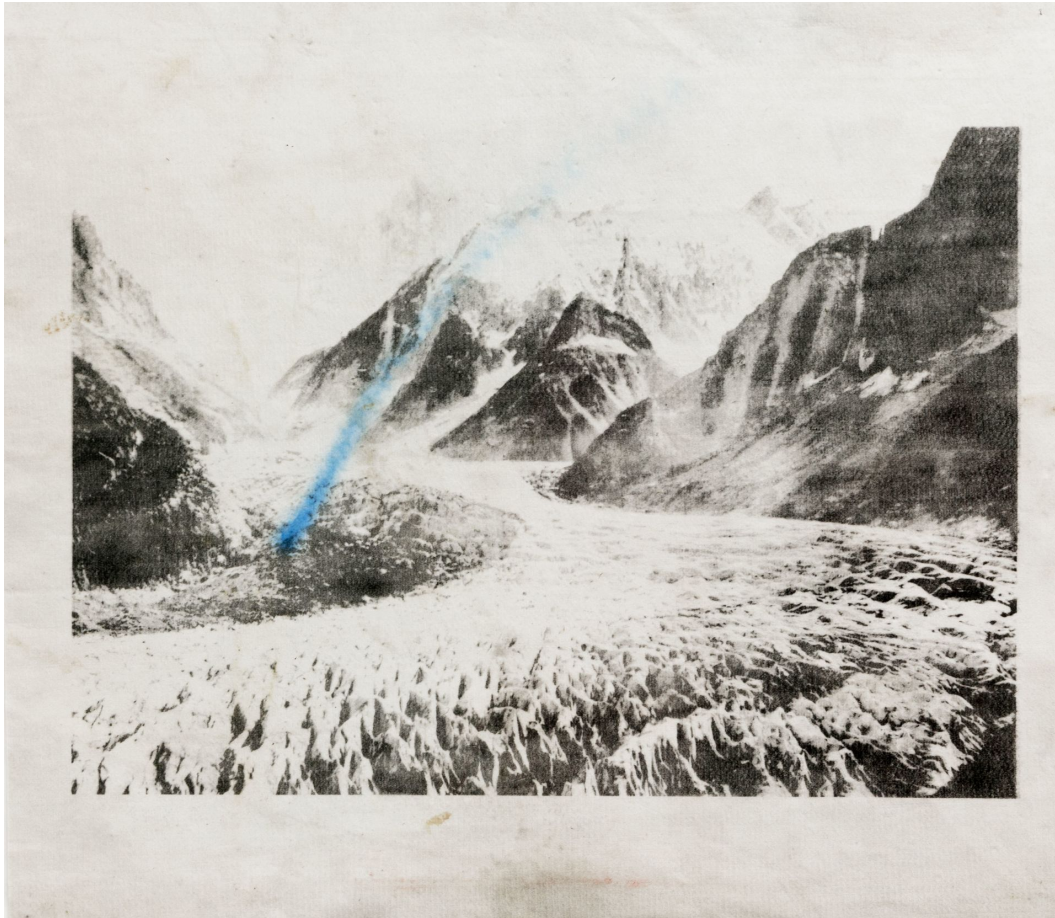


Fig. 1. Douglas Mandry, *Eismeer (Monuments)*, 2019, lithography on glacier canvas.  
Courtesy of the Artist/Douglas Mandry, [douglasmandry.com](http://douglasmandry.com)

This process of disappearance plays a central role in the discussions surrounding the Anthropocene for several reasons. Glaciers are considered the most crucial early warning system for climate change. The thawing ice masses provide global warming with the 'sensual-visible evidence' that the diagrammatic visualizations of statistical models of probable long-

term developments and complex global dynamics mostly lack (Schneider, *Klimabilder* 40-41). As Jennifer Gabrys and Kathrin Yusoff state, images of melting ice have “accumulated in the collective imagination, where receding glaciers and torrents of water are propelled onto some unpredictable course” (2). Climate change communication employs these images as “icons of the present climatic regime” (Latour 14), as they are emblematic of a series of closely interwoven, but, for the most part, invisible processes. They show the already visible effects of global warming. However, they say little about its causes and the unequal distribution of its consequences (Garrard and Carey).

### **Becoming Media**

As the remarks on the soot deposits from the 1850s onward demonstrate, more than just frozen water disappears when glaciers melt. Such observations on climate history and the consequences of human influences are only possible through the study of glacial ice in its capacity as a “medium of time which, through its materiality, is directly related to temperature” (my trans.; Schneider, “Zeit im Bild” 138). In this perspective, the cryosphere’s ice is a planetary geochronological discourse network that records and preserves indexical traces: it consists of numerous layers of frozen and compressed snow, resembling the annual rings of a tree. This “charismatic mega-terra of geo-archives” (Mattern) contains evidence of long-term temperature development, shifts in the atmosphere’s chemical composition, traces of volcanic activity and industrialization, and the occurrence of microorganisms and pollen (Frank and Jakobsen). In order to make the information sedimented in the glacier’s “sentient materiality” (Weizman 52) *readable*, samples must be taken from the (metaphorical)<sup>1</sup> natural archive and then stored in actual archives to be sliced up, analyzed, and finally translated into

climate diagrams (Mattern). This process is one of the ways in which glaciers are *becoming media*.

Since the 1960s, ice core drillings are systematically carried out, initially in Cold War military research that redefined the cryosphere as a geopolitical battlefield. This sampling process generates extremely bulky cylindrical storage media, which require enormous amounts of energy to ensure their long-term preservation. In most cases, they allow a one-time only read access: the extraction of the contained data leads to the destruction of the ice core in most analysis procedures (Mattern). The Alpine glaciers of Central Europe play only a minor role in ice core research compared to the Polar Regions, where the ice sheet has accumulated over considerably more extended periods. Nevertheless, they have the advantage of covering a period of ‘only’ a maximum of a thousand years (compared to several hundred thousand for the Polar caps) in ‘higher resolution.’ Moreover, they are much closer to the emission sources of industrialized Europe (Bohleber). As average temperatures rise, however, this archive is increasingly recording its own disappearance, making future scientific investigation of climate history increasingly difficult. The loss is, therefore, a double one.

Glaciers are not only archives of their climatic conditions, though. Thomas Elsaesser also regards them as “natural ‘media’ of historical topographies” (147). According to him, glaciers (as well as permafrost, amber, or bogs) are the more plausible genealogical precursors to analog recording media that, in his media historiographical model, no longer have to be located within the framework of the evolution of symbolic notation systems. Glaciers may preserve objects and even entire creatures in a kind of snapshot, but they usually rerelease them later. They do not store—at least in this respect—an imprint, but the thing itself, albeit only temporarily. Already the first proto-glaciological studies describe this underlying



mechanism of arbitrary conservation. Since glaciers eventually expel all foreign matter they ingest, glaciologists often described them as capable of self-purification (Agassiz 4). In the 19th century, this capacity was often metonymically transferred to the entire Alpine region, which in the Romantic imagination was lastingly stylized as the Other of urbanized and industrialized civilization.

However, the notion of glaciers as archives ignores the fact that they are anything but static: “Flow is what glaciers are all about,” as Lutz Koepnick notes (86). Naturalists like Johann Jacob Scheuchzer described this extremely slow movement in the early 18th century and presented first speculations about its causes. At the beginning of the 19th century, glaciologists laid boulders on the glaciers to measure their slowly shifting position, sometimes waiting patiently for years (Evans 31). By doing so, they recognized the slow but relentless glacial movement as a cause for several phenomena, of which the so-called “erratic blocks” were the most important. These huge boulders occurring far away from the mountains were long considered the epitome of scientific mystery because of their mineralogical composition, which does not match the site of discovery, and their enormous weight, which precludes transport by humans (Evans 119).

The consequences of this finding were quite far-reaching, as they indicated that large parts of Europe must once have been covered by an “immense sea of ice” (my trans.; Agassiz 241). The slow grinding movement of the glaciers had left distinct traces in the landscape. However, “only those who know the matter know how to decipher its meaning,” writes Louis Agassiz (my trans.; 221), whose name is associated with the popularization of the so-called Ice Age theory, although this revolutionary concept originated in the local knowledge of Alpine

peasants (Rudwick 142). Today, Agassiz is discussed mainly for his nefarious role as a white supremacist and racial theorist after relocating to the United States in 1846 (Mirzoeff).

In his *Études sur les glaciers*, published in 1840 in French and 1841 in German, he compares the geomorphological legacies of vanished glaciers with the barely visible traces on a frequently used lithographic stone (221-222). Thus, Agassiz, too, equates glaciers with a reproduction technique and describes them as a natural medium of topography, albeit in a completely different sense. Unlike Elsaesser, for whom the glaciers are a storage medium that preserves objects in a frozen state and so fixates them—at least for a certain time—, Agassiz emphasizes the opposite process, which can be understood as one of imprinting or inscription. In this perspective, the object of interest is not what is ‘stored’ in the glacier and thereby transported from one moment in time to another. Instead, it is the indexical trace that the glaciers have left behind precisely where they have vanished; the imprint of their erosive movement proves their former presence, comparable to the grooves on a phonograph cylinder.<sup>2</sup> The landscape thus becomes, as it were, an inscription of its changeable history: it is the medium that is repeatedly reshaped over thousands of years in countless writing processes, with the glaciers appearing as pivotal geomorphological actors.

An atlas in folio format with lithographs “drawn after nature” supplements Agassiz’s book. On 14 of the 16 double pages, he juxtaposes matching pairs of images (see fig. 2). The right image is always a lithographic landscape image by Joseph Bettanier showing the glaciers and the mountain ranges surrounding them. These pictures are committed to a realistic paradigm but intended to evoke the “wonderful beauty” (Agassiz 72) of the ice masses. The left image depicts the same view in a strictly abstracted schematic form, a landscape reduced to outlines. The admiring view of the landscape is thus contrasted with the scientist’s measuring

gaze—art picture with utility picture. Instead of surfaces, only outlines emphasize the fissures and other geological characteristics of the glacier formations in relief. It seems as if Agassiz had tried to strip the ice landscape of its aesthetic surface in order to be able to study it unhindered by its sublime impression and exclusively as the result and scene of deep temporal processes.

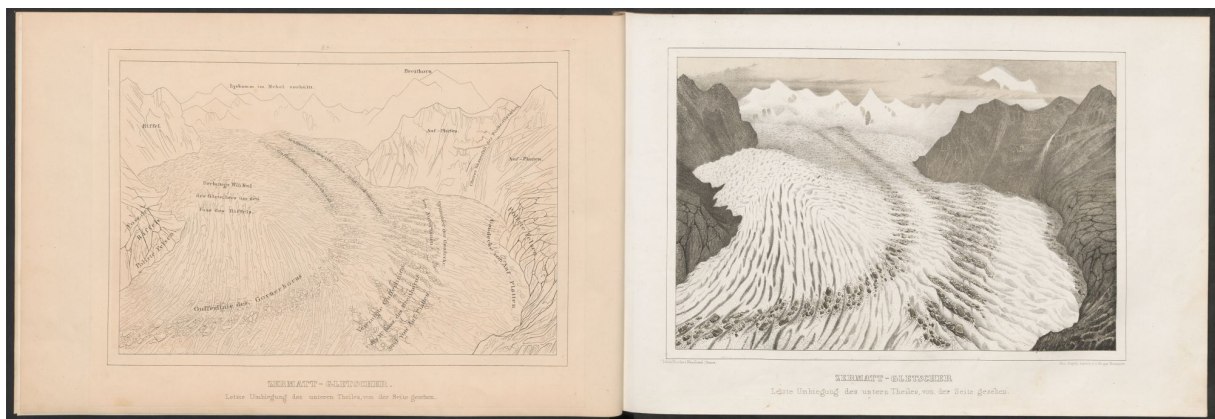


Fig. 2. Joseph Bettanier, *Zermatt-Gletscher*, 1840, lithography (Agassiz).  
 Courtesy ETH-Bibliothek Zürich, Rar 5772, <https://doi.org/10.3931/e-rara-22309>

Inscriptions directly in the image provide the mountain peaks' names, indicate the ice layers' different provenances, and mark where the glaciers have “polished” the rocks over centuries. Individual inscriptions are typographically nestled against the contours, thereby visualizing, for example, the glacial flow direction. This way, the indexical traces that Agassiz boasts of being able to “decipher” are also made readable for those laypersons (and skeptical colleagues) who are not equipped with his scientific “hypervision” (Mirzoeff 133). According to Agassiz, the glaciologist can read the landscape and deduce the former processes that shaped it, based on his understanding of present glaciers' movements (Rudwick 138).

## Deep Time

Thus, the early scientific study of glaciers and their movement is an essential factor in the epistemological turn that Stephen Gould has described as the “discovery of geological time” (1-20). In the 19th century, this scientific revolution permanently shattered the scales of historical perception by colliding incommensurable time scales. These questions of scale also play a central role in the more recent discussions about the Anthropocene, as they suggest a decentering of the *anthropos*. In this context, Friedrich Balke, Bernhard Siegert, and Joseph Vogl have raised the question of the media that make this expansion of the historical horizon beyond the extent of anthropogenic interventions conceivable in the first place.

As shown previously, glaciers themselves can be understood as geochronological media capable of such an expansion. Central to this understanding is their complex temporality and their oscillating between the paradoxical idea of an unimaginably slow but unstoppable flow that plows up entire landscapes with its sheer force, and the warning of a process of dissolution that is extremely slow from a human perspective but incredibly fast on a geological scale. The latter is the result of the anthropogenic influence accumulating over centuries, which Robert Nixon characterized as “slow violence.”

Obviously, this dimension of deep time is challenging to represent in pictures. Stereoscopic photographs of relief-shaped furrowed former glacier channels sometimes evoke it intentionally (Latsis 12) but still implicitly. In 1891, Étienne-Jules Marey proposed chronophotography as the solution to this problem. He describes the method as an “invaluable tool for the study of natural phenomena” (my trans.; 701). According to Marey, chronophotography can play out its specific strengths when processes occur so quickly or slowly that the human perceptual apparatus can no longer register them adequately. However,

while photography had already penetrated deep into the micro-temporal dimension by this time, the visualization of deep time remained a desideratum: “One cannot rule out the hope that one day we will be able to follow the slow changes in the position of glaciers and the geological transformations of the surface of entire countries with the help of pictures taken in very long spaces in between” (my trans.; 701).

He was apparently unaware of the fact that Sebastian Finsterwalder and other geodesists had already begun using chronophotography for precisely that purpose two years earlier, though without using the term. Finsterwalder is best known for his contributions to the then still young methods of photogrammetry, a spatial rather than temporal surveying technique that aims to obtain reliable topographical data from photographs. Photogrammetry works best when an object or landscape has very distinct features that can be used as anchors to triangulate the perspectival measurements in several photographs taken from differing angles. With their rugged surfaces, the Alpine glaciers were the terrain where terrestrial photogrammetry proved most advantageous over traditional land surveying (Eichberg 19-26) since it was no longer the difficult-to-access terrain itself that was measured but its photographic record. Finsterwalder and his team not only began to survey Austrian glaciers photogrammetrically but also refined the method in such a way that they could precisely document changes over time as well.

From 1889 to 1928, they periodically took photographs that recorded in detail the slow retreat (and occasional advance) of the Vernagtferner Glacier. To this end, the images were always taken from precisely the same locations and not designed to meet established aesthetic criteria but with a strict view to their later scientific evaluation. Each photo was marked with a date in one of its corners. Finsterwalder’s glacier photogrammetry established, so to speak, a

specific sub-genre of image comparison, which is now one of the essential means of climate change communication. Today, photographs (and, to an increasing degree, historical paintings and drawings) of glaciers are systematically collected and archived to visualize the effects of global warming through temporal comparisons (Schneider, “Zeit im Bild”), an effort that was first institutionalized in the 1890s by Finsterwalder and others who saw the need to monitor the glacier fluctuations worldwide closely.

While earlier glaciologists considered the glaciers themselves to be chroniclers of sorts, actively registering the earth’s history in real-time like an “endless scroll ... upon whose stainless ground is engraven the succession of events” (Forbes 22), Finsterwalder’s temporal monitoring aimed at making sense of the glaciers differently. It transformed them into what Cubitt describes as “translational geomedia,” establishing them as passive objects of history and mere markers of a changing climate.

A cartoon from 1911 caricatures Finsterwalder’s glaciological work and presents the surveyed Tyrolean glacier as a wild and literally unpredictable animal that actively opposes any attempt at such rationalization (see fig. 3).

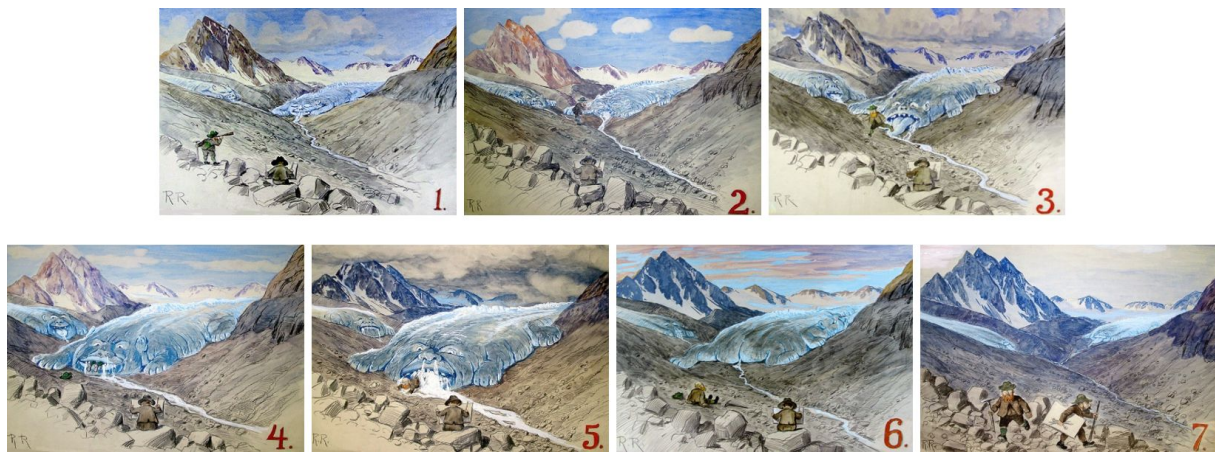


Fig. 3. Rudolf Reschreiter, *Vorstoß und Rücklauf des Vernagtferners beobachtet von Prof. Dr. S. Finsterwalder*, 1911.

The caricature is reminiscent of the unorthodox behavior attributed to glaciers by indigenous peoples in the Yukon Territory studied by Julie Cruikshank: “These glaciers were depicted as sentient, willful beings that responded directly and sometimes dramatically to human behavior” (239). The glacier-monster even threatens to devour one of the two researchers but finally lets go of him—as we know, the glacier ejects foreign bodies to cleanse itself. While the anthropomorphized glacier seems to move very fast, the second scientist remains completely unchanged in the first six frames, reversing the usual temporal logic of glacier observation. Completely immersed in his calculations, Cartoon-Finsterwalder does not even notice the very process of the glacier’s advance and retreat that he set out to document. In the last image, the glacier-monster seems to be sleeping again; the frightened scientists abandon their attempt at surveying after this uncanny confrontation with their untamable object of investigation.

Despite the resistance to the abolishment of glacial agency that we find expressed in this caricature, the notion is largely missing in the contemporary comparative pictures of climate change communication that attempt to rationalize loss without explicitly addressing its causes. The goal of an aesthetics of nature “in times of an unnatural nature” (Horn and Bergthaller 11) could, therefore, be to deal with this rationalizing view of operational images and to counter them with a form of representation that attempts to do justice to the complex materialities and tempor(e)alities of the glaciers.

### **Mountains of Data**

Dan Holdsworth’s *Continuous Topographies* comes close to this postulated form of representation. The title of the series alludes to the New York exhibition *New Topographics: Photographs of a Man-Altered Landscape* from 1975, which stands for a paradigm shift in

landscape photography. Instead of a (supposedly) untouched nature, the exhibition's protagonists focused on landscapes formed and, above all, built by humans. Unlike these explicit paragons, Holdsworth leaves the architecturally transformed spaces behind and turns to the Alpine glacier landscape, but he also sets himself apart from those contemporary artists who address the entanglement of nature and culture through glacier-canvasses, artificial snow slopes, or avalanche fences. Holdsworth's Alpine topographies show no visible traces of human intervention. Instead of a built or untouched nature, however, he presents a nature that has been digitally scanned and remodeled. The interweaving of the two poles, so neatly separated in Western thinking of modernity, is carried out on another level, namely that of the imaging technique itself. Holdsworth's topographies systematically resist classifications within established binary categories. The images seem equally scientific and artistic, indexical and non-referential, aesthetic and anaesthetic, weightless and gravitational. With Eyal Weizman, we could describe them as image spaces that are "at once virtual and photographic" (100).



Fig. 4. Dan Holdsworth, *Continuous Topography, Argentiere Glacier no. 1–35*, 2017, c-print. Courtesy of the Artist/Dan Holdsworth, [www.danholdsworth.com](http://www.danholdsworth.com)



The large-format images in the series display views of three-dimensional computer models of the glacier surfaces, here (see fig. 4), for example, of the Glacier d'Argentière in the French Montblanc massif. Together with a geologist, Holdsworth photogrammetrically surveyed several glaciers, using the digital successors to the methods introduced to glaciology by Finsterwalder. They took thousands of photos, both from the ground and with drones, and combined them with the help of imaging software to three-dimensional computer models with millions of individual points, each determined with a precision of just a few millimeters. In a long and complicated process, Holdsworth thus translates mountains into mountains of data: "The photograph continues to travel, as it were, through the process, ... so there are still trace elements of the original photograph in the final point-cloud model" (Hardy 2018). Compared to the sampling of ice core drilling, though, this is a conservative, not an extractive sampling, completely satisfied with the surface's impression and disregarding all the information sedimented underneath. Although based on scientific imaging technologies, the image spaces created by Holdsworth are of no scientific use, at times even emphasizing the limits of the process of translating the photographs into pixel clouds by leaving glitched areas in the otherwise hyper-precise models.

The first visual impression is reminiscent of the schematic representations from Agassiz's *Études sur les glaciers* discussed above, which reduced the glaciers to outlines of their essential morphological characteristics and thus made them readable as actors of deep-time processes. Holdsworth, too, removes the landscape from the landscape image, leaving only the liminal space that separates the material from the immaterial. Instead of contour lines, he uses a fine-meshed digital grid that renders the fissures in the ice and rock formations

aesthetic as the only remaining visual element. Here, too, an imprint of sorts is created. The glacier surface is peeled off and stretched out in the empty space of mathematical abstraction.

In contrast to Agassiz, however, the comparative view that shows the landscape's totality intact is missing. Additionally, there are no captions, and the titles of the individual images in the series remain relatively vague, indicating only the depicted glacier, a consecutive number, and the year the underlying data was sampled. Often, the images' scale has to be guessed, sometimes presenting whole mountain ranges in panorama, sometimes what seems to be somewhat close details of crevasses and other characteristic glacial features. Unlike Finsterwalder's photogrammetry that can be described with Cubitt as geomeidia of numerical (or, in this case, geometrical) translation addressing the imagined collective of the scientific community, Holdsworth seems to presume a different kind of subjectivity: "*Continuous Topography* presents us with what is recognizably a landscape—but one that seems as though it is from its *own* viewpoint rather than ours. There is no indexical registration of any human eye 'behind' the camera asserting their artistic subjectivity in an orthodox way," as Alistair Robinsons concisely puts it (252).

Some of the three-dimensional glacier pictures resemble ghostlike shadows of immaterial beings in greyish shrouds, pressed down by the weight of time that has created their formless formations, to paraphrase Simmel, who, in 1911, described the realm of the glacier as "the absolutely 'unhistorical' landscape, ... here where not even summer and winter change the image, the associations with the human fate, which comes into being and passes away, are broken off, associations which in some way or other accompany all other landscapes" (182). Today, there might be no landscape imaginable that is more historical, more symbolically interwoven with "human fate" in the Anthropocene than the glaciers. What Holdsworth creates

is an inventory of their evanescent surfaces, cataloging them in the very moment of their vanishing.

As Gloria Meynen recently noted, at the heart of all modern inventorying projects lies a deep unease. People only start cataloging when a catastrophe is impending or has already occurred, as already the legendary catalyst for the cultural technique of mnemotechnics, the collapse of Scopas's banquet hall, reveals (39). In this sense, Holdsworth's digital glacier topographies can be thought of as a modern "mummy complex" (Bazin), snatching a bodily appearance from the "flow of time," as it were. As the title *Continuous Topography* already suggests, this project of a digital map that is larger than the territory can't be completed (at least not before the glaciers have disappeared entirely). While the formations of materialized time are precisely cataloged and inventoried here in order to preserve them virtually, they will always already have changed their shape, lost a little bit more of their substance.

## **Conclusion**

Arguing that the materiality of Alpine glaciers was linked to notions of emergency and greed long before discussions of anthropogenic climate change, this article began by observing different ways in which glaciers are conceptualized as recording media that either 'mummify change,' or register and archive even subtle atmospheric changes, making them essential proxies for climate research. In the mid-19th century, however, they were predominantly discussed as writing media that produce indexical traces in the landscape visible only to those familiar with their geomorphological agency. Building on these notions, the second half of the article discussed three paradigmatic surveying projects that, based on different modes of visualization, make sense of the glaciers and their complex materialities and tempore(a)lities in different ways.

Agassiz's lithographs aimed at making glacial movement 'readable' for laypersons by reducing the depicted landscape to outlines and providing explanatory inscriptions directly in the image that embodies his scientific gaze. Finsterwalder employed terrestrial photogrammetry and chronophotography to survey the glaciers and their fluctuations over time, translating them into data and, thereby, ultimately recasting them as passive objects of scientific scrutiny. Holdsworth's *Continuous Topographies*, in some regards, picks up on both these traditions while dismissing their presumed subjectivities. While they *sense* the Alpine glaciers, they do not attempt to *make sense* of them in a rationalizing way. As we have seen, his image spaces refuse to offer an embodied point of view, instead suggesting a posthuman subjectivity of a glacial perspective, undermining established dichotomies.

## Notes

<sup>1</sup> Wolfgang Ernst points out the problems and limits of the description of natural preservation processes as archiving, as there is no deliberate selection at work, and the storage is not intentional ("Archival Metahistory").

<sup>2</sup> Katie Paterson prominently builds on this idea of glacial erosion as a phonographic trace in her video installation *Langjökull, Snæfellsjökull, Solheimajökull* (2007), dedicated to three Icelandic glaciers whose melting sounds she recorded and consequently pressed on records made of frozen meltwater of the same glaciers (see Schrey 324-329).

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