Photography and other autographic acts

We live in a warming world, and yet, none of its living beings are directly affected by the climate—they only care about the weather.[1] As humans, likewise, we can never experience the climate itself: it is a statistical concept, or as the philosopher Timothy Morton puts it, a *hyperobject* distributed in space and time.[2] While science is concerned with the bigger picture—long-term trends that only become visible through statistical generalizations—the same abstractions cause endless public confusions and disinformation. "It is only a model" is the rallying cry of climate skeptics, as if mathematical representations of complex natural systems could be anything else. Climate and weather are often conflated, leading to speculations if certain extreme weather events prove or disprove global warming. The public awareness of a heating planet is hampered by the fact that we cannot perceive the climate, only the weather. But not all hope is lost, at least in this regard: as Morton also points out, *hyperobjects* such as the climate tend to leave footprints everywhere, and these footprints can be perceived and aesthetically experienced: shrinking glaciers and countless other traces in our environment. Tree rings and ocean sediments are natural forms of statistical aggregation—the impacts of many small weather events condensed into physical patterns that form over decades, centuries, and millennia.

Our present intellectual culture, however, has largely stopped paying attention to physical traces. We tend to consider them only in mediated and highly processed form-translated into data sets or wrapped into rhetorical arguments. Meteorological instruments, which used to inscribe curves onto rotating paper cylinders in plain sight, are now hermetically sealed into black boxes, only offering signals and encoded numbers as outputs. The physicality of measurement receives little attention outside the sciences, its numeric results are taken at face value. The graphical conventions of charts and graphs have become the universal language of communicating data, their aesthetics detached from the phenomenon they represent.

In contrast, the epistemology of the late 19^{th} century was obsessed with traces, imprints, and inscriptions. As Henry Thoreau roamed the forests around Walden and Cape Cod, he never failed to report traces he encountered, from animal tracks to native-american arrowheads. Contemplating a tree stump of a freshly cut tree, he notes: "See how many traces from which we may learn the chopper's history. From this stump we may guess the sharpness of his axe, and, from the slope of the stroke, on which side he stood, and whether he cut down the tree without going round it or changing hands; and, from the flexure of the splinters, we may know which way it fell. This one chip contains

[1] As marine scientist Brian Helmuth notes, increases in mean temperature over decades (i.e., climate) are not the proximate drivers of performance and survival at the scale of the organisms. Their vulnerability is affected by short term variations (i.e. weather) including extreme events that are implicit in climatic predictions. See Helmuth et al., "Beyond Long-Term Averages", p. 2

[2] Morton, *Hyperobjects*.

inscribed on it the whole history of the wood-chopper and of the world."[3] Contemplating found arrowheads, the word *mindprint* comes to him: "They are not fossil bones, but, as it were, fossil thoughts, forever reminding me of the mind that shaped them."[4] The boundaries between text and trace, author and the world are fluid for Thoreau; writing is always also an act of self-writing, or autography, producing a plethora of unintentional traces.[5]

Although Thoreau may have seemed like an eccentric figure, many of his contemporaries shared a similar perspective on the world. Historian Carlo Ginzburg calls this epistemology the *conjectural paradigm*, a method of reasoning based on the close reading of clues. He finds it in the methods of the art critic Giovanni Morelli, the psychoanalyst Sigmund Freud, and the fictional detective Sherlock Holmes.[6] The three share a taste for seemingly insignificant details, which lead them to significant discoveries. Morelli can identify forged portraits based on the style of an ear or a hand. Freud attaches great significance to every carelessly spoken word, and Holmes pays attention even to absent traces, such as the dog that did not bark when the owner's horse was stolen. Ginzburg locates the origins of this epistemology of traces in the advances of medical diagnostics—Morelli, Freud, and Arthur Conan Doyle were all physicians by training, attuned to the interpretation of symptoms as indicators of underlying conditions.

But one could argue that there is another cultural phenomenon contributing perhaps more directly to the fascination with the trace: photography and its emergence as a mass medium in the second half of the 19$^{\text{th}}$ century. No other method of trace-making and self-inscription produces such a vivid result. An imprint of the world appears seemingly out of nowhere and without human contact. Of course, none of this is unfamiliar. The dual life of a photograph as a picture and a physical trace—or in semiotic terms, as an icon and an index—is a well-worn trope in media theory. But while the contemporary discourse around photography tends to take its materiality for granted, the early days were still captivated by the optical-chemical process itself—Henry Fox Talbot describes it as the pencil of nature. The photographic trace becomes an epistemic metaphor: it is only a small step to compare the darkening silver halide crystals that can capture an image of reality to learning and knowledge production. After all, are not all human memories, knowledge, and desires essentially imprints in the human body and mind?

Similar to a photographic plate, the earth is also a sensitive surface registering whatever has taken place. Transcendentalist poet Ralph Waldo Emerson wrote in 1850: "All things are engaged in writing their history. The planet, the pebble, goes attended by its shadow. The rolling rock leaves its scratches on the mountain; the river its channel in the soil; the animal its bones in the stratum; the fern and leaf their modest epitaph in the coal."[7] The trace becomes

[3] Thoreau, *Natural History Essays*, 61.
[4] Thoreau, *The Journal of Henry David Thoreau, 1837-1861*, 557.
[5] See Garber, *Thoreau's Fable of Inscribing*.
[6] Ginzburg and Davin, "Morelli, Freud and Sherlock Holmes."
[7] Emerson, *Works of Ralph Waldo Emerson*, 203.

an all-encompassing metaphor for material information and the basis for an epistemology that blurs dichotomies such as the boundary between the human body and the world, intentional acts and non-human processes, human thoughts and material interactions—concerns that have recently reemerged in discussions around new materialism and in the work of the feminist philosophy of Karen Barad.

Could a renewed sensibility for the self-inscribing capacity of the world help us better understand global warming and thus become competent observers of terrestrial changes? If we were to pursue this line of thought, what kind of visualization approaches could facilitate recognizing the traces of climate change—the planetary diagrams, as the festival's curators put it?

Taking a cue from environmental scientists, we can turn our attention to the vast trove of physical data sources they mobilize. So-called proxy data sources offer clues that allow reconstructing the past climate, biology, and geology of the planet. Often, such proxies involve material aggregations such as the structure and chemical composition of annual layers of trees, ice cores, coral skeletons, or the sediments accumulating in lakes and on the ocean floor, which reflect past temperatures and precipitation. Volcanic dust, pollen, insect remains, and other minute traces can provide additional information. Proxy data are not only useful for obtaining data from a distant past when observations were not available, but also for determining current conditions in remote regions that are hard to reach and observe. Their quantification produces data that feed scientific models, but I would argue they can do more than that — they constitute tangible, material data themselves. Their patterns can offer a strong aesthetic experience, become visualizations in their own right.

But here is something strange - despite this broad material sample of the earth sitting in material archives,[8] its living and non-living parts, we don't get to see this lively material variety, but only curves, heatmaps, other canonical data visualization types. according to birgit schneider, the Natural form of representation. they speak through the authority of the expert language, and not through the experience of the world. And one should expect that many non-scientists have also made observations about long-term changes in their environments. Shouldn't these play a role / contribute something valuable to public discourse? (Climate indicator EPA)

Can we use proxy data sources and other environmental markers for a visualization approach that enables the sensory experience of global warming, rather than just the weather? Here I need to be careful, since I don't want to imply that the methods of a 19th century naturalist can replace the complex set of inquiries that this phenomenon demands. Traces are not like data visualizations. Most people know how to read tree rings, but it is rare that traces can be decoded that easily; their interpretation requires a robust epistemic framework, whether it is the formal expertise of a scientist or the tacit knowledge of

[8] Mattern, "The Big Data of Ice, Rocks, Soils, and Sediments."

a farmer. Until fingerprints were successfully operationalized for identification purposes, generations of scholars embarrassed themselves with superstitious interpretations and racist theories. Thoreau admired the richness of traces, but at the same time emphasized their opacity and illegibility.

But I think that traces and proxies can be a critical tool for connecting the models in which they are implicitly contained back to the realm of experience; to close the gap between data and the world. As I have argued elsewhere, this is what the perspective of autographic visualization aims to achieve.[9] In essence, autographic visualization is a design strategy based on staging and framing material traces to support their interpretation. To understand the goals and properties of autographic visualization, it is helpful to contrast it with data visualization, for which it is in many ways a counter model. To begin with, data visualization is about the representation of data. Autographic visualization considers traces as material data, but these traces are not representational - they do not stand for anything else, but merely present themselves. Data visualization tries to find patterns and draw insights from data, while autographic visualization is more concerned with the data generation process—it shows how traces become data records. Data visualization considers data as unambiguous, or *monosemic*, while working with traces requires keeping many possible explanations and hypotheses in play.

Among the broader range of autographic techniques, photography offers a fitting case study for visualizing planetary diagrams. Tarja Trygg solargraphy method involves pinhole cameras that record the path of the sun over multiple months in a single exposure. As a result of the long exposure time, the emulsion darkens by itself without the need for a darkroom, a process that can be compared to the historical "printing out" method. Trygg sends her makeshift pinhole to people all over the world to show the local differences depending on latitude and cloud cover. In some way, solargraphy is a contemporary version of Campbell's sunshine recorder from the 1850s, which involved a glass sphere inside a wooden bowl. During clear skies, the sun would burn a similar path into the wall of the bowl, focused by the spherical lens. Environmental health researchers Sara Wylie and Lourdes Vera use regular BW photo paper for detecting H_2S, a corrosive gas that taints the paper. This allows the researchers detect the harmful pollutant that is often emitted as a byproduct of fracking operations, cheaply monitor large areas, and pinpoint the emitting source. The visual artist Tuula Närhinen explores autographic methods for capturing the elements—rain, waves, the wind, and light—often by reenacting historical science experiments. In "Baked Rain," she uses the method of the scientist Wilson Bentley to make replicas of individual raindrops and measure their volume. She does this by capturing rain with a pan of flour, which is subsequently baked. Artist Erich Berger maps the background radiation of the landscape with x-ray films, revealing a surprisingly nuanced structure. As he explains, the radiation is associated with a particular kind of rock which results from biological activ-

[9] Offenhuber, "Data by Proxy Material Traces as Autographic Visualizations."

ity in during the geological past, offering clues about past life. Considering the surface of the planet as a photographic plate is more than a metaphor—it can be taken literally since light is the main external source of energy for the world.

The autographic perspective differs somewhat from the familiar semiotic concept of indexicality, which is often used for describing traces in general and photography in particular. Charles Sanders Peirce introduced the index as a sign that (in contrast to the icon and the symbol) has an existential, often causal connection to its object. But a sign requires a mind that interprets it, and, as Umberto Eco proposed, also involves a shared convention: the first doctor who inferred measles from red spots on a patients face made an inference, but it becomes a sign only once it finds its way into medical treatises. The autographic perspective, in contrast, is not primarily concerned with the many dimensions of meaning: it is not about *what*, but more on the *how* it is written. An autographic perspective decenters visualization practices away from human the human mind. a curiosity focused on the material interactions. no longer what the photographic trace signifies, but what it shares with other forms of inscription.

The emergence of the digital image has again complicated the trace-like, indexical nature of the photograph and its ability to support evidentiary claims. Also the iconicity of the digital image has received new scrutiny, expressed in discussions around whether a satellite image should even be compared to a photograph, as it is a sythetic product of algorithms operating on numerical measurements.

but from perspective of autographic visualization, these seemingly difficult and fraught issues are not relevant. Both chemical photo and the satellite image are physical traces in the same sense. the only difference is the complexity of the apparatus in between. And in this sense, both share qualities with the layers in the ice core, the shrinking of the glacier, the tree rings … the planetary self-inscriptions, in which processes manifest themselves - processes that rival or exceed the complexity of the satellite imaging device.

the world does not only report and visualize itself, it also computes itself. Analog process of computation that does not consist of the manipulation of logical symbols, but the transformation of actual matter. Planetary computation.

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