

<http://artnodes.uoc.edu>

Article

NODO «DIALOGS BETWEEN ART AND FUNDAMENTAL SCIENCE»

Remarks on Certain Affinities and Differences Between Aesthetic and Scientific Practices

Thomas Zimmer

The European Graduate School

Date of submission: October 2019

Accepted in: January 2020

Published in: January 2020

Recommended citation

Zimmer, Thomas. 2020. «Remarks on Certain Affinities and Differences Between Aesthetic and Scientific Practices». Artnodes, N°.25: pp. 1-14. UOC. [Consulta: dd/mm/yy]. <http://doi.org/10.7238/a.v0i25.3326>



The texts published in this journal are – unless otherwise indicated – covered by the Creative Commons Spain Attribution 4.0 International license. The full text of the license can be consulted here: <http://creativecommons.org/licenses/by/4.0/>

Abstract

In 1969 Werner Heisenberg presented a paper at a symposium initiated by the Karajan Foundation in Salzburg. The theme of this symposium was the 'significance of modern scientific knowledge—in medicine, physiology, and physics—for art, music, pedagogy and aesthetic practice.' Heisenberg's paper was titled «The Tendency to Abstraction in Modern Art and Science.»¹. Heisenberg dissembled, preferring to avoid an approach from a technical point of view, in favour of a consideration of principle, or of a «philosophy of culture», in order to ask whether certain tendencies in modern art, at times strange or incomprehensible, might have some parallel in the form of similar phenomena in modern science. Heisenberg was not concerned with specific forms or techniques of contemporary aesthetic or scientific practice, but with what he described as their «overall shape». It is an interesting position, not because it afforded Heisenberg a necessarily new or privileged insight, but because unlike most discussions of the relations between art and science it did not proceed in a hegemonic manner wherein one discipline annexes and establishes sovereignty over another. In Heisenberg's query scientific procedures did not circumscribe or annex art (as mere illustration, exemplar or ornament) and aesthetic practices did not circumscribe and annex scientific data (as argument, justification, evidence or authority). Neither was he overly concerned with an equanimity or symmetry in the relationships of these various disciplines; he was interested in certain affinities, the possibility of common grounds, in science and art as they are practised.

...the step towards greater generality is always itself a step into abstraction—or more precisely, into the next highest level of abstraction; for the most general unites the wealth of diverse individual things or processes under a unitary point of view, which means at the same time that it disregards other features considered to be unimportant. In other words, it abstracts from them.²

It is in this context that I will situate my remarks on certain affinities and differences between scientific and aesthetic practices, by considering the possibility of their common ground in terms of *abstraction*, *technics*, and *capture*, (i.e., what it is that is purported to be captured, secured or preserved, in order to be represented).

Keywords

aesthetic practices, scientific practices, abstraction, technics, capture

*Observaciones sobre ciertas afinidades y diferencias entre prácticas estéticas y científicas***Resumen**

En 1969, Werner Heisenberg presentó un artículo en un simposio promovido por la Fundación Karajan en Salzburgo. El tema del simposio era la importancia del conocimiento científico moderno (en medicina, fisiología y física) para el arte, la música, la pedagogía y la práctica estética. El artículo de Heisenberg se tituló «La tendencia a la abstracción en el arte y la ciencia modernos»¹. Heisenberg prefirió evitar centrarse en un punto de vista técnico, a favor de una consideración de principios o de una «filosofía de la cultura», para preguntar si ciertas tendencias en el arte moderno, a veces extrañas o incomprensibles, podrían tener un fenómeno similar en la ciencia moderna. A Heisenberg no le preocupaban las formas o técnicas específicas de la práctica estética o científica contemporánea, sino lo que describió como su «forma general». Resulta una posición interesante, no porque le haya proporcionado a Heisenberg una visión necesariamente nueva o privilegiada, sino porque, a diferencia de la mayoría de las discusiones sobre las relaciones entre el arte y la ciencia, no procede de manera hegemónica, en la que una disciplina se anexiona y establece la soberanía sobre otra. En la investigación de Heisenberg, los procedimientos científicos no circunscribieron ni anexaron el arte como mera ilustración, ejemplar u ornamento, y las prácticas estéticas no circunscribieron ni anexaron datos científicos como argumento, justificación, evidencia o autoridad. Tampoco se mostró demasiado preocupado por tener equanimidad o simetría en las relaciones de estas diversas disciplinas; le interesaban ciertas afinidades, la posibilidad de tener puntos en común en la práctica de la ciencia y el arte.

...el paso hacia una mayor generalización siempre es en sí mismo un paso hacia la abstracción, o más en concreto, hacia el siguiente nivel más alto de abstracción; porque lo general une la riqueza de diversos objetos o procesos individuales bajo un punto de vista unitario, lo que significa que, al mismo tiempo, ignora otras características consideradas sin importancia. En otras palabras, se abstrae de ellos².

1. Heisenberg, Werner, «The Tendency to Abstraction in Modern Art and Science,» in *Across the Frontiers*, Ruth Nanda Anshen, ed., [New York: Harper & Row/World Perspectives] (1974) See also: Heisenberg, W., «Abstraction in Modern Science,» *ibid.*, pp. 70-88.
2. *ibid.*, p. 144.

Es en este contexto que ubicaré mis comentarios sobre ciertas afinidades y diferencias entre las prácticas científicas y estéticas, al considerar la posibilidad de un terreno común en términos de abstracción, técnica y captura (es decir, qué es lo que se pretende capturar, asegurar o preservar para ser representado).

Palabras clave

prácticas estéticas, prácticas científicas, abstracción, técnicas, captura

I on technics

A camera captures everything, and loses it in exactly the same moment. The instant within which the impress of an event, an act, or phenomenon is secured as a trace is simultaneously the instant of severance, where the relation to what is captured becomes indexical, standing for or in place of something—the ostensible subject of the image—that has passed away and admits no further direct access. Drawing, painting, choreography, writing, as well as modes of mechanical reproduction, despite their differences, have a commonality in the technical substrate that grounds their practices and procedures, that discerns or produces patterned regularities, and that admits the perception of common traits underlying the contingencies of form, style, iteration, epoch or progression. Each operation or apparatus purports to capture and represent or reproduce something, something which is not there, which is no longer present, and which such procedures are constrained to hold place for the trace of an absent and inaccessible origin. Such procedures, anaphorically linked to subsequent actions, trace but the possibility of an archive, the promise of memory.³

No matter the intention involved in the placement of the camera/apparatus, in composition, performance, documentation, or accident, at a certain point photography is an irreducibly autonomous process, and human access is not possible⁴. In this recognition the fluid boundaries of the index are recast, and the claims exacted for the truth or verisimilitude of what has '*happened*' before the aperture or lens of the camera, the '*event*' *captured* by the framing apparatus, skips over this void to subsequent manipulations (tonal gradations, pixel depth, codecs, digital artefacts, false colour processes) of the '*photograph*' as an evidentiary trace. While classical notions of the phototonic impress on a sensor or sensitive surface as an unproblematic index of the '*real*' have been eroded or dismissed in recent theoretical discourses, the concomitant recognition of the '*constructedness*' of the image still preserves, in the technical and material autonomy of physical processes, an indexical '*data stream*' that remains to some extent

beyond human manipulation. While the representational conventions employed in making this information visible, causing it to *appear*, may at times harbour some bias or prejudice, truth claims, or even a desire to fit happily within taxonomic or paradigmatic armatures or established aesthetic, scientific, or theoretical configurations, the field destabilises, and such easy habitual attributions are compromised. This is especially so in aesthetic practices working with found footage, archives, and even stock footage, compilations from multiple sources or suturing '*effects*' and CGI, as well as primary footage. A similar problematic confronts the visual representation of scientific data, quantitative or evidentiary, as the discernment of the presence of a certain particle, for example, requires an extensive and massive redundancy, often conveyed via robust computational data processing. Even the determination of a trace on a photosensitive surface requires a complex configuration of observation, judgement, and confirmation, to determine that it is reasonably likely to be what has been predicted or required, or what one has been looking for.

In the tacit reconfiguring of the apprehension of '*data*' sense as an indefinite multiplicity—introducing pluralities or duplicities in primary data, rethinking secondary sensory information as evidence, consequence, potentiality, or ground—the visual/medial work redefines the possibilities of thinking via the deferred technics of the visual, the mathematical, the material or conditional. In so doing, such works also tacitly interrogate the genealogy of re-presenting technics, and narratological habituations, those patterned regularities that have formed the history of the appearance of '*objects*'—scientific, aesthetic, medial—and engage in a perceptible configuration of possible worlds, admitting different methods of apprehension, new forms of visualisation, and often exceeding, or even overturning, established theoretical/empirical/conceptual/aesthetic speculations. This condition persists as a common ground in aesthetic and scientific practices alike, coextensive with what are clear disciplinary and methodological differences, and often incommensurate intentions and teleologies.

Technically reproduced images are always *belated*; even the most proximate coincidence of live transmission and the recording of an

3. see Thomas Zummer, «The Resistance of Shadows: On the Work of Ranbir Kaleka,» «... an afterword, belatedly,» in *RanbirKaleka Moving Image Works*, Hemant Sareen, ed., [Berlin: Kerber Verlag] (2018), p. 78.

4. see Peter Geimer, «'Self-Generated' Images,» in *Releasing the Image: from Literature to New Media*, Jacques Khalip, Robert Mitchell, eds., (Stanford, 2011) pp. 27-43.

event, performance, or phenomenon, has a discernible, if minute, disparity or lapse. This structural condition of media is often dismissed, ignored, or suppressed in order to situate an appropriate and useful indexical claim to the verisimilitude, or 'truth', of the technical image. In addition to media's spatialising operations, there are also what might be described as *chronotopological* operations [the reference is to Bakhtin's notion of the *chronotope*, or literary shape of time, but also to the notion of chronophotography as an abstraction of life-processes imbricated in various forms of analysis, scientific and otherwise]. The *release* of the artefactual image from its ostensible referent only increases with time and distance, so that 'found' or appropriated (or purchased/produced, stolen or accidental) footage is increasingly laboriously conscripted into the artificiality of narrative coherence, often by 'announcing' itself as plausible, or holding to established forms of recognition as a naturalising and familiar trope.

This citationality, this duplication or duplicity, this iterability of the mark is not an accident or an anomaly, but is that beyond (beyond normal and abnormal) without which a mark could not even have a so-called 'normal' functioning. What would be a mark that could not be cited? And whose origin might not get lost in the process?
— Jacques Derrida

This *citationality* of the evidentiary trace is common to both artistic and scientific practices, and constitutes, through myriad forms of reiterability, the *object, evidence, or truth* of appearance, its implications, and its possibilities of attachment or imbrication into other discourses. It is a primary and ubiquitous form of abstraction, one which serves as a common ground of human endeavour in both registers. But what is abstraction, and what are the implications that we are trying to draw out?

It is clear that there is an unavoidable perceptual bias in our relation to the instruments we devise. For example, our senses register stimuli in logarithmic, not linear, increments, so that the systems and tools we employ—the acoustic decibel scale, the seismic scale for measuring earthquake severity, the magnitude scale for stellar brightness—are also logarithmic, in part because they reflect our propensity to perceive the world in that way. Other scales and types of detectors may increase the range of human senses—into the infrared register, for example—but they also translate data back into familiar forms and intuitions. The difference between the optics of the eye and of the camera is both marked and subsumed as it becomes

naturalised. «The camera,» as Walter Benjamin writes, «introduces us to unconscious optics as does psychoanalysis to unconscious impulses.»⁵ The substrates of unconscious memory, technical or somatic, support an economy of translations between perceptions and instruments, such that «prosthetic» perceptions occupy the same cognitive space as bodily sensations. This is a process common to scientific procedures, such as the design of an experiment, and to aesthetic practices, which may include traditional forms of representation, or documentation (where, for example, a secondary recording of a performance or conceptual operation takes the place of absent primary data). In a similar manner the representation of (the conclusion of) experimentation presents a controlled, sifted, result—a closure which is subsequently linked to other orders of representation.

There are memoirs and personal accounts in the development of the electron microscope⁶ in the mid-twentieth century that sound eerily close to phenomenological descriptions of embodiment. For these scientists the microscope became, within limits, an extension of the operator in his or her interactions with the minuscule. The microscope became a prosthetic sense-organ, and microscopists were among our earliest cyborgs. And, since almost all of the U.S. electron microscopists in the 1940s and 1950s used the same instruments,⁷ there was a remarkable uniformity in their tacit and intimate understandings of their craft. This in turn, must have contributed greatly to the subsequent cohesiveness, even in popular magazine depictions, of their accounts of research into the realms of the unseen. It is an interesting problematic: with optical microscopes resolution is limited by the wavelength of light. Electron microscopes employ a beam of electrons, operating well below the wavelengths of visible light, to form an image of very small objects. In these devices high-energy electrons associated with considerably shorter wavelengths, allow far greater resolution. The transmission electron microscope uses a sharply focused electron beam passing through a metallised specimen onto a fluorescent screen, where a visual image—which can be photographed—is formed. The scanning electron microscope forms a perspectival image, although both magnification and resolution are considerably lower. In this type of instrument, a beam of electrons scans a specimen, and those electrons that are reflected (along with any secondary electrons emitted) are collected. This current is then used to modulate a second electron beam in a television monitor,

-
5. Benjamin, Walter, «The Work of Art in the Age of Mechanical Reproduction,» in *Illuminations. Essays and Reflections*, ed. and with an introduction by Hannah Arendt, trans. by Harry Zohn (New York: Harcourt, Brace and World, 1968).
 6. See Nicolas Rasmussen, *Picture Control. The Electron Microscope and the Transformation of Biology in America, 1940-1960* (Stanford: Stanford University Press, 1997). For a brilliant and sustained exploration of the place of the body as both a mode and object of perception, see Susan Stewart, *On Longing. Narratives of the Miniature, the Gigantic, the Souvenir, the Collection* (Baltimore: Johns Hopkins University Press, 1984).
 7. *Ibid.* The early microscopists were apparently not unfamiliar with the European phenomenological tradition, and the notion of «dwelling» here may be given a distinctly Heideggerian inflection. The continuum of decreasing consciousness moving towards greater familiarity maps a certain form of amnesia coextensive with technical artefacts. One treats an interface, network, or circuit as if it is the thing one is directly manipulating, and patterns of connectivity, habit, and artifice fade into the background. From turning out a light to playing the latest video game, there is a metaleptic conflation of interface and event in our perceptual horizon.

which scans the screen at the same frequency, thereby building up a picture of the specimen.

Electron microscopists, like the general populace, experienced themselves «transported by this instrument to an alien landscape,»⁸ and the habitual conventions of reading «landscapes» came into play in the representation of these invisible topographies by invoking and communicating common bodily experiences and pictorial conventions. The interface of operator/machine/phenomena is modified—tuned—by both physical limitation and cultural presupposition. The intuitive perception of the resulting micrographs as everyday landscapes is further supported by the fact that in order to be reflective, specimens were coated with a thin layer of metallic atoms (gold or platinum mist) by spraying them from a low angle. Microscopists used the length of the resulting «shadow» (formed where a feature has blocked metal deposition onto the surrounding support) to determine the «height» of that feature, thus casting the electron beam's «illumination» at «noon,» rather than from the actual direction of metal deposition. In this way the micrograph is constructed in such a familiar manner that it does not intrude on one's intuitive perception of the image as a «landscape.»⁹ A horizon has appeared, astonishingly, in an environment so small and of such an unfamiliar scale that certain determinations are set in place relative to our own somatic bias, making images that admit familiar coordinates and points of perceptible location. In the process of refining the scientific apparatus, the observer's lived experience takes up residence in—is sutured into—the machine, such that one «dwells» within the instrument, in a continuum of decreasing consciousness and increasing familiarity, consequently moving from alterity to familiarity and embodiment.¹⁰

Cinema, and subsequent imaging operations, one might say, are just such lived technologies. In the interface of architecture, technology, perception and habit, we, as spectators, are intimately inscribed into the mediated imaginary, taking up residence—for a moment—within a phantasmatic technology. Here we are an element of the dream, linked to a specular machinery where unconscious behavior, modifying and modified by the instrument, interactively constructs our experience. In the long history of projection-environments—from Ibn al-Haytham to Leonardo da Vinci, from Athanasius Kircher to E.G. Robertson, Edison and the Lumière brothers to today's cineplexes, home entertainment systems, digital streaming and virtual/augmented realities—the body persists as a common and inextricable component of the apparatus, and familiar everyday perceptions are linked to a history of cinematic and medial artefacts and behaviors in diverse,

complex, ways, so much so that even our recognition of their artifice is a culturally mediated form.

...if there is neither machine nor text without psychical origin, there is no domain of the psyche without text. — Jacques Derrida¹¹

One might add, to complete the symmetry, 'without machine'. Derrida's implication of the relationship between unconscious memory and historically specific machine-metaphors reproblematises issues of subjectivity and spectatorship relative to philosophical questions of ontology, technical reproduction, and virtuality, as well as to scientific questions concerning evidence, repeatability, falsification, and verification. If unconscious memory is coextensive with, and inextricable from, the various «technical substrates» given to it with historically specific technologies, then a complex series of problems concerning specularity, interactivity, evidence and mediation are rendered salient, and analysis and critical theories acquire another set of tasks. That certain of these technical substrates are more closely aligned with, and even derive from, projective environments such as cinema, television, computers, telecommunications systems, and the internet is an issue to be seriously considered in any analysis of contemporary media. What might the role of such psychic/technical substrates be within a more singular, reflexive, and critical model of media, such as was articulated in certain interactive/projective art installations of the early 1970s? While these works were enormously important and influential, they were also transient, localized, and somewhat marginal to the generalised interior technical unconscious of popular media. Yet at the same time they were permeated by it, and a good deal of their critical impetus was directed toward a tacit «auto-deconstruction» of the canonical discourses/categories of objects and subjects, references, representations, and institutions. These early seminal works dissolved traditional boundaries of territory and the body, transforming architectures into relays, passive reception into active engagement, data into interaction and connectivity, in a diffused topology that laid the initial traces of today's aesthetic digital mediascape. It might be useful to examine some of the sites/origins of this transformation, and to look at some of the technical substrates of unconscious memory that continue to suffuse, constrain, and shape the contours of perception and apprehension, in both aesthetic and scientific processes.¹²

Here again, in this context, the question of abstraction reappears as a common ground of human endeavor in both technical registers, in scientific and aesthetic practices. Again, what is *abstraction*, and what are the various implications that we are trying to draw out?

8. Ibid.

9. Ibid.

10. Ibid.

11. Derrida, Jacques, «Freud and the Scene of Writing,» in *Writing and Difference*, trans. Alan Bass (Chicago: University of Chicago Press, 1978), p. 199.

12. see Patricia Ticineto Clough, *Autoaffection: Unconscious Thought in the Age of Teletechnology*, (Minneapolis: University of Minnesota Press, 2000), for a superb and thorough discussion of «technical substrates.»

II on abstraction

The Oxford English Dictionary attends to the definition of 'abstraction' in the following brief, and rather curious manner:

«...how to understand abstraction :: *to draw away* »
(at first, like its Latin original, a participle and adjective):
drawn, derived, extracted; withdrawn, drawn away, removed, separated —even secretly, therefore: *to 'secret'*—sometimes *to purloin*.
[withdrawn from: *contemplation, matter, embodiment, practice, or particular exemplars*]

... and so, *subtily*, as a withdrawing from the actual, the concrete, the commonplace...or, in a more common sense, not knowing what (one) they (might) say / after the appearance of...or with numbers, those which have no denomination annexed into them; a *compendium*, one thing «drawn from others» a smaller quantity containing the virtue or power of a greater [that is to say: the *virtual* or the *potential* of a greater/exterior/other]

(so that)

An image, of cast shadows, captured in a trace, an image whose arrestment secures the index of capture as a claim to truth or to the verisimilitude of what has (after all) passed away, of what we might say (with some risk) continues to pass away (as if what is gone persists in that negative interval, as if the presumed continuity of its passage grounds such absence as the very promise of repetition, confirmation, or recall).

A state of being withdrawn: in this sense, all images are abstract. And, in the consequence of this sense, we are constrained to take up, again, the question of 'surface'.¹³

It is not just the brevity that is unusual here, nor even the ambiguities, of this entry in the *OED*, but the fact that a rather problematic duplicity has been completely passed over. If we consider that the definition of the terms *abstraction*, *abstract*, or *to abstract*, all having the meaning of *to draw away*, then it is surprising that there is no indication whether what is meant by that phrase is 'to extract, derive, represent, or secure a trace or impression of something' (to withdraw), or if *to withdraw* means to 'take leave, evacuate, or absent oneself from something'. Both imply different proximities, and different forms of presence and apprehension. Perhaps there is even a bit of both processes at play in abstraction, a process that recasts proximities, represents and thus realigns evaluations, establishes or abnegates evidentiary claims, and tempers the possibilities of citation and authority. Certainly, in this sense, all such artefactualities are abstract.

It is within the technical reproducibility of traces—recorded images and sounds—that we might begin to address the exemplary work of Leslie Thornton as an instance of abstraction common to both artistic and scientific endeavor. In a recent series of surprising

and compelling media installations, entitled *Binocular*, she traces the complex interactions between nature, technology, representation and abstraction, through the *figure* of the animal. Thornton's images are already configured and enframed, already artefactual and empty. What becomes inescapably clear is that what appears in the place of an animal is not an animal, but a recording, a double that strips away the possibility of presence, something that is more akin to a form of extinction, an appearance which is not present, and which cannot be evacuated: a *spectre* or *phantasm*. The space that Thornton creates is the '*haunt*' of an animal, a terrible *lacuna* in the place of being, a tacit auto-deconstruction of the promise of presence, return, utterance, by a thorough disarticulation of the mimological apparatus that would speak or (re)present, perversely, in that place.

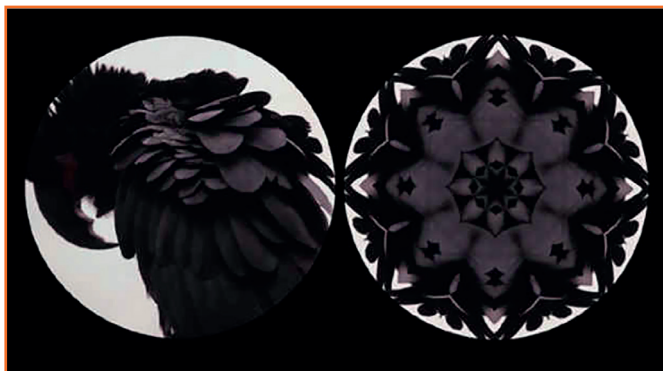
An '*image*' impressed on a surface, similarly, a '*voice*' inscribing itself into letters, as Giorgio Agamben says, are diacritical markers denoting emphasis: «*who is speaking?*» «*what is there?*» «*who is present?*»—no one; a doubled negation overtaking, subsuming, and, in the very moment of its enunciation, appearing to cancel the uttered affirmation. It is a form of erasure, to be sure, but one which releases a persistent trace, a trace caught forever in a pattern of iterability which resonates and repeats, an abstract movement constantly casting across the space of negation and return: the echoes of bodies; presence recast as an image of presence. In Thornton's work the image of the animal is just such an iterative trace, a corporeal surface coextensive with a medial surface, an abstract relation whose constant appearance and withdrawal has the structure of an echo, so that what appears, non-reciprocally, as the very armature of appearance itself, is but the empty interval of an enframing techné.¹⁴

Leslie Thornton's ongoing media project, *Binocular*, consists of a series of large flat-screen monitors. On each screen two circular fields appear: on the left, images of animals — birds, reptiles, fish, mammals; some are exotic, others familiar and commonplace — all beautifully 'captured,' filmed in the wild; on the right, the image is folded back on itself in a centripetal pattern, reminiscent of a kaleidoscope. The two circular fields are intimately connected: the movements of the animals on the left are remapped into the elegant mathematical abstraction on the right. It is the same original footage, each field in sync. The effect is unexpected and profound: the viewer notices minute tremors and shifts (a small heart beating, for example, in an otherwise apparently immobile mollusc) in the left sphere, by catching the very same resonant motion, multiplied, recast, and folded into itself in the pattern on the right. There is no anthropomorphism

13. All of the definitions are from the entry on 'abstraction' in *The Compact Edition of The Oxford English Dictionary, Complete Text Reproduced Micrographically, Volume 1, A–O* (Oxford: Oxford University Press, 1971; 23rd Printing, 1984), pp. 42–43. The initial definition of abstraction, and the list of subsequent definitions compiled above, are a citation derived and slightly edited from the OED. By citing the configuration of references on abstraction in this manner in relation to various problems of a philosophical, scientific, or of an aesthetic nature, my intention was to initiate a consideration of the complex and intertwined relations of scientific and aesthetic practices; it is also a reinscription of one text within another text, an attempt to draw upon the manner in which an authority common to both, comes into place to expand, dilate or delimit the field of reference, or to establish a hierarchy of significations via the same gesture.

14. see Khalip, Jacques, Robert Mitchell, eds., *Releasing the Image: from Literature to New Media*, [Stanford: Stanford University Press] (2011).

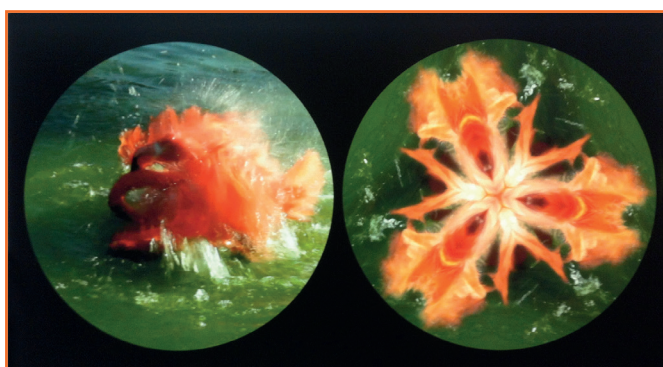
here, no Disney-like cuteness, no identification or domestication. Allusion is dissolved to its bare technical armature as Thornton gives us a glimpse of a world prior to language and exterior to consumption, mute, opaque, uncontainable, and absolutely other.



Leslie Thornton. *Palm Parrot* [*Binocular Series*, digital video/installation] (2010–ongoing)
Photo credit: L. Thornton, digital frame grab



Leslie Thornton. *Zebra* [*Binocular Series*, digital video/installation] (2010–ongoing)
Photo credit: L. Thornton, digital frame grab



Leslie Thornton. *Flamingo* [*Binocular Series*, digital video/installation] (2010–ongoing)
Photo credit: L. Thornton, digital frame grab

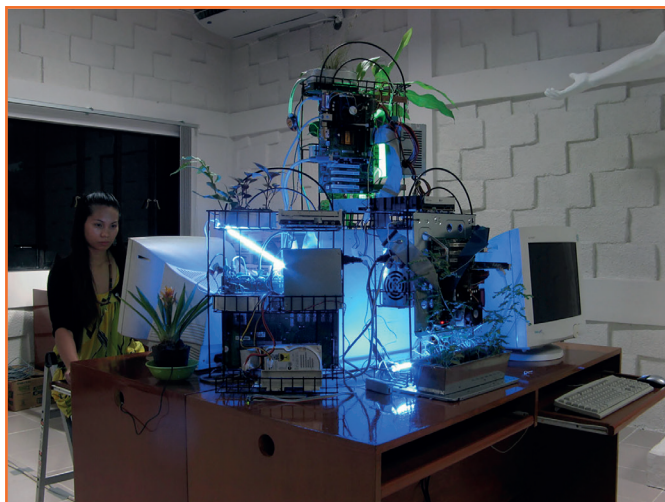


Leslie Thornton. *Blue Bird* [*Binocular Series*, digital video/installation] (2010–ongoing)
Photo credit: L. Thornton, digital frame grab

Thornton's beautiful, meditative, camerawork locates the movements of predator/prey relations in the most subtle fragments and configurations of behaviour and morphology. This is all the more remarkable in that it is most salient in an abstraction, a withdrawal to a remote margin of the natural image which is its source. All of her work has this intensity, an almost painfully precise focus on the fundamental minutiae of being in the world.

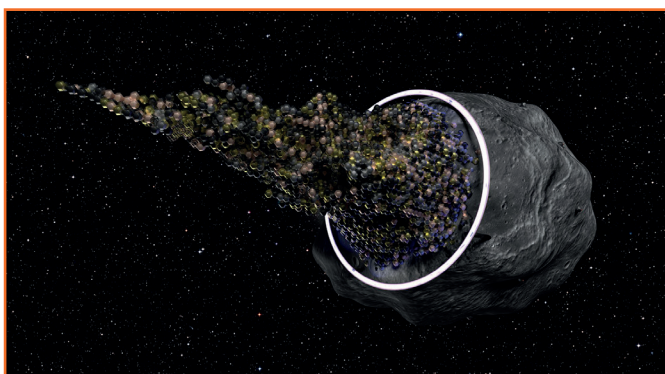
We are similarly transported by the succession of animal/animate spaces in *Binocular*. Nature is not subsumed or (re)produced, circumscribed or contained, so much as it is reflected, perhaps even deflected, into a strange and elegant mirroring that acknowledges that the space of otherness traced in the image of the animal is filled by an abstract artefactuality, that in fact, there was nothing but an artefactuality present to begin with. 'Capture' is an empty category, consonant with the empty interval that designates the difference between human and animal, a difference or negation that Thornton brings to the foreground within the frame of technology, appearing less as in index of loss (the Edenic animal) than an impossibility (the possession of the animal, even as an image, is both illusory and destructive).

One might consider in terms of abstraction, other artistic works that draw away from an ostensible referential field in order to form a more precise (or different) image of formal practice. Angelo Vermeulen is a Belgian biologist, space systems researcher, and artist. Vermeulen's works operate simultaneously as elegant experiments having to do with complex ecologies and as art installations. Vermeulen exploits a common ground—in the design of experimental processes and the performative dimensions of aesthetic practices—to indicate a complex register of affinities and differences. By stepping away from habitual apprehensions, he is able to emphasise visual and conceptual configurations common to scientific and aesthetic practices, and to explore these relations without imposing a preconceived hierarchy or bias.



Angelo Vermuelen, *Biomodd LBA2 Project* (2009) mixed media, sensors, botanicals, installation

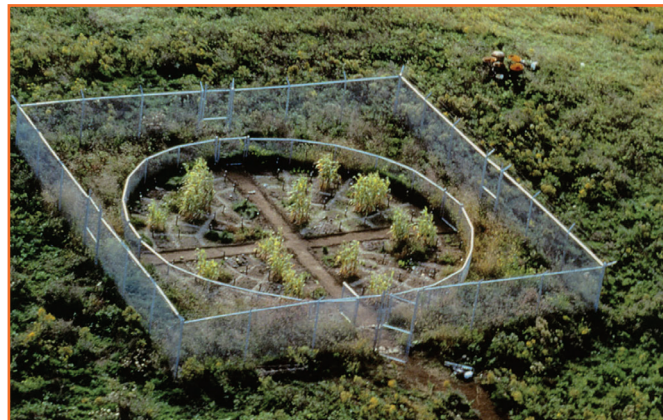
Photo credit: Angelo Vermuelen



Angelo Vermuelen, *Biomodd-TU-Delft Evolving Asteroid Starships Project* (2007–2011; ongoing)

Photo credit: Angelo Vermuelen

Mel Chin, though his work emerges from an art context, has consistently tampered with boundaries and expectations. In a project titled *In the Name of the Place* he covertly inserted art objects (ostensibly as props) into the set of the prime-time television series *Melrose Place*. Chin's project was a conceptual public art project—though it was also hidden and subversive. He has described «thinking of the virus as a paradigm for this art project. Viruses are self-replicating, but they mutate...I was wondering, how do you get an idea into a system, and let it replicate within that system? Using the virus as a model, how could I interact with television? Syndicated television as a host can serve as a place for the generational transfer of an idea». [from an interview with the artist, 2006]. In other works, such as *Revival Field* (1991-present), Chin has addressed the remediation of toxic waste sites through chemical and biological intervention.



Mel Chin, *Revival Field* (1991-ongoing) mixed media, remediation of toxic waste site

Photo credit: Mel Chin

Natalie Jeremajenko is an artist and engineer whose background includes studies in biochemistry, physics, neuroscience, and precision engineering. She is an active member of the net.art movement, and her work primarily explores the interface between society, the environment, and technology. Among her projects is an open source robotics project providing resources and support for the upgrading of commercially available robotic dogs. Her mediagenic *Feral Robotic Dog Pack Release* events sent modified robotic dogs, outfitted with sensors to follow concentration gradients of environmental contaminants, to track and provide data, produce information for discussion, and facilitate public and official participation in environmental monitoring and remediation.



Natalie Jeremajenko, *Feral Robotic Dog Pack Release* event [detail] (2005) robotics, sensor technologies

Photo credit: Natalie Jeremajenko



Natalie Jeremajenko, *Weeping Trees: The Hard Way* (2011) mixed media, botanicals
Photo credit: Natalie Jeremajenko

Werner Heisenberg's stance regarding the apprehension of a common ground between scientific and aesthetic practices through a withdrawal to a marginal, general and abstract position is echoed by many contemporary artists and scientists. In addition to those mentioned above, we might also include Peter Galison, Lorraine Daston, Donna Haraway, Kelly Dobson, Char Davies, Hilary Mushkin, David Goodsell, Neri Oxman, Olafur Eliasson, Trevor Paglen, Chris Dougherty, Chris Roh, and many more.

In similar fashion, the Italian philosopher, semiotician (and novelist) Umberto Eco, reminds us that

[i]n order to understand a philosophical system (or the philosophical corpus of an entire historical period), it is often necessary to approach it from the margins rather than from the center. From its center, a system always seems well defined and hardly challengeable; it is at its periphery that it gets put to the test.

The *ek-stasis* of withdrawal, the «step outside,» or to the edge of a given paradigm, reveals a common trait in scientific and aesthetic reasoning: that to render porous or break the given frame of reference may admit of a hitherto unexpected perspective, might open a space for thinking, or creativity, that might otherwise remain inaccessible. *Ecstasy*, from the Greek *ekstasis* (ἐκστασις, consisting of ἐκ- «out»—combined with στασις «staticos», from the stem «histanai»—to «to make stand»,— «to place in balance») is a «standing outside oneself». The term is a subtle, tacit, and entirely appropriate lens through which one might consider certain affinities between aesthetic and scientific practices. At times it is a struggle that is

difficult, destructive, and throws one off balance, outside oneself (one's practice) and into another. The artists and scientists noted above present, in their varied works, a trace of that impress, of a singular or collaborative move toward the exterior of established medial, scientific, and artistic configurations, a withdrawal, but also a circumscription, of the marginal. In that sense, it is through *abstraction* that an image, configuration, or sense of a phenomenon or event may be captured and enter into a field of discourse or public sphere, may become accessible, admitting of an apprehension otherwise impossible.¹⁵

III on the notion of *capture*

It is here, within a discussion of the idea of abstraction as withdrawal, that we must pose the question of *capture*. What is 'captured' in a drawing, a poem, or an algorithm, in a description, a text, or image? What is secured and contained in a hypothesis, a taxonomy, a mathematical formula, or a theory? What is the ostensible content of a map, a blueprint, a directive, or a law? What is circumscribed by physics? Mechanics? Mathematics? What do devices, machines, or apparatuses 'capture'? What resides in a built environment? What is enframed by a technology? What is grounded by a principle, a foundation, an ontology, *arché* or origin? What (re)appears in a drawing or work of art, or a scientific diagram, illustration, or explanation? To *capture* is to *arrest, apprehend, fix, retain, detain, secure, circumscribe, delimit, territorialize; to take, to seize, to catch*. At the same time there is an unavoidable relation to origin, commencement, inception; *inception*, beginning or emergence: etymologically, *in capere*: '(in)capturing.' All of these cognates imply that there is 'something' to be apprehended, transfixed, initiated, removed, and/or re-presented. We might ask, in the act of observation: *what is that 'something'?* What is *captured*, what *appears*, and *disappears* in a 'media artefact'?

There is a conceit, for example, in any mimetic act, scientific or artistic, that a *semblance* has somehow been captured, drawn out of or away from, that original which it—as translation, reproduction, or semiosis—is constrained to re-present. A body 'abstracts' and is 'abstracted'—drawn out of, and away from—that which is represented, even as the impression made, via an instrument or an action, takes leave of a surface, abandons all but a trace. It is precisely within this performative excess that we take up a tacit skepticism, a destabilising auto-deconstruction, one that is nonetheless occluded and displaced by our very efforts to apprehend (as one might apprehend

15. conversations with Leslie Thornton (unpublished notes); for initial information on Angelo Vermuelen, Mel Chin, Natalie Jeremajenko, Kelly Dobson see Wikipedia entries; see Peter Galison, *How Experiments End* [Chicago: University of Chicago Press] (1987), and Lorraine Daston, Elizabeth Lunbeck, eds., *Histories of Scientific Observation* [Chicago: University of Chicago Press] (2011), and Lorraine Daston, ed., *Science in the Archives: Pasts, Presents, Futures*; Umberto Eco's remarks are from Umberto Eco and Constantino Marmo, eds., *On the Medieval Theory of Signs*, [Amsterdam: Benjamins] (1989); the definition of *ekstasis* is from H.G. Liddell, R. Scott, eds., *A Greek-English Lexicon: With a Revised Supplement*, 9th revised edition [Oxford: Clarendon Press/Oxford University Press] (1996).

an illicit loiterer, or a thief, in order to, in time, make them honest and true) or to arrest, and therefore ground upon a legitimate foundation, principle, or origin, the object as such.

It is here that we might begin to examine what is both circumscribed, and lost, by the mark or trace. The term *graphology*, derived from the Greek verb *graphein* + *logos*: a reasoning or grounding of the act of marking/making a mark or trace, is a claim exacted against a persistent ontology, a 're-presentation' of what is. It is necessary to interrogate such graphological reappearances. It is here that a skepticism that haunts all of our representational technologies (re) appears: we have a faith in the eye of the artist or portraitist, the efficacy of the hand, or in the dark chamber of the camera, or the flow of electrons linked to a scientific procedure, a certitude that they have captured, with a clear verity, what has appeared before them, and that they have—remarkably—instituted the very promise of recall, or repetition, even as the immediacy of what had been present is severed. Whether this haunting suspicion is intermittently overt, or hidden, it suffuses every aspect of representation. There is also a hidden theological disposition at play here, a certain *acheiropoeton*, a de-profanation, an aspect of *having not been made by hand*, and so therefore removed from the register of the human, an artefactuality that is autonomous and unimpeded by human intervention. An *objective* image or process. This may allude to the divine (as with the Byzantine *ikon*), to the reductivity of experimental procedures, or to mere absence. The *tekné* of writing, as Augustine remarks, is «communication with the absent,» a conveyance or transport of an initiating capture, that carries a promise of the truth of its origin. How much more is this so with images, and, especially, with the objects, artefacts, and bodies that appear, disappear and reappear as images?

Photography, cinema, digital and subsequent technologies are profoundly incomplete and incompletable; they become immanent, if unstable, artefacts via their inscription or attachment to a cultural, technical or social register, consequently linked to communities, histories, themes, concepts, objects, or tasks that are outside of the artefact itself. Various and variable communities of reception, recognition, interpretation and interest are exterior to the medial artefact, and at the same time inextricably supplemental. It is their

unanchored irresolution that allows for the attachment of technical images/photographic artefacts to multiple conditions, and contexts, which also grants a fluidity of relevance and possibilities of re-inscription. The referential infrastructure of photography requires a common ground, within which the excesses of difference and affinity play freely, establishing what one might call an ecology, in order to become an evidentiary trace, to engage with things, events, truths, lies, or to be interpretable at all. In a sense, they constitute an *archive in potentia*. And, while such articulations may appear as stable configurations, that is often far from the case. Contemporary digital photography, for example, is marked by the constant disappearance of the photographic; its immateriality and instabilities are an inherent aspect of its being. Images appear and disappear on innumerable screens, in multiple places, with varying effect, having a tenuous and provisional archival presence, simultaneously holding forth the promise of recall, and deflecting it.¹⁶ This holds true for artworks and the artefacts of scientific practice alike. A photograph is inscribed into multiple discourses as an artwork, as an iteration in a controlled series (e.g., an edition of 10), linked to language, via a series of proper names, titles, venues, evaluations, transactions, institutions, all of which secure and anchor the artefact as an artwork as such, regardless, for example, of other artefacts such as other images bracketing that work, that were done in the same session, that were excised or suppressed, never having achieved the status of 'artwork'. There is a kind of canonisation of the image, wherein it takes place or comes into being as an artwork, through operations and procedures which occur outside, and in a different temporality, than that of the configuring of the work as such. The images construed as evidentiary within the framework of scientific practices are subject to much the same sorts of processes. These images may be technical images, such as the elegant symmetries and dis-symmetries of traces that appear in a bubble chamber, or artefactual and illustrative (Durer's image of a rhinoceros, Audubon's paintings and sketches, Darwin's descriptive images, or paleontological reconstructions). In a sense, they have a strange «life of their own» which develops exterior to the image—Durer's rhinoceros, compiled from verbal descriptions,

16. Zummer, Thomas, revised from notes, outlines and publications: «Catachresis: On Nancy Haynes» in *Nancy Haynes: this painting oil on linen*, exh. cat., [Regina Rex Gallery] (2017). «A Matter of Shadows: Thomas Zummer in Conversation,» Kate Macfarlane, in *Double Take: Drawing and Photography-Research Papers*, exh. cat., Drawing Room, London, UK (2016); «Projection and Dis/embodiment: Toward a Genealogy of the Virtual,» in *Moving Image*, Omar Kholeif, ed., Documents of Contemporary Art series, [London, Cambridge, MA: Whitechapel Gallery, MIT Press] (2015-16); reprint; «On the Notion of 'Capture': Arché, Techné, Epistémé,» [excerpt] in *Programming EMPAC: The First 4, 158 Days*, Johannes Goebel, Kevin Duggan, eds., EMPAC/Experimental Media and Performing Arts Center, Rensselaer Polytechnic Institute, Troy, NY (2016); «'... someone said ...': annotations on a citational apparatus in media,» in *Left(t)*, CPI Publications, NYC 2013; Ghent Belgium, 2013; '(médusante)', in *Graphology*, Edwin Carels, ed., MuKHA (Museum van Hedendaagse Kunst/Antwerpen) (2012); 'The Appearance of Animals (Leslie Thornton) | Ventriloquoy (名) 腹语术 (Ellen Zweig)', in *Split Attention*, Fan Lin, ed., 53art press, Shanghai, China (2012); 'Properties of Others (I. On Luis Buñuel)' *Journal of Visual Studies*, 2012; '(explosion)' in «*Is This What You Were Born For?*»: *The Films of Abigail Child*, François Bovier, ed., [Paris: Éditions MetisPresses] (2010); *Eco-Sophia: The Artist of Life*, ed. Marjorie Vecchio, essays by Wolfgang Schirmacher, Thomas Zummer, exh. cat., [Reno: Sheppard Fine Arts Gallery/University of Nevada, Reno] (2008).

was erroneous¹⁷; Darwin's use of photographs in *The Expression of the Emotions in Man and Animals*¹⁸ was criticized as obfuscating and obscure when compared to drawings and engravings which were the norm for scientific representation at the time¹⁹; Audubon's birds are more or less accurate, as much so as their arranged carcasses will have admitted, though there are errors here, too, as in his painting of a flamingo.²⁰

There are also exemplary linguistic, lexical and rhetorical ambiguities. For example:

The grizzly bear (ursus arctos horribilis) at one time ranged over large parts of the continental US, mostly in the area to the west of the Missouri River, and numbered 10,000 in California alone. Today its US range is restricted to Montana, Wyoming and Idaho, and it numbers fewer than 1,000.

Of course, no particular bear numbers 1,000, and no particular bear ever had a range comprising most of the area west of the Missouri. It is a type of bear, a species of bear, that has both properties. The fact that type and token may be coextensive, even as they are incommensurate, has been productive of much confusion and vagueness, both in a philosophical arena and in the commonplace world of objects (and bodies). This structural lexical ambiguity might also be considered a tacit, or even accidental, form of abstraction, and thus take place in relation to other species of abstraction or figuration.

One draws—one traces or extracts—in order to show. One shows by extending or spreading out in front of oneself. Better, in order to show something well, in order to render it fully manifest, one must not cease drawing (if only to draw attention), and in order to draw out (trace or pull), one must not lose sight of the invisible extremity of the mark [trait], the point by which the line advances and loses itself beyond itself in its own desire.

The gesture of showing by extending—extending in order to show or bring to light, extracting the lineament and incision of a form, contour, sense, or idea from the shadow or a compact mass—such is the gesture of existing. A sketch (Entwurf), Heidegger says, a term for which one retains above all the meaning of jet (werfen—«throwing, casting»), of projection toward what continues to come [le non-advvenu], leaving in shadow the value of the mark, the tracing out, the form in the process of forming itself. —Jean-Luc Nancy²¹

...no one knows...

—[response to the question «what is an image?»]²²

There is always more in a photograph, as Giorgio Agamben notes, than one can ever see; the task that remains is to interrogate that excess, to trace the contours of a surplus that overturns the medial boundaries of what we have taken for so long to be a relatively stable, if not unproblematic, artefactuality.

Darkness and invisibility in images are recognized not only as neutral or absent *continua*, but as dynamically produced or constructed artefactualities, spatialities rendered salient through the interjection of a register of instrumentalities that secure or allude to different sets of truth-conditions. Newtonian coordinates such as extent, verticality, horizontality, acentrality, no longer appear as limits or terminal boundaries, but as contingent contours within a radical rethinking of spatiality and temporality. In contemporary physics an almost entirely different, new, conception of space, time, energy, matter has come about. Without abnegating classical models of the kinematic, causal world we inhabit, new empiricisms, evidentiary technics, and apprehensions of what is, take place, supplementing, modifying, preserving the lifeworld we inhabit. From the perspective of contemporary physics the universe is a truly bizarre place, almost beyond comprehension. At the same time, whether one apprehends these 'new models of the universe,' or finds them incomprehensible and obscure, one thing is certain: whatever is *there*, however static, dynamic, unyielding or strange, has been the case for the entirety of our lives, and there is something astonishing and marvellous in that simple observation. Other conceptions of *cosmos* endure and abound, from the *reductio ad infinitum* of turtles, to the paradoxical dispositions of deities, or the mysteries and orthodoxies of theologies, the pantheons or apophanies of other peoples. Nietzsche, an astute and athletic observer of nature, writes in his posthumously published notebooks, while hiking in the Alps,

«look, there, at that mountain; or above, at the clouds—what, I ask you, would be the case if you were to withdraw all that is human from such things, what phantasms might remain, oh, you sober ones, if only you could do that?»²³

Like every translation, this is a sort of paraphrase, but the point comes clear: a mountain is not a *mountain*, to a mountain; nor a dog a *dog*, and so on. Such very human terms have an invisibly abstract referential necessity imbricated in our grammar, and (only)

-
17. Dürer's Rhinoceros is the name commonly given to a woodcut executed by German painter and printmaker Albrecht Dürer in 1515. The image is based on a written description and brief sketch by an unknown artist of an Indian rhinoceros that had arrived in Lisbon in 1515. Dürer never saw the actual rhinoceros. Dürer's woodcut is not an entirely accurate representation of a rhinoceros, since he depicts an animal with hard plates covering its body like sheets of armour, with a gorget at the throat, a solid-looking breastplate, and rivets along the seams. Dürer places a small twisted horn on its back and gives it scaly legs and saw-like rear quarters. None of these features are present in a real rhinoceros.
18. Darwin, Charles, *The Expression of the Emotions in Man and the Animals* [London: John Murray] (1872).
19. Armstrong, Carol, *Scenes in a Library: Reading the Photograph in the Book, 1843–1875* [Cambridge, MA: MIT Press] (1998).
20. Audubon, John James (1785–1851). *American Flamingo*, Plate CCCCXXI, *The Birds of America* (1838) [hand colored engraving and aquatint on paper, 87.63 cm X 58.58 cm, No. 431].
21. Nancy, Jean-Luc, *The Pleasure in Drawing*, Philip Armstrong, trans., [New York: Fordham University Press] (2013).
22. Zimmer, Thomas, response to questions, live interview, 2014 [unpublished].
23. Nietzsche, Friedrich, *Nietzsche: Writings from the Late Notebooks*, Rüdiger Bittner, ed., [Cambridge: Cambridge University Press] (2003).

through that, in the world. A mountain, and other paratactic or proper names, serve as a structural aegis under which we might organize or demonstrate (cause to appear) in an orderly fashion a hierarchy of terms. Under *mountain* we might place the names *Fuji*, *Everest*, *Matterhorn*, *the Rockies*, *Appenines*, *Alps*, *Urals*, or *Himalayas*, and thereby construct a patterned regularity of semblance and signification. Mountains were considered inert, massive, static, and unmoving before Darwin, Lyall, and von Humboldt. The notion of geologic motion on such large scale as plate tectonics, now widely accepted (in spite of the resurgence of a few recent flat-earth theories) is of surprisingly recent manufacture. Pop culture representations of black holes, cyberspace, alternate dimensions or possible worlds—like representations of apparitions, revenants, hallucinations, miracles, or intoxications before them—are ubiquitous if, almost always, dramatically inaccurate. Still, they hold place for *something*. Though it has a rich etymology, we don't know how to name what *light* is, and we have a constant recourse to cumbersome descriptive formulations like «*sometimes a particle, sometimes a wave*,» or «*faster than...*» and we retain a similar metaphoric with, for example, electricity, naming it after a figure from Greek mythology, designating attributes (watts, volts, roentgens) after other proper names, or saying that electricity *flows*, and has *currents*, like water. We will say that a copy of a copy of a copy of a photograph carries—is—the same *image*, but, however well-established as habit or practice, this is a species of philosophical *nonsense*, and depends on an uncritical and phantasmic apprehension of the photographic artefact, that relentlessly defers the question of the *image*. This too, is a problem of abstraction.

The words object, objectus, objet, Gegenstand, oggetto, voorwerp all share the root meaning of 'throwing before,' a 'putting against,' or 'opposite,' as 'opposing.' In the English verb 'to object,' the oppositional, even accusatory sense of the word is still vivid. In an extended sense, objects throw themselves in front of us, smite the senses, thrust themselves into our consciousness. They are neither subtle, nor evanescent, nor hidden. Neither effort, nor ingenuity, nor instruments are required to detect them. They do not need to be discovered or investigated. They possess the self-evidence of a slap in the face. — Lorraine Daston²⁴

Michael Doser, a senior research physicist at CERN (*Conseil européen pour la recherche nucléaire*/European Center for Nuclear Research) in Geneva, Switzerland, where he specialises in working with antimatter, using it either as a tool (to study the strong interaction), or as an object of study in itself (concerning the formation of anti-atoms, the study of matter-

antimatter asymmetry, and the measurement of the gravitational interaction between matter and antimatter), has written on the role of photography²⁵ in scientific discovery, especially relating to cosmic radiation and antimatter. He demonstrates how an apparatus using a visual medium designed to react to photons could be successfully co-opted to detect invisible particles and antiparticles through the traces left by their collision, the so-called *annihilation events*. For Doser, the archaeologies of photography foreground the fact that the continuous presence of cosmic radiation indicates that every photograph is already a *doubled image*, carrying both a visible surface, formed by photons, and a latent *image* carrying traces of cosmic rays, this latter '*image*' persisting in a perpetual state of 'development.' It was the physical irregularity of the photograph, exposed to a continuous and uniform shower of cosmic radiation, that led Doser to speculate upon, and to rethink, image formation not through an external referent, but through an internal manipulation of a material substrate. In essence, without giving in to the irresolute fixation of an image, Doser defers his address to the question of what a '*camera*' might be. It is a direct, and brilliant, strategy, and it has an impending effect on both theoretical and genealogical aspects of photography. The 'auto-deconstruction' of the camera, from the inside out (or from image to the world), by inverting the conventional technical configuration of the apparatus, indirectly addresses both the problematics of the image, and the alterities and potentialities of image-production as scientific artefact (a *technischen-bild*, or technical image²⁶—which doesn't merely illustrate, depict, or represent a given or accomplished state, but that operates instead as an active and dynamic participant in the production of knowledge. It is an innovative and necessary approach, though not without certain methodological precedents (e.g., swapping out photons for electrons in the development of the scanning electron microscope). It is also an interesting subsidiary effect of Doser's work on photography that the implications of a technical archaeology of the image also recuperates and reveals a register of practices and researches that have been almost forgotten, and often remain unrecognized or obscure, but which have deflected or inverted certain processes of abstraction, drawing out of the imaging-processing of the camera a new means of drawing away, or abstracting what a camera is, or what it can be or do. It would be very interesting to continue to examine the axes of technics, abstraction, and capture, to write another, strange, alternate, history of the photographic apparatus, from early scientific imaging processes, such as chronophotography, fluoroscopy, and x-rays, from cloud chambers, to bubble chambers (e.g., Gargamelle at CERN) to contemporary 'camera-less, lens-less, aperture-less' cameras. Such an endeavor would be commensurate with a technical history of abstraction and capture.

24. Daston, Lorraine, *Biographies of Scientific Objects* [Chicago: University of Chicago Press] (2000).

25. See: Doser, Michael, «The World Unseen: Photography as a Probe of Particulate Materiality,» in *Philosophy of Photography* Vol.7, No. 1-2 (2016). Doser employs photographic emulsions to study the gravitational behaviour of antimatter. Doser is the editor of *Physics Letters B* and of the *Review of Particle Properties*. See also: Maudlin, Tim, *Philosophy of Physics. Quantum Theory* [Princeton: Princeton University Press] (2012), and Maudlin, Tim, *Philosophy of Physics. Space and Time* [Princeton: Princeton University Press] (2012).

26. Brederkamp, Horst, Vera Dunkel, Birgit Schneider, eds., *The Technical Image. A History of Styles in Scientific Imagery* [Chicago: University of Chicago Press] (2015); see also: Beshty, Walid, ed., *Picture Industry: A Provisional History of the Technical Image (1844–2018)* [JRP | Ringier] (2018).

Images

Leslie Thornton. *Palm Parrot* [*Binocular Series*, digital video/installation] (2010–ongoing)

Photo credit: L. Thornton, digital frame grab

Leslie Thornton. *Zebra* [*Binocular Series*, digital video/installation] (2010–ongoing)

Photo credit: L. Thornton, digital frame grab

Leslie Thornton. *Flamingo* [*Binocular Series*, digital video/installation] (2010–ongoing)

Photo cred: L. Thornton, digital frame grab

Leslie Thornton. *Blue Bird* [*Binocular Series*, digital video/installation] (2010–ongoing)

Photo credit: L. Thornton, digital frame grab

Angelo Vermuelen, *Biomodd LBA2 Project* (2009) mixed media, sensors, botanicals, installation

Photo credit: Angelo Vermuelen

Angelo Vermuelen, *Biomodd-TU-Delft Evolving Asteroid Starships Project* (2007–2011; ongoing)

Photo credit: Angelo Vermuelen

Mel Chin, *Revival Field* (1991-ongoing) mixed media, remediation of toxic waste site

Photo credit: Mel Chin

Natalie Jeremajenko, *Feral Robotic Dog Pack Release event* [detail] (2005) robotics, sensor technologies

Photo credit: Natalie Jeremajenko

Natalie Jeremajenko, *Weeping Trees: The Hard Way* (2011) mixed media, botanicals

Photo credit: Natalie Jeremajenko

CV

**Thomas Zimmer**

The European Graduate School
tomzimmer967@gmail.com

Thomas Zimmer is a philosopher, scholar, writer, artist and curator whose current researches address the relations between philosophy, technology and aesthetic practices. He is Director of the Graduate Program in Design [Graphic/Information] at Central Connecticut State University and Regular Faculty in Philosophy at the European Graduate School, Saas-Fee, Switzerland. His publications include «Projection and Dis/embodiment: Genealogies of the Virtual,» in *Into the Light: The Projected Image in American Art 1964-1977*, Chrissie Iles, ed., Whitney Museum of American Art/Harry Abrams, [reprinted 2015 in *Moving Image*, Omar Kholeif, ed., Documents of Contemporary Art Series, [Whitechapel/MIT Press]; «On the Notion of an Improvisatory Archive,» in *Biennale de l'Image en Mouvement 2018*, Geneva; «The Resistance of Shadows,» in *Ranbir Kaleka: Moving Image Works; CRASH: Nostalgia for the Absence of Cyberspace*, with Robert Reynolds; «*What the Hell is That?*» (Beehive, 2000), an experimental and humorous look at the rhetoric of cinematic monstrosity; *Portraits of Robots and Other Recent Works*; 'A Matter of Shadows,' in *Drawing Room/Double Take: Research Monograph*. He has translated works by Giorgio Agamben, Michel Foucault, Jean-François Lyotard, and others. Dr. Zimmer lives and works in Astoria, NY.