SYDNEY COLLEGE OF THE ARTS

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MEASURING BY MEASURING AGAINST:

A CONSIDERATION OF SCIENTIFIC METHODS IN CONCEPTUAL ART PRACTICES

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This is to certify that to the best of my knowledge; the content of this thesis is my own work. This thesis has not been submitted for any degree or other purposes.
I certify that the intellectual content of this thesis is the product of my own work and that all the assistance received in preparing this thesis and sources have been acknowledged.

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ABSTRACT

The entanglement of conceptual art practices, analytical philosophy and scientific enterprise is a unique provocation — exploring ideas of transference between the visual, the theoretical and the abstract. In this thesis, conducted in the dual modes of empirical (practice-led) and critical research, I aim to unpack these interrelationships — advocating for the recognition of a common, underlying methodological basis that cuts across disciplinary boundaries and activates disparate conceptual concerns. Traversing the historical lineage of conceptual praxis, I present Duchamp's proto-experimental investigations as the genesis of subsequent conceptual endeavours, leading to the establishment of formal 'idea art' in the mid-twentieth century. In addition to an analysis of the visual modalities associated with such practices, I argue that these propositional works draw inevitably on the fields of analytical philosophy, logic, and, ultimately, science itself. In this, I suggest there is a borrowing of *formalistic style* — a deeply vested structural aesthetic and systematised approach to the development of conceptual works that deploy the mechanics of the 'experiment' to engage the viewer *in the space of the mind*. Such activities pivot irresistibly towards modes of performative action, which amass artefactual documentation as a result of an explicit *testing of ideas in the field*. These theoretical arguments are buttressed by a sequence of 'experimental investigations' — a visual practice developed to consider notions of time and space as measured against a set of self-reflexive metrics. These works were manifest as a set of performative actions that consider questions of interstitial tension that arise near states of disciplinary juncture. Ultimately, the objective of these inquisitions was an assessment of self — to *test* and in turn *be tested* in service to preconceived methodological schema.

If the stars — or the patterns of their constellation — correspond to our present, the darkness that surrounds them is not empty, but rather full of constellations that might no longer or not yet be there. While looking at the darkness of the sky, we can imagine still invisible stars that might shine or never shine in front of our eyes. The darkness of the present is not empty, but rather it carries within it the possibility of a different constellation, of a universe different from the one we know, or the presence of other planets still preserved by the darkness of time. If the present manifests itself in the light, the darkness that surrounds it is first of all an exercise of imagination, and a space of contingency. The darkness is not the opposite of the light, but a laboratory where one can imagine a different conformation of the light. The darkness is not occupied by the nothing, but by the possible. Looking at the darkness of our time means to find the black spot of the present, where we can imagine a different conformation of the present; to be able to distance ourselves from the beast of time, to imagine — while firmly looking inside and almost archeologically digging in the dark of its eyes — a different form of the beast.

DANIEL BLANGA-GUBBAY,
"THE DISTANCE WITH THE PRESENT.
ON AGAMBEN'S NOTION OF THE CONTEMPORARY,"
IN *DOCUMENTA* 34, NO. 2 (2016): 94.

INTRODUCTION

At some point in the twentieth century, artists began adopting a new set of terms, referring to *tests*[1] and *experiments*,[2] *methods*[3] and *observations*.[4] They spoke of *systems,*[5] of *logic,*[6] *propositions*[7] and *hypothesis.*[8] Their actions became a demonstration of *theory*[9] and their studios were transformed into investigative spaces akin to the *laboratory.*[10]

Such terms have long formed part of my artistic vocabulary and I have defined my own conceptually-driven, performative practice by *leaning against*[11] the valuative qualities inherent in this *language system.*[12] The structure of this discourse is, I suggest, fundamentally loaded — orienting the audience (and the artist, as a result) toward a

[1] "I suppose it was a way of testing yourself to find out if you are really a professional artist. That's something I was thinking about at the time." From "Nauman Interview, 1970 with Willoughby Sharp" reprinted in Bruce Nauman, *Please Pay Attention Please: Bruce Nauman's Words: Writings and Iinterviews*, ed. Janet Kraynak (Cambridge, MA: MIT Press, 2005), 119.
[2] "So you can set those problems up so that they appear intellectually to be experiments." From "Bruce Nauman, January, 1972, Interview with Lorraine Sciarra," reprinted in Nauman, *Please Pay Attention Please*, 169–70.
[3] "The methodology directs the inquiry whose aim is to discover on what basis knowledge and theory may be possible… to uncover the links between idea and representation." From Mel Bochner, "Three Statements for Data Magazine," reprinted in Mel Bochner, *Solar System & Rest Rooms: Writings and Interviews, 1965–2007* (Cambridge, MA: MIT Press, 2008), 100.
[4] "This disconnected time, a lingering bias of tense in language, restricts our experiencing the conjunction between object and observation. When this conjunction is acknowledged, 'things' become indistinguishable from events. Carried to its conclusion, physicality, or what separates the material from the nonmaterial (the object from our observation), is merely a contextual detail." From Mel Bochner, "Excerpts from Speculation 1967–1970," reprinted in Bochner, *Solar System & Rest Rooms*, 72.
[5] "The system is the work of art; the visual work of art is the proof of the system. The visual aspect can't be understood without understanding the system. It isn't what it looks like but what it is that is of basic importance." From Saul Ostrow and Sol Lewitt, "Sol LeWitt," *BOMB*, no. 85 (2003).
[6] "I was interested in the logic and structure of math and especially how you could turn that logic inside out." From "Breaking the Silence: An Interview with Bruce Nauman, January 1987 with Joan Simon," reprinted in Nauman, *Please Pay Attention Please*, 323.
[7] "Works of art are analytic propositions. That is, if viewed within their context — as art — they provide no information what-so-ever about any matter of fact." From Joseph Kosuth, "Art After Philosophy," in Joseph Kosuth, *Art After Philosophy and After: Collected Writings, 1966–1990*, ed. Gabriele Guercio (Cambridge, MA: MIT Press, 1993), 20.
[8] "In the Hypothesis series I was investigating myself as an object that moves through space and time just like any other object, but unlike other specific three-dimensional objects, this one has a particular capacity; namely the capacity to register self-consciously the time and space I am moving through, to actually represent that consciousness symbolically — in photographs — and abstractly — in a coordinate grid, and communicate it." From "About the Hypothesis Series," in Adrian Piper, *Out of Order, Out of Sight* (Cambridge, MA: MIT Press, 1996), 19.
[9] Mel Bochner, "*Notes on Theory*: 1. hypothesis (what if…) 2. demonstration (it could be like this…) 3. theory (therefore it seems that…)," reprinted in Bochner, *Solar System & Rest Rooms*, xxii.
[10] "Places, things, and persons are seen at a distance as objects to be examined and studied. This laboratory like observation allows for the free-play of re-mixture and re-organization." From "PROJECTIONS OF HOME, January 1988," in Vito Acconci, *Vito Acconci: Writing, Works, Projects*, ed. Gloria Moure (Barcelona: Ediciones Polígrafa, 2001), 388.
[11] *Leaning against* is a term used by Maggie Nelson to describe her creative process of writing "with, from and for others." Maggie Nelson, "A Sort of Leaning Against: Writing With, From and For Others," in *The Writer's Notebook II: Craft Essays from Tin House*, ed. Francine Prose (Portland, OR: Tin House Books, 2012), 83–103.
[12] The concept of a *language system* of *language-game* was introduced by Ludwig Wittgenstein in his work *Philosophical Investigations* to demonstrate "the fact that the speaking of language is part of an activity, or a form of life," which instils meaning in language itself. Ludwig Wittgenstein, *Philosophical Investigations*, 3rd ed., trans. G. E. M. Anscombe (Englewood Cliffs, NJ: Prentice Hall, 1973), 23.

specific frame of thinking and mode of working — imbuing thoughts, actions and outcomes with the currency and methodological rigour of scientific activity — a *measuring by measuring against* that is as clear as it is unspoken.

The practice of conceptual art has, I argue, always assumed something of a scientific character, one that is surprisingly undocumented in contemporary critical analysis. This thesis is an attempt to address this omission and seeks to examine how the formal constructs of science and its philosophy have underscored the conceptual practices of artists for over a century.

I assert that certain processes, practices and *modes of thinking* inherent within conceptual art (and, by extension, contemporary practices informed by conceptual art) are indebted to the systematic rigours of modern science. By combining a programme of studio-led research and critical analysis, I aim to establish how conceptual processes and performative actions have been transformed by their proximity to, and application of, scientific thinking and its industry.

This research has been conducted both as a theoretical and empirical investigation — dual approaches accounting for the shared philosophical entwinement of the disciplines, as well as the practicality of their outputs. The 'two cultures' of artistic and scientific inquiry exist as both *noun* and *verb*: as bodies of knowledge amassed abstractly and sets of activities to be performed and tested.[13] Embracing the mobility of these perspectives,

[13] This notion was first proposed by C.P. Snow in his 1959 Rede Lecture and subsequent publication, *The Two Cultures and the Scientific Revolution*. Snow suggests that science and the humanities, which represented "the intellectual life of the whole of western society," had divided into two siloed cultural entities, a division that was detrimental to solving the world's problems. Further, Snow argues the competitiveness of various post-WWII societies would hinge on their capacity to harness scientific and creative cultural output through balanced educational outcomes and industrial ingenuity. C. P. Snow, *The Two Cultures and the Scientific Revolution* (Cambridge: Cambridge University Press, 1959).

this thesis consists of two parts: a series of practice-led *experiments*, designed to examine, subvert and react-to the procedural frames of scientific methodology; preceded by a broader critical survey that frames these activities within an art historical and contemporary context. While the field of conceptual practice is broad, I have focussed this re-examination on an established canon of conceptual art in the 1960s and '70s, primarily based in post-war America. I aim to disrupt and reframe the accepted narrative surrounding key conceptual practitioners, many (but not all) of whom have been white, male, and English speaking. Because it re-examines a canon, this project works within the limitations of this canon. Rather than turning away from their work, I have aimed to enter into and contend with this canon unapologetically: not to seek out alternate or hidden histories, but to claim the right of access and revision within an existing historical framework for my own purposes, as a female artist working in the twenty-first century. I will, in future projects, extend this analysis to engage with contemporary intersectional material and practitioners — in other words, to that which has lain outside the scope of this thesis.

METHODOLOGY OF RESEARCH

This research approaches art, science and philosophy as active, complex and entangled ecologies, which require perpetual (re)definition and *testing in the field*.[14] As Gilles Deleuze intimates, these disciplines are "separate melodic lines in constant interplay," which should be offered neither "pseudoprimacy, nor equally, any creative inferiority."[15] Rather, approached as equals, an engagement with science and art through their shared

[14] The notion of *entanglement* is introduced repeatedly in this thesis to give clarity and additional texture to the term *interdisciplinary*, the use of which feels insufficient on its own to describe genuine, complex collaborations across disciplinary boundaries. Entanglement implies complexity and interwovenness, and signals toward the messy, *performative* character that I ascribe to interdisciplinary actions and experiments conducted *in the field*.

[15] Gilles Deleuze, "Mediators," in *Negotiations, 1972–1990*, trans. Martin Joughin (New York: Columbia University Press, 1995), 125.

philosophical basis allows for an equilibrating of the methodological, the creative, the performative, and the speculative through interdisciplinary convergence.

METHODOLOGICAL OUTLINE

The objectives of this thesis are framed around two central hypotheses:

Hypothesis 1:

The systems and process-based practices that we have come to refer to as *conceptual* art (or *conceptualism*) are indebted to the methodological structures of contemporary science and its philosophy.

Hypothesis 2:

The role of performativity in method production is common to the practice of conceptual art and the experimental sciences.

Through a combination of both theoretical and empirical research, these hypotheses will be explicated in detail. The theoretical components of this study are presented in a series of chapters, as per the summaries outlined below. My practice-led research is documented as a set of empirical outputs, henceforth known as *experiments*, created in response to the core propositions defined above.

METHODOLOGY OF THE THEORETICAL

Addressing the limitations of an art historical approach that "tends to look mainly at the art object and its transformations, rather than the changing procedures of art-making or the repositioning of the artist in the social or cultural field," chapters one, two and three examine the methodological practices within conceptual art that have been adopted and/or adapted from modern science and its philosophical discourse.[16] Seeking to expand on dialogues introduced by Newman and Bird,[17] Osborne,[18] Metzel[19] and van Winkel, I present an interpretation of conceptual art framed by the notion of a *methodological turn*, acknowledging a structural proximity to the practices of contemporary experimental science. In the context of such analysis, I examine the tendency of key conceptual figures to draw upon the philosophy of science, investigating the response of various artists to the works of, for example, Henri Poincaré,[20] A.J. Ayer,[21] Thomas Kuhn[22] and, most notably, Ludwig Wittgenstein.[23] While conceptual art's relationship with such philosophy is well-documented, I seek to address the unarguably scientific origin of this material and its ensuing impact on the development of conceptual practice throughout the twentieth century.[24] This historical analysis is evaluated in the context of more recent practices that Camiel van Winkel would consider

[16] Camiel van Winkel, *During the Exhibition the Gallery will be Closed: Contemporary Art and the Paradoxes of Conceptualism* (Amsterdam: Valiz, 2012), 20.
[17] Michael Newman and Jon Bird, eds., *Rewriting Conceptual Art* (London: Reaktion, 1999).
[18] Peter Osborne, *Conceptual Art* (New York: Phaidon, 2011).
[19] Eve Meltzer, *Systems We Have Loved: Conceptual Art, Affect, and the Antihumanist Turn* (Chicago: University of Chicago Press, 2013).
[20] Duchamp extensively details the work of Henri Poincaré, which will be discussed in chapter one.
[21] Mel Bochner quotes A.J. Ayer (along with Husserl and Hume) in his 1967 article for Arts Magazine, "Serial Art Systems: Solipsism," cited in Bochner, *Solar System & Rest Rooms*, 37.
[22] Thomas Kuhn's *The Structure of Scientific Revolutions* is cited by a wide range of artists, including Art & Language, Joseph Kosuth and Mel Ramsden.
[23] Wittgenstein is directly referred to in the works of multiple artists, including Mel Bochner, Joseph Kosuth and Bruce Nauman.
[24] See Peter Osborne, Elisabeth Schellekens and Peter Goldie.

"post-conceptual,"[25]examining how both conceptual and scientific strategies have been employed in a contemporary context.

Chapter four investigates the inherent performativity of method and its application, locating the *experiment* as a normative site for performative behaviour in both conceptual art and experimental science. Building upon John Law's assertion that all method practices are performative, in that "[t]hey help to enact the world that they describe,"[26] I will consider the pseudo-scientific worlds constructed in the studio-as-laboratory, which produce "dynamic, creative, constructive and normative actions" in much the same manner as their scientific counterparts.[27] I will evaluate varying constructs of performativity within the critical discourse of performative practices and will employ the terms p*erformative action* (inferring process-based, methodologically-driven work that assumes a scientific 'testing' role), and *performative artefact* (identifying objects activated by/through a performative agenda) to situate methodologically-charged work in this broader environment. Additionally, this chapter will consider how such gestures have been resumed in contemporary artistic practices, in what Anneke Jaspers regards as a "return to performative strategies in art-making" that characterised "ideas of the 1960s' avant-garde."[28] Here the *verb*-like properties of art and science will be explored to underscore an inherent reciprocity bound to the act of *doing.*

[25] In *During the Exhibition the Gallery will be Closed,* van Winkel considers 1970 to be the historical starting point for contemporary art, and therefore defines contemporary practices as "'post-conceptual' in the double sense of *coming after* and *permeated by…* [as] *all* art produced since the 1970s has had to come to terms with the legacy of conceptual art." Van Winkel, *During the Exhibition the Gallery will be Closed*, 13.
[26] John Law, "Seeing Like a Survey," *Cultural Sociology* 3, no. 2 (2009): 249.
[27] Henk Borgdorff, "Artistic Practices and Epistemic Things," in *Experimental Systems: Future Knowledge in Artistic Research*, ed. Michael Schwab (Leuven: Leuven University Press, 2013), 115.
[28] Anneke Jaspers, "Spectres of the Sixties," in *Framed Movements*, ed. Sally Gardner, Lauren Dornau, Anneke Jaspers and Hannah Mathews (Melbourne, Vic: ACCA, 2014), 17.

METHODOLOGY OF THE EMPIRICAL

A natural part of the scientific method is to test theory through experimentation, and the final component of this thesis documents my efforts to enact similar paradigms through a performative conceptual practice. I have sought to bring physicality to abstract notions of science, engaging ideas of *definition*, *proposition*, *proof* and *theorem* as active mechanisms pursued through *performative action*. The creative work undertaken has consisted of a set of *experiments*, each developed around a unique hypothesis, performative methodology and system of data collection, generating experimental results that encompass not only the original action but an additional range of *performative artefacts*, including images, objects and text-based outcomes, audio-visual documentation and archival material.

This particular mode of research was developed to investigate scientific structures from within their own apparatus, assessing their utility within an arts-based practice and exploring opportunities for adaptation, subversion and reinterpretation. It is a methodology that extends upon the experimental modes of conceptual practitioners, such as Marcel Duchamp, Mel Bochner, Bruce Nauman, John Baldessari, Vito Acconci, On Kawara and Tehching Hsieh, and more recently Katie Patterson, Simon Faithfull, Guido Van der Werve and David Horvitz, who have all adopted forms of process-based experimentation as part of their long-term artistic strategies. As curator Fabiola Iza has noted, art history has often neglected the study of such generative processes, instead favouring an analysis of what such methods produce and thus framing "artworks as autonomous, immutable objects."[29] While conceptual operations tended to repudiate such dislocation, this study seeks to go further. Through both its theoretical and practice-

[29] Fabiola Iza, "Out of Frame," in *Out of Frame: Gabriel de la Mora*, ed. Fabiola Iza (2018), 11, http://gabrieldelamora.com/fueradecuadro/FUERA-DE-CUADRO-ENG.pdf.

led objectives, I attempt to not only elevate the methodological and process-based strategies found within conceptual practices, but to attribute to these methodological interventions a scientific origin. This effort, as François-Joseph Laponte suggests, acknowledges that the "essence of this experimental approach holds much to the act of experimenting, and not just to the results and products of such experiments."[30]

Seeking to extrapolate these same pseudo-scientific strategies to the work's written form, my various *performative actions* are presented as a collection of *scientific papers* — an experimental literary device that adapts the structure, tone and evaluative tools customarily applied to formal scientific writing and analysis. While such an approach is undoubtedly novel, it is one uniquely suited to a performative practice examining scientific methodology. Consequently, the *scientific papers* presented here are to be considered *performatively*, and should be seen as an *activity* or an *action in their own right* — one that will require form and mode of expression to be considered as much as content.

Despite my compliance to a scientific framework, as an artist I have also been afforded a singular opportunity for subversion — to apply the mechanisms of scientific labour against themselves, in order for them to be evaluated more critically. I argue that in order to test the concept of scientific rigour, one needs the capacity to push against it — articulating *what it is* by demonstrating *what it is not*. The format of an experiment (and by extension, the experimental write-up) provides not only context but also opposition, situating the work and its conceptual objectives in a particular form of tension, one that is intentionally exploited to advance the assertions of this thesis.

[30] François-Joseph Lapointe, "On the Role of Experimentation in Art (and Science)," *NMC media-n : Journal of the New Media Caucus* 11, no. 3 (2015), http://newmediacaucus.org/journal.

I will detail a collection of four works across three papers, documenting the theoretical and experimental approaches developed for each of the performative actions undertaken. These papers, like the works they delineate, are interwoven refrains — calculated attempts to explore not just the *map and its territory,*[31] but also the *cartographic acts of creation* — that bind the theoretical to the construct through methodological intercession. Here, method is an intermediary, a tool that supports as it dissects. In this way, I aim to illustrate how the methods of science have come to inform conceptual art and how both now inform me: making my own methods, work, and this research possible.

THE END OF THE BEGINNING

Any act of measuring, and thus, of *measuring by measuring against* infers an examination of intrinsic value by allowing two distinct systems to be brought into a field of comparison. It is through such proximity that individual traits can be assessed, and overlap acknowledged. This process in no way eliminates nor imposes upon individual agency — each component remains a separate entity serving its own unique purpose. Rather, it is an acknowledgement of self-reflexivity — a mode of intersection that can actively dissolve as it demarcates — recognising adaptive potential without assuming equivalence or sameness. It is from this perspective that I consider the activities of conceptual practitioners in relation to their scientific counterparts — that in leaning into the methodological and performative modes of scientific discourse, conceptual artists

[31] This analogy is made with consideration of the map-territory relations described by scientist and philosopher Alfred Korzybski and the understanding that "A map *is not* the territory it represents, but, if correct, it has a *similar structure* to the territory," in a similar way that an idea and an artwork may possess *similar* structural frameworks yet continue to operate independently. Alfred Korzybski, *Science and Sanity: An Introduction to Non-Aristotelian Systems and General Semantics* (Brooklyn, NY: International Non-Aristotelian Library Pub. Co., 2000), 58.

were able to examine their own agendas, providing a radical interpretation of what art could be and how artists could work.

Consequently, this thesis operates neither as a survey nor a definitive history of conceptual practice, performance, science or philosophy — rather it is a contextual prism through which these disparate fields can be viewed together. It is a consideration of both *noun* and *verb*-like properties that such terms imply, to produce not only a field of knowledge but also an *activity* — a specific mode of working, thought process and physical practice informed by ideas as much as by action and outcome.

As social theorist John Culkin wrote, "We shape our tools and thereafter our tools shape us,"[32] and it is with this underlying philosophy that I have approached all that follows — the activity of shaping the tools of my practice that, through the process of shaping, have come to shape me. It is an operation that will continue *ad infinitum*, with no beginning and no end. What is presented here is an articulation of this incremental process, an excerpt *of action, about action, in action.*

[32] J.M. Culkin, *A Schoolman's Guide to Marshall McLuhan* (New York: Saturday Review Inc., 1967), 54.

THEORETICAL RESEARCH

CHAPTER ONE: A METHODOLOGICAL TURN

The task of defining conceptual art is not a straightforward one.

Bereft of a singular unifying theory and operating neither strictly as a movement nor a style, conceptual art has always possessed an elusive and mercurial disposition.[1] Representing a broad cross-section of attributes and methodological strategies, it has operated as an imprecise term[2] and an ambiguous classification — one that has paradoxically sustained its currency through its own malleability — allowing a "contested field of multiple and opposing practices" to be brought together into an amorphous coalescence.[3] Paraphrasing mathematician and physicist Blaise Pascal, artist Mel Bochner once described his work as "a sphere whose centre is everywhere, but whose circumference is nowhere," a statement that could have just as easily been applied to conceptual art itself.[4] Even at its apogee, when its methods were prevalent, conceptual art was always a tacit construction — one built upon, leant into, or indeed refuted as needed — a measure by which artists and theorists *measured against* in order to examine interrelated yet independent narratives.

What has become evident through repeated attempts to delineate the edge (or multiple edges) of conceptual art is that regardless of the chosen point of indexation, or the ideological attributes prescribed, conceptual art consistently represents a dynamic shift in

[1] Curator Andrew Wilson, cited in Isaac Kaplan, "If You Don't Understand Conceptual Art, It's Not Your Fault," *Artsy*, March 31, 2016, https://www.artsy.net/article/artsy-editorial-if-you-don-t-understand-conceptual-art-it-s-not-your-fault.
[2] Lizzie Borden, "Three Modes of Conceptual Art," *Artforum*, no. 10 (1972): 68.
[3] Alexander Alberro, "Reconsidering Conceptual Art, 1966–1977," in Alexander Alberro and Blake Stimson, eds., *Conceptual Art: A Critical Anthology* (Cambridge, MA: MIT Press, 1999), xvii.
[4] A description given to his experimental text-based intervention *The Domain of the Great Bear*, created in 1966 with Robert Smithson. Quote featured in Mel Bochner, "Secrets of Domes (2006)," in Bochner, *Solar System & Rest Rooms*, 201.

the activity and attitude of artistic practices — one in which the methodological processes of artistic action were themselves moved to the forefront. As noted by Rosalind Krauss, Alexander Alberro, Thierry du Duve and Benjamin Buchloh, the only consensus that truly appears among artists and theorists alike is "that redefining the conditions of the frame of a work of art is something that conceptual art put into the conversation [maybe]." [5]

It is the nature of this methodological change that is the central concern of my own research — to not only recognise the profound change of *methodological structure* that conceptual art represents, but to consider the influences that helped define this methodological rupture. Rather than viewing the genesis of conceptual practice as an event unto itself, I instead contend that the development of contemporary science and its supporting philosophical discourse in the first half of the twentieth century created a societal environment that both visually and philosophically influenced the actions, structures and aesthetics that we now associate with conceptual art and its historical legacy.

1.1 TURNING TOWARD METHOD

That a shift in the nature and practice of art occurred in the mid-twentieth century is undisputed, yet what precipitated this shift remains speculative, a culmination of factors in which I argue an emergent interest in the methods of science is one.

[5] Benjamin Buchloh et al., "Conceptual Art and the Reception of Duchamp," *October* 70 (1994): 145.

The methodological changes that conceptual art exemplified have been characterised by theorist Peter Wollen as "the greatest shift in art since the Renaissance,"[6] and could be further understood by what philosopher of science Thomas Kuhn would term a "revolution."[7] Conceptual practitioners enacted a paradigmatic rupture that reshaped the field of art from new fundamentals, "a reconstruction that change[d] some of the field's most elementary theoretical generalisations as well as many of its paradigm methods and applications."[8] In severing artistic intent from aesthetic output, conceptual art established a new self-reflexive, analytical model for artistic production, one that elevated idea and action above outcome, valuing concept and process above result.

I proceed from the premise that this was an inherently 'scientific' gesture — one indebted to scientific method, scientific philosophy and a prevailing scientific attitude that had found footing within the cultural zeitgeist of the twentieth century. I propose that these gestures can be traced back to a multitude of sources — evaluating the methodological changes that occurred not only within the visual output of practitioners (in the form of artworks and performances) but also as evidenced through the artist's own words (demonstrated in broader forms of communication, including text-based interventions, interviews and written commentary) that position the artist's work within ideological contexts. This reveals not only their own structural and methodological narratives, but a larger socio-cultural framework that defined the period in which they worked.

This re-examination of conceptual practice is situated in the context of contemporary scholarship of theorists such as Camiel van Winkel, Eve Meltzer, Peter Osborne, Jörg

[6] Luis Camnitzer et al., *Global Conceptualism: Points of Origin, 1950s–1980s* (New York: Queens Museum of Art, 1999), 81.
[7] Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 4th ed. (Chicago: University of Chicago Press, 2012).
[8] Ibid, 85.

Heiser, Jon Bird and Michael Newman, who have sought to leverage the inherent ambiguity surrounding conceptual art to re-examine conceptual enterprise from a broader frame of reference. Such research suggests that there is a more expansive interpretation of the conceptual agenda and further room for interpretation, an effort that Meltzer suggests can ultimately "recalibrate the intellectual-historical optic under which we interpret the meaning of these far-reaching aesthetic forms — even further reaching, that is, than our ordinary understanding of 'conceptual art' has allowed us to see."[9] As Heiser intimates: "while conceptual art may have been advocated for with particular force and conclusiveness by its western, male, cosmopolitan and hence canonical proponents, their claim is by no means exclusive, and that the definition of what may be considered conceptual art has been subjected to repeated restrictions by interested parties as a way of dominating the field accordingly."[10]

The theoretical advantage of such re-litigation is in the capacity of such endeavours to extend beyond the confines of the historical, to address the expanded field of conceptual practices — including terms such as conceptualism[11] and post-conceptual[12] — transporting assessment of the conceptual past into actions of the present. Consequently, I follow van Winkel's lead and look to "conceptual art from a deliberately anachronistic point of view, taking into account after-effects that may never have been planned or foreseen by the artists in question or their advocates."[13] Similarly, I evaluate "the original

[9] Meltzer, *Systems We Have Loved* , 8–9.
[10] Jörg Heiser and Ellen Seifermann, *Romantischer Konzeptualismus* (Bielefeld: Kerber, 2007), 141.
[11] Although widely used as an interchangeable term with conceptual art, some scholars have tried to disambiguate meanings, suggesting that *conceptualism* refers to conceptual gestures that sit outside the established conceptual canon (temporally, geospatially or culturally).
[12] Camiel van Winkel suggest that the term *post-conceptual* is made in reference to contemporary practices both "*coming after* and *permeated by* conceptual art." Van Winkel, *During the Exhibition the Gallery will be Closed*, 13. This position is supported by Peter Osborne, who indicates that "'post-conceptual art' is not the name for a particular type of art, so much as the historical-ontological condition for the production of contemporary art in general." Peter Osborne, "Art Beyond Aesthetics: Philosophical Criticism, Art History and Contemporary Art," *Art History* 27, no. 4 (2004), 666.
[13] Van Winkel, *During the Exhibition the Gallery will be Closed*, 12.

ideas and intentions in close connection to their offshoots and derivatives, whilst trying to avoid the danger of teleological reduction."[14] From this frame it is clear that the methodological and philosophical apparatus of science has received scant recognition for the development of the logical systems and propositional schema present within conceptual practices, and yet I argue, the contributions of such mechanisms are far reaching, and readily identifiable within both the written and visual work of key conceptual practitioners.

This line of inquiry does not seek to frame conceptual practices (either historical or contemporary) *as* or *becoming* singularly scientific, nor to consider such work as an extended form of scientific philosophy. It is not designed to ascribe conceptual activity with any enduring scientific merit or allude to the establishment of hybridised form or *third culture.*[15] Rather, it is my intention to recognise the way in which conceptual practitioners were *leaning into* and *leaning against* the structural integrity of scientific disciplines to validate their own investigative concerns. The 'experiments' of conceptual art were not constructed as empirical studies designed to generate certainty; instead, they provided a format that facilitated structure and focus upon the idea itself — allowing the gesture, the activity, and the *performative action* to be registered as essential. And while not intimating any specific scientific agenda, they can collectively be seen to demonstrate a sensibility, a mode of expression, a cadence, which speaks to the procedural nature of scientific disciplines and the philosophical questions that defined their growth.

[14] Ibid.

[15] The term *third culture* was first coined by John Brockman in 1995 in his book *The Third Culture: Beyond the Scientific Revolution* (New York: Simon & Schuster, 1995), and has since been adapted by a number of art-science scholars, including Victoria Vesna and Arthur I. Miller, to advocate for an alternative categorisation in which the boundaries between art and science dissolve.

1.2 DUCHAMP AND PROTO-CONCEPTUALISM

In order to ascertain the extent of this methodological affect, it is necessary to open the definitional aperture of conceptual practice and consider earlier proto-conceptual frameworks that, in their radical departure from artistic norms, laid the groundwork for subsequent conceptual developments. For this purpose, I specifically look beyond the 1960s to examine the work of Marcel Duchamp, the French-American painter, sculptor, chess player and writer who, beyond his contributions to Cubism and Dada, is widely regarded as "the grandfather of conceptual art."[16]

Duchamp is unquestionably a pivotal figure in art history whose immense impact spans both twentieth century art and twenty-first century art marking practices. He is particularly relevant to my own research in that not only is his work instrumental to later conceptual developments (a subject examined further in chapter two) but, as demonstrated by the scholarship of Linda Dalrymple Henderson, Thierry du Duve, Herbert Molderings, Craig Adcock and James Housefield, Duchamp was also significantly invested in and influenced by the scientific discourse of his era, providing "the foundation on which Duchamp developed his new style of experimental visual thinking, a form of artistic imagination that explores the absurd constellations of ideas against the background of scientific logic."[17]

[16] Calvin Tomkins, "No More Boring Art," *The New Yorker*, 18 October, 2010, 42.
[17] Herbert Molderings, *Duchamp and the Aesthetics of Chance: Art as Experiment* (New York: Columbia University Press, 2010), 90.

While there has been considerable examination of Duchamp's influence upon conceptualism,[18] and also science's influence upon Duchamp,[19] there has been surprisingly little consideration of what this causality logically implies: that, if we accept Duchamp was influenced by science and scientific strategies, then these same mechanisms are (either consciously or inadvertently) embedded within any subsequent conceptual agenda developed as a result of Duchamp's practice.[20] This suggests that conceptualism is (at least abstractly) indebted to these same revolutions in early twentieth century science that influenced the trajectory of Duchamp's thinking and mode of working.

1.3 IN SERVICE TO THE MIND

In 1912, Marcel Duchamp found himself rejected by the Parisian artworld. His two elder brothers, both preeminent figures in the Cubist movement, were tasked with travelling to the artist's studio in Neuilly-sur-Seine to inform him that the hanging committee of Salon des Indépendants (of which they were part) were formally requesting he withdraw his submission to their upcoming exhibition.[21] The work in question, *Nude Descending Staircase* (fig. 1) had become a point of contention. It was argued not only that "a nude never descends the stairs — a nude reclines,"[22] but that the painting itself, an eruption of

[18] *The Duchamp Effect*, ed. Martha Buskirk and Mignon Nixon (Cambridge, MA: MIT Press, 1996) collates a number of articles originally published in *October*, examining the relationship between Duchamp and conceptual art, a link also recognised by most conceptual theorists including Osborne, Godfrey and Alberro.

[19] See Linda Dalrymple Henderson, *The Fourth Dimension and Non-Euclidean Geometry in Modern Art* (Cambridge, MA: MIT Press, 2013); Thierry de Duve, ed., *The Definitively Unfinished Marcel Duchamp* (Halifax, NS: Nova Scotia College of Art and Design, 1991); Molderings, *Duchamp and the Aesthetics of Chance*; Craig Adcock, "Conventionalism in Henri Poincaré and Marcel Duchamp," *Art Journal* 44, no. 3 (1984); and James Housefield, *Playing With Earth and Sky: Astronomy, Geography and the Art of Marcel Duchamp* (Hanover, NH: Dartmouth College Press, 2016).

[20] A notable exception is here is Michael Schwab, ed., *Experimental Systems: Future Knowledge in Artistic Research* (Leuven: Leuven University Press, 2013), which integrates a scientific reading of Duchamp's practice within conceptual narratives.

[21] Jacques Villon (a painter and print maker) and Raymond Duchamp-Villon (a sculptor) were, along with their younger brother Marcel, part of the Section d'Or, a prominent collective of painters, sculptors and critics associated with Cubism and Orphism, active in Paris from 1911–14.

[22] "Philadelphia Museum of Art – Collections Object: Nude Descending a Staircase (No. 2)." Philamuseum.org, 2020, https://philamuseum.org/collections/permanent/51449.html.

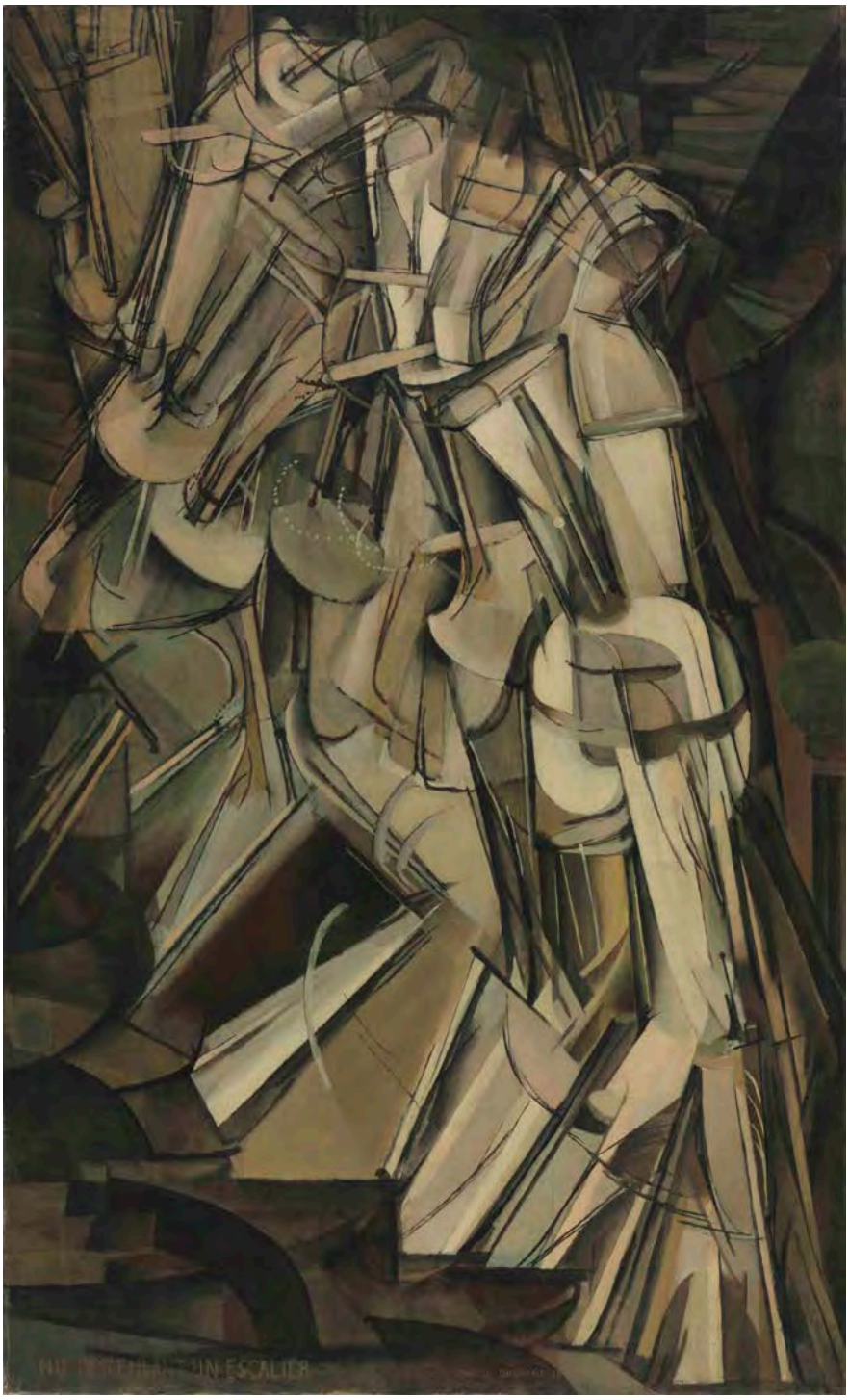

FIGURE 1.

MARCEL DUCHAMP
NUDE DESCENDING A STAIRCASE (NO. 2)
1912
OIL ON CANVAS
147 × 89.2 CM
THE PHILADELPHIA MUSEUM OF ART

conical repetition inspired by Victorian-era scientific studies of motion (fig. 2–4) (known as chronophotography)[23] once famously described as "an explosion in a shingle factory,"[24] was somehow an affront to the "established notion of what Cubism should be."[25]

The fiasco led to the young Duchamp taking an extensive tour of Europe's major institutions, an activity that would cause even further disillusionment. Duchamp would note that in contrast to the works of the Renaissance and the Baroque that, in his view, "had all been in service of the mind,"[26] the paintings of his contemporaries were a form of 'retinal art' displaying little to no engagement with anything beyond the painterly surface.[27] "I was interested in ideas — not merely in visual products,"[28] he would state, in contrast to the work of his age that demonstrated "no thought of anything beyond the physical side of painting. No notion of freedom was taught. No philosophical outlook was introduced."[29]

Concerned by this apparent lack of philosophical rigour and determined to develop a new approach, Duchamp returned home and retreated from both the canvas and the

[23] Chronophotography is a nineteenth century photographic technique designed for the scientific study of locomotion, which captures a rapid sequence of images, revealing movement unseen by the human eye. French physiologist Étienne-Jules Marey and English–American photographer Eadweard Muybridge are both considered pioneers of this technique that had implications for the scientific study of human/animal movement, becoming a source of inspiration for avant-garde art experimentation. The influence of chronophotography is explored in depth in Douglas Rosenberg, Nicolás Salazar-Sutil, and Sebastián Melo, *Exposed to Time* (Oxofrd: Oxford University Press, 2016).
[24] "Explosion in a Shingle Factory," *New York Times*, August 3, 1975, 197.
[25] Duve, ed., *The Definitively Unfinished Marcel Duchamp*, 51.
[26] Molderings, *Duchamp and the Aesthetics of Chance*, 8.
[27] The concept of *retinal art* is attributed to Marcel Duchamp and specifically refers to art which appeal to the eye rather than the mind. In his interview with Cabanne in 1966 he would expand on this term, stating: "From too great an importance given to the retinal. Since Courbet, it's been believed that painting is addressed to the retina. That was everyone's error. The retinal shudder! Before, painting had other functions: it could be religious, philosophical, moral. If I had the chance to take an antiretinal attitude, it unfortunately hasn't changed much; our whole century is completely retinal, except for the Surrealists, who tried to go outside it somewhat. And still, they didn't go so far! In spite of the fact that Breton says he believes in judging from a Surrealist point of view, down deep he's still really interested in painting in the retinal sense. it's absolutely ridiculous. It has to change; it hasn't always been like this.", Pierre Cabanne, *Dialogues with Marcel Duchamp*, ed. Marcel Duchamp (New York, NY: Da Capo Press, 1987), 43.
[28] Duchamp, quoted in "Eleven Europeans in America," James Johnson Sweeney, ed., *The Museum of Modern Art Bulletin* 13, no. 4/5, 1946, 20.
[29] Ibid, 7.

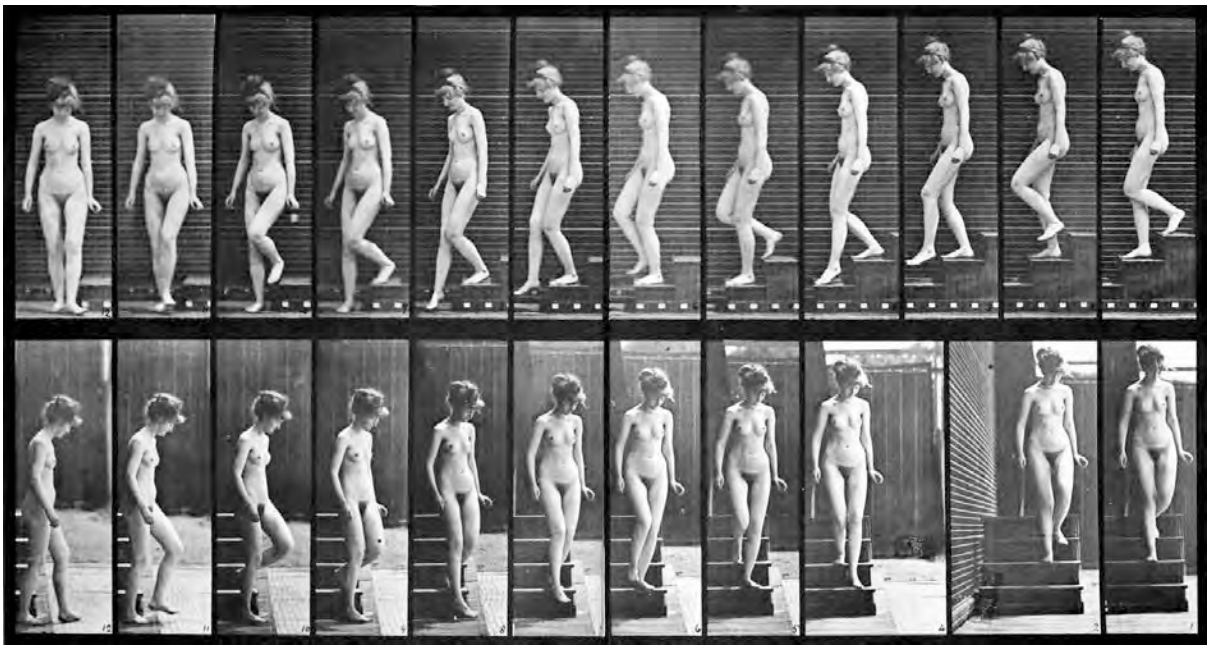

FIGURE 2.

EADWEARD MUYBRIDGE
FEMALE NUDE MOTION STUDY
C. 1887

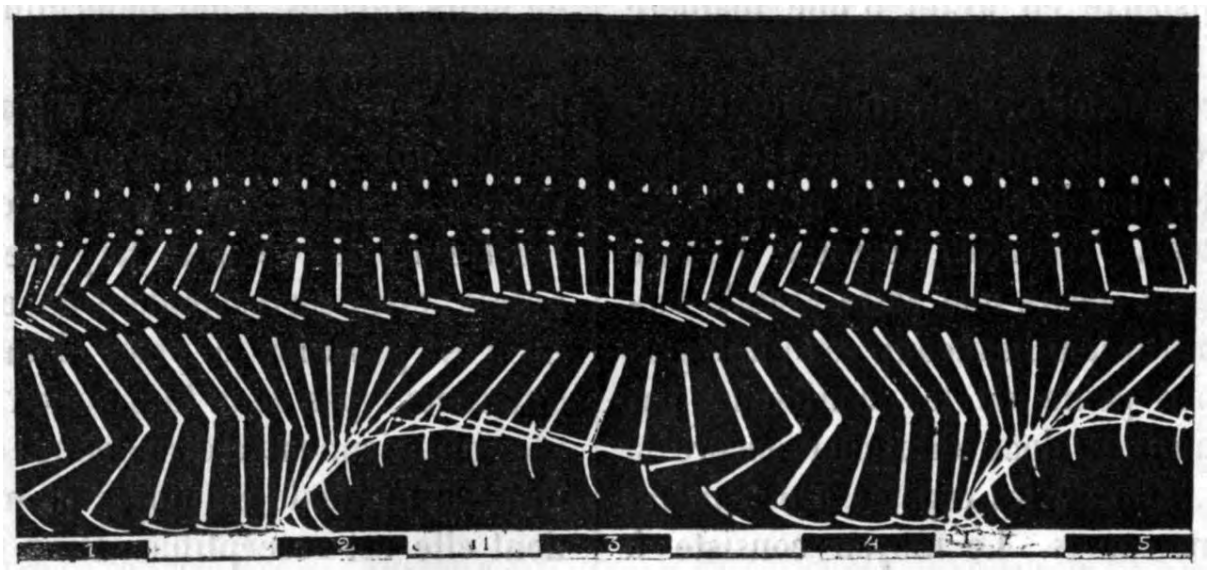

FIGURE 3.

ETIENNE-JULES MAREY
LINEAR GRAPH OF RUNNING MAN IN BLACK WITH WHITE STRIPES
C. 1882
CHRONOPHOTOGRAPH

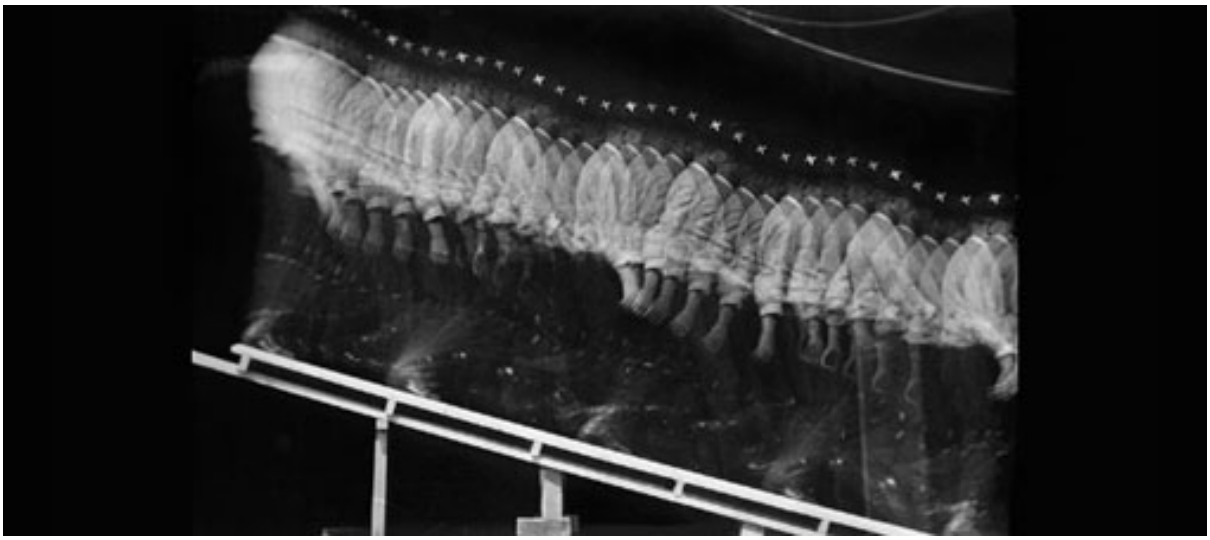

FIGURE 4.

ETIENNE-JULES MAREY
DESCENT OF INCLINED PLANE
C. 1882
CHRONOPHOTOGRAPH

Parisian art scene, embarking on an alternate career path in librarianship, enrolling in a course at the Sorbonne and gaining employment at the Biblothèque Sainte-Geneviève by 1913.[30] It was here that Duchamp pursued the independent education that he truly sought, immersing himself in the theoretical disciplines of his era, including geometry, philosophy, science and perspective.[31] Duchamp would prove particularly enamoured with the work of preeminent mathematician, physicist and philosopher of science Henri Poincaré, whose fundamental contributions to the fields of pure and applied mathematics, mathematical physics and celestial mechanics led him to be regarded as the 'Last Universalist,' who excelled in all disciplines that existed in his lifetime.[32] It was from this intensive grounding in science and philosophy that Duchamp's artistic character would take form, as noted by Craig Adcock: "through reading Poincaré, Duchamp found a paradigm for articulating his art problems; science provided a metaphorical schema for defining the process of making art."[33]

1.4 A MENDING OF METHOD: THE STANDARD STOPPAGE

No work so clearly demonstrates the impact that science (and particularly an obsession with Poincaré's work on non-Euclidean geometry had upon Duchamp's artistic practice) than *3 Standard Stoppages* (1913–14) (fig. 5).[34] Made prior to his monumental 'Large

[30] Molderings, *Duchamp and the Aesthetics of Chance*, 8. In *The Definitive Unfinished Marcel Duchamp,* Duchamp states: "I wanted to be free of any material obligation… so I began a career as a librarian, which was a sort of excuse for not being obliged to show up socially [as an artist]," 51.

[31] Molderings, *Duchamp and the Aesthetics of Chance*, 8.

[32] Eric Temple Bell, *Men of Mathematics* (New York: Simon and Schuster, 1965). In addition to his notable contributions to multiple fields of science, Poincaré was also responsible for a broader popularisation of contemporary scientific advancements. His four publications, *Science and Hypothesis* (1902), *The Value of Science* (1905), *Science and Method* (1909) and *Last Thoughts* (1913), presented complex scientific ideas with an appreciation of their philosophical implications, addressing the aesthetics of systems from a physical (human) perspective and a mathematic viewpoint simultaneously. The proximity of these dual proposition and his capacity to deliver them with clear, succinct prose — often bordering on poetry — meant that his work appealed not only to a scientific audience but a broader community of intellectuals with an interest in the history of mathematics and the philosophy of science. Thus, the influence of his work extends from scientists such as Einstein and George David Birkhoff to philosophers such as Louis Rougier and a range of artists who expressed an interest in the fourth dimension, including Marcel Duchamp, Pablo Picasso, Albert Gleizes, Jean Metzinger and M. C. Esher (to name a few).

[33] Adcock, "Conventionalism in Henri Poincaré and Marcel Duchamp," 251.

[34] Non-Euclidean geometry refers to the study and implantation of curved surfaces in contrast to flat (Euclidean) spaces.

FIGURE 5.

MARCEL DUCHAMP
3 STANDARD STOPPAGES
1913–14; SCHWARZ EDITION 1964
WOOD BOX 28.2 X 129.2 X 22.7 CM, WITH THREE THREADS 100 CM
GLUED TO THREE PAINTED CANVAS STRIPS 13.3 X 120 CM,
EACH MOUNTED ON A GLASS PANEL 18.4 X 125.4 X 0.6 CM,
THREE WOOD SLATS 6.2 X 109.2 X 0.2 CM,
SHAPED ALONG ONE EDGE TO MATCH THE CURVES OF THE THREADS
YALE UNIVERSITY ART GALLERY

Glass' (*The Bride Stripped Bare by Her Bachelors, Even*)[35] and predating (or produced concurrent to) his most notable readymade fabrications, including *Bicycle Wheel* (1913),[36] *Bottle Rack* (1914)[37]and *Fountain* (1917),[38] *3 Standard Stoppages*, in both its conceptual framing and physical outcome, signalled a profound shift in the artist's methodological approach — one that demonstrated a distillation of scientific process into artistic form.

When asked in his 1962 interview with Katherine Kuh which of his works he considered the most important, Duchamp immediately acknowledged *3 Standard Stoppages:*

> That was really when I tapped the mainspring of my future. In itself it was not an important work of art, but for me it opened the way — the way to escape from those traditional methods of expression long associated with art. I didn't realise at the time exactly what I had stumbled on. When you tap something, you don't always recognise the sound. That's apt to come later. For me the *Three Stoppages* was a first gesture of liberating me from the past.[39]

With *3 Standard Stoppages* Duchamp conceived of a new form of work creation — one relying upon an experimental hypothesis to generate a visual outcome. He articulated this protocol through his preliminary text entitled "The Idea of Fabrication":

[35] Marcel Duchamp, *The Bride Stripped Bare by her Bachelors, Even (the large glass)*, 1915–1923, Oil, varnish, lead foil, lead wire, and dust on two glass panels, 277.5 × 177.8 × 8.6 cm, The Philadelphia Museum of Art, https://www.philamuseum.org/collection/object/54149
[36] Marcel Duchamp, *Bicycle wheel*, 1913 / replica 1951, Metal wheel mounted on painted wood stool, 129.5 x 63.5 x 41.9 cm, Museum of Modern Art, https://www.moma.org/collection/works/81631
[37] Marcel Duchamp, *Bottle rack (Porte-Bouteilles)*,1914 / replica 1959, Galvanized iron, 59.1 × 36.8 cm, Art Institute Chicago, https://www.artic.edu/artworks/238749/bottle-rack-porte-bouteilles
[38] Marcel Duchamp, *Fountain*, 1917 / replica 1964, Porcelain, 36 × 48 × 61 cm, Tate Modern, https://www.tate.org.uk/art/artworks/duchamp-fountain-t07573
[39] Katharine Kuh, *The Artist's Voice: Talks with Seventeen Artists* (New York: Harper & Row, 1962), 81.

If a straight horizontal thread one metre long falls
from a height of one metre onto a horizontal plane
twisting *as it pleases* and creates
a new image of the unit of length. ———

——— 3 patterns obtained in more or less similar conditions: *considered in their relation to one another* they are an *approximate reconstitution* of the measure of length.

The 3 standard stoppages are the metre diminished.[40]

Through "The Idea of Fabrication" Duchamp demonstrated a structural and syntactic point of view that was transparently influenced by scientific exposition, a point that Duchamp himself admitted in his notes of this period:

> Give the text the style of a proof by connecting the decisions taken by conventional formulae of inductive reasoning in some cases, deductive in others. Each decision or event in the picture becomes either an axiom or else a necessary conclusion, according to a logic of appearance. This logic of appearance will be expressed only by the style (mathematical formulae etc.)[41]

[40] Marcel Duchamp and Paul Matisse, *Marcel Duchamp, Notes* (Boston, MA: G.K. Hall, 1983), note #97.
[41] Duchamp and Matisse, *Marcel Duchamp, Notes*, note #77.

In his book *Duchamp and the aesthetics of chance: art as experiment,* Herbert Molderings argues that Duchamp was particularly inspired by Poincaré's *Science and Hypothesis,*[42] which would have familiarised Duchamp with

> the notion of conventionality and hence with the relativity of all scientific "étalons" but also gave him, very probably, the inspiration for the concrete form in which this notion could be visualized in a humorous way: an experiment with threads.[43]

This material transference for Duchamp's "Idea of Fabrication" is most readily identifiable in the chapter concerning "The Classical Mechanics" where Poincaré describes the "school of the thread":

> This school tries to reduce everything to the consideration of certain material systems of negligible mass, regarded in a state of tension and capable of transmitting considerable effort to distant bodies — systems of which the ideal type is the fine string, wire, or thread. A thread which transmits any force is slightly lengthened in the direction of that force; the direction of the thread tells us the direction of the force, and the magnitude of the force is measured by the lengthening of the thread.[44]

In order to discuss *3 Standard Stoppages* it may be useful to take a brief diversion into the field of differential geometry; not unlike Duchamp himself when inspired by the work of

[42] Henri Poincaré, *Science and Hypothesis* (New York: Dover, 1952).
[43] Molderings, *Duchamp and the Aesthetics of Chance*, 43.
[44] Poincaré, *Science and Hypothesis*, 121.

Poincaré. In the late nineteenth and early twentieth centuries, much mathematical effort was devoted to an understanding of systems associated with non-Euclidean geometries — dynamics that relate to curved surfaces such as those described by planetary motion (spheres, ellipsoids), and to higher-dimensional spaces such as the four-dimensional space-time metric associated with Einstein's theories of relativity. In familiar terms, this mathematical work involves determinations of lengths, angles, areas, and volumes that cleave not to the *flat* Euclidean environment of our perceptions but to curved and distorted surfaces and higher-dimensional manifolds. In such environments, conventional notions may become distorted: the shortest distance between two points is not necessarily a straight line, but a curved *geodesic*, draped and deformed to adhere to the troughs and ridges of an underlying surface. The quest to find such *étalons* — paths of shortest length or minimal energy — constitute both a significant focus of early twentieth century science, and, playfully, an avenue exploited by Duchamp through his stoppages.

In dropping a set of 'standard' metre lengths from a metre height and *allowing them to twist as they please*, Duchamp riffs not only on Poincaré's geometry, but on the notion of standards and the experiment itself. Duchamp's *étalons* are subsequently standard metres, but not as we know them. Instead he creates a set of pseudo-scientific objects distorted by the happenstance of his 'experimental apparatus'.

What makes *3 Standard Stoppages* such a distinct conceptual proposition is the work's unique capacity to operate as an elegant realisation of a complex mathematical theorem that simultaneously *obeys* and *disregards* the science on which it is based. Linda Henderson has described it as the "purest expression of Non-Euclidean geometry in

early twentieth-century art" [45] — a position supported by Craig Adcock, who views the stoppages as "topological homeomorphisms in one dimension," which suggest through their curved form a physical (and conceptual) folding of non-Euclidean space.[46] Yet, as Herbert Molderings has correctly identified, the *3 Standard Stoppages* are also "entirely useless for scientific purposes."[47] While each stoppage may allude to non-Euclidean distortions, it carries no specific scientific nor mathematical purpose and thus is "of use only to the artist, for his creation of his own imagined world of forms."[48] That the work is both theoretically credible yet functionally redundant is perhaps essential to Duchamp's intrinsic application of scientific material:

> Although the experiment with the three-metre-long threads is pure nonsense from a scientific standpoint, it is in fact a kind of "not-sense" that makes more sense inasmuch as it points to the conventionality and relativity of all thought. Thus, the *3 Standard Stoppages* may be understood not as a scientific but as an artistic "thought figure" that embraces all categories of meaning, including the seemingly unshakable principles of science.[49]

Duchamp himself appeared unconcerned by the ambiguous basis of his work, embracing the pataphysical nature of such contradtions and generally demonstrating a lack of deference toward scientific authority.[50] This distinction between artistic and scientific objectives is an important one: Duchamp's intention was never to directly replicate a

[45] Henderson, *The Fourth Dimension*, 131.
[46] Adcock, "Conventionalism in Henri Poincaré and Marcel Duchamp," 256.
[47] Molderings, *Duchamp and the Aesthetics of Chance*, 91.
[48] Ibid.
[49] Ibid, 92.
[50] The term *pataphysical* was coined by French author Alfred Jarry as a form of parody, mocking the language and tropes of the philosophy of science. Described as "a branch of philosophy or science that examines imaginary phenomena that exist in a world beyond metaphysics; it is the science of imaginary solutions," it was popularised by artists such as Duchamp, Joan Miró and Max Ernst, then later by 1960s conceptualists such as John Cage and the Situationists International.

scientific system in order to deliver a form of exacting or logical proof; rather, it was the occupation of scientific structual frames that gave Duchamp a tool to lean upon and against in order to advance his artistic concerns. As Duchamp himself would state, "without being a scientist myself I can still hope to reach parallel results, if you will, in art."[51] In doing so he acknowledged the objective boundaries of each discipline and further illustrated the significance of his methodological precept into artistic action. Molderings remarks:

> [T]he fact that Duchamp's logic differed from the logic of the science accounted for his genuinely aesthetic way of thinking and acting and, despite the inspiration he drew from his reading of modern scientific literature, ensured that his work never once fell into the category of mere illustrations of scientific problems or theses. In breaching the rules of all the disciplines and confusing the logic of geometry and physics, science and aesthetics, the *3 Standard Stoppages* operate according to an alternative, genuinely imaginative logic.[52]

It was in pursuit of this logic that Duchamp sort to redefine the nature of what art was (and could become), using the schema of science to direct an ideological approach and an experimental condition. With *3 Standard Stoppages* Duchamp conveyed a new form of methodological attitude, one through which an idea (and its material manifestation) could be both visually examined and theoretically tested — the 'art work' becoming the result of an empirical process within artistic expression.

[51] Housefield, *Playing with Earth and Sky*, ix.
[52] Molderings, *Duchamp and the Aesthetics of Chance*, 44.

It is perhaps little wonder, then, that coincident with the production of *3 Standard Stoppages,* Duchamp was also asking himself:

> Can one make works which are not works of 'art'?[53]

This note, written during the same period as "The Idea of Fabrication," has customarily been examined in contextual relation to Duchamp's Readymades, which challenged the accepted norms of authorship, aesthetics and value through their mass-produced construction. Yet I argue, this query could have equally applied to *3 Standard Stoppages*. Through its dislodgement of traditional forms of art praxis, *3 Standard Stoppages* instituted a new form of experimental (conceptual) examination, where 'works of art' operated as investigations, with controlled, yet indeterminable outcomes. As Molderings notes:

> *The 3 Standard Stoppages* reached… toward a scientifically underpinned notion of the image as a functional, epistemic object. Whereas hitherto the term "artist" referred purely to the creator of paintings and sculptures, it was now extended — following the inception of the *3 Standard Stoppages* — to include the invention of experimental setups in which "images" are both the instruments and the results of an experiment. The *3 Standard Stoppages* established a new style in the art in the twentieth century, one of experimental thinking.[54]

[53] A facsimile of this note forms part of *À l'Infinitif (La Boîte Blanche)* (*In the Infinitive [The White Box]*) 1912–20, published 1966, an editioned box containing screen-prints, bound text, and seven folders containing 76 collotype reproductions.
[54] Molderings, *Duchamp and the Aesthetics of Chance*, xiv.

1.5 IDEA AS OBJECT

Although undertaking the initial experiment at some point in 1913 or 1914, *3 Standard Stoppages* would not been exhibited until 1936, as part of the exhibition "Fantastic Art, Dada and Surrealism,"[55] shown at the Museum of Modern Art in New York, for which Duchamp was billed as a "20th Century Pioneer."[56] In this twenty-two-year gestational period between conception and exhibition, the appearance of the *stoppages* would undergo a somewhat radical transformation, with Duchamp performing a series of significant alterations in order to clarify his methodological agenda. By the time the work was displayed, the soft, splinar curves of each stoppage — offset against canvas painted a deep Prussian blue — would be detached from the stretches used in their original fabrication and cut down to form long narrow strips mounted onto glass. This presentation erased any previous affiliation with painting, requisitioning a new, distinctly scientific aesthetic where the *stoppages* bore an acute resemblance to microscope slides — admittedly of inflated proportions. In this way Duchamp remodelled the work as an active investigative specimen — evidence of "experimental trials performed with an experimental set-up."[57] Duchamp enhanced this perception by pairing the glass slides with a set of three wooden straight-edge templates replicating the contour of each stoppage (originally fabricated in 1918),[58] and fitting these assembled parts into a refashioned wooden croquet box, replete with built-in compartments to safely store each component. The overall effect was the formation of a tool set or a collection of instruments that, aside from their absurdity and lack of discernible purpose,

[55] Fantastic Art, Dada and Surrealism, December 7, 1936 – January 17, 1937, MoMA Online Archive, https://www.moma.org/collection/works/78990.
[56] From press release, accessed via https://assets.moma.org/documents/moma_pressrelease_325072.pdf?_ga=2.158430076.793699186.1607469129-439436725.1605292506&_gac=1.116292852.1605677321.Cj0KCQiAhs79BRD0ARIsAC6XpaWAoV6dJFBYCd9O7r6YfH5sWqk8tOydcHMnph1YNuuVxA_yAYI_saQaAhhfEALw_wcB
[57] Molderings, *Duchamp and the Aesthetics of Chance*, 33.
[58] Ibid, 64.

would visually register as an object more at home in a museum of science than as one belonging in an art gallery.

Thus, *3 Standard Stoppages* would take on the guise of a scientific implement: implying rigour, measure and exactitude. As Molderings corroborates, this invocation of a "social order of knowledge" was by no means accidental; rather, it was a loaded gesture — an implicit *leaning against* that served to simultaneous infer, critique and subvert forms of scientific application.[59] In his interview with Pierre Cabanne, Duchamp himself acknowledged this: "I was interested in introducing the precise and exact aspect of science, which hadn't often been done, or at least hadn't been talked about very much. It wasn't for a love of science that I did this; on the contrary, it was rather in order to discredit it, mildly, lightly, unimportantly."[60]

The evolution of *3 Standard Stoppages* did not end even at this juncture, with the work's arrangement continually transformed throughout successive installations. The wooden templates and storage box that Duchamp had appended to the work were ultimately not displayed as part of its 1936 presentation, with museum director Alfred Barr, installing only the three glass panels, affixed vertically to the wall in order to accentuate his curatorial thematic centred on "Composition by Artificial Accident" (fig. 6).[61] By the time the work was exhibited at Yale University in 1949, and bequeathed to the Museum of Modern Art in 1953, more specific instructions were provided to clarify the "visual protocol" of the experiment,[62] including the addition of a further two elements: a set of

[59] Ibid.
[60] Pierre Cabanne, *Dialogues with Marcel Duchamp*, 39.
[61] Alfred H. Barr and Georges Hugnet, *Fantastic Art, Dada, Surrealism* (New York: Published for the Museum of Modern Art by Arno Press, 1968).
[62] Molderings, *Duchamp and the Aesthetics of Chance*, 68. The work was part of the Katherine Dreier bequest.

FIGURE 6.

INSTALLATION VIEW OF THE EXHIBITION "FANTASTIC ART, DADA, SURREALISM"
DECEMBER 7, 1936–JANUARY 17, 1937. PHOTOGRAPHIC ARCHIVE.
THE MUSEUM OF MODERN ART ARCHIVES, NEW YORK

PHOTOGRAPH BY SOICHI SUNAMI.

metre rulers (to be installed vertically and horizontally upon the wall), that were included in the display until approximately 1977.[63] At this time, the configuration was once again transformed to align with the version on display in the collection today: a set of instruments inside a Perspex vitrine (fig. 7).

The description of the work has similarly evolved in this period, with historical iterations of museum wall text explicitly articulating the scientific nature of the work in a manner the contemporary expression does not. The Museum of Modern Art originally labelled *3 Standard Stoppages* as a "work of many things": "a carefully executed and documented experiment, an ironic commentary on empirical or scientific method, a subtle philosophical prank, a proto-dada act, a speculation on the workings of chance, a poetic gesture, a new outpost on the frontiers of aesthetic experience."[64] In more recent versions this description has been truncated, describing Duchamp's actions without assigning any scientific impetus.[65] It could be said that such a move merely demonstrates the acceptance of Duchamp's approach as canonical. On the other hand, I suggest this formal erasure of science is a degradation — for not only is the work stripped of its experimental and ideological basis, this act of abbreviation limits an understanding of both the way science shaped Duchamp's methodology and its role in laying the groundwork for subsequent conceptual strategies.

[63] This addition of these elements is recorded in the documentation of the work in "Summer Exhibition: New Acquisitions; Recent American Prints, 1947–1953; Katherine S. Dreier Bequest; Kuniyoshi and Spencer; Expressionism in Germany; Varieties of Realism," June 24 – September 27, 1953, Museum of Modern Art, https://www.moma.org/calendar/exhibitions/2824?installation_image_index=6 Supplemental exhibition information accessed through the Study Centre in the Department of Painting and Sculpture the Museum of Modern Art on November 14, 2016.

[64] Original label text for *3 Stoppages étalon*, written upon acquisition by the Museum of Modern Art, New York (via the Katherine S. Dreier Bequest) used in the "Special Summer Exhibition," June 24 – September 27, 1953. This archival material was accessed through the Study Centre in the Department of Painting and Sculpture the Museum of Modern Art on November 14, 2016.

[65] Gallery label from 2020: "It is 'a joke about the meter,' Duchamp glibly noted about this piece, but his premise for it reads like a theorem: 'If a straight horizontal thread one meter long falls from a height of one meter onto a horizontal plane twisting as it pleases [it] creates a new image of the unit of length.' Duchamp dropped three of these threads onto three stretched canvases, where they were then adhered, in order to preserve the random curves they assumed upon landing. The canvases were cut along those curves, creating a template for new units of measure that retain the meter's length but undermine its rational basis." MoMA Online Collection, https://www.moma.org/collection/works/78990.

FIGURE 7.

MARCEL DUCHAMP
3 STANDARD STOPPAGES
CONTEMPORARY INSTALLATION VIEW
"THERE WILL NEVER BE SILENCE: SCORING JOHN CAGE'S *4'33"*
OCT 12, 2013–JUN 22, 2014
MUSEUM OF MODERN ART, NEW YORK

PHOTOGRAPH BY JONATHAN MUZIKAR

1.6 IDEA AS PRACTICE

Through his engagement with science, Duchamp established a new proto-conceptual framework that centred on ideas and methodology, rather than objects and their aesthetic outcomes. He approached scientific material not to emulate the work of a scientist, but as theoretical, philosophical and experimental apparatus to be leveraged and exploited for his own purpose. In this way, Duchamp fundamentally altered the terms and conditions by which art was defined — shifting the process of *how* art was made, *what function* it served and precisely *where* the 'work' was situated. This merging of artistic, scientific and philosophical epistemology represented a radical new direction to be embraced by subsequent conceptual practitioners, an agenda foretold by art historian Thomas Munro in his 1928 publication, *Scientific Method in Aesthetics:*

> [I]t is possible that the methods of artists will become more rational and closer to science as our culture itself becomes more scientific…The artist of the future, as a product of such education, may be willing to think out his projects more planfully than in the past, with all the help that scientific knowledge and theory including aesthetics can give him… Certainly, science will never solve all the artist's problems, or attempt to do so. It will offer certain maps and compasses, based on past experience, to guide [their] flights. But in so far as [they are] genuinely original, [their] flights will soon take [them] into unexplored regions, where the maps (if any) are still vague and unreliable… It will be a happy stage in cultural history when the artist, the philosopher, and the scientist can understand and

> recognize each other's functions in the common task of advancing human welfare, and work together more effectively.[66]

Such dictums would prove to be prophetic, with the conceptual practitioners of the 1960s and 1970s taking up this mantle and visiting Munro's "unexplored regions," charting new epistemological territories "where the maps [were] still vague and unreliable" in pursuit of the *idea*.

[66] Thomas Munro, *Toward Science in Aesthetics: Selected Essays* (New York: Liberal Arts Press, 1956), 323.

CHAPTER TWO:
THE MECHANICS OF METHOD

Examining the transition from Duchamp's proto-conceptualism to the establishment of formal conceptual practices in the 1960s United States from a purely art historical perspective does not provide sufficient context for the extraordinary societal and structural changes that occurred in the intervening decades.[1] Considering the advent of world wars, economic depression, widespread commercial industrialisation and mechanisation, as well as the subsequent reorganisation of global societal and political structure associated with the collapse of Eurocentric empire, it is little wonder that the popularisation of Duchamp's conceptual ideology was a multi-decade effort.

Central to this protracted timeline was the growing influence of scientific thought, processes and aesthetics on the cultural zeitgeist, and I argue that this broad-based *scientification* of society is a critical component in the adoption of the method-driven conceptual paradigm that would follow. The popularisation of science in the early and mid-twentieth century was pervasive: in addition to its hitherto conventional academic focus, by the post-war era scientific output impacted directly on most aspects of daily life, shifting, I argue, the perspective with which the world at large was viewed. This recalibration had profound consequences for how 'The Arts' and 'The Sciences' were to be considered as independent and yet entangled entities, requiring a newfound degree of

[1] While much of this exposition is focused upon the efforts undertaken by artists based in America, it is important to acknowledge that activities of conceptual art were by no means exclusive to the United States. Conceptual activities were a global phenomenon undertaken across the UK, Europe, Japan, Australia, New Zealand South Korea, mainland China, Taiwan, Hong Kong and Latin America. These activities were expressly considered in the 1999 exhibition *Global Conceptualism: Points of Origin, 1950s–1980s* at the Queens Museum in New York City and catalogued in the accompanying publication, *Global Conceptualism: Points of Origin, 1950s–1980s* (New York: Queens Museum of Art, 1999).

shared literacy and interdisciplinary discourse. In his 1959 Rede Lecture, "The Two Cultures," the English novelist and chemist C. P. Snow warned against the 'siloing' of artistic and scientific knowledge:

> A good many times I have been present at gatherings of people who, by the standards of the *traditional* culture, are thought highly educated and who have with considerable gusto been expressing their incredulity at the illiteracy of scientists. Once or twice I have been provoked and have asked the company how many of them could describe the Second Law of Thermodynamics. The response was cold: it was also negative. Yet I was asking something which is about the scientific equivalent of: *Have you read a work of Shakespeare's?*
>
> I now believe that if I had asked an even simpler question — such as, What do you mean by mass, or acceleration, which is the scientific equivalent of saying, *Can you read?* — not more than one in ten of the highly educated would have felt that I was speaking the same language.[2]

Snow's address recognised a form of cultural bifurcation — a growing intellectual divide that was taking place between the *classical* humanities and the sciences, observable within the scholarly circles of academia and the established art orthodoxy. For Snow, duly educated in both scientific and literary exposition, the arts and sciences had become antipodal forces — antagonistic tribes held apart by a "gulf of mutual incomprehension," and he lamented the consequences of this dual-sided value imbalance.[3] Snow continues:

[2] Snow, *The Two Cultures and the Scientific Revolution*, 15–16.
[3] Ibid, 4.

> The clashing point of two subjects, two disciplines, two cultures — of two galaxies, so far as that goes — ought to produce creative chances. In the history of mental activity that has been where some of the breakthroughs came. The chances are there now. But they are there, as it were, in a vacuum, because those in the two cultures can't talk to each other. It is bizarre how very little of twentieth-century science has been assimilated into twentieth-century art… It has got to be assimilated along with, and as part and parcel of, the whole of our mental experience, and used as naturally as the rest.[4]

In many respects, Duchamp's original engagement with the methods and philosophy of science, and his 'experiments' with *3 Standard Stoppages* embodied the interdisciplinary approach advocated by Snow. In the decade following his lecture, I argue that Snow's hypothesis was embraced even more fully by an emerging group of conceptual practitioners drawing upon the underlying methodological and structural framework associated with contemporary science of the era. As expressed by Peter Galison in *Picturing Science, Producing Art*:

> a new body of work emerged in the 1960s that sought explicitly to explore the similarities (and admitted difference) between practices of art and science. These thinkers constructed, in a way, the "anthropology" of the two cultures that Snow had presupposed but never fully explained. When historian and philosopher of science Thomas Kuhn wrote *The Structure of Scientific Revolutions* (1962) and its follow-on essays, he deliberately treated the production of science in a

[4] Ibid, 17.

"sociological" way that made both science *and* art the "products of human behaviour," demanding a more ethnological approach.[5]

2.1 BOUNDARY WORK

Much of the mythology that has come to be constructed around the disciplines of science is far from accidental. It has evolved from a conscious demarcation process that sought to establish the parameters of scientific and *non*-scientific activity, providing the emergent twentieth century notion of 'modern science' with a renewed sense of identity, specificity, and tactile materiality. I argue the advent of conceptual art practices in the 1960s was associated with a similar effort toward delineation — carving out a space for the operation of method/concept-driven activities, and thus expanding the definition of what *was* and *was not* art.

In his commentary on the development of twentieth century science, theorist Thomas F Gieryn characterised this process of demarcation as "boundary work:" an ideological endeavour that distinguishes the institutional structures of a discipline through the attribution of select characteristics.[6] Through this operation "practitioners, methods, stocks of knowledge, values and work organisation" produce both *content* and *a style*, facilitating a social manifestation that defines not only *what an activity is* but also *how that activity should be done*.[7] Gieryn suggests that such boundaries were designed to be "drawn and redrawn in flexible, historically changing and sometimes ambiguous ways,"

[5] Caroline A. Jones, Peter Galison, and Amy E. Slaton, eds., *Picturing Science, Producing Art* (New York: Routledge, 1998), 4.
[6] Thomas Gieryn, "Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists," *American Sociological Review* 48, no. 6 (1983), https://doi.org/10.2307/2095325.
[7] Ibid, 782.

providing characteristics that are fundamentally adaptable to varying aspects of inquiry — from empirical to theoretical, pure to applied.[8] This flexibility enables a rendering of these characteristics for both academic and public purpose, generating specificity for formal internal dialogues as well as substantial latitude for a more generalised (societal) interpretation. That Gieryn's analysis was directed toward the temperament and idiosyncrasies of science in the mid-twentieth century is, I think, noteworthy, since such critique could just as readily have been applied to the development of conceptual art during this same period.

Gieryn argues that a significant attribute of disciplinary boundaries is the establishment of the concept of *method* — an approach that characterises the activity of a discipline by an array of procedural operations. In the case of science, such methodology includes systematic observation, measurement and experiment, alongside the formation, testing and modification of hypotheses.[9] While the establishment of such methods offers no singular procedure to be applied unilaterally, it provides a form of *schema* — a tactical approach, to be employed as needed, and implied through process.

I argue that conceptual art adopted an operationally analogous approach, deploying ambiguous methodological structures to provide form, while continuing to negate definition. In the three seminal publications written during the mainstay of conceptual practice: *Six Years: The Dematerialization of the Art Object from 1966 to 1972* by Lucy Lippard, *Idea Art* by Gregory Battcock and *Conceptual Art* by Ursula Meyer[10] — that

[8] Ibid, 781.
[9] *Oxford Dictionary of English*, 3rd ed. (2011), s.v. "method."
[10] Lucy R. Lippard, *Six Years: The Dematerialization of the Art Object from 1966 to 1972; A Cross-Reference Book of Information on Some Esthetic Boundaries* (New York: Praeger, 1973); Gregory Battcock, *Idea Art: A Critical Anthology* (New York: Dutton, 1973); Ursula Meyer, ed., *Conceptual Art* (New York: Dutton, 1972).

would serve as the primary English-language reference material on conceptual art for the next twenty five years[11]— each author stopped short of nominating a functioning definition of conceptual art, instead electing to catalogue "the chaotic network of ideas"[12] demonstrated by 1960s practitioners as an archive, free of "critical interpretation."[13] For her part, Meyer implied that conceptual art was "best explained through itself, i.e., through the examination of conceptual art, rather than through any assumptions outside of itself," and thus a "critical anthology" was rejected in favour of "documentation of Conceptual Art and Statements."[14] Battcock stressed that conceptual (or idea) art should be investigated "not for what it is but, rather, for the ideas and changes that it motivates."[15] The consequence of these conscious acts of abstention was the creation of an elastic and idiosyncratic *boundary* that could be reshaped by any number of temporal, theoretical and [de]material constraints — facilitating the inclusion of multiple, often opposing agendas, to the point that some claimed the term *conceptual art* "created more problems that it solved."[16]

While such historical analysis fails to provide a working definition for the mechanics of conceptual art, it does allude to the expansion of art's definitional perimeters (however amorphic) that was associated with the development of conceptual practices. As noted by Sol LeWitt in his acclaimed "Paragraphs on Conceptual Art":

[11] Thomas McEvilley, *The Triumph of Anti-Art: Conceptual and Performance Art in the Formation of Post-Modernism* (Kingston, NY: McPherson & Co., 2005), 336.
[12] Lippard, *Six Years*, 5.
[13] Meyer, *Conceptual Art*, viii.
[14] Ibid.
[15] Battcock, *Idea Art*, 9.
[16] Mel Bochner and John Baldessari, "Outside the Box," *Artforum International* 45, no. 10 (2007): 101.

> In conceptual art the idea or concept is the most important aspect of the work. When an artist uses a conceptual form of art, it means that all of the planning and decisions are made beforehand and the execution is a perfunctory affair.[17]

Contrary to the analysis of Lippard, I argue that when viewed through this prism, conceptual art need not be considered as merely "a chaotic network of ideas," but is rather a space in which the idea and its methodological activation are a central concern. That conceptual art led to a large array of seemingly disparate outcomes is, I suggest, unimportant; it is the preferencing of procedural planning and intent invoked in these activities that is the unifying metric.

An obvious question, then, is why conceptual art adopted such an approach? What motivated this notion of the artwork-as-idea and inspired the deployment of process- and experiment-based action within emergent conceptual practices?

While there are certainly numerous causalities, I argue that, in part, the underlying *scientification* that occurred in mid-twentieth century western societies played a significant role in this pivot — as evidenced by the adoption of *science-like* methods, philosophical frameworks and collaborative practices that developed throughout the period.

2.2 THINGS NOT NECESSARILY VIEWED AS ART

In the fall of 1966, artist Mel Bochner was asked to arrange an exhibition of drawings at the School of Visual Arts in New York where he was working as an instructor.

[17] Sol LeWitt, "Paragraphs on Conceptual Art," *Artforum* 5, no. 10 (1967), 79-83.

Constrained by a limited budget and scant institutional resources, Bochner took an alternative approach to established exhibition protocol — forgoing conventional framed, finished works in favour of a collection of works-in-progress: a procured set of sketches, diagrams, notes and receipts that, once amassed, were resized (for parity) and copied using the school's recently purchased state-of-the-art Xerox machine. Four identical photostatic volumes were produced — printed onto standard-sized sheet paper, with the content then sorted alphabetically, placed into binders, and positioned upon table-height plinths arranged in the gallery.

The resulting work, entitled *Working Drawings And Other Visible Things On Paper Not Necessarily Meant To Be Viewed As Art* (fig. 8–10) was a singular outcome, one widely attributed as the first conceptual art exhibition, in which Bochner occupied the dual roles of artist and curator — becoming an objective administrator and subjective participant in his own work.[18]

The contributors to Bocher's intervention were essentially a who's who of the emerging avant-garde art scene of the period, including names that would eventually become synonymous with conceptual practices, such as artists Donald Judd, Carl Andre, Dan Flavin, Sol LeWitt, Eva Hesse, Dan Graham, Jo Baer, Robert Moskowitz and Robert Smithson, composers Karlheinz Stockhausen and John Cage and choreographer Tom Clancy. In addition, contributions were also made by mathematician Arthur Babakhanian (the long-term collaborative partner of Sol LeWitt), biologist M. Corsiodes, engineers and architect James Ingo Freed (from the firm Tibbetts-Abbett-McCarthy-

[18] Michelle Grabner, "Mel Bochner," *Frieze*, no. 105 (2007).

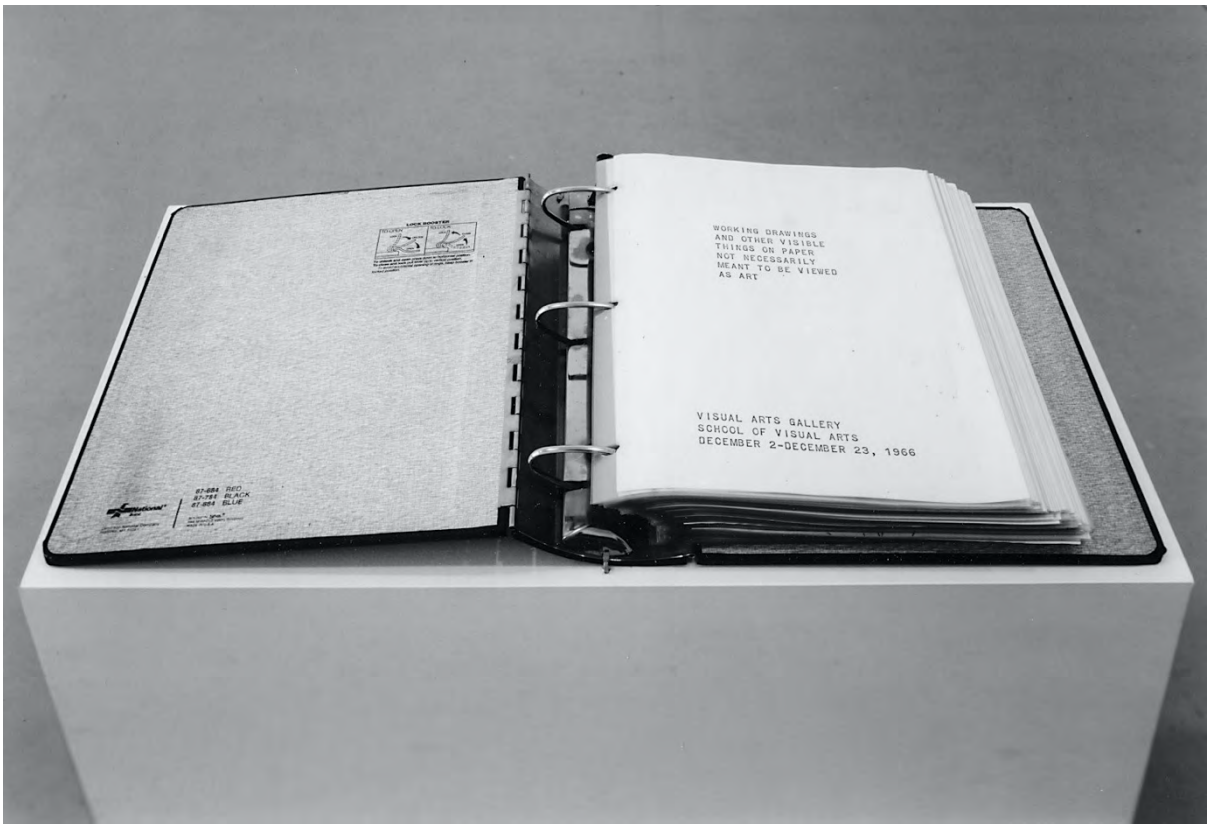

FIGURE 8.
MEL BOCHNER
WORKING DRAWINGS AND OTHER VISIBLE THINGS ON PAPER NOT NECESSARILY MEANT TO BE VIEWED AS ART —
INSTALLATION VIEW
1966
FOUR IDENTICAL LOOSE-LEAF NOTEBOOKS
29.8 X 29.2 X 7.9 CM

FIGURE 9.

MEL BOCHNER
WORKING DRAWINGS AND OTHER VISIBLE THINGS ON PAPER NOT NECESSARILY MEANT TO BE VIEWED AS ART
INSTALLATION VIEW
1966
FOUR IDENTICAL LOOSE-LEAF NOTEBOOKS
29.8 X 29.2 X 7.9 CM

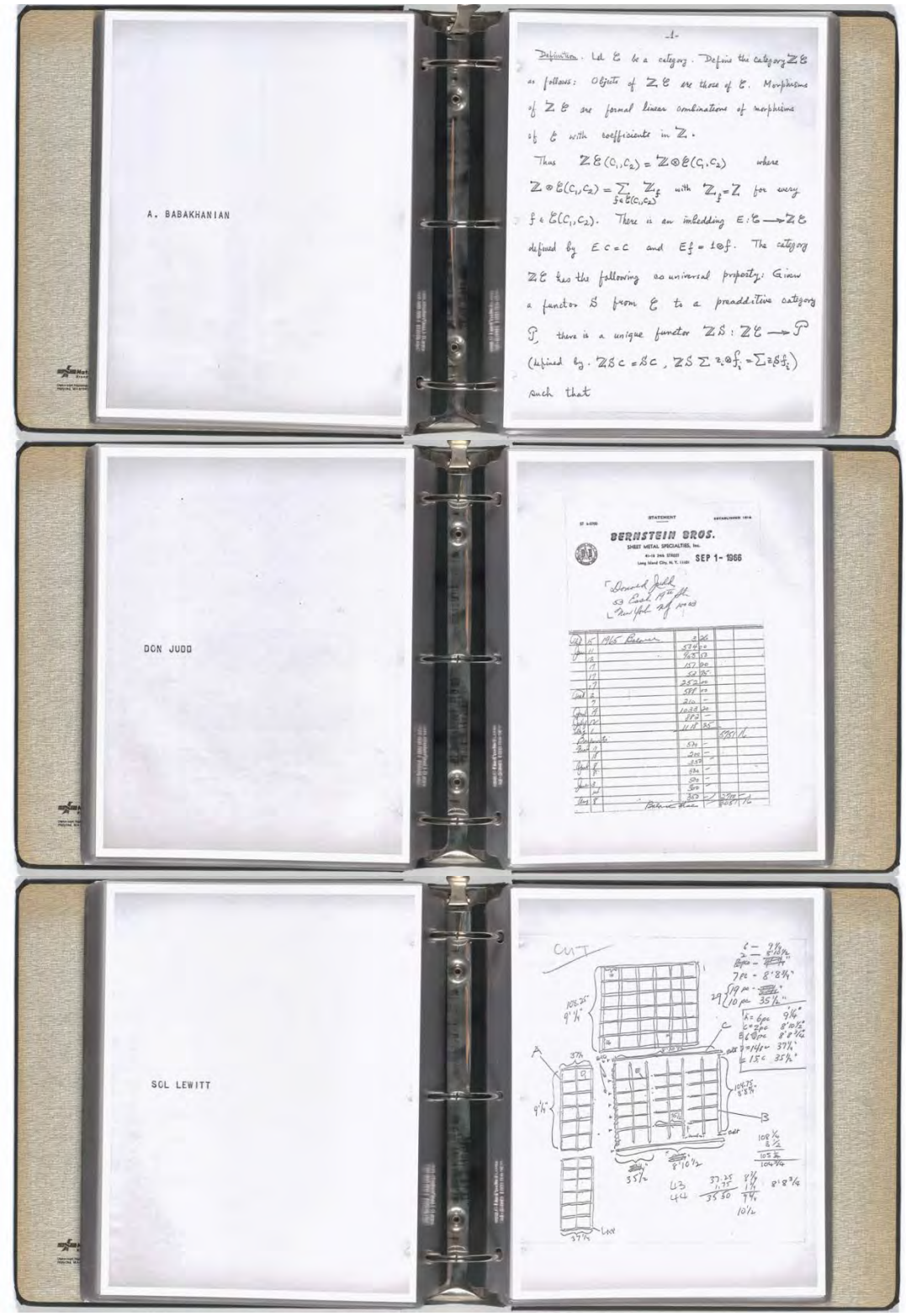

FIGURE 10.

EXCERPTS FROM MEL BOCHNER'S
WORKING DRAWINGS AND OTHER VISIBLE THINGS ON PAPER NOT NECESSARILY MEANT TO BE VIEWED AS ART
(FROM ARTHUR BABAKHANIAN, DONALD JUDD AND SOL LEWITT)

Staraton), which were placed alongside a range of unattributed ephemera collected from *Scientific American*, contributed by Bochner himself. [19]

As curator James Meyer noted, there was no precedent in 1966 for the presentation of photocopies within a gallery setting, let alone a collection of material that was — as the work's title clearly indicated — not necessarily meant to be viewed as art.[20] Yet bound to these sketches (yet-to-be made), invoices (yet-to-be paid) and equations (yet-to-be-completed) clung *the material of process* — the idea as a dynamic, yet-to-be realised entity that existed beyond the classification of a single discipline. Bochner was drawn to this commonality of purpose, and through *Working Drawings*… "transformed systematic method into an object of reflection, a *cause*," seeking parity between methodological systems that he recognised shared common foundational objectives, irrespective of particular outcomes.[21]

The exhibition was not just unconventional with regards to the material presented, but also in the nature of its contributors. Bochner's efforts in *Working Drawings*… sought to flatten preconceived divisions between artistic and scientific enterprise to represent each, non-hierarchically, as a form of conceptual activity. Such an undertaking represented a radical departure from the *silos* of C.P. Snow's 'two cultures' and was evidence of both an awareness of and growing interest in how the methodological strategies demonstrated within scientific enterprise might intersect with artistic concerns. *Working Drawings*… exhibited what Bochner would come to classify as a *Serial Attitude*,

[19] Richard S. Field and Mel Bochner, *Mel Bochner: Thought Made Visible, 1966–1973* (New Haven, CT: Yale University Art Gallery, 1995), 95–6.
[20] Yve Alain Bois et al., *Mel Bochner: language is not transparent* (New York: Michael Blackwood Productions, 1997), 95.
[21] James Mayer, "The Second Degree," in Field and Bochner, *Mel Bochner: Thought Made Visible*, 97.

"a method, opposed to a style" that examined the order and process of rendering thought.[22] It was a form of practice he attributed to many of his peers — although perhaps most succinctly illustrated himself — that demonstrated a deliberative pivot towards process, elevating the embedded methodological actions involved in an artwork's construction to the point that they became synonymous with the work itself.[23] In this way, a *serial attitude* adopted a form of operational parallel with established scientific modalities, where the *verb* and *noun* of science operate as one in the same. Through his work, "Bochner wanted to provide his audience with a kind of mental tool kit. That is, he sought to make art that compelled viewers to attend to, and reflect on, the most basic cognitive processes involved in seeing the structural relations between objects."[24]

As Meyer suggests, Bochner "opened onto a broader consideration of intellectual processes" that effectively expanded the notion of artistic practice to include the exploration of other forms of information.[25] He continues: "[t]he *Working Drawings*… propose a conceptual art process, a process art located in the development of an idea. Bochner's 'conceptualism' thus emerges as a dynamic model, a thought-activity occurring in the gaps between language and things… The *Working Drawings*…, we have seen, did not so much present 'art' as its methods."[26]

[22] Mel Bochner, "The Serial Attitude," reprinted in Bochner, *Solar System & Rest Rooms*, 42.
[23] In his essay Bochner examines the concept of the "serial attitude" in relation to Donald Judd, Larry Poons, Sol LeWitt, Eva Hesse, Jasper Johns, Robert Rauschenberg, Pierre Boulez and Alfred Jensen. He also makes mention of Marcel Duchamp and the chronophotographs of Muybridge and Marey, further contextualising this concept within a (pseudo)scientific frame.
[24] Mel Bochner, "Thought is a Material: Talking with Mel Bochner about Space, Art, and Language. Interview by Alexander Kranjec," *Journal of Cognitive Neuroscience* 25, no. 12 (2013): 2015, doi: 10.1162/jocn_a_00465.
[25] Bois et al., *Mel Bochner : language is not transparent*, 101.
[26] Ibid. 102-3,

2.3 THE TWO CULTURES AND DISCIPLINARY ENTANGLEMENT

On the 29th of September, 1965, a little over a year before Bochner would present *Working Drawings…* in New York, more than two hundred people gathered in the White House Rose Garden to witness US President Lyndon Johnson sign the National Foundation on the Arts and Humanities Act in to law, establishing, amongst other things, the National Endowment for the Arts (NEA) as a US federal agency dedicated to investment and support of cultural advancement.[27] This effort is noteworthy for the breadth of support it received — championed not only by various figures from the arts and humanities but also by many in scientific and industrial fields who recognised the necessity of entangled cross-disciplinary research and collaboration. As American chemist and Atomic Energy Commission head Glenn Seaborg noted:

> We cannot afford to drift physically, morally, or aesthetically in a world in which the current moves so rapidly, perhaps toward an abyss. Science and technology are providing us with the means to travel swiftly. But what course do we take? This is the question that no computer can answer.[28]

The establishment of the NEA was, I argue, representative of the unique cultural agenda of the era, in which a conscious (and unconscious) attempt was made to equilibrate the role of art and science in societal change. In her essay "Launching Hybrid Practices in the 1960s: On the Perils and Promise of Art and Technology," Anne Collins Goodyear notes that "the intellectual and cultural climate of the 1960s [was] indelibly marked by

[27] "How NEH Got Its Start," National Endowment for the Humanties, accessed 22 April 2021, https://www.neh.gov/about/history.
[28] States United et al., *National Arts and Humanities Foundations: Joint Hearings before the Special Subcommittee on Arts and Humanities of the Committee on Labor and Public Welfare, United States Senate and the Special Subcommittee on Labor of the Committee on Education and Labor, House of Representatives, Eighty-Ninth Congress, First Session, on Bills to Establish National Foundations on the Arts and Humanities* (1965), 425.

the perceived need to bridge the gap between the 'two cultures,'" and thus elevate the role of art in ongoing and unfolding dialogues.[29] Goodyear continues:

> [A]rt came to be seen as a necessary complement to science. If science was seen as an engine of social and political well-being, art had to inform and temper it, helping to ensure that scientific advancement did not result in human devastation.[30]

This revelation led to a new form of cultural praxis that expanded interdisciplinary activity between art and science, with the belief that collaborative and experimental engagement could not only further innovation, but also moderate both the scientific and societal mindset. As scientist Jacob Bronowski would state in his 1958 article, "The Creative Process:"

> We expect artists as well as scientists to be forward-looking, to fly in the face of what is established, and to create not what is acceptable but what will become accepted.[31]

Before returning to an analysis of the development of Bochner's conceptualism, it is worth unpacking the chronology of various events, contributions and provocations of the era — cataloguing the manifestation of hybrid art-science epistemologies. Foundationally, C.P. Snow's delineation of the 'two cultures' in his 1959 lecture was a

[29] Anne Collins Goodyear, "György Kepes, Billy Klüver, and American Art of the 1960s: Defining Attitudes Toward Science and Technology," *Science in Context* 17, no. 4 (2004): 615, https://doi.org/10.1017/S0269889704000286.
[30] David Cateforis, Steven Duval and Shep Steiner, *Hybrid Practices: Art in Collaboration with Science and Technology in the Long 1960s* (Oakland, CA: University of California Press, 2019), 26.
[31] Jacob Bronowski, "The Creative Process," *Scientific American* 199, no. 3 (1958): 64.

call to action — identifying the schism that was at risk of forming between scientific and artistic modalities. By 1962, this provocation had been followed by George Kubler's *The Shape of Time: Remarks on the History of Things* and Thomas Kuhn's *The Structure of Scientific Revolutions*, with both texts providing an *alludatory* response anchored in an analysis of the ontologies of their own disciplines through the prism of the other.[32] Both texts achieved a level of public notoriety and were in wide circulation by 1963 when the US government established the National Commission on the Humanities to evaluate issues of equitability in support for the sciences and the arts. This commission would ultimately identify the importance of both disciplines in the advancement of the national culture, leading to the establishment of the NEA and support for the arts and humanities more broadly.

It is of interest then to situate Bochner's *Working Drawings…* (produced in 1966) within this contextual frame, and to consider related implications on the emergence of conceptual practice overall. Of particular significance is the works' proximal relationship to science, scientific methodology and object production, in which I suggest Bochner's approach was undoubtedly informed by scientific activity, as was his collaborative structure. I argue that Bochner's interdisciplinary engagement in *Working Drawings…* was reflective of a growing scientific consciousness across society, emerging in response

[32] George Kubler, *The Shape of Time: Remarks on the History of Things* (New Haven, CT: Yale University Press, 2008); Kuhn, *The Structure of Scientific Revolutions*. In *The Shape of Time* Kubler would specifically state, "The value of any rapprochement between the history of art and the history of science is to display the common traits of invention, change and obsolescence that the material works of artists and scientists both share in time," (9). Kuhn would outwardly acknowledge an indebtedness to the history of art for his thinking in *The Structure of Scientific Revolutions* (particularly to the work of art historian Ernst Gombrich, and his renowned publication *The Story of Art*). In his article "Thomas Kuhn, the Image of Science and the Image of Art: The First Manuscript of Structure," J. C. Pinto de Oliveira observes that Kuhn found "persistent parallels" between art and science — disciplines that he had been "taught to regard as polar." Kuhn suggested that revolutions in science were "not only incompatible, but often actually incommensurable, with that which has gone before. Only as this is realized, can we grasp the full sense in which scientific revolutions are like those in the arts." J. C. Pinto de Oliveira, "Thomas Kuhn, the Image of Science and the Image of Art: The First Manuscript of Structure," *Perspectives on Science* 25, no. 6 (2017): 9.

to and as a result of the newly arrived era of 'big science' in post-war America.[33] This was a period in which large, multi-disciplinary teams of researchers were assembled at institutions such as MIT, IBM, NASA and the US government laboratories at Los Alamos, and in which the outcomes of scientific research were extended beyond their academic base to further commercial industry, national governance and military policy, as well as to galvanise and capture the public imagination.[34] As per the analysis of Goodyear, and consistent with the NEA's founding manifesto, such efforts were countered by a number of artist-led interventions, that sought to capitalise on, question, and at times subvert and actively advocate against this purist scientific agenda.

While such collaborative art-science initiatives were established globally, the American response was particularly prolific, cultivated by the unique social and political buoyancy of the era. Of these programs the most consequential included: the Artists' Cooperation Program by the National Aeronautics and Space Administration (NASA) in 1962,[35] Experiments in Art and Technology (E.A.T.) in 1966, the Center for Advanced Visual

[33] The term *big science* is used by scientists and historians to describe the changes that occurred within scientific enterprise after World War II when scientific progress became increasingly dependent upon large-scale, government-sponsored programs run through centralised laboratories. While such programs facilitated rapid progress, they were not without criticism, particularly for their role in the military-industrial complex, the bureaucratisation of science and research curtailment as a result of governmental or industrial oversight. The term is widely attributed to nuclear physicist Alvin M. Weinburg who, in spite of being director of Oak Ridge National Laboratory, raised concerns about the impact of large-scale science in the United States in *Science* Magazine in 1961.

[34] By the 1960s a perception of science was firmly established in the public lexicon with dramatic advancements across multiple fields — from space exploration to computer science, atomic energy to climate and weather modelling — impacting not only the physical reality of day-to-day life but also the intellectual and ideological expanse of what science made possible.

[35] According to Hereward Cooke in his book *Eyewitness to Space*, "NASA decided to ask artists to supplement the record after reviewing the documentation of the first few years of the Space Age. It was realized that important steps in the Space Age were missing. When a launch takes place at Cape Canaveral, Fla., more than 200 cameras record every split second of the activity. Every nut, bolt, miniaturized electronic device is photographed from every angle. The artist can add very little to this in the way of factual record. But, as [Honoré] Daumier pointed out about a century ago, the camera sees everything and understands nothing. It is the emotional impact, interpretation and hidden significance of these events which lie within the scope of the artist's vision. An artist may depict exactly what he thinks he sees, but the image has still gone through the catalyst of his imagination and has been transformed in the process." Hereward Cooke, *Eyewitness to Space: Paintings and Drawings Related to the Apollo Mission to the Moon, Selected, with a Few Exceptions, from the Art Program of the National Aeronautics and Space Administration (1963 to 1969)* (Washington, DC: National Aeronautics and Space Administration, 1969). Similarly, when reflecting upon the moon landings, Michael Hanlon has suggested that "the moonwalkers should have included writers, a poet perhaps, or an artist among the pilot-jocks. Then we would have heard how the moon smells of gunpowder and tastes of burnt sulphur; of how, after taking their bulky suits off in the module, moon dust and grit would get into every crack and crevice on the body, of the cold and the terror, and exactly what it is like to gaze up at the Earth, a blue and green orb that from the moon appears four times the size that the moon does from our world." Michael Hanlon, "Mankind has Stepped Back from Armstrong's Giant Leap," *Sydney Morning Herald*, August 28, 2012, https://www.smh.com.au/politics/federal/mankind-has-stepped-back-from-armstrongs-giant-leap-20120827-24wbv.html.

Arts (CAVS) at the Massachusetts Institute of Technology (MIT) in 1967, and Art & Technology (A&T) in association with Los Angeles County Museum of Art in 1967.[36]

Of such efforts, Experiments in Art and Technology was perhaps the most significant. Founded in New York City by engineers Billy Klüver and Fred Walhauer and artists Robert Rauschenberg and Robert Whitman, the organisation was established in response to an initial series of interdisciplinary performances entitled *9 Evenings: Theatre and Engineering* (1966), which had brought together ten contemporary artists (John Cage, Lucinda Childs, Öyvind Fahlström, Alex Hay, Deborah Hay, Steve Paxton, Yvonne Rainer, Robert Rauschenberg, David Tudor and Robert Whitman) working in collaboration with forty research engineers.[37] Expanding upon this original concept, E.A.T. became a non-profit organisation facilitating collaborative partnerships between artists and scientists through industry cooperation.

As formulated by Rauschenberg and Klüver, the organisation's stated purpose was to create "a working alliance of industry, the arts, science, technology, politics and labour,"[38] which would:

> — Maintain a constructive climate for the recognition of the new technology and the arts by a civilized collaboration between groups unrealistically developing in isolation.

[36] Founded by György Kepes (who had taught at the New Bauhaus in Chicago prior to becoming faculty at MIT), CAVS was designed " to facilitate 'cooperative projects aimed at the creation of monumental scale environmental forms' and to support participating fellows in the development of 'individual creative pursuits'" by engaging them with the broader community of scientists and engineers at MIT. The CAVS program ran from 1967 until 2009 when it merged with the MIT Visual Arts Program, to become the MIT Program in Art, Culture and Technology (ACT), "MIT Museum Presents Two Exhibitions of Rare and Never-Before-Seen Photographs from Influential Artist György Kepes," *MIT Museum*, July 27, 2017, https://mitmuseum.mit.edu/about/press-releases/mit-museum-presents-two-exhibitions-rare-and-never-seen-photographs-influential

[37] *9 Evenings: Theater and Engineering,* 69th Regiment Armory, New York, NY, October 13–23, 1966.

[38] Norma Loewen, "Experiments in Art and Technology: A Descriptive History of the Organization," (PhD diss., New York University, 1975), 120.

— Eliminate the separation of the individual from Technological change and expand and enrich technology to give the individual variety, pleasure and avenues for exploration and involvement in contemporary life.
— Encourage industrial initiative in generating original forethought, instead of a compromise in aftermath, and precipitate a mutual agreement in order to avoid the waste of a cultural revolution.[39]

Through this model, science would provide E.A.T. practitioners with access to emerging technology, but, I suggest, more importantly, the conditions to question the underlying structures and systems presented by scientific research itself, along with an opportunity to calibrate their own modes of working alongside scientific teams. In doing so, E.A.T. invested in process — providing tools and instructions, and establishing an experimental mindset in which the outcome was only a singular component of a larger ideological proposition. As Billy Klüver reflected on the program, "Like any good research laboratory, [they] left us alone to carry on our own experimental or theoretical research"[40]

Initially working exclusively with Bell Labs, E.A.T. would eventually partner with a broad range of research entities, including Singer, CBS, AT&T, IBM and RCA, as well as attracting large corporate sponsors, such as Pepsi-Cola. At its high-water mark in 1970, the program's membership would swell to over 5,000 individuals (equally divided

[39] Experiments In Art And Technology, "A Brief History and Summary of Major Projects 1966–1998," 1, http://www.vasulka.org/archive/Writings/EAT.pdf.
[40] Billy Klüver with Julie Martin, "Working with Rauschenberg," in Walter Hopps et al., *Robert Rauschenberg: A Retrospective* (New York: Guggenheim Museum, 1997), 312.

between member artists and member scientists) that were operating in as many as twenty regional and international centres.[41]

The practitioners involved in these initiatives would prove to be among the most influential figures across various fields of art in the twentieth century, demonstrating "how the goals of young avant-garde artists could be linked with the emerging technologies and scientific culture of the 1960s."[42] Documentation from the Experiments in Art and Technology archive indicates that artists including Robert Barry, Mel Bochner, John Cage, Walter De Maria, Agnes Denes, Marcel Duchamp, Dan Flavin, Nancy Graves, Deborah Hay, Eva Hesse, Alice Hutchins, Joe Jones, Allan Kaprow, Alison Knowles, Sol LeWitt, Robert Morris, Fujiko Nakaya, Dennis Oppenheim, Nam June Paik, Yvonne Rainer, Carolee Schneemann, Richard Serra, Alan Sondheim and Andy Warhol were engaged with the program.[43] Although not all of these interactions would produce specific outcomes or documented collaborations, the expanse of this directory clearly indicates the embedded nature of such interdisciplinary programs throughout the 1960s and '70s, and showcases the proximity of these programs to key conceptual figures.[44] While initiatives such as E.A.T., CAVS and A&T were not established to deliver any specific aesthetic or conceptual objectives, what is clear is that an extensive list of conceptual and conceptually-adjacent figures were never far from their orbit.[45]

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[41] Experiments in Art and Technology, "A Brief History," 2.
[42] Cateforis, Duval and Steiner, *Hybrid Practices*, 26.
[43] Experiments in Art and Technology, "Experiments in Art and Technology Records, 1966–1997 (bulk 1966–1973)," in *E.A.T. records*, ed. Billy Klüver et al. (1966).
[44] E.A.T. was specifically designed to be open-ended, funding projects without any anticipation of what might result. This meant that often projects resulted in dead ends, failed collaborations or collaborations that were in no way recorded, making a comprehensive list of all the interactions that occurred between E.A.T. artists and scientists impossible to document. See Michelle Kuo, "'To Avoid the Waste of a Cultural Revolution': Experiments in Art and Technology" (PhD diss., Harvard University, 2018), https://dash.harvard.edu/handle/1/41128206
[45] E.A.T specifically aimed to have no aesthetic judgment relating to an artists' work or ideas, focussing instead on establishing effective collaborative partnerships that could assist artist with their needs. Experiments in Art and Technology, "A Brief History," 2.

Signifying this link directly was the 1970 exhibition *SOFTWARE — Information Technology: Its New Meaning for Art*, curated by Jack Burnham at the Jewish Museum in Brooklyn.[46] This exhibition sought to explicitly pair "the results of scientific experiments, conducted by research teams and scientists, alongside projects born out of the conceptual art movement."[47] Participating artists and collaborators included Vito Acconci, David Antin, Architecture Machine Group (MIT), John Baldessari, Robert Barry, Linda Berris, Donald Burgy, Paul Conly, Agnes Denes, Robert Duncan Enzmann, Carl Fernbach-Flarsheim, John Godyear, Hans Haacke, Douglas Huebler, Joseph Kosuth, Nam June Paik, Alex Razdow, Sonia Sheridan, Evander D. Schley, Theodosius Victoria and Lawrence Weiner.

The development of the Art & Technology program followed a similar trajectory to E.A.T. Established by curator and Director of Modern Art at the Los Angeles County Museum of Art (LACMA), Maurice Tuchman, the five-year program (1967–1971) matched leading contemporary artists with aerospace and technology companies located on the US West Coast, culminating in an exhibition and publication in 1971. Artists involved in the program included Jon Baldessari, Iain Baxter, Larry Bell, George Brecht, John Chamberlain, Christo, Walter De Maria, Dan Flavin, Hans Haacke, Channa Hoorwitz, Robert Irwin, Donald Judd, Aleksandra Kasuba, Ellsworth Kelly, Roy Lichtenstein, Robert Morris, Bruce Nauman, Claes Oldenburg, Edwardo Paolozzi, Robert Rauschenberg, Richard Serra, James Turrell and Andy Warhol.

[46] *SOFTWARE — Information Technology: Its New Meaning for Art*, Jewish Museum, Brooklyn, New York, NY, 16 September – 8 November 1970, and the Smithsonian Institution, Washington, D.C., 16 December 1970 – 14 February 1971
[47] Vincent Bonin, "Software — Information Technology: Its New Meaning for Art," 2004, accessed April 27 2021, https://www.fondation-langlois.org/html/e/page.php?NumPage=541.

Both the E.A.T. and A&T programs led to a range of diverse projects that resulted in admittedly mixed outcomes, from Fujiko Nakaya's *Fog Sculpture*[48] (fig. 11) shown at the Expo '70 Pepsi Pavilion in Osaka, Japan, to numerous unrealised proposals (particularly those initiated by more conceptually-driven practitioners) that were ultimately abandoned due to industrial or financial constraints, as well as misalignment, friction and breakdowns between various scientific, commercial and artistic partners.

When reflecting upon the relative success of initiatives such as E.A.T. and A&T, it is interesting to consider the rapidity with which such conceptual misalignments evolved in time, from an attempt to respond to Snow's 'two cultures' diagnosis in the early 1960s, to the arrival of corporatised science and the confluence of military and industrial agendas through the Vietnam War era of the 1970s.[49] A&T director Tuchman noted in 1971:

> I suspect that if Art and Technology were beginning now instead of in 1967, in a climate of increased polarization and organized determination to protest against the policies supported by so many American business interests and so violently opposed by much of the art community, many of the same artists would not have participated.[50]

This shift in political perspective may explain the reticence of many conceptual practitioners to acknowledge an explicitly scientific influence on their work, as exemplified by Sol LeWitt's remarks in "Paragraphs on Conceptual Art," in which he

[48] Fujiko Nakaya (with engineer Thomas Mee), *Fog Sculpture* (1970), water vapour, Pepsi Pavilion, Expo '70, Osaka Japan, March 15 – September 13, 1970.
[49] For further analysis of the effect of the Vietnam war, see Anne Collins Goodyear, "From Technophilia to Technophobia: The Impact of the Vietnam War on the Reception of 'Art and Technology,'" *Leonardo* 41, no. 2 (2008): 169–73.
[50] Maurice Tuchman, introduction to *A Report on the Art and Technology Program of the Los Angeles County Museum of Art 1967–1971* (Los Angeles: Los Angeles County Museum of Art, 1971), 17.

FIGURE 11.

FUJIKO NAKAYA
FOG SCULPTURE
1970
WATER VAPOUR
INSTALLED AT THE PEPSI PAVILION FOR EXPO '70 IN OSAKA, JAPAN
(MARCH 15–SEPTEMBER 13, 1970)

PHOTO: SHUNK-KENDER / J. PAUL GETTY TRUST / GETTY RESEARCH INSTITUTE, LOS ANGELES

stated, "Conceptual art doesn't really have much to do with mathematics, philosophy, or any other mental discipline[s]."[51] This sentiment is difficult to take at face value, considering his collaboration with mathematicians Arthur Babakhanian and Erna Herrey, as well as the unambiguously algorithmic nature of his work.[52]

Nonetheless, such commentary does speak to potential modes of failure in the establishment of art-science initiatives, in which disputes over both the conceptual underpinnings as well as practical outcomes of such work come to the fore. For a brief moment in the early 1960s, science and technology "carried the sheen of modernity" seemingly untarnished, and appeared to offer a limitless course for progress and advancement.[53] This perspective seems ultimately to have created problems — leading many of the scientists and scientific administrators involved in such collaborative efforts to misunderstand artistic purpose and interest. The scientific focus of such projects appears often to have referenced purely technological innovation, while, I argue, conceptual artistic intent was ultimately more engaged with the underlying methodological and philosophical frames of scientific research in the abstract.

While collaborative art-science initiatives would not begin in earnest until the 1960s, I suggest that it is in fact an earlier expansion of science that was of more practical interest and utility to the establishment of conceptual art — one that dealt with and popularised the notion of method. In 1932, physicist Robert Millikan stated that the "main thing that the popularisation of science can contribute to the progress of the world consists in the

[51] LeWitt, "Paragraphs on Conceptual Art," 79-83.
[52] Natasha Rozhkovskaya and Michael Reb, "Is the List of Incomplete Open Cubes Complete?," *Nexus Network Journal* 17, no. 3 (2015), https://doi.org/10.1007/s00004-015-0254-8, 923.
[53] Peter Lunenfeld, "Cal Tech: Peter Lunenfeld on 'Art and Technology' at LACMA," *Artforum* 54, no. 1 (2015).

spreading of a knowledge of the method of science to the man in the streets,"[54] an objective historian of science Daniel Thurs suggests was demonstrably achieved throughout the 1940s and '50s, when the term *scientific method* saw a rapid expansion of use and application.[55] This active dissemination of scientific vernacular led to a form of societal registration — a general-purpose understanding of the methods, processes and philosophical attitude that science had and would continue to generate, establishing, I argue, the environment for method-driven conceptual practice as illustrated by Bochner's *Working Drawings*…

Returning to an analysis of E.A.T., it is interesting to document the way these cross-disciplinary dynamics played out in practice. In the chaotic process of producing *9 Evenings*, for example, there was a recognition that "even more important than the final product was the process behind it."[56] Rauschenberg would suggest that the audience should arrive early in order to observe the set-up of performances: "They should understand that we're involved in a process and not presenting finished products."[57] Similarly, Simone Forti (Whitman) would state: "I am beginning to feel that the main function of the performances is not so much the presentation of art pieces but a step towards the creation of situations which will later be important to the making of art."[58] When speaking of their own experiences working with E.A.T., Dan Flavin suggested that "it would not surprise me to see the evolution of a type of scientist-artist,"[59] and Allan Kaprow acknowledged that the "newest energies are gathering in cross-overs, the

[54] Robert A. Millikan, "The Natural Sciences," *The Scientific Monthly* 35, no. 3 (1932), 205.
[55] Daniel P. Thurs, "Scientific Methods," in *Wrestling with Nature: From Omens to Science*, ed. Peter Harrison, Ronald L. Numbers and Michael H. Shank (Chicago: University of Chicago Press, 2011), 321.
[56] Goodyear, "György Kepes, Billy Klüver, and American Art of the 1960s," 33.
[57] Simone Whitman, "1. Notes by a Participant," *Artforum* 5, 6 (1967): 30.
[58] Simone Whitman, "A View of 9 Evenings," in *E.A.T. : Experiments in Art and Technology*, ed. Sabine Breitwieser (Köln: Verlag de Buchhandlung Walther König, 2015), 142.
[59] Goodyear, "From Technophilia to Technophobia," 169.

areas of impurity, the blurs which remain after the usual boundaries have been erased."[60] Robert Morris would remark:

> In the beginning, I merely intended to use industry to implement certain ideas I had which were fairly clear in my own mind. I knew what I wanted and it was simply a matter of finding someone to build it. This approach changed in proportion to what I found out about how things got made. It became less and less a matter of being in a studio thinking of things, making the plans and sending them off to the fabricator. More and more it became a matter of incorporating methods and materials I had found out about in the process of being related to particular fabricators. The process of working became more direct and also more complex — involving as it would not only the ever-increasing acquisition of technical information but also the development of a social and executive sense which had not been necessary when I made the work myself in the studio.[61]

Such positive engagement with the experimental structure of E.A.T. (and *9 Evenings*… specifically) from the artistic perspective was, however, immediately tempered by the attitudes of various scientific collaborators, who appeared to be less enthusiastic regarding the unstructured nature of the experience and lack of tangible outcomes. Simone Forti (Whitman) would later recall conversations with collaborators from the engineering team in her journal (later published in *Artforum*):

[60] Ibid.
[61] Robert Morris, "Remarks," transcript, press conference for E.A.T., October 10, 1967, MoMA/E.A.T. Klüver Documents, #56. Cited in Kuo, "'To Avoid the Waste of a Cultural Revolution,'" 146.

> The first two nights started very late and were drastically rough…
>
> … The audience was incensed. There was a feeling of disaster. Robbie (tech) said to me, "You guys are emotionally prepared for this. We aren't." I tried to tell him that we're used to having audiences boo, hiss, and walk out. That the [art] history books are full of accounts of performances at which the audiences were incensed, and which later were recognized to be important achievements. Robbie kept saying, "You guys were emotionally prepared."[62]

While the particular outcomes realised through programs such as E.A.T. and A&T may not have, in my opinion, always delivered upon the potential that art-science initiatives offer, these programs clearly did aid in the establishment of a new form of conceptual art practice informed through collaboration with science. As Goodyear notes, "*9 Evenings* and the numerous collaborations it helped generate bespeaks a deeper and more pervasive appreciation of art itself as an intellectual practice."[63]

2.4 METHOD AND ACTS OF MEASURE

In 1968, Mel Bochner was invited to participate in an E.A.T. program with the Singer Corporation's Research and Development Laboratories based in New Jersey. The four-month residency allowed Bochner to work on site, three days per week, participating in think-tank style discussions with mathematicians and physicists who were investigating new forms of computational and aerospace technology.[64] In order to be viewed as an

[62] Whitman, "1. Notes by a Participant," 30.
[63] Cateforis, Duval and Steiner, *Hybrid Practices,* 37.
[64] Mel Bochner, "Mel Bochner," *Artforum* 51, no. 1 (2012), https://www.artforum.com/print/reviews/201207/mel-bochner-31993.

equal and not seen as merely a "tourist," Bochner requested (and was granted) a salary equivalent to that of a research scientist as well as his own office for the duration of the program, ensuring his research was viewed on a similar footing to his scientific peers.[65] Although none of the projects that Bochner had initially conceived for the program would come to fruition, the residency would ultimately become a pivotal moment in the artist's career, offering an intensive interdisciplinary exchange that would clarify his understanding and interest in the underlying methodological processes common to both science and conceptual art.

Strangely, one of the primary outcomes from his experience, *Singer Notes* (1968) (fig. 12), is an obscure and largely unrecognised work that has only recently been rediscovered, publicly exhibited for the first time in 2017.[66] An archive of drawings and annotations made by the artist during his time at Singer Labs (displayed in a similar fashion to *Working Drawings*…), *Singer Notes* provide a detailed account of the artist's mental trajectory during this period, documenting several key thematic concerns. These include questions, such as "How do scientists translate their research into more concrete applications? How do they design experiments? The nature of colour as a type of energy; the fundamental differences between the analog and the digital; how do scientists (and in a broader sense, people) know what they know?"[67]

[65] Hans Ulrich Obrist and Sandra Antelo-Suarez, "Hans Ulrich Obrist and Sandra Antelo-Suarez interview Mel Bochner," *e-flux*, http://projects.e-flux.com/do_it/notes/interview/i003.html.
[66] "Mel Bochner - Singer Notes - Exhibition," 2017, MFC-Michèle Didier website, accessed April 20, 2021, https://www.micheledidier.com/en/expositions/presentation/44/singer-notes
[67] Ibid.

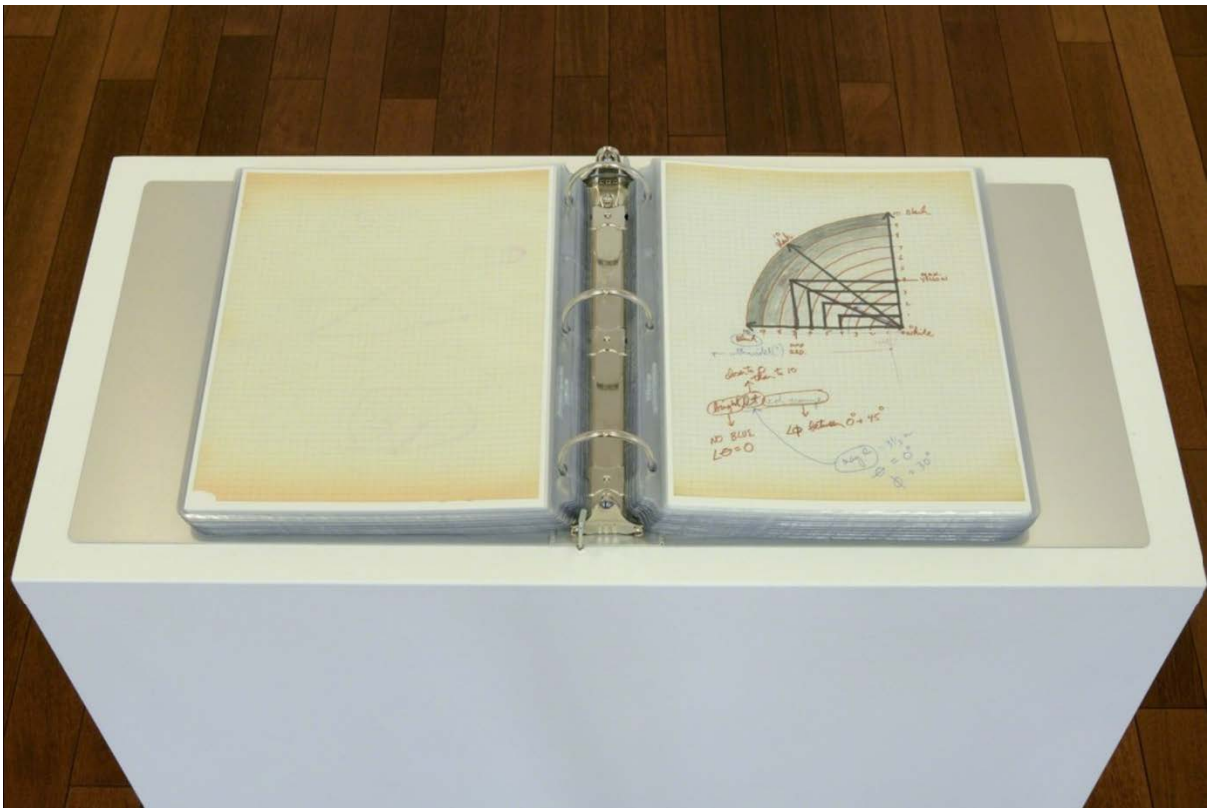

FIGURE 12.

MEL BOCHNER
SINGER NOTES
INSTALLATION VIEW
1968
ALUMINIUM BINDER 30.3 X 29.1 X 7 CM,
47 LOOSE-LEAVES IN PLASTIC FOLDS

Singer Notes also document a set of thoughts and experimental sketches for what would become foundational to Bochner's later *Measurement Series,*[68] one of the artist's most significant bodies of work and a dominant part of his ongoing practice.

Consequently, *Singer Notes* operate not only as an archival artwork but as an intellectual record — demonstrating the significant impact of Bochner's engagement with scientific researchers and offering substantive proof of how this interaction would influence his methodological process and conceptual agenda moving forward. Bochner himself would verify the extent of this influence in a 2012 article published in *Artforum,* reflecting on his experience at the Singer Laboratories and the development of his work on measurement:

> As time went on, the subject of discussion kept coming back to how communication could be objectified, which boiled down to the issue of measurement. That's when measurement as an idea entered into my thinking, because it was the only form of verification that the scientists would accept. If they didn't have a measurement, and it wasn't repeatable, then they feared ambiguity could creep in. I wanted to show them that measurement itself is not immune to ambiguity, so one day I came in early with some Letraset numbers and black tape, and randomly put different measurements around the lab, not attached to anything, just free-floating on walls, on doors, on the floor. I didn't

[68] Bochner's *Measurement Series* included works such as *Measurement: Room,* 1969, tape and letraset on wall size determined by installation; *48" Standards: Set A ,* 1969, brown paper stapled to wall, black tape and letraset, size determined by installation; and *Measurement: Plant,* 1969, live plant, tape, letraset on wall, size determined by installation, http://melbochner.net/archive/1960s/

> tell anybody what I had done, so when they came in and discovered them, it brought up a whole new round of questions, starting with, "What does it mean to divorce measurement from an object?" This led to the ultimate question of scepticism: "How much 'trust' is embedded in objectivity?"[69]

Bochner was not alone in his employment of measurement as a tool of conceptual investigation. While he was examining measurement in the context of the Singer Laboratories, Walter De Maria was producing *Mile Long Drawing* (1968) (fig. 13), an ephemeral work consisting of two parallel chalk lines drawn across the floor of the Mojave Desert. This work would be a precursor to two of De Maria's most significant works: *The Vertical Earth Kilometre* (1977) (fig. 14), a permanent installation in Kassel, Germany (originally created for *Documenta 6)*[70] consisting of a one-kilometre long solid brass rod embedded vertically into the earth, in which the only visible part is the solid, circular top that sits flush with the ground;[71] and its companion piece, *The Broken Kilometre* (1979) (fig. 15), a permanent installation within a street-level storefront in SoHo, New York City, comprised of five-hundred two-meter long solid brass rods (each the same diameter as the rod used for *The Vertical Earth Kilometre),* arranged in five parallel rows of one-hundred rods each.[72] These works, each a direct expression of the

[69] Bochner, "Mel Bochner."
[70] "documenta, Works in Kassel — Walter de Maria, *The Vertical Earth Kilometer* 1977," Documenta website, accessed April 22, 2021, https://www.documenta.de/en/works_in_kassel.
[71] "Walter De Maria, The Vertical Earth Kilometer," Dia Art Foundation website, accessed March 3rd, 2021, https://www.diaart.org/visit/visit-our-locations-sites/walter-de-maria-the-vertical-earth-kilometer-kassel-germany.
[72] "Walter De Maria, The Broken Kilometer," Dia Art Foundation website, accessed March 3rd, 2021, https://www.diaart.org/visit/visit-our-locations-sites/walter-de-maria-the-broken-kilometer-new-york-united-states.

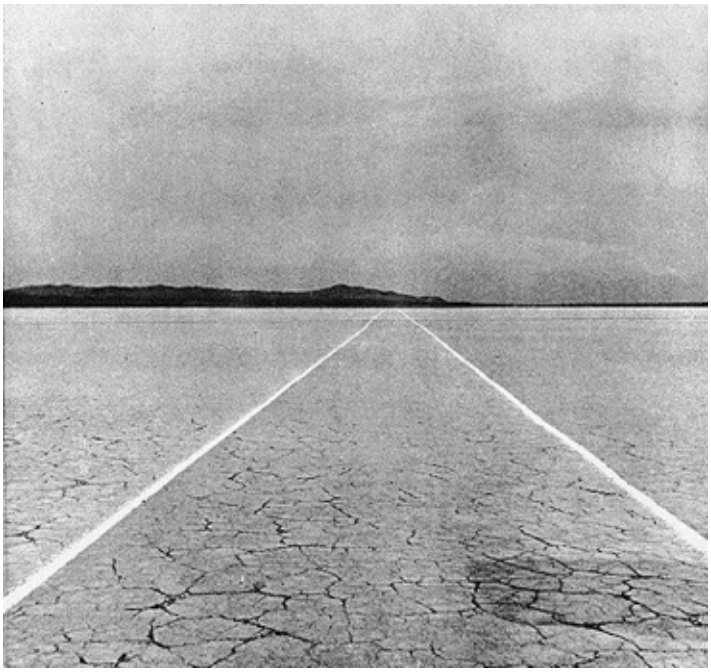

FIGURE 13.

WALTER DE MARIA
MILE LONG DRAWING
1968
CHALK
TWO PARALLEL LINES SPACED 12 FEET (356 CM) APART
EACH LINE: 4 INCHES WIDE X 1/2 MILE LONG (0.01 X 804.67 M), MOJAVE DESERT

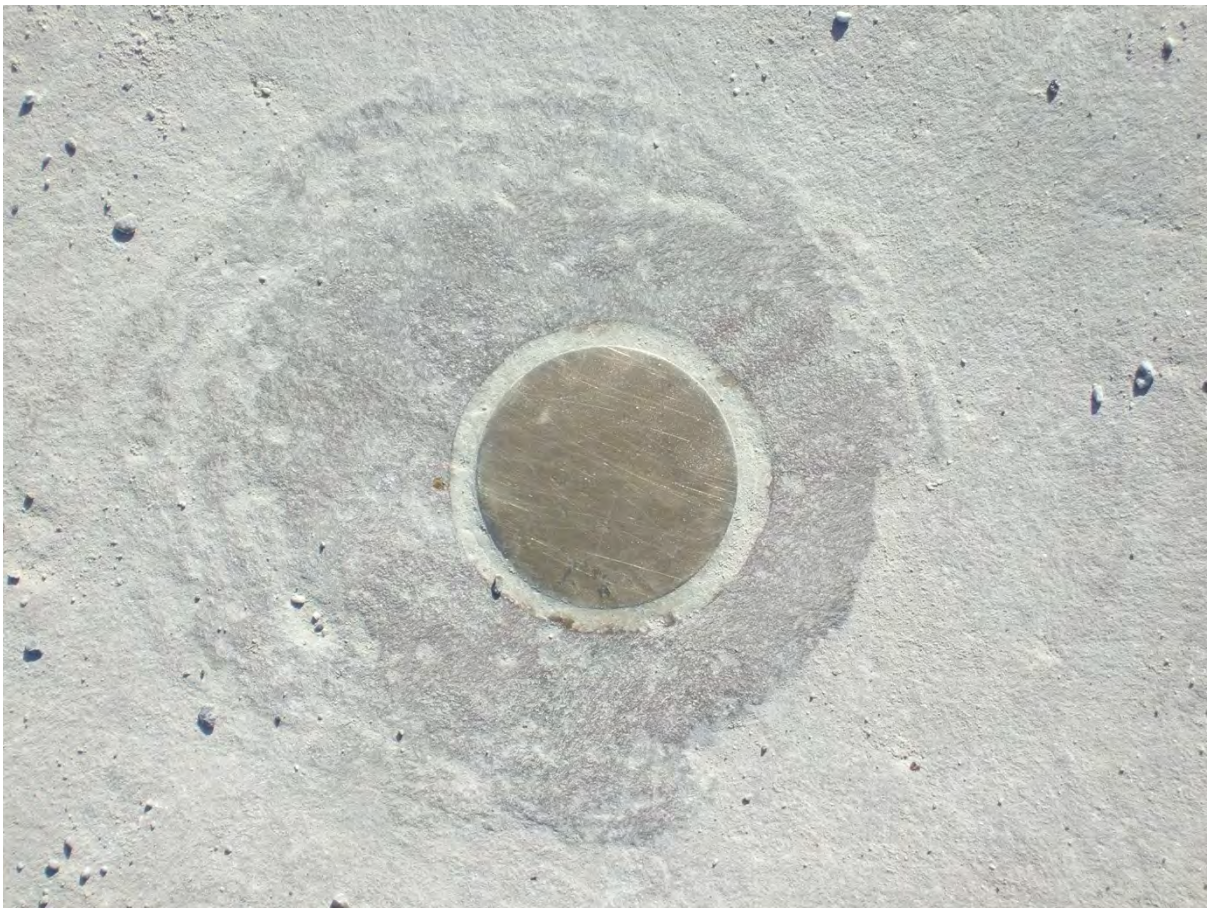

FIGURE 14.

WALTER DE MARIA
VERTICAL EARTH KILOMETER
1977
SOLID BRASS ROD INSERTED INTO THE EARTH, WITH RED SANDSTONE PLATE
167 THREADED ROD SECTIONS, EACH: 19 FEET 81/4 INCHES (6 M) X 2 INCHES (5.1 CM) DIAM.
VERTICAL ROD, OVERALL: 3,280 FEET 10 1/16 INCHES (1 KM) X 2 INCHES (5.1 CM) DIAM.
SANDSTONE PLATE: 79 3/16 X 79 3/16 INCHES (200 X 200 CM)
FRIEDRICHSPLATZ, KASSEL, GERMANY
COMMISSIONED AND MAINTAINED BY DIA ART FOUNDATION, NEW YORK

FIGURE 15.

WALTER DE MARIA
THE BROKEN KILOMETER
1979
SOLID BRASS
FIVE HUNDRED RODS, EACH 2 INCHES (5 CM) DIAM. X 78 3/4 INCHES (200 CM)
OVERALL AREA: 45 X 125 FEET (13.7 X 38.1 M)
OVERALL WEIGHT: 37,500 LB. (16,991.6 KG)
393 WEST BROADWAY, NEW YORK
COMMISSIONED AND MAINTAINED BY DIA ART FOUNDATION, NEW YORK

methodology of measure, operate as acts of calibration and divestment from ambiguity. Each work seeks to test our collective registration of the value of metrics when set against the unfamiliar — exposed to the expanse of landscape, inset into the substrates of the Earth or fractiously laid bare in (human sized) increments, allowing people to "think and feel about the Earth and its place in the universe."[73]

What distinguishes Mel Bochner among such figures as Walter De Maria and others was his willingness to articulate his own underlying methodological concerns (De Maria was notably reluctant to speak about his work or its meaning), expressly identifying how measurement systems — situated in Bochner's view between scientific and societal use — were the perfect vehicles to test (and exploit) the "gulf of mutual incomprehension" to be found between scientific, societal and artistic concerns.[74] As art historian Derek Weiler recently noted:

> Bochner understood artistic work to be the product of historical circumstances, he also saw the aspect of time that it contained as thoroughly informed by the particular nature of intellectual progress in Western industrialized societies… For Bochner, then, technology and science were not extraneous to the work, mere means of bringing it about… but significantly encoded in the material of artistic work, indeed substantially related to its manifestation in categorical terms.[75]

[73] Statement by Walter De Maria, 1977, reprinted in Katherine Atkins and Kelly Kivland, eds., *Artists on Walter De Maria* (New York: Dia Art Foundation, 2017), 62.
[74] Snow, *The Two Cultures and the Scientific Revolution*, 4.
[75] Derek Weiler, "Serial Aesthetics and the Concept of Technique: Mel Bochner and the 1960s" (Ph.D.diss., New York University, 2013), 358, http://ezproxy.library.usyd.edu.au/login?url=https://www.proquest.com/dissertations-theses/serial-aesthetics-concept-technique-mel-bochner/docview/1334957239/se-2?accountid=14757 (3557040).

In this way, Bochner specifically (and perhaps in contrast to various other of his E.A.T. contemporaries) is an exemplar of the particular style of method-driven conceptual practice that is of central concern to me in this thesis. I argue that his work establishes a direct causal link between emerging conceptual practices in the United States in the 1960s and an engagement with scientific research, as per his time at Singer Laboratories. That this relationship has not been more broadly acknowledged in the analysis of the development of conceptual art is, I suggest, an omission, and one that when rectified provides insight into the establishment of certain aspects of the conceptual narrative.

CHAPTER THREE: IDEA AS ACTIVITY

Of the various scaffolds upon which the dynamics of conceptual art have been constructed, the underlying relationships and proximity to philosophy are foundational. Evident in the written and visual output of key conceptual practitioners is a clear leveraging of philosophical strategies — one that scholars such as Peter Osborne, Eve Kalyva, Peter Goldie and Elisabeth Schellekens have suggested singularly distinguish the conceptual practices of the 1960s and 1970s from all forms of conceptual activity that have followed.[1] Although this philosophical pivot is widely accepted, the specific focus demonstrated by conceptual practitioners upon analytical philosophy — a branch of inquiry popularised by the philosopher/mathematicians Bertrand Russell, Ludwig Wittgenstein, Alfred Whitehead, A. J. Ayer and others, — is, I argue, an underdeveloped narrative in which the role of scientific methodology and influence goes unacknowledged.

Characterised by investigations pertaining to logic, reason, conceptual clarity and the disambiguation of language and intent in all of its forms (i.e., mathematical as well as linguistic), analytical philosophy offered conceptual practitioners an active, epistemological space to examine the structure of ideas, and engage with abstract notions of the *experiment* in order to situate their own methodological activities and forms of knowledge production. While introduced here in the context of conceptual art, analytical philosophy was originally established to contend with developments in twentieth century

[1] Peter Osborne, "Conceptual Art and/as Philosophy," in *Rewriting Conceptual Art*, ed. Michael Newman and Jon Bird (London: Reaktion, 1999), 47–65; Eve Kalyva, *Image and Text in Conceptual Art: Critical Operations in Context* (Cham: Springer, 2016); Peter Goldie and Elisabeth Schellekens, *Philosophy and Conceptual Art* (Oxford; New York: Clarendon Press; Oxford University Press, 2007).

science, in which the ambiguous nature of abstract thought experiments was a critical component in the construction of new theories and in the analysis of physical observations and experiments. Such mechanisms could, and were, readily adapted and subsumed by emerging idea-driven artistic practices, in which artists combined the rigor of methodological frames with ontological perspectives.

When considering the development of these practices, art critic Bazon Brock observed that such artists "brought together experiments and hypothetical concepts of art in developing a logic that was intended to make it possible to see the meaning of artistic work in the confrontation with the unknown, the incommensurable, the uncontrollable, i.e., reality."[2] These efforts sought to contend with Ludwig Wittgenstein's notion that "philosophy is not a theory but an activity," establishing a new process-driven praxis activated by philosophical inquiry, resting upon experimental modalities and motivated by artistic concerns.[3]

In addition to the conventional analysis, in which connections between the development of conceptual art and philosophy are widely acknowledged, I wish to underscore the unarguably scientific origins of such linkages and to document the conscious and unconscious ways that conceptual practitioners were influenced by the analytical nature of this material. Wittgenstein himself is a clear example of this dichotomy. Favoured by conceptual artists for his engagement with linguistics, in truth, Wittgenstein was a philosopher/logician,[4] working with Bertrand Russell on the philosophy of mathematics

[2] Bazon Brock, "Cheerful and Heroic Failure," in *Failure*, ed. Lisa Le Feuvre (Cambridge, MA: MIT Press, 2010), 180.
[3] Ludwig Wittgenstein, *Tractus Logico-Philosophicus* (London: Routledge & Kegan Paul, 1958), 4.112.
[4] As Jacob Bronowski intimates: "Those who led the return to the empiricist tradition, first Bertrand Russell and then Ludwig Wittgenstein, were in fact trained in scientific disciplines… In his early writings Wittgenstein held that a statement makes sense only if it can be tested in the physical world. In his later writing Wittgenstein came to look for the meaning of a statement in the way in which it can be used: the contexts and the intentions into which it fits. That is his early view of truth was positivist, and his later view was analytical… Wittgenstein's followers have now enthroned his later analysis of usage into a philosophical method which often seems remote from any universal tests,

at Cambridge University.[5] The mis-contextualisation of Wittgenstein's contributions is, I feel, a remarkable oversight, and it is of interest to consider the one-sided implications of divesting his theories of their scientific emphasis and applying them to language alone. In practice, Wittgenstein and Russell were attempting to unpack various epistemologies — both lexical and scientific — into sequences of logical constructs in order to confirm or refute the objectives of logical positivism.[6] In leaning upon this material, I contend that conceptual artists synthesised aspects of the scientific attitude with their own agendas, leading to the development of practices informed by this exchange.

In the decades prior to the development of conceptual art, science itself underwent a period of rapid conceptual expansion, and it is of interest to consider how the establishment of a mode of abstract, conceptual scientific discovery and experimentation was subsequently filtered into the conceptual lexicon. The early twentieth century saw the development of scientific theories of relativity, quantum mechanics and nuclear physics — requiring a new metaphysical understanding of science's own operations and boundaries. Scientific research was extended beyond the physical realm — describing the infinitesimal, the invisible; the notion of systems suspended in chance and probability. Such work required the scientist to experiment in the space of the mind — grappling with unphysical or inaccessible entities that expanded and distorted perceptions of reality.

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but their aim remains, as it was his, to make our understanding of the world tally with the way in which it works in fact." Jacob Bronowski, *Science and Human Values* (New York: Harper & Row, 2008), 56.

[5] "Historical Perspective — Faculty of Philosophy, University of Cambridge," University of Cambridge website, accessed 31 May, 2021, https://www.phil.cam.ac.uk/aboutus/philosophy-cambridge-history.

[6] Logical positivism (also known as logical empiricism) was a philosophical movement that arose in the Vienna in the 1920s, characterised by the central thesis that knowledge should be verifiable by observation or logical proof. It was an attempt to circumvent unclear language and unverifiable claims by creating a form of scientific philosophy that shared the ideological and structural framework of empirical sciences.

The parallels between this scientific abstraction, metaphysical analysis and the development of conceptual practices were not entirely overlooked by theorists during the 1960s, with Ursula Meyer addressing this interplay directly in *Conceptual Art:*

> The physicist J. Robert Oppenheimer's comment on science applies as well to art: There have been more discoveries during the past few decades than during all the preceding centuries. In *Physics and Beyond*, Werner Heisenberg described how scientists approached the key area of philosophy, the area between mathematics and physics, with the various means of analysis, formulas, experimentation, image, parable, and poetry; the extension of one field into another is conducive to discovery. The trends of scientific discovery apparently parallel developments in art. There is the exploration of other fields — film, performance, poetry, philosophy, science, and technology. There is also the break with tradition and the incessant casting about for an entity that one does not yet know. The initial atomic investigation, for instance, proceeded in the absence of any language that could adequately describe what the scientists were looking for.
>
> Analogously, the traditional language of art is no longer adequate to questions of Conceptual Art. What has occurred in science, as in art, is that a new form of apperception has been added, which allows for perceiving phenomena that are abstract and/or invisible.[7]

3.1 AN INTERDISCIPLINARY EDUCATION

In many respects, the introduction of analytical philosophy to conceptual practices was indicative of changes that had occurred within the American education system during

[7] Meyer, *Conceptual Art*, xv–xvi.

1930s and 1940s — a period that saw an influx of European intellectuals fleeing fascism and war, as well as the introduction of a US government initiative known as the G.I. Bill that included provisions for returning servicepeople to undertake educational opportunities.[8] These dual events brought about a recalibration of American academic institutions, leading to a significant expansion in the US university system as well as the establishment of a series of bespoke, experimental liberal arts colleges that championed an entangled education in art, science and philosophy.

Two notable examples of such initiatives were Black Mountain College (BMC), established in 1933 in North Carolina, and the New Bauhaus which opened in 1937 in Chicago. Both schools would become significant refuges for European artists escaping Nazi occupation and persecution, with notable figures such as Joseph and Anni Albers becoming founding members of Black Mountain College, and László Moholy-Nagy and György Kepes (who would later go on to found the Centre of Advanced Visual Studies at MIT) taking faculty positions at the New Bauhaus. Through their tenure, these artists propagated progressive models of integrated practice, where science and philosophy were successfully merged with the principles of artistic education.[9] In his book, *The New Vision: Fundamentals of Bauhaus Design, Painting, Sculpture and Architecture,* László Moholy-Nagy would acknowledge this interrelation, stating:

[8] The program provided a range of financial reliefs in the form of low-cost loans, mortgages, unemployment compensation, with benefits available to all servicemen who had been on active duty for at least 90 days during the war. Of the 16 million military personnel that had served in the war, 7.8 million veterans used the education program, with over 2.2 million attending a university or college. John Bound and Sarah Turner, "Going to War and Going to College: Did World War II and the G.I. Bill Increase Educational Attainment for Returning Veterans?," *Journal of Labor Economics* 20, no. 4 (2002): 786, https://doi.org/10.1086/342012.

[9] The Bauhaus (also Staatliches Bauhaus) was a German art school from 1919 to 1993 that became renowned for its progressive education model that amalgamated science and art into an integrative approach to creative practice known in German as Gesamtkunskwerk (comprehensive artwork). With a core objective to "reimagine the material world to reflect the unity of all the arts," the Bauhaus had a lasting influence on graphic, interior and industrial design as well as art, typography and architecture.

> America is the bearer of a new civilization whose task is simultaneously to cultivate and to industrialize a continent. It is the ideal ground on which to work out an educational principle which strives for the closest connection between art, science, and technology.[10]

In the case of Black Mountain College, such interdisciplinary principles were integrated alongside those of American philosopher, psychologist and educational reformer John Dewey, whose pedagogical innovations were core to the governing tenets of the academy, providing "a place where free use might be made of tested and proved methods of education and new methods tried in a purely experimental spirit."[11]

Although Dewey's contribution to the arts is often considered in relation to his seminal text *Art as Experience*,[12] it was his previous work advocating for scientifically enriched educational reform that was integral to the establishment of BMC. Built upon his belief that "Science, so conceived, is not a body of knowledge but a method of inquiry tethered intrinsically to the needs and desires of everyday life,"[13] Dewey had long advocated for the replication of laboratory methods across all field of education to encourage a "perpetual process of self-correcting inquiry."[14] According to John Beck and Ryan Bishop, "Black Mountain modelled itself, in Deweyan fashion, as a laboratory in this sense, providing the conditions under which experimentation might take place,"

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[10] László Moholy-Nagy, *The New Vision: Fundamentals of Bauhaus Design, Painting, Sculpture, and Architecture: With Abstract of an Artist* (Mineola, NY: Dover, 2005).
[11] Black Mountain College, "1933–34 Black Mountain College Catalog" (Black Mountain, NC: UNC Asheville, Special Collections, May 13 2021 1933), 4, https://unca.contentdm.oclc.org/digital/collection/p15733coll6/id/90.
[12] John Dewey, *Art as Experience* (New York: Berkley Publishing Group, 2005).
[13] John Beck and Ryan Bishop, *Technocrats of the Imagination: Art, Technology, and the Military-Industrial Avant-Garde* (Durham, NC: Duke University Press, 2020), 21.
[14] Ibid, 22. Dewey would argue that the laboratory method was "the lesson which all education has to learn." The laboratory, he continues, "is the discovery of the conditions under which labor may become intellectually fruitful and not merely externally productive." John Dewey, *Democracy and Education* (New York: Sheba Blake Publishing, 2015), 839–40.

resulting in an "an improvisatory, experimental environment unencumbered by conventional institutional or disciplinary hierarchies [that] was the perfect site for the emergence of as yet undetermined forms of creative experience."[15] While such conditions did not, as historian Phillip Mirowski intimates, specifically mimic "the actual quotidian procedures of the physical scientists,"[16] they did, in Dewey's words, engender "a certain logic of method"[17] — one that, arguably, had a profound effect upon the artists who encountered it.

It was in this environment that artists John Cage, Merce Cunningham and Robert Rauschenberg would pioneer a new form of experimental, avant-garde performance that would come to be known as a *happening*.[18] The first of these, retrospectively named *Theatre Piece No. 1,* was a multilayered, multidisciplined event involving simultaneous yet uncoordinated actions undertaken by the trio alongside fellow BMC artists (including M.C. Richards, Charles Olson, David Tudor and Dorothea Rockburne) in August of 1952. While no form of documentation exists of the event, the score-based experimental activity would prove instrumental to later developments in conceptual and performative practices. That Cage, Cunningham and Rauschenberg would later be involved in the first E.A.T. event, *9 Evenings,* suggests that Dewey's quasi-scientific focus at BMC led indelibly to the establishment of a certain mode of conceptual methodology amongst its adherents.

[15] Beck and Bishop, *Technocrats of the Imagination*, 26, 25.
[16] Philip Mirowski, "The Scientific Dimensions of Social Knowledge and their Distant Echoes in 20th-Century American Philosophy of Science," *Studies in History and Philosophy of Science Part A* 35, no. 2 (2004), https://www.sciencedirect.com/science/article/pii/S0039368104000160.
[17] John Dewey, *The Public and its Problems* (New York: H. Holt and Company, 1927), 202.
[18] The term *happening* was coined by artist Allan Kaprow in 1959 to describe a new form of artist-led performative event. The name was selected to suggest "something spontaneous, something that just happens to happen" in which "the line between art and life should be kept as fluid, and perhaps as indistinct as possible." "Performance Art: The Happening," Tate, accessed 31 May 2021, https://www.tate.org.uk/art/art-terms/h/happening/happening.

In addition to this scientifically-inclined operating principle, Black Mountain College also facilitated an explicitly interdisciplinary education, with faculty including a number of philosophers, scientists and inventors who presented various mathematics and physical science courses as part of its academic program. Preliminary reports published by the college affirmed these objectives, stating that "a small number of students may secure an adequate training in laboratory work of undergraduate calibre in physics, chemistry, and biology."[19]

The school's scientific instruction was further bolstered by numerous visiting scholars, including Albert Einstein — who would also serve on the school's board of directors — and Max Dehn, who became a member of faculty in 1945. Dehn in particular was well regarded by the artists of the college, known for delivering scientific lectures in a Socratic style that often strayed into philosophy and considerations of the parallels between art and mathematics. Artist Dorothea Rockburne would credit her time studying with Dehn as being instrumental to the development of her mathematically derived practice. Introducing her to mathematical theory through titles such as Poincaré's *Science and Method*, along with *Non-Euclidean Geometry* by Henry Parker Manning, *The Fourth Dimension* by C. Howard Hilton, and *Flatland* by Edwin A. Abbott.[20] Rockburne would later state: "By understanding the history of mathematics, I learned of an exquisite emotional beauty of thought. This in turn gave me greater access to an understanding of a more universal creative process."[21]

[19] Mark-Ellis Bennett, "The History and Legacy of Black Mountain College," *Biltmore Beacon*, January 10 2019, https://www.biltmorebeacon.com/news/the-history-and-legacy-of-black-mountain-college/article_78d71bea-128e-11e9-b717-cbf736298181.html

[20] David Peifer, "Dorothea Rockburne and Max Dehn at Black Mountain College," *Notices of the American Mathematical Society* 64, no. 11 (2017): 1314, https://doi.org/10.1090/noti1599. Henry Parker Manning, *Non-Euclidean Geometry* (New York: Dover, 1963); Charles Howard Hinton, *The Fourth Dimension* (London: Swan Sonnenschein & Co., 1904).

[21] Peifer, "Dorothea Rockburne and Max Dehn at Black Mountain College," 1314.

As Black Mountain College was implementing experimental modes of interdisciplinary education, more traditional models — in the form of universities — were also experiencing an unprecedented rate of expansion, fostered, in part, by implementation of the G.I. Bill, which was signed into law in 1944. Imparting financial benefits to returning US military veterans in the form of tuition and living expenses, the program enabled mass-scale education — effectively doubling the number of US college and university degree holders between 1940 and 1950.[22] With no limitation upon the fields of study undertaken, this comprehensive growth led to the expansion, and ultimately, accreditation and integration of art schools within the university system more system more broadly, as denoted by the establishment of the MFA program in the 1940s.[23]

As Peter Osborne observed in his book *Conceptual Art,* the generation of American artists that came to prominence in the 1960s were the first to emerge from this academic model.[24] Beneficiaries of the experimental application of Dewey's work at Black Mountain College as well as the integration of the study of art into the university system alongside disciplines such as science and philosophy, conceptual artists would leverage these opportunities to create a new style of methodologically informed practice. Unpacking the credentials of various practitioners of the period supports such a theory, with many taking circuitous, multidisciplinary pathways en route to their formal artistic careers. Prior to pursuing his art education at the

[22] Glenn C. Altschuler and Stuart M. Blumin, *The GI Bill: A New Deal for Veterans* (New York: Oxford University Press, 2009), 118. "75 Years of the GI Bill: How Transformative It's Been," U.S. Department of Defence, accessed 31 May 2021, https://www.defense.gov /Explore/Features/story/Article/1727086/75-years-of-the-gi-bill-how-transformative-its-been.

[23] The idea of bringing artists and schools together in an academic context was first considered in the US by the University of Iowa in the 1920s. Known as the "Iowa Idea" the program sought to bring major practicing artists into the school alongside art historians to create a liberal arts environment that would combine studio courses with the history and theory of art. The school would eventually be established in 1938, and the first scholars graduating in 1940, including Elizabeth Catlett (1915–2012) who was the first person, first woman and first African American to receive an MFA degree. The success of the University of Iowa program lead to the development of the MFA as a terminal fine arts degree across the United States."The Iowa Idea," Univeristy of Iowa, School of Art and Art History, accessed 31 May 2021, https://art.uiowa.edu/about/iowa-idea; "Historical Timeline: School of Art and Art History," University of Iowa — School of Art and Art History, accessed 31 May 2021, https://art.uiowa.edu/about/historical-timeline-school-art-and-art-history.

[24] Osborne, *Conceptual Art*, 28.

University of California, Bruce Nauman studied mathematics and physics at the University of Wisconsin–Madison; after completing his BFA at Carnegie Mellon University, Mel Bochner studied philosophy at Northwestern University; Joseph Kosuth would study anthropology and philosophy at the New School for Social Research (in addition to his artistic studies at the Toledo Museum School of Design, the Cleveland Institute of Art and the School of Visual Arts, New York); and Walter De Maria, who ultimately graduated with a degree in European history from the University of California, also studied philosophy, art history and political science, while engaging with various geologists and physicists he met on campus.[25]

3.2 IN THE SPACE OF THE MIND

Concurrent with this expansion of educational opportunity, the mid-twentieth century represented a key era in the development of conceptual scientific thinking, with the arrival of various abstract theories designed to engage with the *phenomena of the unseen* — a range of speculative observations and inferences that sat outside the scale of human experience and perception. Investigations were conducted to contemplate the nature of space-time, the curvature and extent of the universe, the nature of the atom, and, ultimately, to consider whether our reality is constructed based on deterministic interactions or is fundamentally a sequence of random and stochastic processes in which chance and probability are the governing principles.

[25] In his 1972 interview with Paul Cummings for the Smithsonian Institution's Archives of American Art, Walter de Maria spoke of his time at Berkley: "It was a very good atmosphere. I think that helped set the tone and I made very good friends with some geologists and physicists and I learned a lot from these people and I liked the idea that there was not such a range of subjects but that you knew that basically most of the people teaching the subjects were experts in their fields." Walter De Maria, "Oral history interview with Walter De Maria," interview by Paul Cummings, *Archives of American Art*, 4 October 1972, https://www.aaa.si.edu/collections/interviews/oral-history-interview-walter-de-maria-12362#transcript.

To grapple with both the nature of this work, and the ramifications of the resulting discoveries, a new form of abstract experimental process was required, in which physicists, mathematicians and philosophers could contend with conceptual ideas and correlations that were inaccessible in the physical realm. For this purpose, the notion of the *thought experiment* was established and exploited, providing a new metaphysical tool for conceptual investigation.

The thought experiment is a form of well-structured, well-defined hypothetical question, which employs subjunctive reasoning to consider an idea or an event from an unconventional vantage point. It is a tool of the imagination with pre-Socratic origins, employed in simplified forms by key scientific figures from Galileo to Newton.[26] The idea of the thought experiment was not given any formal definitional properties until 1811, when it was referenced (as *Gedankenexperiment*) by Danish chemist and physicist Hans Christian Ørsted.[27] The technique was to gain prominence in the early twentieth century through use by the Austrian physicist and philosopher (and prominent member of the Vienna Circle) Ernst Mach in his work *Knowledge and Error: Sketches on the Psychology of Enquiry* (1905).[28] Mach considered the value of mental experiments "guided by thought" as a means of both clarifying and refining scientific intent prior to physical experimentation.[29] It was during this period that thought experiments became a significant form of intellectual deliberation — offering experimental inference for

[26] Nicholas Rescher, "Thought Experimentation in Pre-Socratic Philosophy" in *What If? Thought Experimentation in Philosophy* (London: Routledge, 2005).
[27] Johannes Witt-Hansen, "H. C. Ørsted: Immanuel Kant and the Thought Experiment," in *Kierkegaard and His Contemporaries*, *The Culture of Golden Age Denmark*, ed. Stewart (Berlin: De Gruyter, 2003), 62.
[28] Ernst Mach, *Knowledge and Error: Sketches on the Psychology of Enquiry* (Dordrecht: Springer, 1976). The Vienna Circle were a group of scientists and philosophers specialising in the natural and social sciences, logic and mathematics who met regularly at the University of Vienna from 1924 to 1936. Invested in the development of logical positivism and empiricism and greatly influenced by the early work of Ludwig Wittgenstein, key members included Gustav Bergmann, Rudolf Carnap, Herbert Feigl, Philipp Frank, Kurt Gödel, Hans Hahn, Olga Hahn-Neurath, Béla Juhos, Felix Kaufmann, Victor Kraft, Karl Menger, Richard von Mises, Otto Neurath, Rose Rand, Josef Schächter, Moritz Schlick, Friedrich Waismann, Edgar Zilsel and Karl Popper.
[29] Ibid, 135.

conditions that were either difficult or impossible to achieve in real life — an especially relevant concern in the field of subatomic (quantum) physics where physical experimentation was generally beyond the capabilities of the time.

Perhaps the most widely recognised of these thought experiments is a contemplation known as Schrödinger's Cat — an experiment devised by physicist Erwin Schrödinger in 1935 in discussion with Albert Einstein, designed to illustrate the paradox of quantum superposition.[30] In the thought experiment, a hypothetical cat could be considered simultaneously both alive and dead as a result of being exposed to a random subatomic event that may or may not occur, based on the balance of probabilistic interactions.[31]

As a foundational conceptual principle, the thought experiment is of significant importance to the development of conceptual art practices, shaping, I argue, the output of various practitioners throughout the 1950s and '60s. Early adopters of abstract experimental paradigms included John Cage, who in his composition *4'33"* (1952)[32] developed a score-based musical performance absent of sound; Yoko Ono,

[30] Quantum superposition is a principle of quantum mechanics that suggests if a physical system may be in one of multiple configurations then the most general state is a combination of all known possibilities. According to quantum physicist Anton Zeilinger, the supposition is only valid if there is no way to know, even in principle, which path of the known possibilities was taken. Anton Zeilinger, "Experiment and the Foundations of Quantum Physics," in *More Things in Heaven and Earth*, ed. B. Bederson (New York: Springer, 1999), 484, https://doi.org/10.1007/978-1-4612-1512-7_30.

[31] Schrödinger's thought experiment in full: "One can even set up quite ridiculous cases. A cat is penned up in a steel chamber, along with the following diabolical device (which must be secured against direct interference by the cat): in a Geiger counter there is a tiny bit of radioactive substance, so small, that perhaps in the course of one hour one of the atoms decays, but also, with equal probability, perhaps none; if it happens, the counter tube discharges and through a relay releases a hammer which shatters a small flask of hydrocyanic acid. If one has left this entire system to itself for an hour, one would say that the cat still lives if meanwhile no atom has decayed. The first atomic decay would have poisoned it. The q+-function of the entire system would express this by having in it the living and the dead cat (pardon the expression) mixed or smeared out in equal parts." cited in John Archibald Wheeler and Wojciech Hubert Zurek, *Quantum Theory and Measurement* (Princeton, N.J: Princeton University Press, 1984), 157. "It is typical of these cases that an indeterminacy originally restricted to the atomic domain becomes transformed into macroscopic indeterminacy, which can then be resolved by direct observation. That prevents us from so naively accepting as valid a "blurred model" for representing reality. In itself it would not embody anything unclear or contradictory. There is a difference between a shaky or out- of-focus photograph and a snapshot of clouds and fog banks." John D. Trimmer, "The Present Situation in Quantum Mechanics: A Translation of Schrödinger's 'Cat Paradox' Paper," *Proceedings of the American Philosophical Society* 124, no. 5 (1980).

[32] John Cage, *4'33"*, "Tacet, for any instrument or combination of instruments," (1952).

with her compendium of largely unrealisable instruction pieces *Grapefruit* (1964);[33] Alan Kaprow, who formalised the notion of 'the happening' as a form of experimental performance; and Ian Wilson, who, by 1968, had eschewed the creation of physical works altogether in favour of undocumented verbal exchanges.[34] Reflecting on the development of such abstract praxis, Peter Osborne states that "language was increasing used as a theoretical model for the ontological status of all artworks as special kinds of 'statement' or 'propositions,'" designating "potential acts which might subsequently be undertaken or may take place only imaginatively."[35]

3.3 THREE CHAIRS AND FIVE RED APPLES

In the winter of 1972, artist Joseph Kosuth staged an exhibition at Castelli Gallery on West Broadway in New York City. The exhibition, entitled *Protoinvestigations*, presented a selection of work that had been made by Kosuth between 1965 and 1967 (between the ages of 20–22).[36] The installation was sparse, clinical and monochromatic. Described in reviews as "forbidding," it presented a collection of ubiquitously quotidian objects (including a saw, a hammer, a table and a chair) as articles primed for interrogation.[37] Adapting a "scientific-style," Kosuth would utilise these objects as experimental intermediaries — situating them within investigatory spaces designed to test the lexical ambiguities inherent to an object and its representation.[38]

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[33] Yoko Ono, *Grapefruit*, 1964, Artist's book, offset printed, 13.8 x 13.8 x 3.2 cm, edition of 500, Museum of Modern Art, https://www.moma.org/collection/works/128103.
[34] René Denizot, "Ian Wilson, For Example: Texts On Words," *Artforum* 18, no. 7 (1980), https://www.artforum.com/print/198003/ian-wilson-for-example-texts-on-words-35829.
[35] Osborne, *Conceptual Art*, 28, 27.
[36] Joseph Kosuth, *Protoinvestigations 1965–67*, Castelli Gallery, December 2–23, 1972, https://www.castelligallery.com/exhibitions/joseph-kosuth8
[37] Bruce Boice, "Joseph Kosuth: 2 Shows," *Artforum International* 11, no. 7 (1973): 85.
[38] Joseph Kosuth, "Intention(s)," *The Art Bulletin* 78, no. 3 (1996): 407.

Each of the objects was displayed in triplicate — establishing an operational format and an aesthetic sensibility that would become synonymous with the series, Kosuth's oeuvre, and indicative of broader themes in conceptual art itself. Of these various *Protoinvestigations,* the first, entitled *One and Three Chairs*[39] was the most recognisable, and has come to be considered a defining work of the period.[40] The work consisted of three chairs situated in varying states: the *physical*, *representational*, and *definitional*.

The first chair was unremarkable; a wooden, mass-produced piece of furniture, which was placed with its back flush against the wall; the second chair was a photographic image of the first — taken on site, documenting the chair as it appeared within the room — enlarged to match the dimensions of the original and mounted to the wall to its left; the third was a photostatic image of the definition of the word 'chair' — extracted from the dictionary and enlarged to be legible at distance. It too was affixed to the wall — this time to the right-hand side of the original, with its upper edge aligned with that of the chair's photograph.[41] Together, these elements would represent *One and Three Chairs* — a work conceived of as *concept* as opposed to *object* — that would be remade (with a new chair, new photograph, new photocopy) for each subsequent installation,[42] with the work's ownership denoted by possession of the instructions for production rather than attached to the physical material on display.[43]

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[39] Joseph Kosuth, *'One and Three Chairs'*, 1965, Black and White photos and chair, The Museum of Modern Art, https://www.moma.org/collection/works/81435,

[40] First shown in the 1970 exhibition Information at the Museum of Modern Art, July 2 – September 20, 1970, curated by Kynaston McShine, https://www.moma.org/calendar/exhibitions/2686.

[41] Hans Dickel and Gerda Wendermann, *Neues Museum Weimar: die Sammlung Paul Maenz* (Ostfildern: Cantz, 1998), 82.

[42] According to Kosuth, "Everything you saw when you looked at the object had to be the same that you saw in the photograph, so each time the work was exhibited the new installation necessitated a new photograph", Quote from radio interview, broadcast on WBAI, 7 April 1970: "Art as Idea as Idea: An Interview with Jeanne Siegel," in Kosuth, *Art After Philosophy and After*, 50.

[43] This certificate of instruction would develop alongside the varying iterations that Kosuth produced. In her analysis of curatorial management for *Glass (one and three)* (1965), Sanneke Stigter provides details of the certificate that were provided to the Kröller-Müller

By flanking the physical with its facsimiles Kosuth exposed a visual and semiotic paradox inherent to the operation of language, in which the physical, the virtual and the theoretical function as discrete entities bound to a singular term.[44] In presenting *One and Three Chairs* Kosuth addresses a common act of lexical exchange — one in which linguistical registers are identified, processed and reconciled in order to negotiate the world as it is encountered — allowing for multiple states of expression to operate routinely, simultaneously, and interchangeably in accordance with the stimulus that is presented. In this way, the signification of a *physical chair*, a *photograph of a chair* and the *definition of "chair"* are all equally interpolated within the cognitive apperception *of a chair* — thus allowing each variation to be deployed (and recalled) as needed.

Such consideration of lexemic function is indicative of the *linguistic turn* that was broadly demonstrated by conceptual practitioners in the 1960s — one that afforded the structure and intent of language a new role in the creation of art, and at times led to the negation of the art-object relationship entirely.[45] This orientation towards semiotics mirrored similar investigations that had occurred within analytical philosophy, in which the aphoristic 'linguistic experiments' of logisticians such as Wittgenstein would significantly influence the conceptual agenda and Kosuth in particular. Kosuth would model his practice on the Wittgensteinian notion of *philosophy as activity*, channelling this attitude

Museum upon the works acquisition in 1995, which includes a schematic diagram with explanatory words alongside a stamp stating "It is the intention of Joseph Kosuth that this work be owned or exhibited exclusively in a FLEMISH [filled out by hand] speaking cultural/linguistic context. Fulfilment of this requirement is absolutely essential to the existence of the work (as art)." By all accounts this level of specificity was developed alongside the production of the work (the original *One and Three Chairs* acquired by MoMA possessed significantly less formal documentation). Sannekke Stigter, "How Material is Conceptual Art? From Certificate to Materialization: Installation Practices of Joseph Kosuth's 'Glass (one and three)'," in *Inside Installations: Theory and Practice in the Care of Complex Artworks*, ed. Tatja Scholte and Glenn Wharton (Amsterdam: Amsterdam University Press, 2011), 71.

[44] It could be argued that in the creation of the work all three chairs become facsimiles with the function of the physical chair suspended through its induction into the language-game-as-artwork. The chair used in the work now sits outside its own physical use, and given its status as 'art' is unlikely to be sat upon again.

[45] See Lippard, *Six Years.*

into the production of "*art as idea as idea.*"[46] According to curator Phyllis Rosenzweig, Kosuth "advanced a re-definition of the work of art as a philosophic concept or social construct rather than a specific physical object embodying universal aesthetic values."[47] She also suggests that "...like the linguistic philosopher Ludwig Wittgenstein, Kosuth propose[d] that the meaning of anything exists in its use..."[48] This objective was clearly demonstrated by Kosuth in *One and Three Chairs* — a work that was conceived to operate as conceptual proposition, examining the (in)congruous nature of signs and signifiers in the constitution of meaning — which in many respects operates as a visual interpretation of Wittgenstein's philosophical assertions.

In his seminal work, *Philosophical Investigations,* Wittgenstein introduces a hypothetical exchange with a shopkeeper pertaining to the purchase of *five red apples.*[49] Here ambiguities relating to the definition of a number, a colour and a physical object are introduced in order to demonstrate how language use and social action are woven together to form a system that is reliant upon an assumed (and shared) agreement of meaning — one that Wittgenstein terms a "language-game."[50] Wittgenstein's intention is to illustrate that language is contingent upon a causal relationship between definition and use, and that even in its simplest application there exist instances of bifurcating ambiguity that cleave understanding from intent.

[46] "Art as Idea as Idea" is the subtitle used by Kosuth for his definition-based work. Kosuth, *Art After Philosophy and After*, 30.

[47] Phyllis Rosenzweig, "Joseph Kosuth WORKS," https://hirshhorn.si.edu/dynamic/archives/Works-Joseph-Kosuth-Brochure.pdf

[48] Ibid.

[49] "Now think of the following use of language: I send someone shopping. I give him a slip marked 'five red apples.' He takes the slip to the shopkeeper, who opens the drawer marked 'apples'; then he looks up the word 'red' in a table and finds a colour sample opposite it; then he says the series of cardinal numbers — I assume that he knows them by heart — up to the word 'five' and for each number he takes an apple of the same colour as the sample out of the drawer.— It is in this and similar ways that one operates with words. — But how does he know where and how he is to look up the word 'red' and what he is to do with the word 'five'? — Well, I assume that he acts as I have described. Explanations come to an end somewhere. — But what is the meaning of the word 'five'? — No such thing was in question here, only how the word 'five' is used." Wittgenstein, *Philosophical Investigations*, §1.

[50] Wittgenstein defined language-games as "consisting of language and the actions into which it is woven." Wittgenstein, *Philosophical Investigations,* §7.

In *One and Three Chairs,* Kosuth similarly considers these phenomena in physical form — confronting the tensions that arise through the operational use of language by placing *three states of chair* in visual proximity. As art historian Melanie Marino notes, "[i]f the material representation of the immaterial concept chair can take three possible forms, then the production of meaning cannot be reduced to the immediate association of an object with an indisputable image that could fix its meaning."[51] Thus through Kosuth's work, a form of philosophical experiment is performed with the viewer — one that articulates the ideology of a language-game as a physical installation. This approach has been continued by Kosuth throughout his career, leading to multiple activations of Wittgensteinian logic.[52]

Wittgenstein's impact on conceptual art was significant, with various conceptual practitioners employing or responding to the Viennese philosopher's propositional schema. Notable figures of the period including John Baldessari,[53] Lawrence Weiner,[54] Donald Judd,[55] and Robert Morris[56] have remarked on the influence of Wittgenstein's philosophy on their work, with additional attribution associated to the practices of artists including Carl Andre and Hanne Darboven.[57]

In addition to routinely remarking upon the influence of Wittgenstein's work on his own thinking, artist Bruce Nauman produced a range of referential works, including his 1966

[51] Melanie S. Marino, "Dumb Documents: Uses of Photography in American Conceptual Art, 1959–1969," (PhD diss., Cornell University, 2002), 190.
[52] Joseph Kosuth, *'#276. (On Color Blue)'*, 1990, Cobalt Blue Neon mounted directly on the wall, 30 x 162 in. (76.2 x 441.48 cm), Brooklyn Museum, https://www.brooklynmuseum.org/opencollection/objects/148620, Joseph Kosuth,*'Wittgenstein's Color'*, 1989, Red Neon mounted directly on the wall, 16 x 38 x 2.7 cm, https://www.mutualart.com/artwork/wittgenstein-s-color--red-/c7da67921be2ed75
[53] Moira Roth, "Interview with John Baldessari (1973)," *X-TRA* Online, https://www.x-traonline.org/article/interview-with-john-baldessari-1973.
[54] Gerti Fietzek and Gregor Stemmrich, eds., *Having Been Said: Writings & Interviews of Lawrence Weiner, 1968–2003* (Ostfieldern: Hatje Cantz, 2004), 83.
[55] Richard Shiff, "As It Feels," *Chinati Foundation Newsletter* 19 (2014), https://chinati.org/wp-content/uploads/2019/11/newsletter19.pdf
[56] Robert Morris, "Professional Rules," *Critical Inquiry* 23, no. 2 (1997).
[57] Donald Kuspit, "Hanne Darboven," *Artforum* 32, 2 (1993), https://www.artforum.com/print/reviews/199308/hanne-darboven-55117.

piece *A Rose Has No Teeth*.[58] This took the form of an embossed lead plaque bearing the statement "a rose has no teeth," a reference to Wittgenstein's famous passage in *Philosophical Investigations* intended to be affixed to a tree and left to assimilate into its bark and trunk. [59] Nauman would state that reading *Philosophical Investigations* provided "…a way to question things"[60] and that being "…interested in the logic and structure of math" Wittgenstein's approach provided a map for "…how you could turn that logic inside out."[61]

Similarly, Mel Bochner would produce his own series of drawings in 1971–72, *Counting Alternatives (The Wittgenstein Illustrations)* (fig. 16),[62] inspired by the obscure numerological device adopted by Wittgenstein in the presentation of his work, *On Certainty.*[63] Collecting the various numerical entries associated with Wittgenstein's remarks, Bochner produced a series of alphanumeric 'illustrations', consisting of sequences of numerals hand printed on graph paper in two colours (red and black) and arranged in geometric configurations. Eliciting a scientific style, Bochner's presentation speaks to the structural interrelationship of Wittgenstein's propositions, conveying the sparse and yet circuitous nature of the underlying logic at play. Through his interleaving of harsh and calculating geometrical rigidity with the subtle delicacy of hand-written numerics, Bochner expresses the duality of Wittgenstein's thesis: that any quest for certainty is inevitably shrouded in doubt and ambiguity.

[58] Bruce Nauman, A Rose Has No Teeth, 1966, Lead Plaque, 18.73 x 17.15 x 6.99 cm, San Francisco Museum of Modern Art, https://www.sfmoma.org/artwork/2010.259/
[59] Wittgenstein, *Philosophical Investigations*, II, xi, 221.
[60] "Bruce Nauman in conversation with Michele de Angelus, 1980," reprinted in Nauman, *Please Pay Attention Please*, 231.
[61] "Bruce Nauman in conversation with Joan Simon, 1988," reprinted in Nauman, *Please Pay Attention Please*, 323.
[62] This work was later reproduced in 1991.
[63] Wittgenstein, *Philosophical Investigations*, §XI.

FIGURE 16.

MEL BOCHNER
COUNTING ALTERNATIVES (THE WITTGENSTEIN ILLUSTRATIONS): ASTERISK BRANCH
1971/1991
INK AND COLOURED PENCIL ON PAPER / PHOTOGRAVURE
30 X 22 IN.

Commenting on his reading of Wittgenstein early in his career, Bochner would state:

> What I got from Wittgenstein was the relentlessness of his method. He never stamped anything 'case closed.' It's this constant churning of a process. That idea of taking something and looking at it and pulling it apart, and then pulling the parts apart. Asking yourself a question and then questioning the question; that corresponded for me to the way in which art, when it really functions, functions best.[64]

3.4 ANALYTICAL LANGUAGE

The articulation of philosophical principles (and philosophical activities) was not isolated to acts of visual expression but was to be a reoccurring methodological attribute for conceptual practitioners more broadly, in which both linguistic and philosophical concerns were deeply embedded. I contend that the development of such written propositional material represented a new system of articulation and analysis — a reshaping of the use of language in art and the ontological systems that supported it.

In his work *Art After Philosophy*, first published in 1969, Kosuth himself explored the utility of Wittgensteinian constructs in an analysis of art — seeking to position conceptual practice as an analytical proposition through the introduction of a form of definitional logic and hypothesis testing.[65] This mode of analysis stood in contrast to the

[64] Field and Bochner, *Mel Bochner: Thought Made Visible,* 194.
[65] Joseph Kosuth, "Art After Philosophy," *Studio international* 178, no. 915 (October 1969):134–137; no. 916 (November 1969): 160–161; no. 917 (December 1969): 212–213.

modernist orthodoxy of Clement Greenberg that was ascendant throughout the 1950s, which instead sought to preference the role of the visual (the retinal) as opposed to idea-driven formalism.[66] Referencing A. J. Ayer in *Art After Philosophy*, Kosuth would state:

> the artist, as an analyst, is not directly concerned with the physical properties of things. He is concerned only with the way (1) in which art is capable of conceptual growth and (2) how his propositions are capable of logically following that growth.[67]

In a series of reviews and critiques of conceptual exhibitions published throughout the 1960s and '70s, Mel Bochner similarly advanced such analysis — seeking to frame developments in conceptual practices against the backdrop of analytical philosophical reasoning. In his 1967 essay "Serial Art Systems: Solipsism," Bochner opened with three quotes:

> "Go to the things themselves" — Husserl
>
> "No object implies the existence of any other" — Hume
>
> "There is nothing more to things than what can be discovered by listing the totality of the descriptions they satisfy" — A. J. Ayer[68]

[66] Clement Greenberg was an influential art critic of the 1940s and 1950s who was known for formalist aesthetics and rigorous approach to art criticism. Although an early champion of American Modernism and Abstract Expressionism (which were avant-garde at the time), he found himself at odds with the emerging art movements of the 1960s (i.e., Conceptual art, Pop art) that were antithetical his aesthetic sensibilities and fervour for the visual surface.
[67] Kosuth, *Art After Philosophy and After*, 20.
[68] Bochner, "Serial Art Systems: Solipsism," 40.

firmly establishing his focus upon the underlying definitional structures associated with idea-driven works. Such linkages were embellished to be explicitly scientific in his accompanying essay "The Serial Attitude," in which, referencing Wittgenstein, Russell, Whitehead, Desgargues and Euclid, Bochner introduced a set of 'scientific' constructs — including abstract system, binary, isomorphism, orthogonal, permutation, probability, progression, sequence and series — to interrogate the purpose, function, facilities and ideological precepts of the art in question.[69] In addition to imposing an analytical philosophical style, such writing introduced the notion of a quasi-scientific language and analysis of conceptual practice, in which the success of an artwork was judged by means of a *propositional logic*, in which conceptual tenets were tested as hypothesis akin to a scientific experiment. This was formally expressed in Bochner's essay "Three Statements for Data Magazine," in which he summarised his analytical framework:

> *Methodology*
>
> 1. Hypothesis (What if…)
> 2. Demonstration (It could be like this…)
> 3. Theory (Therefore it seems that…)[70]

This approach, I argue, represents inescapable correlations between not just the development of conceptual artworks and 'scientific' analytical frames, but also of the underlying language and structures of analysis that supported and informed the work. Such modes of exposition were also used as a basis for the creation of visual works themselves, as evidenced by artist Agnes Denes, whose drawings often included

[69] Bochner, "The Serial Attitude," 42.
[70] Bochner, "Three Statements for Data Magazine," 98.

scientific figures, diagrams and equations, which sought to situate her visual output within the systems from which they were originally derived. Denes' own analysis of her practice echoed this scientific character, referring to various projects as "exercises in logic," a "study of unpredictability," and a "study of distortion," summarising her overall approach in the following manner:

> basis of work: inquiry
> nature of work: analytical
> method: evolutionary process based on contradictory forces[71]

In *Dielectric Triangulation — A Visual Philosophy* (1969) (fig. 17), Denes presented a series of schematics — constructing geometrical complexes as "…a building of progressive trichotomies."[72] Paralleling the work of LeWitt, Denes constructed her philosophical triangulations by means of an abstract algorithm — representing a convergence of visual and methodological precepts:

Types of triangulations

a. inanimate tri-groups representing all of a genus, class or category
b. re-grouping or classification
c. accepted facts examined, their importance re-established or denied
d. perceptual and ideational errors, various distortions and loss in communication analysed and diagrammed
e. arriving at a conclusion derived from two propositions

[71] Agnes Denes, *Sculptures of the Mind* (Akron, OH: Emily H. Davis Art Gallery, 1976).
[72] Ibid, 3.

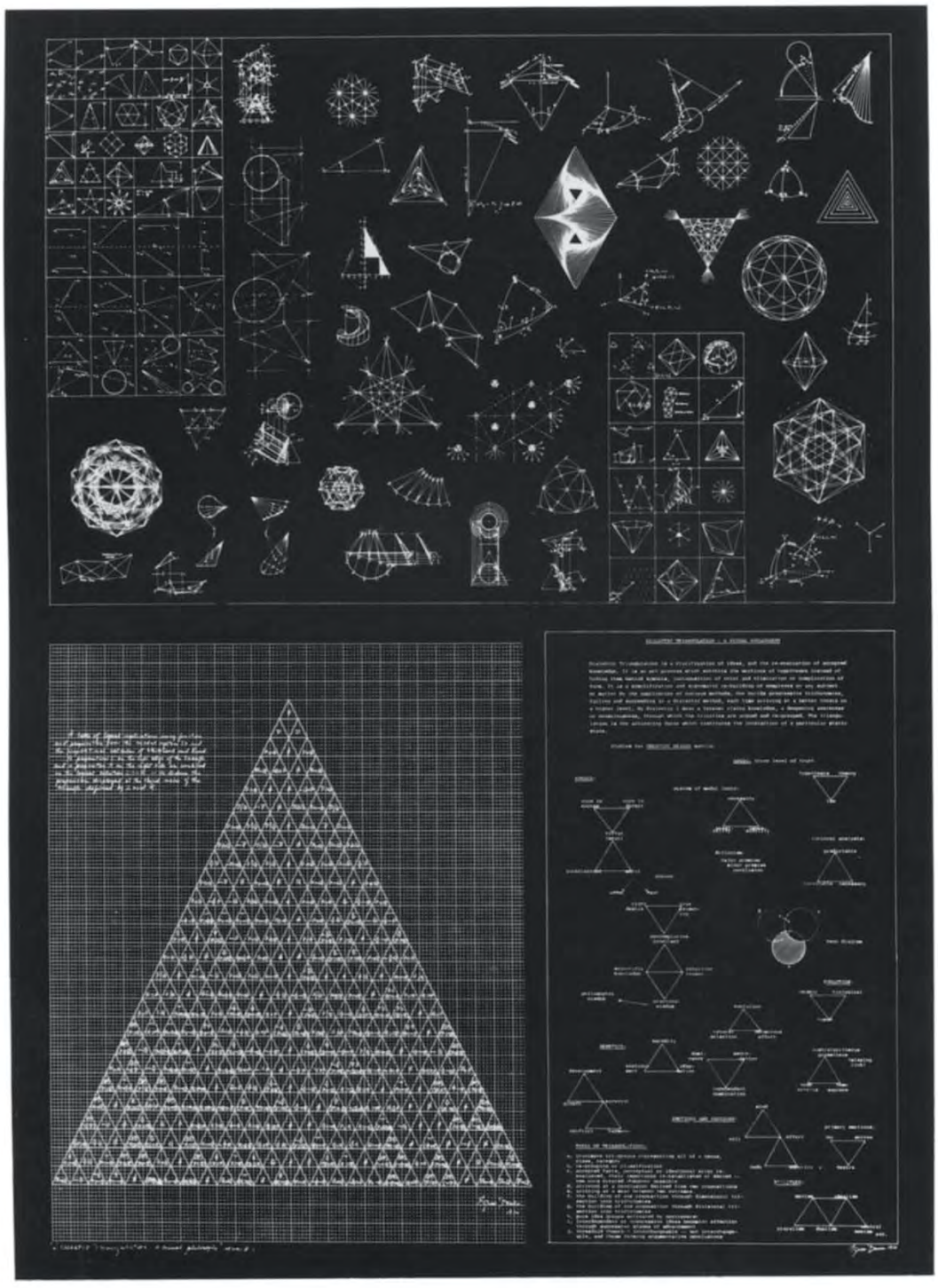


FIGURE 17.

AGNES DENES
DIALECTIC TRIANGULATION: A VISUAL PHILOSOPHY
1970
MONOPRINT
37 X 28 IN.

f. arriving at a mean between two extremes
g. the building of one proposition through dimension trisection into trichotomies
h. the building of one proposition through division trisection into trichotomies
i. pure idea groups activated by controversy
j. interdependent or progressive ideas becoming effective through successive stages of advancement
k. threefold theories interchangeable — not interchangeable — and those forming argumentative conclusions
l. a seeking of universal validity, reality or truth[73]

This transference of propositional logic and language between art, science and philosophy, was, I argue, representative of a larger trend associated with the development of conceptual practices more broadly, in which the formal methodological structures and aesthetics of science (and in particular the mathematical sciences) were subsumed by philosophy and subsequently conceptual art. Consider, for example, the progression of visual language presented in figures 18–21. In figure 18, an excerpt from Erwin Schrödinger's foundational paper on quantum mechanics, *An Undulatory Theory of the Mechanics of Atoms and Molecules* is shown, in which he derives the probabilistic wave equation that would come to bear his name, and for which he was awarded the 1933 Nobel prize in physics.[74] In figures 19 and 20, samples of propositional philosophical

[73] Ibid. Sol LeWitt's systematic wall drawings were routinely produced by others following a set of precise instructions. These instructions operated as an algorithm, "an idea that becomes a machine," which permitted his exacting vision to be executed by another's hand.
[74] Erwin Schrödinger, "An Undulatory Theory of the Mechanics of Atoms and Molecules," *Physical Review* 28, no. 6 (1926): 1057.

$$\Delta\psi - \ddot{\psi}/u^2 = 0 \tag{15}$$

and to insert for u the quantity given by Eq. (6), which depends on the space coordinates (through the potential energy V) and on the frequency E/h. The latter dependence restricts the use of (15) to such functions ψ as depend on the time only through the factor $e^{\pm 2\pi i t E/h}$. (A similar restriction is always imposed on the wave equation, as soon as we have dispersion.) So we shall have

$$\ddot{\psi} = -4\pi^2 E^2 \psi / h^2$$

Inserting this and Eq. (6) in Eq. (15) we get

$$\Delta\psi + 8\pi^2 m(E-V)\psi/h^2 = 0, \tag{16}$$

where ψ may be assumed to depend on x, y, z only. (We omit changing the notation of the dependent variable, which we really ought to do.)

Now what are we to do with Eq. (16)? At first sight this equation seems to offer ill means of solving atomic problems, e.g. of defining discrete energy-levels in the hydrogen atom. Being a partial differential equation, it offers a vast multitude of solutions, a multitude of even a higher transcendent order of magnitude than the system of solutions of the ordinary differential equations of ordinary mechanics. But the deficiency of the latter in atomic problems consisted, as is well known, by no means in that they supplied too small a number of possible orbits, but quite on the contrary, much too many. To select a discrete number of them as the "real" or "stationary" ones is, according to the view hitherto adopted, the task of the "quantum-conditions." Our wave equation (16), by augmenting the possibilities indefinitely, instead of restricting them, seems to lead us from bad to worse.

Happily because of the very interesting character which Eq. (16) takes in actual atomic problems, this fear proves to be erroneous. Putting for instance

$$V = -e^2/r, \tag{17}$$

(e = electronic charge, $r = (x^2+y^2+z^2)^{\frac{1}{2}}$, we get for the simplified hydrogen atom or one body problem:

$$\Delta\psi + 8\pi^2 m(E+e^2/r)\psi/h^2 = 0. \tag{18}$$

Now this equation for a great part of the possible values of the energy or frequency constant E, proves to offer no solution at all which is continuous, finite and single-valued throughout the whole space; for the E-values in question, every solution ψ, that satisfies the two other conditions (viz. continuity and single-valuedness) grows beyond all

FIGURE 18.

EXCERPT OF THE "SCHRÖDINGER EQUATION"
FROM *AN UNDULATORY THEORY OF THE MECHANICS OF ATOMS AND MOLECULES* BY ERWIN SCHRÖDINGER

$*54{\cdot}43.\quad \vdash :. \alpha, \beta \in 1 . \supset : \alpha \cap \beta = \Lambda . \equiv . \alpha \cup \beta \in 2$

Dem.

$\vdash . *54{\cdot}26 . \supset \vdash :. \alpha = \iota`x . \beta = \iota`y . \supset : \alpha \cup \beta \in 2 . \equiv . x \neq y .$

$[*51{\cdot}231] \qquad \equiv . \iota`x \cap \iota`y = \Lambda .$

$[*13{\cdot}12] \qquad \equiv . \alpha \cap \beta = \Lambda \qquad (1)$

$\vdash . (1) . *11{\cdot}11{\cdot}35 . \supset$

$\vdash :. (\exists x, y) . \alpha = \iota`x . \beta = \iota`y . \supset : \alpha \cup \beta \in 2 . \equiv . \alpha \cap \beta = \Lambda \qquad (2)$

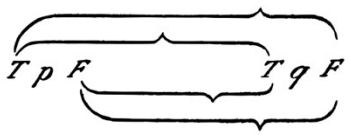
$\vdash . (2) . *11{\cdot}54 . *52{\cdot}1 . \supset \vdash .$ Prop

From this proposition it will follow, when arithmetical addition has been defined, that $1 + 1 = 2$.

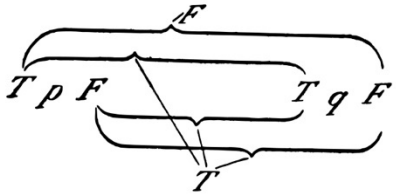
FIGURE 19.

EXCERPT OF THEOREM FROM RUSSELL AND WHITEHEAD'S *PRINCIPIA MATHEMATICA*

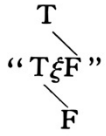
6.1203 In order to recognize a tautology as such, we can, in cases in which no sign of generality occurs in the tautology, make use of the following intuitive method: I write instead of "p", "q", "r", etc., "TpF", "TqF", "TrF", etc. The truth-combinations I express by brackets, *e.g.*:



and the co-ordination of the truth or falsity of the whole proposition with the truth-combinations of the truth-arguments by lines in the following way:



This sign, for example, would therefore present the proposition $p \supset q$. Now I will proceed to inquire whether such a proposition as $\sim(p \,.\, \sim p)$ (The Law of Contradiction) is a tautology. The form "$\sim\xi$" is written in our notation



the form "$\xi \,.\, \eta$" thus:—

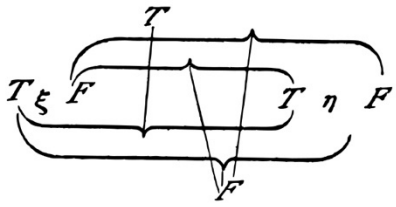


FIGURE 20.

TRUTH DIAGRAMS FROM LUDWIG WITTGENSTEIN'S *TRACTATUS LOGICO-PHILOSOPHICUS*

notations developed by Whitehead, Russell and Wittgenstein are shown, in which the terse, symbolic formalism is clearly seen to emulate the style of mathematical construction presented in Schrödinger's exposition.[75] Lastly, in figure 21, Bochner's *Seven Properties of Between: First and Seventh Properties* are depicted, documenting the artists' visual experiments with theoretical propositions and constructs.

Of this work Bochner would state, "The issue is to define the *task* of an epistemological research, which then pushes the verification problem to the foreground," before going on to reference Wittgenstein's *On Certainty* as a motivating concern.[76] Like Denes' 'algorithms,' Bochner's propositional installations are clearly not explicitly scientific in purpose; they are a playful and subversive riff on the idea and style of scientific output. Nonetheless, such works do convey an aesthetic sensibility that is inescapably scientific in nature — imbuing the viewer with a sense of rigorous and introspective precision, investigatory process, and calculated investment.

In my own work, I have sought to adopt an analogous approach — adapting a subversive form of scientific language, aesthetic and formalism to both document and analyse aspects of my visual practice. Examples of these constructs are included as a set of 'scientific papers' in the second section of this thesis, detailing various experimental interventions in both art and language.

[75] Bertrand Russell and Alfred North Whitehead, *Principia Mathematica,* Vol. 1 (Cambridge: University Press, 1910), 352. Ludwig Wittgenstein, *Major Works: Selected Philosophical Writings* (New York: HarperPerennial, 2009), 78.
[76] Mel Bochner, "Reflections on 7 Properties of Between," in Bochner, *Solar System & Rest Rooms*, 103.

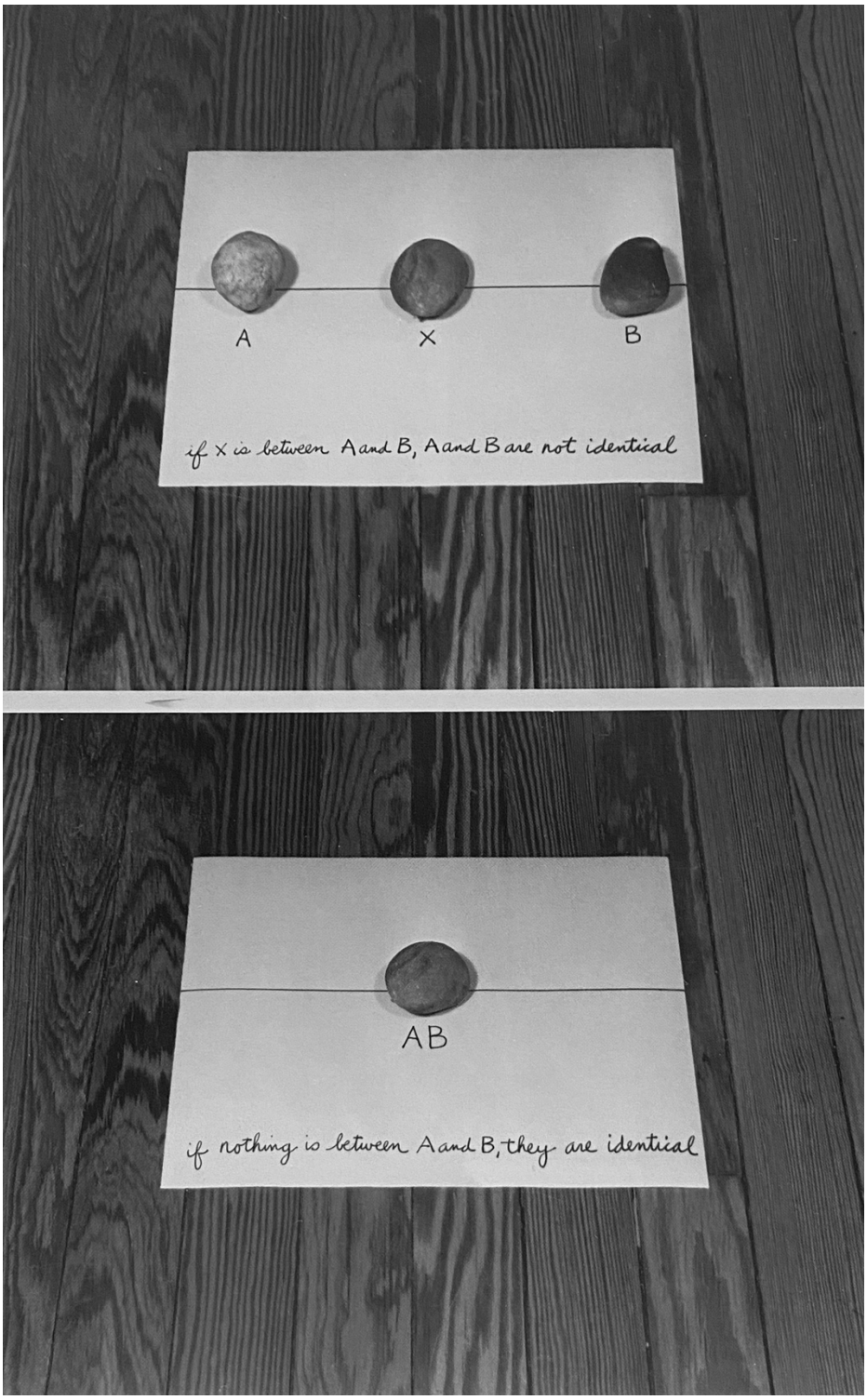


FIGURE 21.

MEL BOCHNER
7 PROPERTIES OF BETWEEN: 1ST AND 7TH PROPOSITION
1971–72
STONES AND INK ON PAPER, ON FLOOR
9 X 12 X 2 IN. EACH

CHAPTER FOUR:
PERFORMATIVITY AND THE EXPERIMENT

Experimental activities are inherently performative gestures. Even in their original purist scientific forms, abstract theoretical acts cannot, and are not, divorced from the physical and emotional reality of the practitioners involved. While striving for dispassionate objectivity, science innumerably fails to achieve such ambitions, for one cannot cleave that very human aspect of self from intellectual activities that hinge fundamentally around concepts of proximity, perception and personal entanglement.

In spite of themselves, scientists remain players in the theatre of scientific experimentation. In her essay "Coveting a Body of Knowledge: Science and the Desires of Truth," philosopher Debra Bergoffen extrapolates on such ideas, stating:

> Science is the study of bodies: lived bodies; bodies in motion; bodies at rest; organic and inorganic bodies; celestial and earthly bodies; bodies in time; bodies in space; social bodies. As the study of bodies, it is said to produce a body of knowledge, an objective, disinterested, experimentally verifiable, coherent account of the way things are. Histories of science teach us that the study of bodies approaches the bodies it studies metaphorically as well as experimentally: the body as machine; the body as organic; the body as woman; the body as centered and de-centered; the body as the source of instinctual drives; the body as the site of disciplines.[1]

[1] Debra B. Bergoffen, "Coveting a Body of Knowledge: Science and the Desires of Truth," in *Continental and Postmodern Perspectives in the Philosophy of Science*, ed. Babette E. Babich, Debra B. Bergoffen and Simon V. Glynn (Aldershot, UK: Avebury, 1995), 139.

Understood from these perspectives, the adaptation of experimental scientific modalities to artistic practices is a logical progression — one that has been exploited by various conceptual and post-conceptual practitioners to test, examine and engage with a range of self-reflexive subject matter.

Experiments in both science and art are uniquely contradictory constructs. They are formal activities designed to understand nature by mimicking aspects of it, and yet somehow without ever actually fully *being* it. There is an inescapable dichotomous interplay between truthful representation and necessary simplification: scientific experiments are cleaved from reality and localised in the laboratory to allow study under controlled circumstances, but questions inevitably arise as to whether the knowledge amassed under such conditions ever truthfully represents unstructured complexity as experienced in full. Artistic experiments, however, are not bound to the same parametric spaces, and are free to subvert, extend, contort and recontextualise reality in order to unpack certain inferences.

The construction of experimental systems is thus an inherently world-building undertaking, codified, I argue, by the establishment of a particular experimental methodology and mode of working. These frames consist of a series of *assumptions*, *hypotheses*, *apparatus*, *methods of observation*, *testing*, *collecting of results*, and, ultimately, *analysis*, *documentation* and *reflection*. I suggest that the nature of such performative systems also invariably sit outside of themselves — that it is only in the communication and *transference of impact*, *result* and *knowledge to others* that the substance of the original experimental activity is given form and lasting consequence. In this there is a notion of *timelessness*, that the audience associated with such activities is perhaps unrelated to those

physically present for their initial undertaking — that an appreciation of trace after the fact is what is defining, with the viewer conceiving of the work in the space of the mind.

Notions of transference and timeless impact are not, though, solely the domain of art, with similar, and perhaps more formalised sentiments also in operation within scientific enterprise. When seeking to refute the interpretation of scientific inquiry and progress as a purely representational undertaking, sociologist, philosopher and historian of science Andrew Pickering notes that such activities are possessed of an inherent materiality and dynamism, and that somewhat dehumanising analysis in which "scientists figure as disembodied intellects making knowledge in a field of facts and observations"[2] should be rejected in favour of a more active ontology, in which:

> …there is quite another way of thinking about science. One can start from the idea that the world is filled not, in the first instance, with facts and observations, but with *agency*. The world, I want to say, is continually *doing things*, things that bear upon us not as observation statements upon disembodied intellects but as forces upon material beings.[3]

Pickering suggests that experimental practices "fall into the sphere of culture," actively creating the conditions in which such activities are received and interpreted.[4] It is these *material, social and temporal dimensions* of scientific activity that, I argue, were assimilated into a particular form of performative and conceptual practice — one that adapted a method, style and aesthetic attitude in imitation of the mechanics of scientific

[2] Andrew Pickering, *The Mangle of Practice: Time, Agency, and Science* (Chicago: University of Chicago Press, 1995), 6.
[3] Ibid.
[4] Ibid, 4.

experimentation. Philosopher and historian of science Robert Crease considers such interplays in his book, *The Play of Nature: Experimentation as Performance*, stating:

> Scientific phenomena, like those of theatre, takes place amid a complex interaction of internal and external horizons. Scientific experimentation is simultaneously ontological and praxical, both concerned with the real presence and disclosure of invariants in the world on the one hand, and shaped by human cultural and historical forces on the other.[5]

The introduction of the performative intervention was important to the development of conceptual activities, representing a singular yet ultimately entwined set of practices that rose to prominence in parallel with avant-garde pursuits of the 1960s. Such performative practices were distinct from the traditional theatrical forms of the period, and were more closely aligned to the linguistic theories of philosopher J.L. Austin (through his lecture series *How to Do Things with Words*, presented at Harvard University in 1955) as well as the work of sociologist Erving Goffman in *The Presentation of Self in Every Day Life*, published in 1956.[6] In these texts, the authors framed the enactment of language and everyday activities as being inherently performative — giving rise to a mode of non-narrative, investigatory performativity that sought to position artistic practice as a propositional undertaking. Of particular interest is a specific subset of performative activities that took on the characteristics of the scientific experimental framework, leaning into the notion of a rigorous and mechanistic testing of ideas in the field.

[5] Robert P. Crease, *The Play of Nature: Experimentation as Performance* (Bloomington, IN: Indiana University Press, 1993), 84.
[6] J. L. Austin, *How to do Things with Words*, ed. J. O. Urmson and Marina Sbisà (Oxford: Clarendon, 1963); Erving Goffman, *The Presentation of Self in Everyday Life* (New York: Anchor, 1956).

4.1 PROPOSITIONAL SYSTEMS

To facilitate a unified analysis of performative experimental systems, I introduce two conceptual constructs that consider the *activity* and *outcomes* associated with such works.

DEFINITION 1: PERFORMATIVE ACTION

The *performative action* represents a methodologically-driven physical activity — one that engenders a particular *act of doing*, which is systematic, process-based and experimental in nature. It operates in accordance with a predetermined score or an active hypothesis — identifying a series of *assumptions, apparatus, methods of observation* and *mechanism of testing* as a means of *collecting results* (in the form of *analysis*, *documentation* and *reflection*) that ultimately become synonymous with *the work itself*. Performative actions occur in observance of methodological constraints yet are otherwise (un)structured, (un)rehearsed and (un)encumbered activities — simulating 'real life' and/or experimental conditions in order to consider/enact an ideological *process*. Performative actions are, therefore, an embodiment of Sol LeWitt's concept of "[t]he idea [that] becomes a machine that makes art."[7]

DEFINITION 2: PERFORMATIVE ARTEFACT

*Performative artefact*s are objects that result from a *performative action* — they are a by-product, a consequence, a vestige, an outcome. Although distinct from their performative genesis, such artefacts remain, as Kristine Stiles suggests, objects borne "out of actions" that are innately tied to the essence of their construction, existing both *of* and *from* performance: "just as lava may differ from the rock it will become, so it is also

[7] LeWitt, "Paragraphs on Conceptual Art."79-83.

the same as what it was."[8] Thus performative artefacts are loaded objects, capable of activating their own sense of becoming from a state of dormancy — extending "the implicit temporality experienced in the *now* beyond now to the *after now*."[9] In their permanence (or semi-permanence) they can achieve what performance may not, in that they can endure — reaching back through time and space to touch the historical performative act, intimating its physicality and ushering its labour into the present.

These two constructs work in tandem as distinct yet entangled entities, symbiotically employed to register and record the performative labour associated with conceptual experiments. In the remainder of this chapter, I will present a compendium of performative works spanning from 1960s conceptualism to contemporary post-conceptual practices that illustrate the operational use of these dual mechanisms.

4.1.1 ACTION AND APPARATUS

In 1967, Bruce Nauman marked-up a square on the floor of his studio. Affixed with masking-tape, it was a simple registration — with each side approximately a metre in length, the mid-points identified by the addition of cross-strips that punctured the uniformity of the square's geometry. In the cavernous space of his San Francisco studio (that was set up in a derelict grocery store, retaining many of its original fixtures) this square became a performative demarcation — indicative of a *methodology* and an operational *apparatus* that endowed activities that took place inside its boundaries with the designation of *art*. Over the next two years, the artist would document a series of methodical physical gestures conducted in proximity to this square that would become

[8] Kristine Stiles, "Uncorrupted Joy: International Art Actions," in Paul Schimmel, ed., *Out of Actions: Between Performance and the Object, 1949–1979* (Los Angeles; New York: The Museum of Contemporary Art; Thames and Hudson, 1998), 231.
[9] Ibid.

known collectively as the *Studio Films*. Usually barefoot, wearing dark jeans and a t-shirt, Nauman's works would follow a *score*: a set of predetermined *rules* and *constraints* that governed the actions that were undertaken inside the square's boundary. These activities included walking along the square's perimeter,[10] performing exercises spanning across its vertices,[11] playing the violin,[12] and bouncing two balls between the floor and ceiling to create changing rhythmic patterns.[13] Each action was documented on 16 mm black and white film (including sync sound), shot with a single camera from a fixed perspective.[14] Each performance was recorded using a 400-foot reel, resulting in approximately ten minutes of footage per action.[15]

Nauman's activities were never witnessed, nor publicly performed; they were internalised propositional experiments enacted by the artist in the studio to measure and assess the definitional parameters surrounding the idea of art and art-making.[16] In her essay "Sense and Sensibility, Reflection on Post '60s Sculpture," theorist Rosalind Krauss remarks on the interplay between the physical and conceptual associated with such undertakings, stating:

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[10] Bruce Nauman, *Walking in an Exaggerated Manner Around the Perimeter of a Square*, 1967-1968, 16 mm film transferred to video (black and white, silent), 10 min, Museum of Modern Art, https://www.moma.org/collection/works/117947

[11] Bruce Nauman, *Dance or Exercise on the Perimeter of a Square*, 1967–68, 16 mm film transferred to video (black and white, sound), 10 min, Museum of Modern Art, https://www.moma.org/collection/works/119087

[12] Bruce Nauman, *Playing a Note on the Violin While I Walk Around the Studio*, 1967–68, 16 mm film transferred to video (black and white, sound), 10 min, Museum of Modern Art, https://www.moma.org/collection/works/119088

[13] Bruce Nauman, *Bouncing Two Balls Between the Floor and Ceiling with Changing Rhythms* (1967–68), 16 mm film transferred to video (black and white, sound), 10 min, Museum of Modern Art, https://www.moma.org/collection/works/119085

[14] All *Studio Films* have sync sound except for *Walking in an Exaggerated Manner around the Perimeter of a Square*.

[15] Eric De Bruyn, "The Empty Studio: Bruce Nauman's Studio Films," in *Hiding Making — Showing Creation: The Studio from Turner to Tacita Dean*, ed. Rachel Esner, Sandra Kisters, and Ann-Sophie Lehmann (Amsterdam: Amsterdam University Press, 2013), 206.

[16] In his book *Conceptual Art,* Tony Godfrey quotes Nauman, "If you see yourself as an artist and you function in a studio… you sit in a chair or pace around. And then the question goes back to what is art? And art is what an artist does, just sitting in the studio," Tony Godfrey, *Conceptual Art* (London: Phaidon, 1998), 127.

> The finished work of art is the result of a process of forming, or making, or creating. It is in a sense the proof that such a process has gone on, just as the footprint in soft ground is proof that someone has passed by. The work of art is thus the index of an act of creation which has at its roots the intention to make the work. Intention here is understood as some kind of prior mental event which we cannot see but for which the work now serves as testimony that it occurred.[17]

Though seemingly uncontroversial to contemporary audiences, Nauman's works were, at the time, radical gestures — making visible the largely undocumented space of an artist's working studio, replete with the clutter and detritus of work-in-process. I argue that such activities are examples of *performative actions* — experimental gestures conducted by the artist in isolation to test ideas and the mechanics of his practice. Of this strategy, Nauman would note:

> My conclusion was that I was an artist and I was in the studio, then whatever I was doing in the studio must be art… At this point art became more of an activity and less of a product.[18]

Nauman's unconventional use of film-technology, which captured the performances as non-narrative, process-based outcomes, adds an additional layer to the experience of the work, with each *Studio Film* becoming, I suggest, a *performative artefact* — a portal to the original performance, viewed retrospectively, and yet activating a sense of dynamic, in

[17] Rosalind Krauss, "Sense and Sensibility, Reflection on Post '60s Sculpture," *Artforum* 12, no. 3 (1973): 46, https://www.artforum.com/print/197309/sense-and-sensibility-reflection-on-post-60s-sculpture-34257
[18] Nauman, *Please Pay Attention Please*, 194.

situ experimental action. When remarking on this interplay between the work-as-performance vs work-as-documentation, curator Ruth Burgon suggests:

> It is clear here that the performing body was always Nauman's central concern, with the act of recording being a kind of after-thought. Such an understanding of the studio works as by-products of a process of performance, I argue, makes sense of their intractability: they are challenging to watch precisely because they are not made to be watched, at least not from beginning to end in a single sitting.[19]

Through the *Studio Films*, Nauman demonstrates the dynamics of the *performative action–performative artefact* relation, whereby the original *activity* is staged under experimental conditions and the subsequent *artefact* (in this case, film) is registered as a vestige of the original act, produced to recognise and verify the activity that had occurred, and to propagate it forward in time. In this way, Nauman resituates interactions between the activity and outcomes of his practice, as well as between performance, performer and audience. Of this exchange, critic Peter Plagens has remarked, "[Nauman is] the lab scientist and we're the rats," subject to "the same tests of endurance and frustrating repetition that the artist faced in his studio."[20]

4.1.2 THINKING THROUGH FOLLOWING

From October 3–25, 1969, artist Vito Acconci undertook a performative action entitled *Following Piece* (fig. 22) in which he discretely followed randomly selected strangers

[19] Ruth Burgon, "Pacing the Cell: Walking and Productivity in the Work of Bruce Nauman," in *Tate Papers*, no. 26 (2016), https://www.tate.org.uk/research/publications/tate-papers/26/pacing-the-cell, accessed 12 June 2021.
[20] Peter Plagens, *Bruce Nauman: The True Artist* (London: Phaidon, 2014), 133.

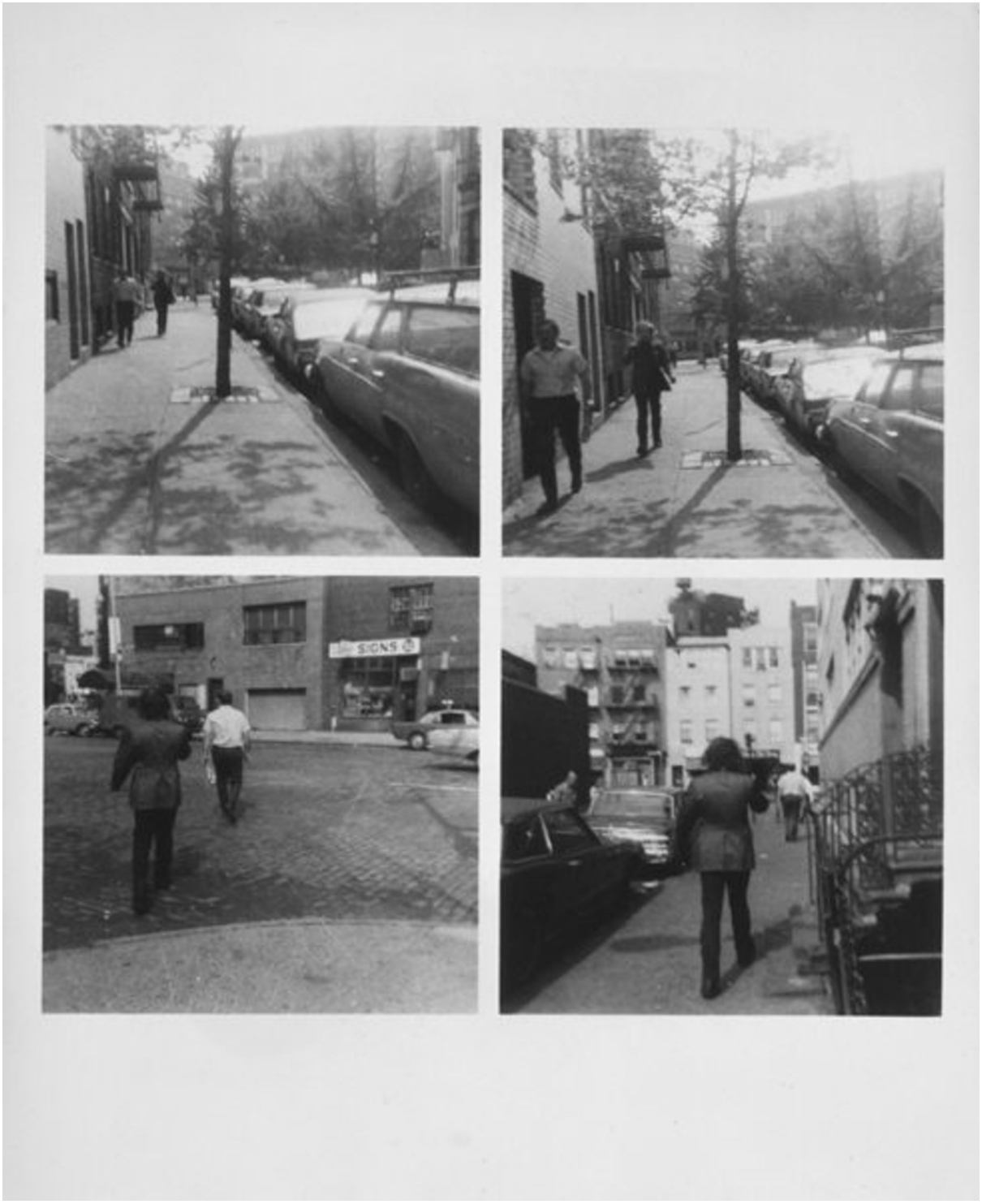


FIGURE 22.

VITO ACCONCI,
FOLLOWING PIECE
1969
GELATIN SILVER PRINTS

IMAGE COURTESY OF

through the streets of New York City. The oblivious participants that Acconci would select each day would determine his trajectory, unwittingly guiding the artist along busy streets, through department stores, restaurants and movie theatres, onto buses and subway cars, all through Manhattan, Brooklyn, Queens and the Bronx. Allowing their actions to dictate the terms of his own, Acconci exploited the paradoxical anonymity of the public spaces of New York City, following the strangers for as long and as far as possible, until a private location was entered (such as an office or residence) where he could not pursue unnoticed. Upon entering such a space, the subject would unknowingly conclude their engagement — the connection between artist and 'subject' ceasing as effortlessly as it had begun, and with no more than the set of handwritten notes, surreptitiously collected by Acconci, acting as evidence of their 'interaction'.

Documentation of Acconci's *Following Piece* would manifest iteratively — largely assembled after the fact, and first disseminated as a series of short, factual statements (specifying times, street names and locations, along with a brief description of his 'collaborators') distributed via mail to a select group of friends and colleagues.[21] These dispatches were subsequently published in *Avalanche* along with a series of diagrams (fig. 23) and photographs that had (controversially) been created post-performance.[22] This larger body of material would become the foundation of *Following Piece* as it is recognised and exhibited,[23] blurring the boundary between the *unwitnessed performance* and its *constructed artefactual documentation.* Historian and critic Martha Buskirk summarises the duality of Acconci's approach to the work and its documentation, in which the latter is

[21] Martha Buskirk, *The Contingent Object of Contemporary Art* (Cambridge, MA: MIT Press, 2003), 217.
[22] Vito Acconci, "Concentration – Container – Assimilation," *Avalanche Mazine*, no. 6 (Fall 1972), 53–61. Of Acconci's photographs Martha Buskirk notes there is a "lack of correspondence between described action and photographs suggest[ing] that these particular images are better understood as illustrations rather than evidence of these activities." Buskirk, *The Contingent Object of Contemporary Art*, 221.
[23] Vito Acconci, *Following Piece*, 1969, Gelatin silver prints, felt-tip pen, and map on board, 76 x 102 cm, Museum of Modern Art, https://www.moma.org/collection/works/146947

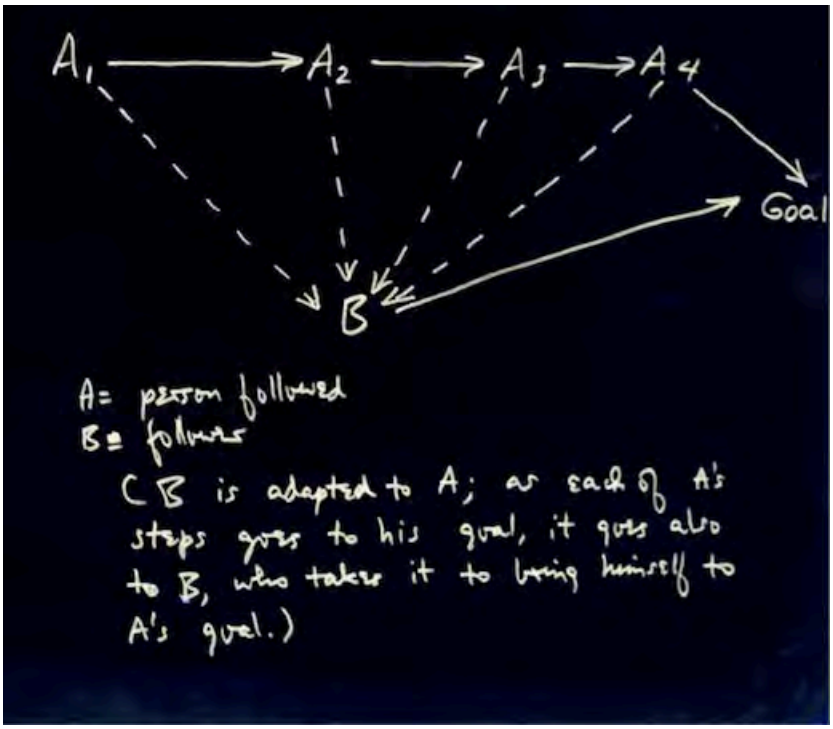


FIGURE 23.

VITO ACCONCI
FOLLOWING PIECE
(DIAGRAMS FOR AVALANCHE MAGAZINE)
1972

created "as outcome of procedure, emerging from an activity rather than existing as an externally produced record."[24]

In either form (as *action* or *artefact*) it is clear that *Following Piece* was a calculated attempt on behalf of Acconci to separate his conception of the work as an idea from its physicality, devising a system that would produce an organic response beyond his control. To develop such a framework, Acconci created an experimental structure: a set of *rules*, *methods of observation* and *mechanisms of testing* that he would enact dispassionately, allowing the constraints encoded in his schema to direct the outcomes of the work. In this, Acconci was influenced by contemporary developments in theoretical psychology of the period, drawing, in particular, on the work of Kurt Lewin, Erving Goffman and Edward Hall, who were examining the collective social dynamics associated with human behaviour and relations within a specific field or space. I suggest that Acconci's *Following Piece* was an experiment conceived to test such ideas — creating an open system, unbiased and ungoverned, in which the artist was both protagonist and test subject in his own investigatory undertaking. Of his experience of the work, Acconci would note "I am almost not an 'I' anymore: I put myself in the service of this scheme."[25] The artist would elaborate further:

> Any time you do something, you make decisions about time and space. I wanted those decisions to be out of my hands. I could be dragged, carried along by another person, I could be a receiver. I could be the agent of the overall scheme, but I didn't want to be the agent of the particular action. I could make the

[24] Buskirk, *The Contingent Object of Contemporary Art*, 225.
[25] "Vito Acconci — Following Piece," Museum of Modern Art, accessed May 26, 2021, https://www.moma.org/collection/works/146947.

> ultimate decision that my space is going to change now, but I don't know where it's going to go.[26]

In spite of its ambitions toward the rigours of an experimental system, *Following Piece*, or at least the nature of its photographic documentation, was largely a fabrication — built upon a series of staged photographs of the artist and (apparent) 'participants' that were in fact created in a wholly manufactured sense after the actual performance series had concluded. In this, I suggest that Acconci was driven by aesthetic and professional concerns relating to the realities of exhibiting the work, where the availability of heightened photographic encounters between the artist-as-protagonist and stranger-as-test-subject were possessed of a certain utility and cache. In numerous photographs, Acconci looms ominously behind supposedly unsuspecting targets, emoting the work's impact into the present for the viewer. That these images do not represent factual events captured throughout the performance initiates an interesting contradictory juxtaposition, in which the dispassionate truthfulness of a work's documentation is set against a visual communication of its impact. While arguably a form of deceit, such a strategy is undoubtedly also effective, as indicated by artist Janine Antoni's conflictions on *Following Piece*:

> I realised at a certain point that I know those works mostly though an oral condition, and through some blurry black-and-white photographs that don't give me much information. I think I love this work so much because I've somehow elaborated on those stories and images in my imagination.[27]

[26] Shelley Jackson, "A Conversation with Vito Acconci," *Believer Magazine*, 2007, accessed May 16, 2021, https://believermag.com/an-interview-with-vito-acconci.
[27] Buskirk, *The Contingent Object of Contemporary Art*, 224.

Here, I argue, is where the modalities of conceptual art and science diverge — art is simply not bound by the same rules, regulations and expectations as scientific enterprise. Where the mis-contextualisation of data and documentation in a scientific experiment would lead inevitably to accusations of fraud, such embellishment in an artistic project may simply be seen as a clever and effective strategy — one that better articulates the intent and consequence of the artist's work. Acconci's *Following Piece* clearly attempts to engage with both sides of this equation — leveraging the systems and aesthetics of scientific experimentation and record to imply factuality and truth, while simultaneously abandoning such precepts for artistic gain. In Acconci's work we can see that the operation of the performative artefact is not necessarily to propagate fact or reality, but rather to convey the sensibilities associated with the original action, distilled through the artist's ideological objectives.

4.1.3 FIVE PROPOSITIONS

Contrastingly, artist Tehching Hsieh would take an entirely different approach to the truthfulness of documentary record, cataloguing with exquisite and unflinching detail the experiential consequences associated with a series of propositional tests of character and personal endurance the artist set for himself. Between 1978 and 1986, Hsieh would instigate a sequence of five year-long performative investigations, each of which would ruminate on the nature of time and human perseverance. In creation of the works, Hsieh constructed various experimental systems, enumerating sets of *hypotheses* and *abstract apparatus* that would constrain his actions in response to different situational restrictions. Each performance would follow a discrete propositional schema that was enumerated through a one-page statement of purpose — providing a set of stringent operational

conditions that would underscore his activities throughout the year. Each of these documents would serve as a binding performative contract, signed by Hsieh and witnessed by his lawyer at the beginning and end of each work to verify the satisfactory completion of the various performative terms and conditions associated with each of his investigatory acts.

Hsieh's first propositional work, *One Year Performance 1978–1979 (Cage Piece)*, involved the artist locking himself inside a 3.5 x 2.7 x 2.4 metre wooden cage containing a single bed, a basin, a light and a pail. For the one-year duration, Hsieh would not leave his cell, nor would he talk, read, write, or listen to the radio — instead, he would mark the passage of each day by carving a running tally into the cell wall and pose for a single photograph taken from a fixed vantage point by an assistant (who would also deliver food, remove waste and check in on the artist's condition).

In Hsieh's second experiment, *One Year Performance 1980–1981 (Time Clock Piece)* the artist would punch into a time-clock located in his studio every hour (day and night) on the hour for an entire year. The 24-hour work would require 8,760 individual actions performed with rigorous punctuality — restricting the length of time Hsieh could sleep and the physical distance he could travel away from his studio in between each action. In addition to 'punching in' to signify his presence, Hsieh would also film a single second of footage on a 16 mm camera — the frames accumulating over time to eventually produce a 6-minute film animation consisting of a set of 24 individually time-stamped stills associated with each day in the performance (fig. 24). Having shaved his head prior to commencing the work (an action he would repeat for each of his performances), the set of images records its gradual regrowth over the course of the year,

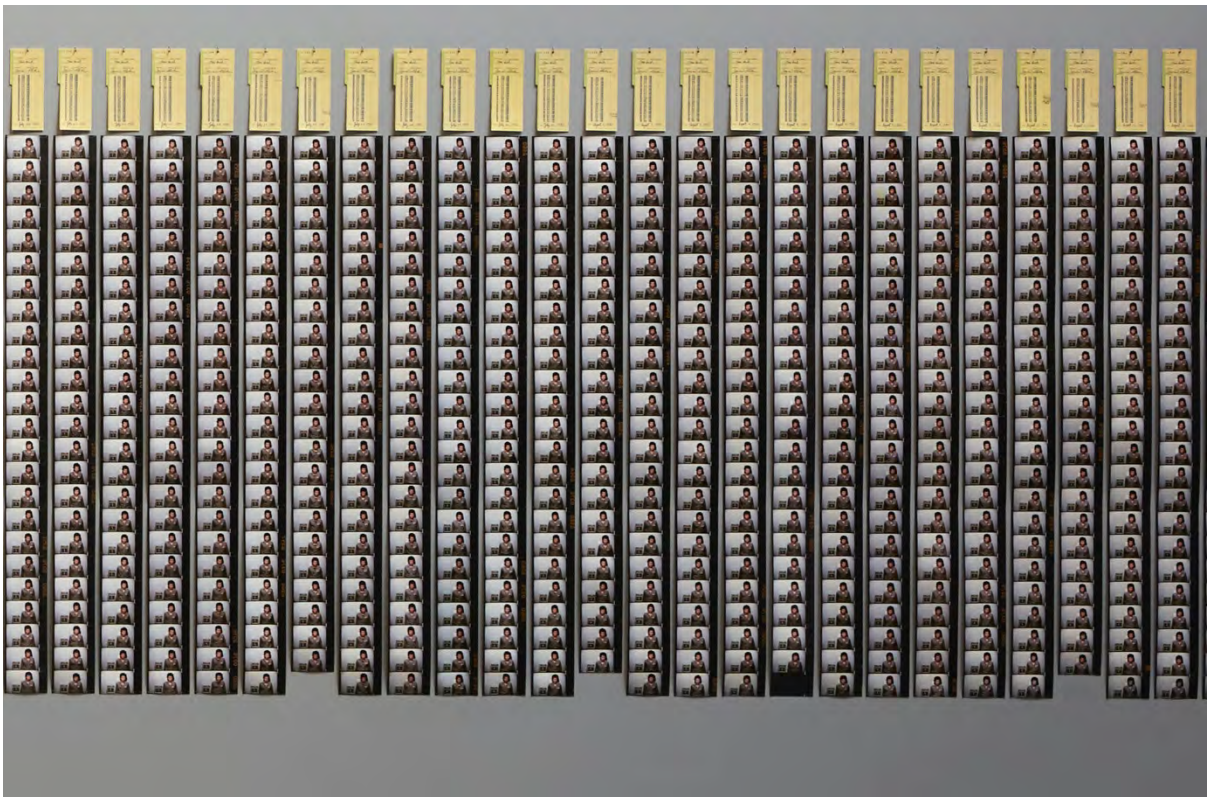


FIGURE 24.

TEHCHING HSIEH
ONE YEAR PERFORMANCE 1980–1981 (TIME CLOCK PIECE)
1980–1981
INSTALLATION VIEW OF FILM STRIPS AND TIME CARDS

COURTESY THE ARTIST, NEW YORK

providing incremental visual evidence of the work's prolific duration.

Hsieh's third proposition *One Year Performance 1981–1982 (Outdoor Piece)*, required the artist to spend an entire year outdoors, not entering any buildings or shelter of any kind. During this action, Hsieh would record his daily movements on photostatic maps — detailing incidental events and ephemera, including his route, where and when he slept, as well as the cost of his meals (fig. 25). These maps would eventually become part of the installation of the work, which also included a succession of black and white photographs (taken by photographers that would meet Hsieh on the streets of New York City and follow him through the course of his daily activities).

The fourth performance in the series, *Art/Life One Year Performance 1983–1984 (Rope Piece)* was undertaken with fellow artist Linda Montano and required the two performers to spend a year physically (and emotionally) attached to each other by an 8 foot (2.4 metre) rope, maintaining constant proximity while avoiding bodily contact. Integrating some of the art/life strategies Montano used in her own personal work, the project would be catalogued via less formal photographic documentation — characterised by daily snapshots with a date-stamp watermarked on the bottom right-hand corner (a common feature of 1980s photography). Hsieh and Montano also created an extensive oral record of their performance, recording their verbal exchanges on numbered and dated cassette tapes. Once completed, each of these tapes was deliberately 'sealed' by the artists,

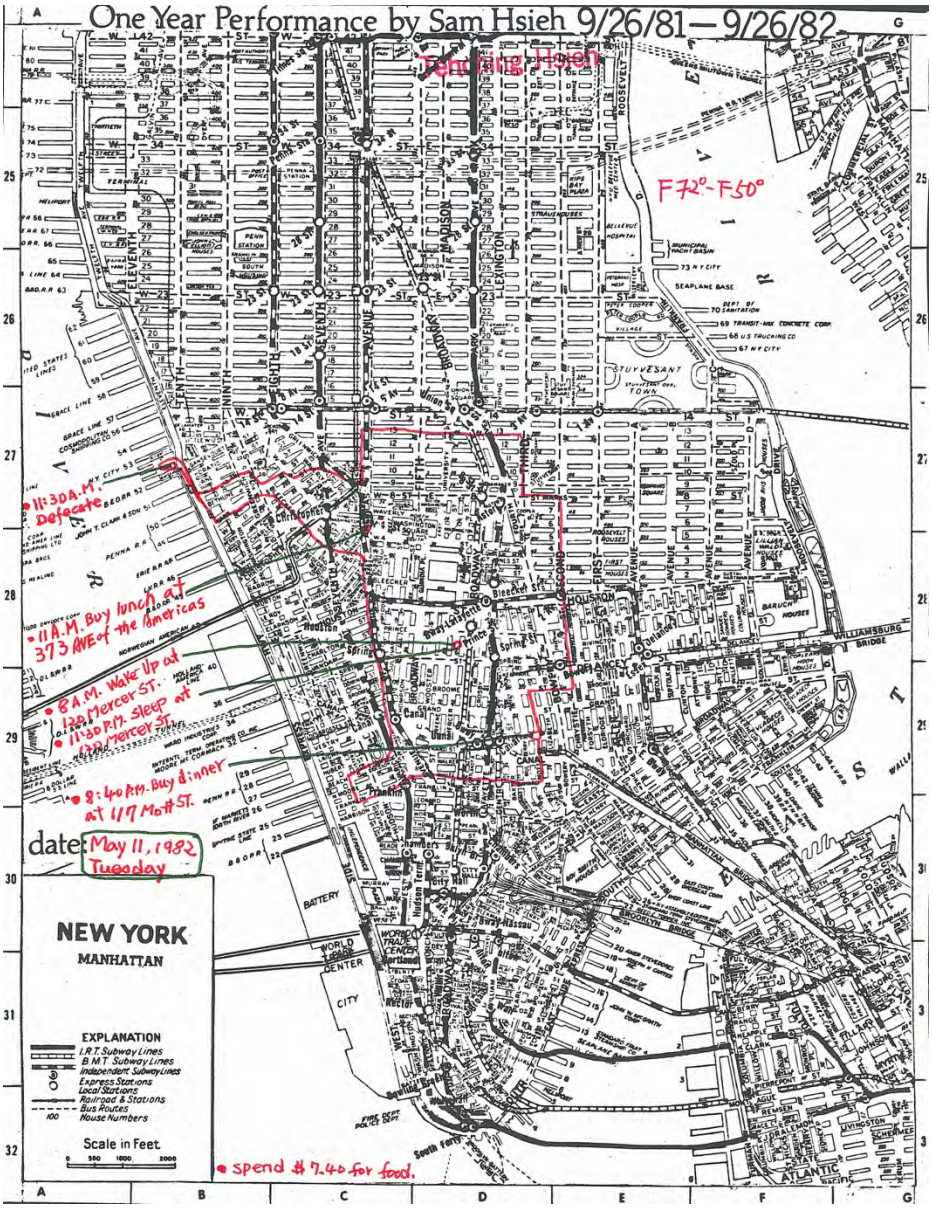


FIGURE 25.

TEHCHING HSIEH
ONE YEAR PERFORMANCE 1981–1982 (OUTDOOR PIECE)
1981–1982
DAILY MAP

COURTESY THE ARTIST
THE GILBERT AND LILA SILVERMAN COLLECTION, DETROIT

creating a visible, and yet inaccessible (and inaudible) archive of their interactions during the work.[28]

In his final year-long proposition, *One Year Performance 1985–1986 (No Art Piece)* (fig. 26), Hsieh extricated himself from all forms of artistic activity, ceasing to create art, talk about art, read about art, visit any museums or galleries, or to otherwise engage with the New York City art scene in which he had become an enigmatic participant. This invisible action effectively allowed the artist to disappear from/into the very activity he was focused upon: the experience of life and time as embedded practice.

Adopting a sparse, institutional formalism that suggests each action (and archive) has been stripped back to embody a raw and essential practicality, Hsieh's approach to *artefactual* documentation is, I argue, a highly significant aspect of the work. I suggest that Hsieh's approach creates an orchestrated accounting of self, paradoxically absent of ego and identity — one that enacts an externalised, objective, experimentally-detached attitude, and conveys a sense of systematic regulation that speaks to the underlying propositional nature of the work. Art historian Adrian Heathfield has described the *One Year Performances* as "persistent experiments as a living performance laboratory," in which

> Hsieh's durational concept is manifested not just as a coincidence of art and life, but a binding sphere of activity and negation, production and redundancy, his immersion in the public sphere is at one and the same time an isolation, his step into the exterior an act of interiority, his movement a kind of stasis.[29]

[28] Adrian Heathfield and Tehching Hsieh, *Out of Now: The Lifeworks of Tehching Hsieh* (London; Cambridge, MA: Live Art Development Agency; MIT Press, 2009), 52.
[29] Ibid, 30.

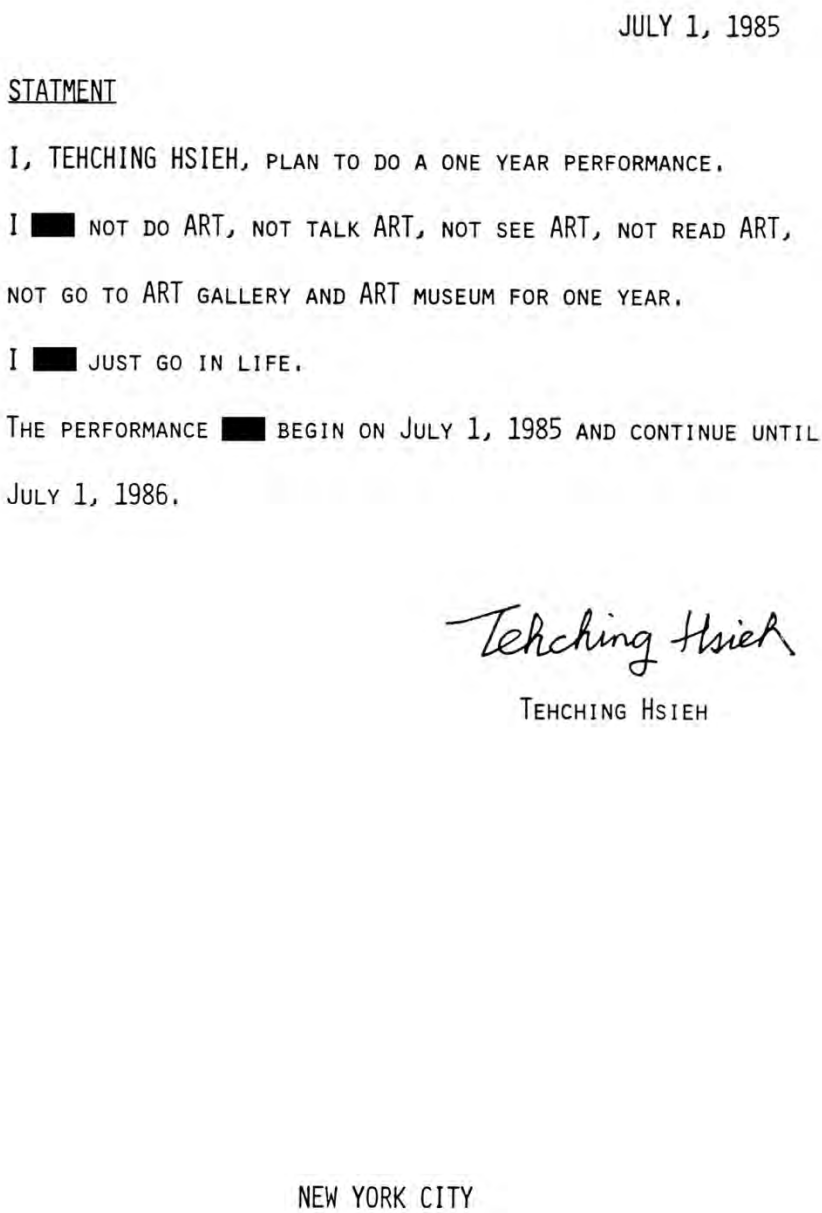


FIGURE 26.

TEHCHING HSIEH
ONE YEAR PERFORMANCE 1981–1982 (OUTDOOR PIECE)
1981–1982
POSTER

COURTESY THE ARTIST, NEW YORK

The extent of Hsieh's commitment to his experimental frameworks is evidenced by his willingness to present the artefacts associated with his actions in an unredacted manner — unfiltered, unaltered, and displaying every instance of fallibility. In *Time Clock Piece*, Hsieh would fail to punch in at the allotted hour 133 times over the course of the year (due to oversleeping, being early, late, etc.), with each absence dutifully noted and accounted for — marked upon his timecards in red pen and observed as an absent frame amongst the printed 16 mm stills.[30] In *Outdoor Piece*, Hsieh was forced to spend 15 hours indoors (violating the conditions of his performance) after being detained by the police when he became involved in a physical altercation on the streets of New York City, released only after Hsieh's serendipitous recognition by a judge who had read about the work in the Wall Street Journal.[31] These events were recorded by Claire Fergusson, who happened to be with Hsieh at the time, and her Super 8 footage of his arrest and detention ultimately became part of the work's performance archive.[32] During *Rope Piece*, Hsieh and Montano fought bitterly, and were often unwilling to be photographed together as originally conceived. In such instances, a blacked-out photograph was recorded instead (occasionally replaced with an image of the word "FIGHT").[33]

These indelible marks inscribed throughout Hsieh's documentary record are revealing of a kind of unvarnished truth that underscores the reality of experimental systems being *enacted in the field.* By acknowledging unforeseen acts and happenstantial deficiencies, Hsieh articulates the interplay between the subjective and objective humanities embedded in *systems that test* — with such constructs invariably examining not only the subject of the investigation, but also the investigator and the system itself. In his

[30] Ibid, 30.
[31] Ibid, 44.
[32] Ibid.
[33] Ibid.

transparency and willingness to account in full for events as they occurred, Hsieh demonstrates how durational performative actions that are situated within the complexities of 'life' become altered by these same undercurrents — that regardless of the structural controls instigated by the investigator, the nature of work is ultimately determined by the indeterminant — unscripted events that lie beyond investigative control. It is in these interstitial spaces that the study of experimental performative systems spills into artistic practice, in which the confrontation between the personal and the methodological leads to a reckoning of self, setting the human, emotional response to experience-in-the-moment, against the underlying structural desire to *endure*.

In this way, Hsieh's experimental system differentiates itself from the works of artists such as Acconci that is more willing to bend and flex the boundaries of experimental truth. Hsieh's work instead provokes a counter *action–artefact* narrative that is defined by unbiased objectivity — one that, I suggest, Acconci emulated rather than achieved in full. Here, truth (or at least, a *form* of truth) is central to the work, and Hsieh's conceptual frame (and its subsequent visual presentation) enumerates a dispassionate engagement with the structural and methodological aspects of the systems he created. As Adrian Heathfield notes, "For Hsieh the artwork is not just the *index* of a preceding and largely unseen duration, it *is* the lived duration itself, a lived time that includes numerous indexical forms and varying degrees of visibility."[34]

This visibility, this *lived*-ness is an important operational structure — a form of *dialectical embedding* associated with the suite of Hsieh's five year-long performances — and is particularly relevant to the performative artefacts that have come to embody the actions

[34] Ibid, 17.

themselves. As Hsieh himself has said of the performances, "once time passes — they all disappear. All that's left are the records; and that's all you see… an archive."[35]

4.1.4 OBJECT ARCHIVES

On May 10, 1968, artist On Kawara sent a picture-postcard to friend and curator Kasper König. The card was relatively non-descript — the kind that would be found in any tourist location, depicting, in this case, an aerial view of Mexico City with the word 'MEXICO' written in bold red type and 'Ciudad de los Palacio' (City of Palaces) inscribed on the bottom left-hand corner. The postcard was a gift of sorts, an expression of gratitude for the financial sponsorship that König had provided to support Kawara's year-long trip through Central and South America. The reverse side would show no immediate sign of Kawara's hand — the physical gesture having been instead mediated through the application of a set of custom-made rubber stamps, marking Köing's address, the date, as well as the phrase "I GOT UP AT 11.38 A.M."

Although Kawara had begun sending König mail intermittently for a month prior, this particular postcard asserted a newfound operational format.[36] The *I GOT UP…* motif would become a reoccurring device that Kawara would stamp on more than 8,000 postcards, sent from locations that he visited around the world to a select group of friends, family, collectors and colleagues over an 11 year period.[37] The work would ultimately end in 1979 as abruptly, and inexplicably, as it began when Kawara's black

[35] Bridgid Delaney, "Tehching Hsieh, Extreme Performance Artist: 'I Give you Clues to the Crime,'" *The Guardian*, October 27, 2017, https://www.theguardian.com/artanddesign/2017/oct/24/tehching-hsieh-extreme-performance-artist-i-give-you-clues-to-the.
[36] On Kawara, *I GOT UP*, 1968–79, Stamped ink on postcards, various dimensions, https://www.metmuseum.org/art/collection/search/284464
[37] "Daily Mail: Showing On Kawara's Postcards at the Guggenheim," Solomon R. Guggenheim Museum, 2015, accessed June 10, 2021, https://www.guggenheim.org/blogs/checklist/daily-mail-showing-on-kawaras-postcards-at-the-guggenheim.

attaché case that contained the set of stamps used to create the *I GOT UP* series was stolen in Stockholm, where the artist had been preparing his first retrospective. Despite eventually recovering the set, Kawara would not return to the work, considering its underlying methodological framework to have been irrevocably violated.[38] This mode of termination, perhaps more even than the nature of the work's beginning, speaks to Kawara's engagement with its elemental structural consistency.

Kawara's *I GOT UP* series is indicative of the artist's broader affinity with methodologically-driven systems, in which he would document the outcomes of endless cycles of *verification exercises* — undertakings that are at once futile, banal and seemingly inconsequential, and are yet revealing of a deeply personal and meditative expression of the artist's association with time and the nature of existence. These activities were at once serious and thoughtful studies of the systematic, and also, simultaneously, playful and irreverent parodies of self, and of institutional sensibilities.[39] Kawara's *I GOT UP* formed part of a family of similarly themed propositional works, including *I MET* (1968–79),[40] *I READ* (1966–95),[41] *I WENT* (1968–79),[42] *I AM STILL ALIVE* (1970–2000),[43] and the *TODAY* paintings (1966–2013),[44] which, taken together, form an immense body of *cumulative artefactual output* — data that forms an operational portrait of both the artist and his activities. In her essay "Sense and Sensibility," Rosalind Krauss reflects also on

[38] Jeffrey S. Weiss, in Weiss et al., *On Kawara — Silence* (New York: Guggenheim Museum Publications, 2015), 26–27.
[39] "The result was a study of the need for measurement despite its futility. What prevents Kawara's work from being science is the concentration on his own life, his own choice of measurement and his personal grasp of time. (His regard for the quotidian, on the other hand, is what prevents him thinking like an old-fashioned historian.)" "On Kawara: The Recording Angel," Frieze, 1997, accessed June 11, 2021, https://www.frieze.com/article/kawara-recording-angel
[40] On Kawara, *I MET,* 1968-1979, Clothbound loose-leaf binders with plastic sleeves and inserted printed matter, Twenty-four volumes (29.2 × 29.8 cm),
[41] On Kawara, *I READ,* 1966-1995, Clothbound loose-leaf binders with plastic sleeves and inserted printed matter, (29.2 × 29.8 cm)
[42] On Kawara, *I WENT,* 1968-1979, Clothbound loose-leaf binders with plastic sleeves and inserted printed matter, Twenty-four volumes (29.2 × 29.8 cm)
[43] On Kawara, *I AM STILL ALIVE,* 1970-2000, Various print medium and dimensions
[44] On Kawara, *TODAY,* 1966-2013, Acrylic on canvas, various sizes.

Kawara's entwinement of structure within logic-driven personal conveyances, stating that:

> Kawara places art within the confines of what Logical-Positivism has called the protocol language — the language of sense-impression, mental images, and private sensations. It is a language implying that no outside verification is possible of the meanings of words we use to point to our private experience — that meaning itself is hostage to that separate video of impressions registered across the screen of each individual's monitor.[45]

It is in this space, through a relentless system of record keeping, collecting, collating, dating, mapping and itemising the incidental activities associated with everyday existence (that would have otherwise gone unseen, unnoticed or unfalsified), that Kawara creates a vast network of data. This cache of individual experience is at once singular (to him) but also universal — recognisable in all human interactions, and triggering an understanding of the personal archive that each individual amasses in their own way in the course of a lifetime.

Of particular interest is what I consider to be an *inherent performativity* associated with Kawara's work — a practice that, although typically recognised through the conventions of process, is, I argue, perhaps better understood through the performative action–artefact constructs presented here. I suggest that Kawara's work is a form of propositional system, which amasses *artefactual documentation* as a result of an abstract *experimental method* and systematic *collection of data in the field*. While the work is registered visually through the cumulation of such artefacts and associated ephemera, I

[45] Krauss, "Sense and Sensibility."

propose that these objects are inherently *laden* in that they convey an active sense of performativity — immersing the viewer in the world of Kawara's historical actions, with each object alluding to the artist's idiosyncratic introspections. As curator Jeffrey Weiss suggests, the existence of this material is a consequence of activity specifically undertaken in order to produce it, thus it operates beyond the function of mere record, serving instead as a ledger of both physical and ideological activity.[46]

In her essay "Three Modes of Conceptual Art," Lizzie Borden similarly considers the operation of such object-archives, remarking on modes of innate transference associated with acts of collecting:

> …photographs, lists, notes, blueprints, etc. Even though the sensibility may have been prompted by that of the chronicler, there is great feeling of historical method in the step-by-step recording of events, journeys, and projects. The transitory becomes fact. The use of the body as the field of thought and action gives a sense of objective data to particular and intimate personal histories.[47]

In this way, I suggest that Kawara's work is a form of *implicit, unwitnessed performance* — one that is innately tied to the physicality of his actions and systematic methodology. While engaging with similar action–artefact relations, Kawara's work is clearly the most heavily biased toward the operation of the artefact as a singular device, compared to the more explicitly performative works of the other artists discussed previously in this chapter. Such considerations bring vibrancy to what historian of science Hans Jörg

[46] Weiss, *On Kawara — Silence*, 25.
[47] Borden, "Three Modes of Conceptual Art," 69.

Rheinberger describes as *epistemic things*[48] — material entities that operate as locations of knowledge, where "phenomenon and instrument, object and experience, concept and method are all engaged in a running process of mutual instruction," becoming a tool or vehicle by which a more expansive body of knowledge can be accessed.[49]

Thus, performative artefacts can be seen to serve as custodians of the original acts that bequeathed them — they are all that remain of an inscribed action, finding their form in film, in photograph, through object or text, operating at once as both artwork and archive (be it truthful of fabricated) — in and of themselves *undertaking an act of performance.*[50]

The operation of such *artefactual archives* negates the necessity of *liveness* associated with performative acts and strips the *embedded actions* of their need to be physically witnessed. While curator Catherine Wood suggests that "these fragments offer only glimpses of the original work," she also concedes that they "form an imperfectly partial but powerfully intoxicating foundation myth…" — one that is essential to an ever-expanding generation of audiences that can only ever view these actions through the documents that preserve them.[51] In these arguments I do not seek to assert that all works (or in fact all human activities) are inherently performative, by rather advocate for a subset of conceptually-driven, methodologically-informed activities in which consideration of the *artefactual*

[48] Hans-Jörg Rheinberger, *Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube* (Stanford, CA: Stanford University Press, 1997).
[49] Hans-Jörg Rheinberger, *An Epistemology of the Concrete: Twentieth-Century Histories of Life* (Durham, NC: Duke University Press, 2010), xiii.
[50] In *Performance in Contemporary Art*, Catherine Wood extends this list to include "photographs, sketches, video, scores, stage sets, reviews, costumes, props, rumours, witness memories." Catherine Wood, *Performance in Contemporary Art* (London: Tate Publishing, 2018), 23–4.
[51] Wood, *Performance in Contemporary Art*, 24. Amelia Jones characterises this phenomena in Tony Godfrey, *The Story of Contemporary Art* (Cambridge, MA; London: MIT Press; Thames & Hudson, 2020) and in her essay, "'Presence' in Absentia: Experiencing Performance as Documentation," *Art Journal* 56, no. 4 (1997), https://doi.org/10.2307/777715.

archive activates a dynamic engagement with the artist's original enterprise in the mind of the viewer.

4.1.5 EXPERIMENTAL THREADS

In 1975, artist John Baldessari set up an experiment in his studio. Taking a one metre length of hemp rope, held taut horizontally and suspended from a one metre height, he dropped it — allowing it to fall *as it pleased* — an action that he photographed using a stroboscopic flash to capture the contorting form as it fell. The resulting image, *Dropping a Rope One Meter Long One Meter (1/2-inch Hemp)* (fig. 27) shows the rope in eight varying positions, capturing, as Baldessari had hoped, the "language idioms of movement" and creating the artist's own Duchampian *stoppage*.[52] This image formed part of the artist's body of work known as *Strobe Series / Futurist*, a series of black and white photographs conceived to explore aspects of dynamic movement that could be captured within single photographic frames.

In these motion experiments, Baldessari was distinctly referential, drawing visually upon various early twentieth century avant-garde sources, including the Futurist movement, the chronophotographic processes of Eadweard Muybridge and Étienne-Jules Marey and, ultimately, Marcel Duchamp's proto-conceptual work *3 Standard Stoppages*. Baldessari's image *Dropping a Rope…* is an experimental re-enactment and homage to Duchamp's conceptual proposition "The Idea of Fabrication", which, as described in detail in chapter one, enumerates the conditions under which Duchamp created his original *stoppages* by allowing each thread to similarly fall and contort under their own

[52] R.H. Fuchs, John Baldessari, Nelleke van Maaren and Anna H. Berger, "John Baldessari: Works 1966–1981," (Eindhoven; Essen: Van Abbemuseum Eindhoven; Museum Folkwang Essen, 1981), 38.

FIGURE 27.

JOHN BALDESSARI
STROBE SERIES / FUTURIST: DROPPING A ROPE ONE METER LONG ONE METER (1/2" HEMP)
1975
BLACK AND WHITE PHOTOGRAPH
10.5 X 10.5 IN. (26.7 X 26.7 CM)

weight. Baldessari's stroboscopic images are "straightforward and informational," suggestive of the quasi-scientific modes of early twentieth century investigatory practices.[53] While clearly a *stoppage* in its own right, Baldessari's photograph is vested with different characteristics compared to Duchamp's objects — alluding to the work's dynamic, experimental genesis and revealing an *inherent performativity* encoded in its creation.

Such experimentally-driven interrelations between the practices of Baldessari and Duchamp are readily identifiable, as per, for example, his 1973 series *Throwing Three Balls in the Air to Get a Straight Line (best of 36 attempts)*, in which the artist undertook a farcical 'experiment' where he attempted to align three red rubber balls (in flight) within a single photographic frame (fig. 28). The resulting photo-series is, I suggest, something of a study in modes of experimental iteration and failure, consisting of visual documentation of Baldessari's various attempts to throw, and concurrently capture (photographically), three balls in various states of motion and (un)alignment. Limited by the capacity of an analogue roll of 35 mm film, Baldessari's photographs are a playful test conducted in defiance of gravity (and atmospheric conditions), comprising of at once absurdist, futile, and yet ultimately beautiful artefactual images that contrast the vibrant and striking red flashes of his apparatus against the deep blue skies of California. When considering the impact of this archive, it is impossible to separate the aura of each of the static images from the performative gestures that produced them. Here, each photograph operates beyond its simple documentary context — invoking the physicality, as well as irreverent intent, of Baldessari's original actions and propositional structure.

[53] Godfrey, *The Story of Contemporary Art*, 89.

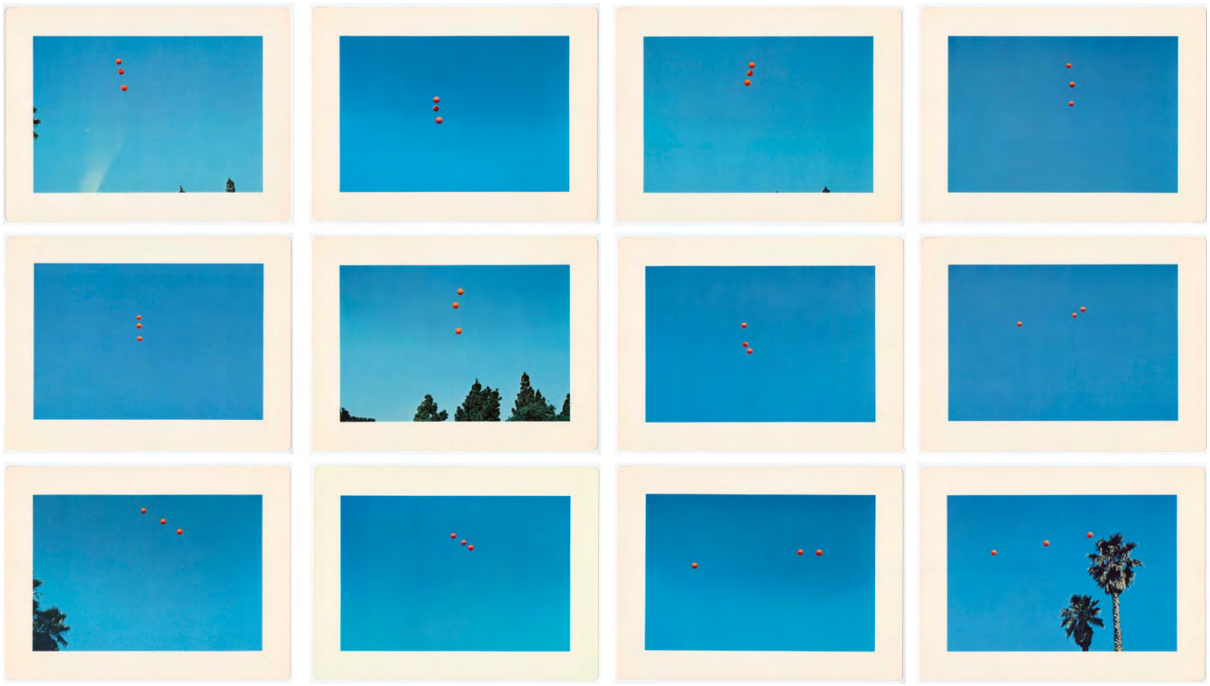


FIGURE 28.

JOHN BALDESSARI
THROWING THREE BALLS IN THE AIR TO GET A STRAIGHT LINE (BEST OF THIRTY-SIX ATTEMPTS)
1973
OFFSET LITHOGRAPH, IN 12 PARTS, EACH 24.2 X 32.3 CM (9 1/2 X 12 3/4 IN.)

What is clearly captured in Baldessari's practice is the element of the subversive — that despite understanding, like Duchamp, the nature of experimental systems, Baldessari's 'experiments' are clearly tongue-in-cheek gestures — attempts to engage with the *idea* of testing a proposition statement rather than enacting a rigorously scientific demonstration.

This same playfulness has not always been exemplified in reference to Duchampian analysis — with, for example, Rhonda Shearer and Stephan Jay Gould finding particular concern in their inability to faithfully reproduce Duchamp's original *3 Standard Stoppages* experiment.[54] Despite multiple attempts with varying materials, Shearer and Gould were unable to form a set of splinar curves similar to Duchamp's as a result of imitating his thread-dropping instructions, and, as a consequence, the authors subsequently suggest that Duchamp's experiments violate notions of *reproducibility.* In this, it is interesting to reflect on the nature of the conceptual transference between science, philosophy and art, and consider both the *intent* and *purpose* with which such material is deployed. While the borrowing of terms and concepts such as *falsifiability*, *reproducibility*, *theorem*, *proof* and *corollary* from science and analytical philosophy is of utility and motivation for conceptual practitioners, such things are not intended to be wielded in a literal fashion — art is not (and should not be) science, even when artistic practice is scientifically informed. Experimental 'truth' in art is a tool to be played with and subverted — ideas that Duchamp and Baldessari are clearly comfortable demonstrating.

[54] Rhonda Roland Shearer and Stephen Jay Gould, "Hidden in Plain Sight: Duchamp's *3 Standard Stoppages*, More Truly a 'Stoppage' (An Invisible Mending) Than We Ever Realized," *Tout Fait*, updated May 13, 2019, accessed June 11, 2021, https://www.toutfait.com/hidden-in-plain-sight-duchamps-3-standard-stoppagesmore-truly-a-stoppage-an-invisible-mending-than-we-ever-realized.

4.1.6 EXPERIMENTS MUST BE PERFORMED

Considering then the genesis, nature and impact of propositional, experimentally-derived works — tracing their linage from Duchamp's proto-conceptual 'experiments' through to the development of conceptualism itself, and as encoded in the various performative praxis presented in this chapter so far — it is of interest to draw a set of overall inferences which, I suggest, could be succinctly summarised to state that *much is indebted to Duchamp and his methodological modalities*.

In addition to the arguments presented in chapter one, in which Duchamp's propositional work was established as a forerunner to the development of conceptual practices, I here suggest that his impact stretches further still — that through the practicality of his *implementation* of experimental systems, a sense of *inherent performativity* was embedded in propositional conceptual practices. Despite myriad differences in style, form, content and intent, I suggest that experimental systems (in either art or science) are unified by ideas of *pragmatic realisability* — in other words, as sociologist Lawrence Busch notes, "Experiments are and must be performed."[55]

What results then is that which I consider to be a network of *definitional games*, whereby each disciplinary perspective employs a deliberately *Wittgensteinian distillation* of concept and terminology to satisfy their own objectives. In conceptual practice, this distillation leads to the idea of *inseparability* between propositional conceptual frames and considerations of performativity, with the realisation of such works requiring a practical

[55] Lawrence Busch, *Standards: Recipes for Reality* (Cambridge, MA: MIT Press, 2011), 306.

implementation and *testing in the field* akin to experimental systems in science. As noted by sociologist John Law:

> Method practices are performative. They help to enact the world that they describe. Since the character of this performativity is predominantly implicit, we need an archaeological reading if we are to start to articulate the realities they imply. Such an archaeology is relational, always incomplete, always capable of articulating new versions of performativity. This is the instinct that informs a baroque or monadological inquiry into the nature of method.[56]

I suggest that notions of realisability in conceptual art practices lead inevitably to the 'performance' of propositional systems, with the resulting modes of performatively-laden 'experimentation' encoded as combinations of *action* and *artefact*. Returning, ultimately, to the contributions of Duchamp, Herbert Molderings remarks:

> With the *3 Standard Stoppages* Duchamp established… an aesthetic in which the boundaries between science and art, artwork and experiment, art and non-art no longer existed. The new approach to the making of art manifest in *3 Standard Stoppages* ultimately led to the experimentalisation of art that has now been a characteristic of contemporary art for the past half century.[57]

[56] Law, "Seeing Like a Survey," 249.
[57] Molderings, *Duchamp and the Aesthetics of Chance*, xv.

4.2 CONTEMPORARY EXPERIMENTAL SYSTEMS

In his 2012 publication *During the Exhibition the Gallery will be Closed: Contemporary Art and the Paradoxes of Conceptualism,* art historian and philosopher Camiel van Winkel suggests that "the entire field of artistic production is now determined, on fundamental level, by conditions that conceptual artists recognised and addressed in their work… contemporary art is a phenomena that has evolved out of the paradoxes of the conceptual movement."[58]

This assertion establishes the notion of the *post-conceptual*, a term recognised by a range of theorists, including Peter Osborne, Michael Newman, John Bird and van Winkel who have collectively employed it to define the conditions and structural modalities of contemporary practice. This, as noted by Osborne, is "not the name for a particular type of art," but rather is concerned with delineating a distinct conceptual space that incorporates the "historic ontological condition[s] for the production of contemporary art…"[59] This space is distinguished by its proximity to the conceptual practices of the mid-twentieth century, extrapolating such ideas into the present by framing, arguably, all contemporary practices with respect to the propositional methodologies and aesthetic sensibilities that were engendered by the conceptual.

It is within this space that my own practice is situated, and in the remainder of this chapter I survey a range of contemporary practitioners who similarly *lean into* this conceptual residue. Of specific interest are those who employ not only systematised, methodologically driven approaches, but also artists who engage scientifically informed

[58] Van Winkel, *During the Exhibition the Gallery will be Closed*, 55.
[59] Osborne, "Art Beyond Aesthetics," 666.

material to build investigatory, propositional 'experiments' designed to *test ideas in the field.*

In developing work in this space, I suggest there is the completion of an ideological loop — returning intuitively to the underlying methodological structures than bind the disciplines of conceptual art and science together. These ambitions, as recognised by academic Michael Schwab, seek to activate a "a post-conceptual understanding of experimental systems as the foundation of an artistic epistemology."[60] These practices build on the legacy of the propositional conceptual works that I have outlined throughout this thesis, providing, as Roberta Smith suggests, "the shifting terra infirma" upon which new experimental systems can be constructed and tested.[61]

4.2.1 GUIDO VAN DER WERVE

The Geographic North Pole is defined as the point in the Northern Hemisphere where the planet's axis of rotation meets the Earth's surface. It is the northern-most point on Earth and the position where all longitudinal lines converge. Unlike the South Pole, which rests on a continental land mass, the North Pole is located in the middle of the Arctic Ocean amid waters that are almost permanently covered in a shifting pack of sea ice. It is a stark, desolate location upon which no permanent structures have been built. At the pole, the Sun does not set for six months of the year.

In this unforgiving space, Guido Van der Werve presents as an isolated figure — weighed down and encumbered by heavy winter clothing, he restlessly shifts his weight

[60] Michael Schwab, "Experiment! Towards an Artistic Epistemology," *Journal of Visual Art Practice* 14, no. 2 (2015): 129.
[61] Roberta Smith, "ART/ARCHITECTURE; Conceptual Art: Over, And Yet Everywhere," April 25, 1999, 2, https://www.nytimes.com/1999/04/25/arts/art-architecture-conceptual-art-over-and-yet-everywhere.html.

from one foot to the other, moving yet also totally immobile (fig. 29). For a twenty-four-hour period spanning April 28–29, 2007, Van der Werve stood 'atop' the Earth's centre of rotation at the Geographic North Pole, turning counter-clockwise as the Earth itself turned counter-clockwise beneath him, and thereby negating the relative rotational movement of the planet against his body. The work, entitled *Nummer Negen. The day I didn't turn with the world* [62] marks a singular act of stasis — an innate desire to stand with (and yet against) nature, to mark the physicality of the planet's movement in relation to the physicality of the body. Van der Werve's work — a gesture of both endurance and futility (the world keeps turning, the planet always wins) — can be seen as a transitory act of calibration: an experiment that situates the body within the vast scales of the planetary environment and elides the passage of time against an unchanging sky.

Van der Werve's action is compressed in the space of the gallery, viewed as an 8 minute 40 second film set to one of Van der Werve's own piano compositions. To experience the work is to meditate on the nature of time, space and relative motion — how they cut across and through our proximal centres. Reflecting on the work, Christine Ross remarks:

> The performer's body is the equivalent of a vanishing point shown in constant reorientation: it moves but it moves without abandoning its standpoint; it moves but does not move forward. It moves only sideways, reorienting itself by turning to the side until a full circle is achieved. [63]

[62] Guido van der Were, *Nummer negen. The day I didn't turn with the world* (2008), time lapse photography (8:40 min), 24-hour performance, April 28–29, 2008, Geographic North Pole.
[63] Christine Ross, *The Past is the Present; It's the Future Too: The Temporal Turn in Contemporary Art* (New York: Continuum, 2012), 99.

FIGURE 29.

GUIDO VAN DER WERVE
NUMMER NEGEN: THE DAY I DIDN'T TURN WITH THE WORLD
2007
TIME-LAPSE PHOTOGRAPHY TO HD VIDEO, GEOGRAPHIC NORTH POLE
8 MIN 40 SEC

Van der Werve's artefactual record transports the viewer to the unworldly apex of our planet's surface, making tangible the invisible dynamics of the Earth itself. This anthropomorphic act responds to our planet's daily ritual — marking the constancy of its incremental rotation, its unacknowledged metronomic performance.

1.2.2 GIANNI MOTTI

The Large Hadron Collider is a high energy particle collider, a device designed to uncover and interrogate the fundamental essence of matter. Built by the European Organisation for Nuclear Research (CERN) in a ten-year collaborative project between 1998 and 2008, it is a 27 km long 'ring' of superconducting magnets designed to accelerate proton/ion (i.e., hadron) beams to near the speed of light, smashing these elemental particles together to study the subatomic structure of mass and the fundamental nature of force and energy.[64] The Large Hadron Collider's main structure consists of a network of circular tunnels containing supercooled magnets, vacuum tubes and a complex array of electronic detectors and measuring systems, buried in a sprawling complex located beneath the Franco–Swiss border near Geneva, Switzerland. While it is easy to become overwhelmed by the scale and complexity of the enterprise, distracted by the sheer volume of scientists involved and the frenetic pace of their research, the Large Hadron Collider's mission is, at its core, quite simple — it is an inimitable machine built for discovery.

In 2005, Gianni Motti was an artist-in-residence at CERN, engaged with the complex and futurist technology embedded in the system. Interested in

[64] "The Large Hadron Collider," CERN, accessed June 25, 2021, https://home.cern/science/accelerators/large-hadron-collider.

understanding the interplay between matter and antimatter that shaped the evolution of the primordial universe, Motti undertook a performative walk — pacing around the entire 27 kilometres of the Large Hadron Collider's ring to mimic the path of a proton through the device. Motti has described this journey as being that of an "unaccelerated human" in search of the *anti-Motti*.[65] The resulting work *HIGGS, In Search of the Anti-Motti* (fig. 30-31), consists of a 5 hour 50 minute film (accompanied by photographic stills) that charts the artist's progress through the claustrophobic tunnels of the giant machine. Accompanied by cameraman Ivo Zanetti (who filmed the performance in its entirety), and physicist/collaborator Jean-Pierre Merlo, Motti's journey was enacted to mark the centenary of Einstein's theory of general relativity, a hypothesis which explains the history and expansion of our universe.

Motti's walk is both banal and disorienting — a slow progression through the liminal spaces of the collider, a contour that is typically traversed by an accelerated particle 11,000 times in a single second. Of his performance, Motti would state "After two kilometres, I lost all notion of time and space. I don't remember anything, I was elsewhere. I was hypnotised by the monotonous tunnel, as if in a video game."[66] The act of engaging with the Large Hadron Collider as a physical (performative) tool, in which the body experiences the odyssey of accelerated matter in an abstracted sense, led to bifurcating considerations of purpose and intent between artist and scientist. The physicality of Motti's action was a perspective not previously acknowledged by the scientists at CERN, leading to the generation of a new form of epistemological engagement between the scientists and their machine.

[65] Gianni Motti, "Becoming a Proton," Science Gallery London, 2019, accessed June 23, 2021, https://london.sciencegallery.com/news/becoming-a-proton.
[66] Ibid.

FIGURE 30.

GIANNI MOTTI
HIGGS, A LA RECHERCHE DE L'ANTI-MOTTI (HIGGS, IN SEARCH OF THE ANTI-MOTTI)
2005
CERN, GENEVA
LHC (Large Hadron Collider)
VIDEO DOCUMENTATION AND PHOTOGRAPHIC STILLS
5 HR 50 MIN

FIGURE 31.

GIANNI MOTTI
HIGGS, A LA RECHERCHE DE L'ANTI-MOTTI (HIGGS, IN SEARCH OF THE ANTI-MOTTI)
2005
CERN, GENEVA
LHC (Large Hadron Collider)
VIDEO DOCUMENTATION AND PHOTOGRAPHIC STILLS
5 HR 50 MIN

4.2.3 KATIE PATERSON

Since 2011, Katie Paterson has been writing letters of condolence, on occasion sending as many as 150 letters in one week. These letters vary in format, being most often typed, although occasionally also handwritten — sent on paper of shifting colour and size, in envelopes addressed to a predetermined recipient.

Each of these letters marks the death of a star — a distant extinguished light, identified on Earth as an alphanumeric sequence assigned by the International Astronomical Union, who officiate the naming of stars and distant celestial bodies.[67] In order to write her obituaries, Paterson subscribed to a scientific bulletin that alerts astronomers, astrophysicists and planetary scientists that the death of a star has been observed and recorded.[68] Coincident with each reported demise, a new letter is written, generating a cumulative archive known as the *Dying Star Letters* (fig. 32). Each correspondence is a terse and seemingly detached account of a star's passing, summoning a precise and clinical procedural rigour that is suggestive of perfunctory administrative duties. Yet, in spite of this, much care and personal investment is fused to the creation of the work, with Paterson committed to her dutiful documentation ad infinitum — an ongoing acknowledgement of that which is no longer seen.

Paterson's work considers time as a multi-valued construct, giving weight and presence to contemplation of the exchange of intervals of time mediated *across time, space and experience*. Performance theorist Felipe Cervera reflects on this loaded temporality embedded in the *Dying Star Letters*, suggesting*:*

[67] "About the IAU," International Astronomical Union, accessed June 22, 2021, https://www.iau.org/administration/about.
[68] Felipe Cervera, "Naming the Cosmos Death: On Performance, Astronomy and Katie Paterson's The Dying Star Letters," *Performance Research* 22, no. 5 (2017): 31.

FIGURE 32.

KATIE PATERSON
DYING STAR LETTERS
2011–ONGOING
LETTERS (INK ON PAPER)
VARIABLE DIMENSIONS

PHOTO © JOHN MCKENZIE, 2014 COURTESY OF THE ARTIST AND INGLEBY GALLERY, EDINBURGH

> The piece collapses several logics and scales of time in the gesture of a few nostalgic lines. There is the duration of the letter: a few seconds; the duration of the encounter between Paterson and the receiver: about a year; the duration for light to travel across vast distances so that humankind could register the event: probably a few hundred thousand, if not a few million, years; and lastly, there is the 'lifespan' of the star: unknown with exactitude… The durational performance is really an encounter between the recipient and the universe at large.[69]

These same modalities are present in Paterson's ongoing work *History of Darkness* (fig. 33), in which the artist has created a continuously expanding catalogue of the darkness found in the night sky, sampling the interstitial spaces that sit between stars in collaboration with various astrophysical observatories worldwide. The jet black images are captured on photographic slides and stored discretely in gallery spaces, arranged from one to infinity, and inscribed with handwritten details including each frame's distance to the Earth in light years.[70] This collection of darkness, one that already extends into the thousands, will continue to be amassed over the artist's lifetime — attempting to capture the near infinite expanse of blackness that endows the night sky overhead.

These two works are companions and yet sit in opposition to each other — performative *corollaries* that account for countervailing dynamics. In the *Dying Star Letters*, Paterson marks the passage of the last vestiges of a star's light, foretelling, in effect, the creation of

[69] Ibid.
[70] "History of Darkness," Katie Paterson website, accessed June 14, 2021, http://katiepaterson.org/portfolio/history-of-darkness.

FIGURE 33.

KATIE PATERSON
HISTORY OF DARKNESS
2010–ONGOING
PHOTOGRAPHIC SLIDE, WOODEN TRAY WITH LID
51.8 × 51.8 × 9 CM (CLOSED, OVERALL)

PHOTO © PETER MALLET, 2012 INSTALLATION VIEW HAUNCH OF VENISON, LONDON

darkness anew. *History of Darkness*, contrastingly, surveys not merely an absence of starlight, but seeks to enumerate the space of the possible — to account for the light that still lies in transit — "to imagine a different conformation of the present," and as such "to distance ourselves from the beast of time."[71]

4.3 THE UNFINISHED EXPERIMENT

Experiments do not ever truly end; they are simply laid to rest — waiting in potent states of dormancy to be taken up again with renewed agency and activated by another. What is evident in the summary of works presented in this chapter is that conceptual art itself is one such experiment, being less a finalised and conclusive outcome and more an active ontological structure that is constantly made, remade, and made again in service to the activation of ideas. In this space the artist as experimenter is never satisfied, seeking constantly to redefine the terms of their own modes of experimental practice, both drifting with and pushing against the winds and undercurrents of thought as form. As Robert Crease notes, "[t]he study of scientific experimentation is of necessity open-ended," one cannot "…pin down an 'essence' of experimentation the way that one can, for instance, pin down the essential features of a triangle, so that one can speak from then on with confidence about its past and future forms."[72] Instead, one must accept that experiments change with and as a consequence of time, melding their structures to the impending needs of art, artist and audience: "Experimentation does not aim at a closed, finished structure, nor does it seek to reify or confirm a structure; instead, it seeks continued inquiry"— a timeless embedding of thought, form and methodological function.[73]

[71] Blanga-Gubbay, "The Distance with the Present. On Agamben's Notion of the Contemporary," 94.
[72] Crease, *The Play of Nature*, 85.
[73] Ibid.

CONCLUSION: SUMMARY & REFRAIN

In the opening of his seminal 1990 essay, "Conceptual Art 1962–1969: From the Aesthetics of Administration to the Critique of Institutions," Benjamin Buchloh claims that a critical distance had (finally) been reached beyond conceptual art, one that "both allows and obliges us to contemplate the movement's history in a broader perspective than that of the convictions held during the decade of its emergence."[1] This thesis has sought to advance these sentiments, considering conceptual practices from my own temporal vantage point, and reflecting upon on the systems and processes that conceptual art has come to define with respect to this renewed perspective. In doing so, I both accept and seek to broaden Buchloh's own assessment of conceptual endeavour as a form of "aesthetics of administration," proposing that aspects of conceptual art's administrative activity are not merely ambiguously institutional in character but are possessed of distinctly scientific traits — ones that have embedded themselves within the methodological systems and structures that historical conceptual practices possessed, and continue to exert and enact in the post-conceptual.

Why, then, this companionship with science — a discipline not widely appreciated for its poetic sensibilities? Simply put, it is because I argue against the adoption of such siloed disciplinary simplification, unpacking a linage of conceptual thinking from Duchamp, to Snow, to Bochner, to Paterson, to establish an entanglement of

[1] Benjamin H. D. Buchloh, "Conceptual Art 1962–1969: From the Aesthetics of Administration to the Critique of Institutions," *October* 55 (1990): 1.

methodological and propositional experimentation that acts in constant *service to the mind*.[2]

For science itself is expansive, complex and surprisingly antithetical. Its inner mechanics often at odds with broad brushstroke views of how science operates. In itself, science is a bifurcated construct that exists in the human psyche as both a product and a process. It is defined by the information it creates and also by the methods with which such information is created. Science is perpetuated by this dual mechanism, with the physical act of *doing* science inescapably contributing to the body of knowledge known *as* science. Science is a historic legacy of this accumulated knowledge — an organisational index that has allowed us to understand the essence of that which we know, to attribute to it not only a name, but also provide a way to see it in relation to all else. Science gives us a way to classify the universe through singular statements — to define behavioural characteristics and provable elemental properties that reveal the current state of *known things*, and perhaps more importantly, provides the tools to predict the circumstances of their future. That which is discovered scientifically can be awarded higher intellectual standing in that it has survived a criterion — a rigorous examination and classification that distils information into a definable knowledge. It has been tested and considered with reference to a set of universal constraints: it has been questioned, *observed* and *observed again*.

In light of such historical iterations, characterised by both empirical and theoretical testing, science has come to be seen as a societal bedrock and totemic pillar — assigned a fixed, immutable veneer that is imbued with an agency of truth. This rigorous execution

[2] Molderings, *Duchamp and the Aesthetics of Chance*, 8.

of strict methodological process has cultivated a robust authority, often mistaken as an unbending and unwavering force. Yet the truth of science is that it *yields*. In light of evidence science will bend, flex and adapt itself — in the pursuit of an idea it will bury its own paradigm and shift irrevocably towards an uncertain future. The rigidity yoked to science is little more than artifice — negating the incontrovertible dualism inherent in its system. Science is a product of flux, an active quest amongst the uncertain and unknown. "Science is not a monument of received truth but [is] something that people do to look for truth"; an ongoing, incremental search for the fabric that constructs our universe, propelled forward by its own action.[3]

In this thesis, I have considered the way in which a similar epistemology can be applied to the mechanics of conceptual art, examining how the underlying propositional structures of conceptual practice are indebted to scientific experimental modalities. In this, it is important to say that I do not mean that conceptual art *is* science or should seek to imitate its specific functions; rather, I suggest that conceptual and scientific practices are cut from the same (philosophical) cloth, deploying experimental systems as a means to engage reality as a propositional construct. In his essay "Mediators," Gilles Deleuze remarks on this triadic cohesion, stating:

> What I'm interested in are the relations between the arts, science, and philosophy. There's no order of priority among these disciplines. Each is creative. The true object of science is to create functions, the true object of art is to create sensory aggregates, and the object of philosophy is to create concepts. From this

[3] Dennis Overbye, "Elevating Science, Elevating Democracy," *New York Times*, January 26, 2009, https://www.nytimes.com/2009/01/27/science/27essa.html.

> viewpoint, given these general heads, however sketchy, of function, aggregate, and concept, we can pose the question of echoes and resonances between them. How is it possible — in their completely different lines of development, with quite different rhythms and movements of production — how is it possible for a concept, an aggregate, and a function to interact?[4]

The main body of this thesis has sought to answer Deleuze's question, proposing that the application of method and abstract methodological topologies represents a shared intersectional juncture that is accessible to all disciplinary functions. I have argued that, beginning with the proto-conceptual work of Duchamp, such mechanisms have been foundational to the development of conceptual practices, leading to the creation of a range of systematised, scientifically informed/proximal works throughout the 1960s and 1970s. I have further argued that such framing continues to influence contemporary conceptual practices, informing and shaping the post-conceptual.

It is in this space that my own work is situated — a practice framed by method as a structural concern, in which durational, propositional actions are employed to consider notions of time and space as measured against a set of self-reflexive metrics and bodily perspectives. Through a sequence of experimental investigations, I test *and am in turn tested* — courting the interstitial tension that sits in between the structures of scientific inquiry, their philosophical frames and my own artistic concerns. An account of these investigations (which include a preliminary exercise in observation, a tethering to the time of another planet, and a study of the imperceptible shifts embedded in the dynamics of orbiting bodies) is presented subsequently — enumerated as a set of 'scientific papers'

[4] Deleuze, "Mediators," 123.

that adopt the style, structure and formalism of scientific writing, as an extension of the propositional 'instructions' employed by a range of conceptual practitioners, including Duchamp in "The Idea of Fabrication," Bochner in "The Serial Attitude," and in Denes' *Dialectic Triangulation*, as explored in previous chapters. This theoretical framing is an attempt to write *with and through* scientific conventions to explore the conceptual structures and artistic outcomes that have been generated by my visual practice from a formal perspective. I have sought to cultivate a set of interwoven definitional constructs and axiomatic principles through the leveraging (and subversion) of scientific language, employing terms and concepts including *definition*, *theorem*, *corollary* and *proof* to frame my works as a set of hypothesis-driven propositions.

These acts of testing and evaluation continue — forming the methodological structure of my ongoing practice. For embedded deep within the constitution of the experiment are notions of duration and endurance — of (re)testing and (re)examining one's own conceptual prism to engage new ideas and material, to determine one's onward trajectory.

EMPIRICAL RESEARCH

[ARTIST'S WORKS]

INTERMEZZO

Set at the intersection of scientific and artistic action, this set of 'experiments' has been designed to demonstrate the high-wire act walked within interdisciplinary studies when seeking to create new forms of knowledge. In both concept and application, they have sought to rupture the traditional structures of an arts-based research paper in order to examine the procedural rigours of scientific methodology from within its own ontological apparatus. As a consequence, the following set of expositions are also *written* as a conceptual test, adapting the structures of scientific discourse to elucidate the systematic interplay between scientific process and conceptual art practice. This oscillatory parlance is a consciously crafted and discordant act — a synchronic device employed to assess both a *system in use* and a *system in critique*. It is a study of process *in process*, merging the vernacular of science with the vocabulary of art so that each can be viewed through the prism of the other. By examining the internal architectures of the underlying processes themselves, it is intended that the rules that govern the creation and implementation of method-based practices become all the more apparent.

When considering the structures of scientific methodology, one need look no further than the conventions of a scientific paper, as such a framework is revealing in itself of many of the mechanisms inherent to science. It is an exemplar of the meticulous processes that characterise scientific action, studiously refined to provide a cohesive defence of the experimental method. In a scientific paper, each section serves a specific function — carefully crafted to ballast the consequent. It seeks to fortify sound logic and to reveal experimental deficiency, acting as a litmus test in the context of science. The application of such a device in artistic exposition serves to demonstrate a conformity to

scientific standards, whilst simultaneously illustrating the inevitable friction borne of such an endeavour. Fundamentally, these are strategies that sit in tension — adroitly shifting between success and failure. This dichotomy is revealing of the fundamental questions at the heart of my research, namely: *What are the mechanics of science? How do they work? How are they recognised? How is method made, unmade, broken down and reassembled? And when stripped of function for the sake of art, what purpose does method serve and how can it be measured?*

Such methodological junctures are hard to delineate because they are just that — *junctures*. They are in-between spaces — interstitial gaps — devised as a means to an end as opposed to a substantive entity in isolation. Once formulated they are offered no weight nor value, becoming instead an unquestioned set of standards by which other concepts are appraised. Yet when scientific methods are pulled into art, these paradigms must again be (re)assessed. Now, unburdened by function, their purpose, practice and identity can be called into questioned and emended — their use opened up to new negations and interpretive responses.

Art, unlike science, can adopt, eschew and redetermine scientific trajectories without being beholden to the rigours of reproducibility and account. The absolutes that govern science can be flexed, singularised and manipulated, for truth in art has always been a subjective entity, determined by alternate pathways, perceptions and ways of knowing. The premise of this study is to analyse the intersection of these two vantage points: unpacking how readily scientific attributes can be adopted into an artistic schema, how these values shift practice and process, and how the speculative edges can be negotiated. It is a breakdown of artistic and scientific thinking to evaluate the volatile space between,

to examine the reciprocity within conceptual systems and to validate a communal passage that seeks to filter art through a scientific idiom.

The following papers invest in the ambiguities of making method, exploring the subjective and the arbitrary embedded in the systems and standards that methods make. They consider how a perceptual shift within a methodological process (and/or the standards that govern them) promotes contemplation of the philosophical principles that belie them.

This is an experiment. I am being tested.

OBSERVATIONS FOR OTHER PEOPLE

ABSTRACT

This paper outlines a performative framework that explores the nature of observation as a function of science and as an action in art. My method is based on a testing of the conceptual boundaries that govern what it means to observe, and serves to demonstrate how actions are transformed through experimental process. This preliminary study is an attempt to understand the theoretical shift that science applies to our sensory experience in order to expose and explore the conceptual interpretation that is latent within its agency.[1] Through a succession of performative tests designed to recalibrate the observable world through the lens of scientific methodology, I document the impact of observational thinking upon artistic endeavour. Each experiment is focused on a singular observation, sourced via an external mechanism and documented over a seven-day period. The incidence of this observable phenomena is as it occurs within my daily experience (or just outside it) and is recorded as accurately and abstractly as possible. The collated data amassed throughout each experiment becomes the foundation of both written and visual research.

[1] An excerpt of this material was first published in Sara Morawetz, "In Observation: The Definition of an Experimental Method," *Runway Journal,* no. 26: Knowledge (2014), http://runway.org.au/observationthe-definition-experimental-method.

1. INTRODUCTION

Observation is an operation we all unconsciously perform — a substratal human experience that connects our conceptual being to the physicality of our existence. Our actions and opinions are all reliant upon our ability to observe, yet the theoretical constructs that shape this epistemological entity are somewhat imperceptible. The question, *how do we observe?* feels immediately hollow — its answer as obvious as if one had asked *how do we see / hear / feel?* Typically, such queries will illicit details of physiological mechanisms, a recount of a corporeal process that fails to illustrate an innateness buried within the term.

While observation may be the most ubiquitous of actions, it is nevertheless a calculated tool — one that defines our investigations by *the way we investigate*. The ability to observe is both a skill and a trait — an instinctual yet cultivated behaviour for which degrees of acuity and specificity can be discovered. Our variable aptitude to observe is unquestionably honed through scientific application, where the act of observation can be focused through objective. Scientific activity is dependent on the implicit values, modes and ideological structures that observation has come to provide, yet science should also be acknowledged as having shaped that behaviour.

My interest in scientific observation lies within the conceptual attunement that the action provides — how the senses become calibrated by the rigours of experimental practice and subsequently heightened in the process. My aim is to experience observation from within a scientific system, to create 'experiments' that require me to build a methodological process and refine my view of everyday encounters. By engaging directly with observation, I am asking myself to view the world with a higher degree of scrutiny

— to question *what I see*, *how I see* and how best to document *the experience of seeing*, questions that regulate scientific agenda, ensuring that its disseminations accurately reflect the physical world.

This study has been structured to reflect a scientific ethos, replicating experimental parameters and modes of working whilst retaining an artistic litheness. The experimental model was designed introspectively — placing myself as the subject in my own investigation to observe in accordance with scientific principles through the completion of performative observational tasks. Each action was subject to its own controlled and indeterminate variables, with fixed procedural processes pitted against the arbitrary nature of everyday experience. The observations, determined by an external submission, are observations made on another's behalf, testing the phenomena in question as well as my own capacity to observe it.

2. THEORETICAL OVERVIEW

"It has not changed; and yet I see it differently"[1]

When considering the valuative role observation has been accorded in science, its historical evolution and its epistemological mechanism are surprisingly under-researched, an oversight that has been astutely addressed by Lorraine Daston in the recent publication, *Histories of Scientific Observation.*[2] Daston speculates that the historical omission of observation as an entity could largely be imputed to the term's own ubiquity — that through its pervasive place within scientific thought and practice, a commentarial

[1] Wittgenstein, *Philosophical Investigations*, 193.
[2] Lorraine Daston and Elizabeth Lunbeck, eds., *Histories of Scientific Observation* (Chicago: University of Chicago Press, 2011).

overview seemed largely unwarranted. Yet as Daston attests, the fluctuating perceptions within the scientific community concerning the role of observation in experimental methodology reveals that its definition is rather more critical and that understanding its origins within the scientific idiom offers greater understanding of the modern scientific method of which it is part.

As a term, observation has always straddled a core dichotomy that stems from the suppositions imposed within its Latin origins. Historically *observatio, observo* and *observare* were used in relation to acts of watching or looking, whilst also inscribed to a notion of heeding, conforming or complying to action.[3] These paired interpretations undoubtedly formed the bedrock for the terms use within scientific endeavour, fusing the collective consequence of both meanings for scientific operations. This consolidative synthesis into a singular definition was by no means an instantaneous occurrence, rather it was part of a lengthy process from which the modern scientific method emerged. Observation became not only the amalgamation of these formal properties but also acquired the cumulative knowledge of prior observational action — a form of sight adjusted by the rigours of method and the formal documentation of these collective experiences. Observation became not only a practice but a honed skill — one that was imbued with its own theoretical context.

The formal acknowledgement of scientific observation as a theory-laden enterprise feels like a surprisingly late revelation, further proof of the prevailing adolescence of scientific

[3] Latin *ob* + *servare*: *ob* means "directions towards", *servare* means "to save, to watch over, to pay attention to" or "to respect" / follow a rule. From OED: Etymon, classical Latin observātiōn-, *observātiō* action of following a rule or practice, action of watching or noticing, inspection of omens, comment, remark, regard, deference, attentive care, in post-classical Latin also ceremony, ritual (Vulgate) <observāt- past participial stem of *observāre* observe v. + -iō -ion suffix1.

principle. While some initial efforts were made by Pierre Duhem in 1914,[4] the full weight of this theoretical proposition is largely attributed to Norwood Russell Hanson, Thomas Kuhn and Paul Feyerabend, who would not explore the subject for another 50 years.[5] The extent of the theoretical attunement attached to observation is most deftly illustrated in Hanson's *Patterns of Discovery*, which considers the proposition of astronomers Johanne Kepler and Tycho Brahe watching the same sunset. Bathed in the warm glow of twilight these two men would undoubtedly share a common visual experience, and yet as their historical legacy testifies (and as Hanson demonstrates), their perception and subsequent conclusions could not be more antithetical.[6] This inner tension within observational experience can be extrapolated across the breadth of scientific endeavour and exemplifies the paradigmatic nature of scientific undertakings and the crucial distinctions between *observer*, *observing* and *observation*.

3. DEFINITIONS[7]

DEFINITION 1 (OBSERVABLE PHENOMENA). Let the thing / idea / concept supplied by external intervention be known as the *observable phenomena*. These phenomena are independent elements supplied by online contributors, who are invited to provide a thing / idea / concept to be observed on their behalf in exchange for the documentation of collected data. This input is completely arbitrary and sits outside the influence of the *observer*. Each observable phenomena offered must be observed by the observer, however the nature and trajectory of this *observation* remains at the observer's

[4] Pierre Duhem, *The Aim and Structure of Physical Theory* (Princeton, NJ: Princeton University Press, 1991).
[5] Norwood Russell Hanson, *Patterns of Discovery: An Inquiry into the Conceptual Foundations of Science* (Cambridge: University Press, 1958); Kuhn, *The Structure of Scientific Revolutions*; Paul Feyerabend, *Against Method*, 4th ed. (London: Verso, 2010).
[6] Hanson's hypothetical scenario between Kepler and Brahe is predicated on the two astronomer's different belief on the nature of the solar system. Kepler regarded the Sun as fixed, with the Earth moving around it, while Brahe believed that the Sun moved around the Earth. Hanson suggest that given this fundamental difference of opinion the shared experience of watching the Sun set would take on entirely different meanings, hence proving his theory regarding the value-laden nature of observation.
[7] The subsequent definitions for *Observations for Other People* were first published in Morawetz, "In Observation: The Definition of an Experimental Method."

discretion. Each observable phenomenon is granted one week (7 days/168 hours) to be observed within the bounds of the observer's weekly routine (or just outside of it). The limitations of the geography, New York City, NY, must therefore apply. The observer will be required to provide documentation on the observable phenomena according to the definition of *collection of data*.

DEFINITION 2 (OBSERVER). Let the *observer* be defined as (myself / the principal / the artist) and the actions, documents and insights of the observer be references to my own behaviour. Let the observer be responsive to the stimulus of her own environment and explore each task as both a physical and conceptual possibility. The observer is bound to document instances, occurrences, ideas and actions, enumerating the logical and illogical within the tasks given parameters. The observer is concurrently an objective and subjective entity who must detail the outcomes, objectives and flaws of both impossible positions. The observer is aware that her actions and responses are the subject of the study and that the nature of the *observable phenomena* and the recorded observations are inconsequential outside of their ability to test the observer's methodology. Art may be found in this material.

DEFINITION 3 (COLLECTION OF DATA). Given an *observable phenomenon*, let the *collection of data* represent the material documented during the time of *observation*. Let the material be neither purely research nor art but a conduit from which either may be made. May the collection of data occur within the specified period according to conditions defined by the *observer*. This data may exist in any form of documentation: text, image, drawing, found material, related experience, etc. It will be collected in the task journal or

kept in close proximity to it. May the relational distance of the collection of data never be greater than x.

DEFINITION 4 (SYSTEM OF RULES). Let the parameters that define an *observation* be known as a *system of rules*. There may be rules within rules and systems within systems, but all comply to the system of rules that govern the larger experiment. Rules should be defined prior to observation but may be changed, adapted or disregarded at the discretion of the observer — more important is the existence of rules than their strict application. A system of rules will apply to each observation independent of the overall study that is pertinent to the *observable phenomena*. These rules may dictate when and how an *observable phenomenon* is observed and documented and shall be recorded within the *collection of data*.

DEFINITION 5 (PERFORMATIVE ACTION). Given an *observable phenomenon*, let the operation of the *observation* be known as a *performative action*. The study is not a performance (as there is no intended audience) rather a succession of actions that are performed to facilitate the observation and its documentation. This *performative action* could also be referred to as life. While some actions may fall outside of the daily routine of the *observer*, in the course of their action they will define the motion of an observation and, as a subsequence, the routine of the *observer* (for the observer's function is to observe *observable phenomena*). *Performative action* is conducted with or without documentation, but evidentiary proof is preferable to substantiate the act of *observation*.

DEFINITION 6 (OBSERVATION). Given a set of *observable phenomena* and a *system of rules*, let *observation* be the process through which an *observer* conducts an *experiment*. Let

observations be an acknowledgement of the senses — a record of things that are seen, heard, felt or intuitively recognised. May the act of *observation* be the instance of noticing or perceiving — a faculty of viewing or noting with a degree of attentiveness that, in this case, is directed by the independently supplied *observable phenomena*. The task of *observation* must border on obsessive and absurd — overtaking the observer's waking hours and allowing them to wander freely off course in pursuit of earth-bound and abstract consequences, unknown outcomes and unintended possibilities.

DEFINITION 7 (TIME). Let *time* be defined as a continuous system of sequential relations, a method of measuring a passage, duration or succession of events within the infinite expanse of the past through the present and into the future. May *time* be understood as a dimension in motion, a temporal measurement used to define both scientific quantities such as *velocity* and humanistic ones such as *value* and *awareness.* Given an *observable phenomenon* let *time* represent action and endurance, a physical constraint and an element of chance. Let *time* be acknowledged within the bounds of physical and conceptual experience — being both *measured* and *felt* — both *real* and *abstract.* Let the passing of *time* be the *performative action* and an inevitable outcome of the act of *observation*.

DEFINITION 8 (EXPERIMENT). Let an *experiment* be the method by which a concept (hypothesis) is tested, applying a *system of rules* over a length of *time*. Let an *experiment* be a logic driven process designed to test ideas and the nature of things, providing the conditions for the *collection of data* and an active space where the act of *observation* can occur. Let the parameters of the *experiment* be tentative — temporary constructs that bend and flex in the pursuit of the unknown, allowing whimsey to

intersect and overtake logic. Let it be known that the principal objective is not to follow the rules the *experiment* prescribes, but to understand *how* and *why* one breaks them in an action known as art.

DEFINITION 9 (KNOWLEDGE). Let *knowledge* be the amalgamation of *observations* over *time* — the consequence of a *collection of data* amassed in the pursuit of *observable phenomena* that can be found in the *observer*'s reflections on *performative action*. May *knowledge* be an act of spontaneous cognisance or a shift in evaluative perception so gradual that it is near indiscernible to the untrained eye. May this *knowledge* offer the *observer* insight into the functions of science and the actions of art, the intersections of these pursuits that can be found in method. Attaining this *knowledge* is the objective of the *experiment* and will continue to accumulate as these words are being read.

4. MECHANICS OF STUDY (DEFINING THE RULES OF THE GAME)

The premise of this study is two-fold:[8] (i) to understand observation from within a scientific system — to see how, if at all, the act of observing would be changed by a scientific system devised for artistic ends; and (ii) to witness the axiomatic properties of a scientific methodology *in process* — to engage in the formation a system based on scientific principles in order to *experience* the limits and bounds of that system in action and to more astutely comprehend the scope and fidelity of the scientific method. This study was formulated to expose operational mechanisms inherent within experimental science and to replicate these structures in a subversive yet systematic act — allowing one to simultaneous act as creator and witness to one's own work. With the prerequisite

[8] The premise outlined was first published in Morawetz, "In Observation: The Definition of an Experimental Method."

that the study would produce its own 'experimental data', which could form, follow and fall out of method (testing my theoretical affiliations with scientific philosophy), the subsequent experimental system was considered to be a vehicle for written and/or visual output of an unknown consequence. The project's outcome was always uncertain.

4.1. THE TEST OF A TEST

A desire to test the methodological foundations of science is a lofty notion that, in many respects, is entirely problematic. For systems in science neither exist in isolation nor do they exist without function. They are a consequence of successive actions — of trial and of error — a knowledge amassed and then distilled by necessity. They are so refined, so ubiquitous, so inbuilt into scientific experience that they are near invisible. In order to test *a test*, one has to *circumvent* this quiet deliquescence and begin to unwind the deep-seated familiarity these concepts are inured with.

For the purpose of this experiment I sought to singularise a scientific experience (as much as such a thing is possible) and examine in isolation as one examines a specimen under a microscope. Observation was chosen for its privileged existence both in and outside of science — understood as a core component of scientific methodology and a part of everyday human experience. Observation therefore seemed the most susceptible for detachment from its methodological counterparts, as well as the most likely to reveal changes in my modes of perception.

4.2 EXTERNAL INTERVENTION AND THE ROLE OF THE VARIABLE

It seemed clear from the outset that any artistic action predicated solely upon my own rationale would be insufficient to replicate the unscripted responses of observational

science. The construction of an artificially contrived system of my own design would result in an inescapable bias, allowing one to unintentionally pivot to the assurances of the familiar. I, as the observer, would be drawn inexorably toward a pre-set observational vocabulary and the use of an inbuilt methodology — unquestioningly reliant upon existing controls, limits and protocols, both deliberate and unconscious, and unable to escape from my own field of vision. In order to question my method and observational methodology a rather more inscrutably unbiased system was required, an *open system* that mimics the function and operational bounds of scientific investigation as an act of exploration when beset by the wilful forces of nature.

An element of chaos was needed — an experimental impartiality that could advance the investigation towards the strange and unknowable. This schism in the methodological order was achieved by relinquishing control of the act of observation, or more specifically the nature of the observation to be performed. By transferring the origins of each observation to an external source, I ameliorated the hypothetical, methodological and conceptual concerns of the overall study. Externally driven, the experiment could generate its own unpredictability, and would allow for the response to such stimulus to be tested without prejudice.

In order to facilitate the acquisition of such observable phenomena a proposition was created — an open invitation, shared online, to observe on another's behalf:

Dear friends – both old and new,

I would like to conduct an observational experiment
on your behalf.

The project, *Observations for Other People* is an
attempt to document the observable (and unobservable)
world suggested by others both known and unknown to me.
It will follow a loose weekly cycle and track introduced
ideas through my everyday life, their trail of words,
images, actions and objects offering evidence of my
experimental system.

I am requesting the submission of an 'observable' object
/ subject / concept that I can devote a week to observing
within my daily routine (or slightly outside of it).
The thing to be observed is your choice.

Think animal – vegetable – mineral – other.
Think sights – sounds – feelings.
Think real – invisible – imagined.

Draw me a line and I will follow it.

Whatever it is that you choose I will attempt to observe
it and document its existence within my surroundings.
I will collate text, images and objects to verify my observations
and then present you with a either a physical or digital summary
of these findings.

An email will be sent to confirm the selection of
your observational task and the dates during which
the observations will occur.

I await your instruction.

xsara

Respondents to this invitation were asked to nominate an observable 'thing' in five words or less. These submissions were entirely at the respondent's discretion and in themselves presented a diverse array of interpretations of both the structure of the study in question and the nature of observation itself. From physical objects that could be easily documented, to larger and more complex ideas that required interpretation and abstraction, the respondents were given no boundaries other than the potential for observation within my 'daily routine' — a term for which I provide no precise definition.

Beyond this initial submission, the respondents played no direct part in the study — the singular input of the respondent being absorbed within the investigative process itself. As in science, this distance is maintained in order to avoid skewing the observer's perceptions, actions and output, allowing for an *open system* that still protects the integrity of the observational method.

5. SELECTED RESULTS

MAY 7TH

DISTANCE TRAVELLED WITHOUT MOVING (at the longitude of NYC)

– 1,260 km per hour

MAY 8TH

Things you work out in the process of doing – 3:15 pm

MAY 9TH

RULES.

RULES WITHIN RULES.

REDEFINING RULES.

FORGETTING RULES.

REINSTATING RULES.

SOFTENING WITH TIME.

HARDENING WITH TIME.

CHANGING WITHIN TIME.

TIME WITHIN TIME.

FAILED TIME.

MAY 10TH

Observation is all about time — commitment of time, a recognition of time, time accounted for and prescribed meaning. What makes my time meaningful? What needs to be revealed to give context? What information is erroneous / irrelevant / circumstantial? I am working this out through the process — through the act of doing — but even then I am not always sure... I need to reflect, examine and attempt to understand. How important is truth? What is truth? How can truth be defined within natural events — how do my actions differ because I am trying to observe them? I move — I falter — I reset myself — I wonder: what happens if I fail to document the intended action (is it considered failure? or is it just what happened?)

MAY 11TH

ACCEPTING TIME

NEGOTIATING TIME

TIME ERROR

TIME SPENT

MAY 12TH

[LOST TIME]

468 Grand Ave, Apt [redacted]
Brooklyn, NY, 11238
UNITED STATES OF AMERICA

May 6th, 2014

Xavier C
[redacted]
AUSTRALIA

Dear Xavier,

Thank you for your observation.

From May 7th until May 13th 2014 I will be observing time/travel on your behalf. These observations will be conducted in New York City according to Eastern Daylight Time.

During this period I will endeavour to document the occurrence of time/travel as accurately/abstractly/often as possible.

You will be notified upon the completion of this task and the evidence of my actions will be provided according to your specifications.

Yours Sincerely,

Sara Morawetz

Edition | of 2

468 Grand Ave, Apt [redacted]
Brooklyn, NY, 11238
UNITED STATES OF AMERICA

May 18th, 2014

Xavier C
[redacted]
AUSTRALIA

Dear Xavier,

Of the 168 hours that transpired during the observation of time/travel I can account for 34 hours, 4 minutes and 24 seconds.

The remaining 133 hours, 55 minutes and 36 seconds that took place were either spent at home (where time was not documented) or simply lost - slipping between experience and documentation in a true act of time/travel.

Some 83.45 travelled kilometres were documented, although this is by no means a full record of all distance travelled due to both technological and operational error.

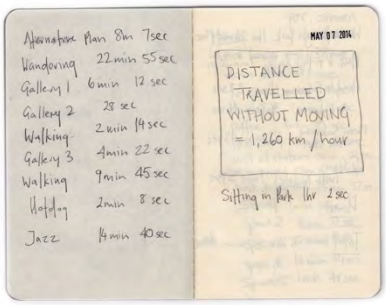
In addition to this, from the latitude of 4040'N where New York is located, some 211,680 kilometres were travelled in orbital rotation - 1,260 kilometres of which were specifically acknowledged by an hour lying in Central Park - contemplating how far we go when going nowhere.

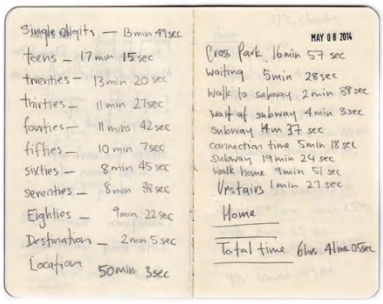
This is time/travel observed on your behalf.

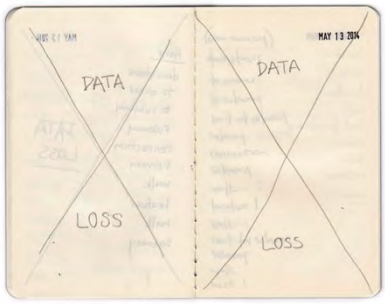
Yours Sincerely,

Sara Morawetz

Edition | of 2


Alternators Plan 8m 7sec
Wandering 22min 55sec
Gallery 1 6min 12sec
Gallery 2 28sec
Walking 2min 14sec
Gallery 3 4min 22sec
Walking 9min 45sec
Hotdog 2min 8sec
Jazz 14min 40sec
MAY 07 2014
DISTANCE TRAVELLED WITHOUT MOVING = 1,260 km/hour
Sitting in Park 1hr 2sec


Single digits — 13min 49sec
teens — 17min 15sec
twenties — 13min 20sec
thirties — 11min 27sec
forties — 11mins 42sec
fifties — 10min 7sec
sixties — 8min 45sec
seventies — 8min 38sec
Eighties — 9min 22sec
Destination — 2min 5sec
Location 50min 3sec
MAY 08 2014
Cross Park 16min 57sec
Waiting 5min 28sec
Walk to subway 2min 58sec
Wait at subway 4min 33sec
Subway 41m 37sec
connection time 5min 18sec
Subway 19min 24sec
Walk home 9min 51sec
Upstairs 1min 27sec
Home
Total time 6hrs 41min 05sec


DATA
LOSS
MAY 13 2014
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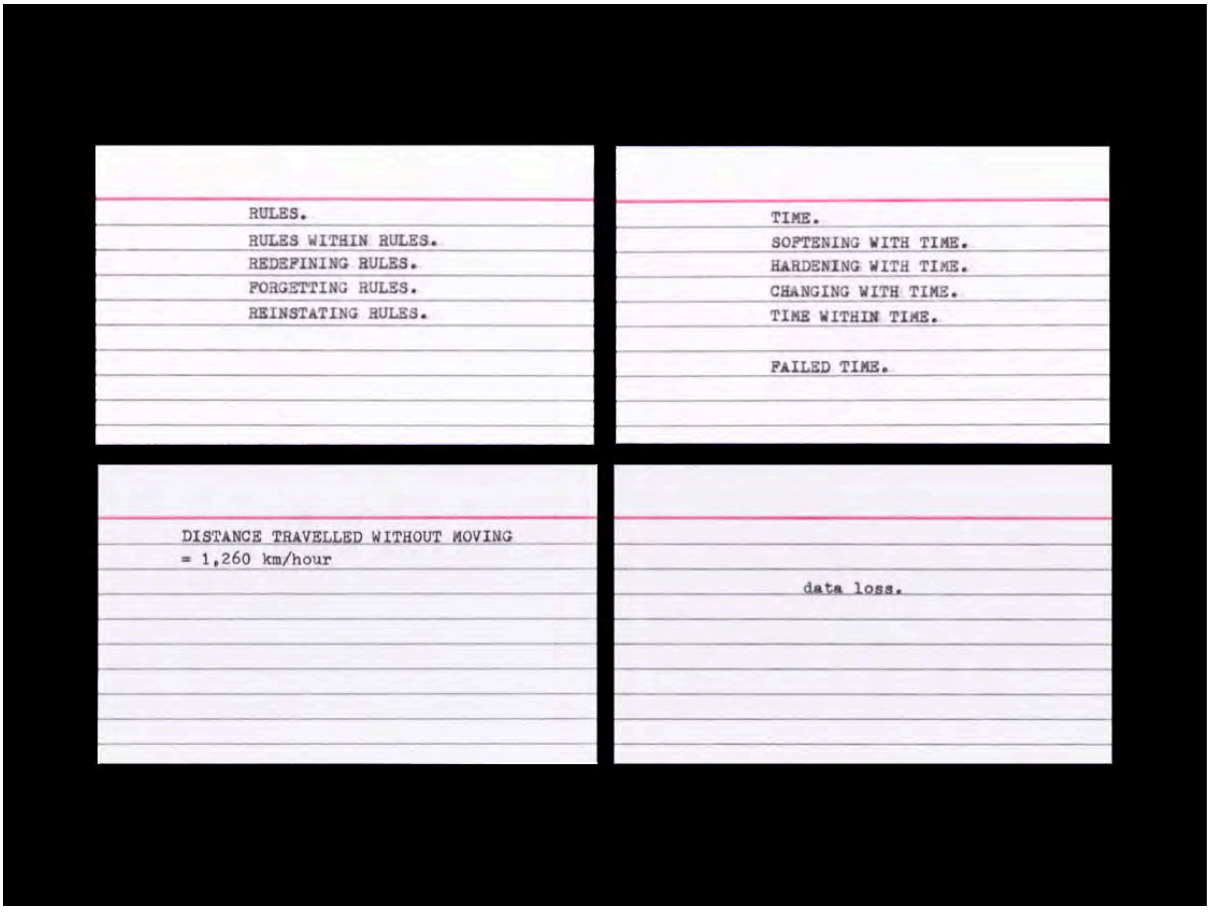
LOSS


RULES.
RULES WITHIN RULES.
REDEFINING RULES.
FORGETTING RULES.
REINSTATING RULES.
TIME.
SOFTENING WITH TIME.
HARDENING WITH TIME.
CHANGING WITH TIME.
TIME WITHIN TIME.
FAILED TIME.
DISTANCE TRAVELLED WITHOUT MOVING
= 1,260 km/hour
data loss.

HOW THE STARS STAND:
TIME AS A MUTABLE STANDARD

ABSTRACT

The metric of time is an elusive and invisible constraint, indexing both the orbital mechanics of planetary bodies and a human desire for measured experience. Through durational action, I examine the structures that time discreetly asserts and study the physical ramifications that stem from adjusting the underlying axiom upon which time is set. 'Performative time' was recalibrated to reflect local mean solar time on Mars, an act that effects a 2.7% lengthening of the 'day' when compared to the standard day on Earth. In order to fully ascertain the consequence of this measure, the study was conducted for a full (although approximated) cycle, allowing experimental time to drift completely out of sync, to invert and to slowly return to synchronicity with that of Earth — an action taking 37 days / 36 Martian 'sols' to complete. This study was conducted at Open Source Gallery from July 15 to August 21, 2015, using the NASA Goddard Institute for Space Studies Mars24 time keeping algorithm developed by Dr. Michael Allison and Dr. Robert B. Schmunk.[1]

[1] "Mars24 Sunclock — Time on Mars," NASA, updated June 26, 2021, accessed May 10, 2015, https://www.giss.nasa.gov/tools/mars24.

1. INTRODUCTION

Where is the clock to show us how the stars stand?[2]

The world is premeditated on a set of basic assumptions to which we unconsciously defer. We measure only by *measuring against*, and it is in this construction of underlying metrics that the notion of 'standardisation' is born.

Systems of standards are those constructs that serve to constrain our reality into a sequence of regulated experiences, allowing for the subsequent relay, comparison and inevitable qualification of that which is measured. Engrained with an inalienable societal authority, standards appear both irrefutable and universal, and yet, they are neither. Standards are concepts emboldened by use, ascribed a certainty proportional to their popularity. While this repetition generates a sense of assurance, it also serves to obfuscate — clouding the fact that these standards were designed *by us*, *for us*, and have come into power *by our own hand*.

In our compliance to these arbitrary systems, we have cultivated a perceptual obstruction — having become blind to the forces and specificity of our own contextualisation. Further, we assume our standards to be universal, being imbued with a constancy spanning all points in space and time. The audacity of such an assertion reveals the extent to which we subscribe to our own experiential system — an inability to place ourselves outside our contextual bounds. By virtue of the underlying assumptions, a set

[2] Ray Bradbury, *The Martian Chronicles* (New York: Bantam, 1967), 85.

of systems originally designed to measure experience has instead come to *dictate experience* — asserting itself as the act of sight rather than *a mode of seeing*.

1.1 TIME AS A MUTABLE STANDARD

Time, popularly framed as a fixed, immutable substance, is commonly cast as something that cannot, will not, change. It is viewed as an *invariant* — offering our lives a rigidity of form and contributing a sense of constancy to our daily routines. Yet in truth, time is far more mercurial and indeterminate. Our experience of time is not constant; rather, it flexes and yields to the specific nature of our passage through space.

We choose not to think of such motion, much less the uncertainty of it. Bound to Earth, these concepts seem imperceptible, *for we know no time but our own*. Yet as we chart our passage around the sun, revolving on our own familial axis, *time operates differently elsewhere*. Compelled by operations outside our experience, each planetary body moves in its own discrete cycles, heeding standards that are as foreign as they appear desultory. From Earth, such notions hold no weight unless we ourselves become tied to them — fastened by our own physical connection to this extraneous action.

In order to assess the validity of these assertions, a strategy of divestment is needed; a mechanism that can *disrupt, deflate* and *devalue* the constructs of time — exploring its limits as a philosophical proposition. This device needs to be fluid, immersive, but also pre-existing — situated within the system it conclusively invalidates. It must challenge the assumed universality of time and requires the observation and documentation not only of time itself, but also of the social ramifications that stem from its structure. *It must evaluate time not only as a function but also as an experience.*

For the purposes of this study, this divestment was achieved by living according to local mean solar time as measured on Mars. Already a fully independent system of planetary time, the adoption of this metric presented the unique advantage of operating outside the frame of our own system while still being steeped in some of its strictures. Time on Earth and time on Mars are autonomous systems, tied irrevocably to the motion of their own planetary bodies. The simultaneous existence of these two 'times' is a direct challenge to the assumed universality of time itself and its acceptance as an immutable standard.

2. THEORETICAL OVERVIEW: TIME AS A STANDARD

A clock is physical expression of time as a numeric value. It assigns a qualitative metric that we cannot only observe but, more importantly, can predict. Its motion acts as a mirror to our own unfolding narrative, our habits an extension of its distinct vocabulary. Its fixed operations impress upon day and night and subsequently upon our own actions, allowing us to conceive a form of ambience within our own temporal experience. In this state, the tone and angle of light become substitutes for the clock's own hands, and we feel as if we *know* time — we have a *sense* of it. Yet such feelings are inevitably illusory, for these things themselves are not time, merely *the consequence of time passing*.

Time is the most abstract of standards, existing in defiance of any singular definition. Situated between the physical, philosophical and psychological realms, time is beholden to no single field exclusively.[3] Instead, time is a compound entity, one that is capable of

[3] Jon E. Roeckelein, *The Concept of Time in Psychology: A Resource Book and Annotated Bibliography* (Westport, CT: Greenwood Press, 2000), 1.

expressing length, duration and location *simultaneously* — a metric framed by context rather than unique conceptualisation.

2.1 TIME OF SCIENCE

In science, time is considered a fundamental quantity, one that when combined with properties such as motion, length and charge, can be used to derive the mechanics of the natural universe.[4] For all intents and purposes, 'scientific time' can be considered an invariant, a metric whose universality is tempered only by the vagaries of relativistic dilation. It is both measurable and deterministic, offering a set of physical certainties that can be validated by precise calculation.

Yet, it is in our definition of the 'increments' of scientific time that our contextual bias is revealed. Blinded by our own experience, we have chosen, rather arbitrarily, to define the length of the second to reflect not only the rotational period of the Earth, but, more tenuously, that of the Earth in its current orbital configuration.[5] In a self-referential quandary, *we have created a time that is of our time* — standardising about a fixed snapshot in the Earth's behavioural development.

2.2 TIME OF MARS

The subject of timekeeping on Mars was once reserved for science fiction, the title of this very study extracted from one such resource. Yet in recent decades, this subject of fiction has become a scientific reality and, moreover, a logistical necessity to aid in the continued exploration of our closest neighbour. The NASA rovers *Perseverance*, *Curiosity*,

[4] Ibid.
[5] The Earth's rate of rotation is actually slowly decreasing with time, due to the moon's gravitational influence.

Opportunity and *Sojourner* have acted as our intermediaries on the Martian surface, investigating far beyond our own physical boundaries — extending our realm of experience into this unfamiliar landscape. And while we readily accept the environmental distinctions that this new world presents, the implications of its temporal variance are not as widely considered.

When measured according to our Earth-based metrics, a day on Mars equates to approximately 24 hours 39 minutes and 35.244 seconds — a duration bearing little resemblance to the systematised 24-hour day experienced on Earth. *But what clock of ours can tell such time, and how can a 'day' contain any more or less than a whole number of seconds?* It is in contemplation of these discrepancies that an irrefutable truth is exposed: *our standards are only ever 'standard' within the context of their own creation.* The discretisation of time on Mars requires a clock and a system of time entirely of its own.

Consider instead notions of 'planetary-time' as distinct and independent measurements, determined by the rotation of a planet upon its own axis. The units of such systems are necessarily tied to the cycles in which they are steeped — constituting a division of the rotational period into a whole number of 'hours', 'minutes' and 'seconds'.[6] As such, a direct translation of time-on-Mars to time-on-Earth is something of an absurdity, for our measures *literally make no sense outside of their own frames of reference.*

It is worth taking a moment to consider the rationale for our system of time, for like most standards, its construction is not entirely straightforward. Its origin is thought to

[6] Divisions which are, by nature, entirely arbitrary.

derive from a system of twelve divisions, uneven in length, used by early Egyptians to chart the passage of the sun.[7] This system would later be expanded to include an additional twelve measures for darkness, ultimately producing the conventional twenty-four hours of the day. Precisely why it was divided in this manner is a mystery lost to time itself.[8] Over centuries these seemingly arbitrary demarcations became conventions traced to sundials, water clocks and most significantly, the mechanical clock — a development that ultimately determined the standardised length of an hour.[9]

Such is our familiarity with this convention it is unsurprising that Mars would also adopt a system of 24-hour time. This was done in 1976, although it would be a '24-hour' system of its own determining. While retaining the conventions of 'hours', 'minutes' and 'seconds', these units represent different values to their contemporaries on Earth — each elongated by approximately 2.7% to match Mars' planetary movements. To limit (although clearly not eradicate) confusion, this local '24-hour' period would become known as a *sol*, with the terms *yestersol*, *tosol* and *solmorrow* also introduced to denote Mars' temporal pacing.[10]

Since NASA's Mars Pathfinder mission in 1996, virtually all Mars operations have been conducted with these Martian time parameters in mind, and more specifically have required a core group of scientists (based on Earth) to acclimate to the Martian system of time in order to complete their duties.[11] With the working conditions defined by the 'hours' of sunlight received on Mars, mission scientists have adopted local mean solar

[7] Duncan Steel, *Marking Time: The Epic Quest to Invent the Perfect Calendar* (New York: J. Wiley, 2000), 385.
[8] Ibid, 386.
[9] Ibid, 386–7.
[10] "Mars 'yestersol', 'tosol' y 'solmorrow,'" *El Mundo*, updated September 28, 2012, accessed July 26, 2015, https://www.elmundo.es/elmundo/2012/09/27/ciencia/1348773912.html.
[11] Tom Chmielewski, "Jet Lag Is Worse on Mars," *The Atlantic*, February 26, 2015, https://www.theatlantic.com/technology/archive/2015/02/jet-lag-is-worse-on-mars/386033.

time at the rover landing sites and lived according to a schedule that this time dictates. No longer cleaved to the orderly procession of day and night, their 'day' (or more correctly, their sol) continuously shifts against time on Earth, displacing it by approximately 40 minutes within each cycle, creating a "perpetual state of jet-lag."[12] Over the course of 37 days, the cumulative effects of these shifts cause the experience of day and night to fully invert before incrementally returning to synchronisation.

The effects of moving to a time outside Earth's solar cycle are more profound than one might anticipate. For this act is not merely a change of schedule but a wilful defiance of our ingrained sense of temporal experience. Time becomes a disputed territory that requires the individual to reject all perceived conditions associated with a 'time of day' and furthermore, accept that they are now driven by an external motion unrelated to their physical surrounds. Scientists who have undertaken this time inversion report increased fatigue, temporal disorientation and a sense of isolation, also citing significant disruption to social relationships due to their continuously varying schedule.[13]

The suspension of temporal convention generates a state of endurance that is both physical and philosophical in nature and it is this *sense of conceptual dissonance* that this study seeks to examine. Without the stipulations of mission parameters, Martian time is no longer a means to an end but rather an end unto itself, providing a distinct insight into how our conceptions of time both manifest and dissipate in the face of subversion. *In the adoption of Mars time, we might perceive our own time with a greater sense of clarity.*

[12] Andrea Thompson, "Living on Mars Time: Scientists Suffer Perpetual Jet Lag," space.com, July 29, 2008, https://www.space.com/5668-living-mars-time-scientists-suffer-perpetual-jet-lag.html.
[13] Katie Worth, "Step into the Twilight Zone: Can Earthlings Adjust to a Longer Day on Mars?," *Scientific American*, January 29, 2013, https://www.scientificamerican.com/article/step-into-the-twilight-zone-can-earthlings-adjust-to-a-longer-day-on-mars.

2.3 TIME OF PHILOSOPHY

The question *what do we measure when we measure time?* presents a lexical impediment that has long haunted philosophical inquiry. It exposes a central ambiguity that allows time to act as an intimate, intuitive and yet ultimately unknowable entity, a "Familiar Stranger" that engages and evades in equal measure.[14] Our entanglement is drawn from the reconciliation of time as a conceptual, logistical and gestural investigation, one that moves fluidly between these considerations out of both desire and necessity — for time *is never just one thing.*

The subject of time is notably absent from early philosophical literature. Herbert Nichols, in his essay "The Psychology of Time," suggests that time was simply taken for granted — its influence tangentially inferred in lieu of addressing the specifics of its nature.[15] One could speculate that this oversight was a consequence of the late linguistical construction of 'time' when compared to terms such as 'past', 'present' and 'future' or, more poetically, that it reflects the pervasive beliefs that time was a limitless continuum, described by Plato as "the image of eternity" as "measured by the movements of heavenly bodies."[16] Irrespective of the cause, this absence itself speaks volumes.

The complex question of *how* we perceive time was first examined by Aristotle, who bound such perceptions to the marking of motion.[17] His assertion, "not only do we

[14] This term was first coined in 1972 by psychologist Stanley Milgram to refer to an individual who is observed repetitively, but with whom one does not interact. It was first applied to time by J.T Fraser in his book, *Time: The Familiar Stranger* (Amherst, MA: University of Massachusetts Press, 1987).
[15] Herbert Nichols, "The Psychology of Time," *The American Journal of Psychology* 3, no. 4 (1891): 453.
[16] Ibid.
[17] Ibid, 454.

measure the movement by the time, but also the time by the movement, because they define each other," offered a circular paradox that would obscure the laws of motion in subsequent centuries.[18] However, it did illustrate a critical observation of time itself: that time cannot be defined autonomously. From this philosophical genesis, in even its earliest conceptualisations, time has been bound to mechanisms outside of itself.

It would take a further eight centuries for time to be truly examined within the context of human experience. In 400 AD, Christian theologian and philosopher Saint Augustine would devote the eleventh book of his *Confessions* to the contemplation of time and its paradoxical capacity to resist definition. He remarks:

> What then is time? I know what it is if no one asks me what it is; but if I want to explain it to someone who has asked me, I find I do not know.[19]

Augustine's introspective analysis derides earlier definitions based purely in the physical motion of the heavens in favour of a more subjective, phenomenological understanding. In this way, Augustine acknowledged that we ourselves form part of time and its measurement, suggesting the duality that time presents is a result of its capacity to operate as both an external and internal process:

> It is in you, my mind, that I measure time… As things pass by they leave an impression on you… It is this impression which I measure when I measure time. Therefore, either this itself is time or else I do not measure time at all.[20]

[18] Samuel A. Goudsmit and Robert Claiborne, *Time* (New York: Time Inc., 1966), 146.
[19] St Augustine and Rex Warner, *The Confessions of St Augustine* (New York: Signet Classic, 2001), 262.
[20] Ibid, 276.

Confessions professed that time was variable in a manner not previously considered and recognised that its calculation and measure rest somewhere within the sphere of human consciousness. For Augustine, the paradox of time was subtly repositioned to a form of self-reflexive questioning, asking whether "things in time change in time… or do they appear to change because we move in time?"[21] While this central question would remain unresolved, it sought to bind time to human perception, a consideration that would be re-examined by philosophers of the twentieth century.

In spite of (or perhaps due to) their inconclusive nature, the observations of Augustine were only to resurface in the early twentieth century, employed by philosophers concerned with the temporal complexities of the modern scientific age. Amid breakthroughs in relativistic space-time scholarship, philosophers began to once again question our relationship with time — grappling with the ramifications of scientific advances and a changing sense of time within scientific discourse. As science measured the universe with increasing exactitude, our measure of time changed also, disrupting previously held assumptions of order and universality.

In his lecture to the Marburg Theological Society (reconstructed in the text *The Concept of Time*), Heidegger unreservedly cites advancements in physics for a renewed interest in the philosophical principles of time, suggesting that a greater awareness of how time functions would, by extension, make sense of the great conceptual strides that science was initiating. He suggests:

[21] Roeckelein, *The Concept of Time in Psychology*, 24.

> If we achieve clarity about what a clock is, then the kind of apprehension thriving in physics thereby comes alive, and so does the manner in which time gets the opportunity to show itself.[22]

Heidegger suggests that a clock of some kind has always been assumed.[23] The natural clock inferred by the alternation between day and night predicates, or rather anticipates, a need for time, suggesting human existence has always dwelled within time's shadow. By expanding Augustine's original assessment of time and the self within it, Heidegger concludes that we do not exist in time but are in fact time ourselves:

> What is this now, the time now as I look at my watch? Now, as I do this… What is the now? Is the now at my disposal? Am I the now? Is every other person the now? Then time would indeed be I myself, and every other person would be time. And being in our being with not another we would be time — everyone and no one…[24]

In a similar fashion, Wittgenstein asserts his own semantic discourse with reference to Augustine, citing the theologian as he deconstructs the grammatical inconsistencies bound to words such as *time* and *measure.* Through *Philosophical Investigations* and his *Blue Book,* Wittgenstein illustrates that it is in the *interpretation of time* and the language of temporal tropes that we ultimately become ensnared, adding that in our attempts to determine a series of universal and binding rules for time in operation, we ultimately disregard the nature of time as a variable metric.

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[22] Martin Heidegger, *The Concept of Time* (Oxford: B. Blackwell, 1992), 2E.
[23] Ibid, 5E.
[24] Ibid, 5E.

> How is it possible that one should measure time? For the past cannot be measured, as it is gone by; and the future can't be measured because it has not yet come. And the present can't be measured for it has no extension.[25]

In this way, Wittgenstein demonstrates how language falls short of our experience of time, as does our philosophy of time itself.

2.4 DEFINITIONS

DEFINITION 1 (PERFORMATIVE TIME). Let *performative -time* be what is measured by a clock, but let that clock measure time differently — an interval of elsewhere that makes time a constant variable. May time be unfastened from the Earth's rotation and instead be a function of a real yet unseen experience — a night and day that occurs 55 million kilometres away, concurrent yet irrelative to our own. Let this time be measured and measured again — compared, calculated — consciously at the centre of everything yet inevitably slipping away. Let time pivot — lapse and reset — let it drift in and out. Let time be everywhere and nowhere at all.

DEFINITION 2 (PERFORMATIVE DAY). Given p*erformative-time* as a function of Mars, let a *day* be the value of a *sol*. Let each sol consist of 24 Martian hours that equate to 24 hours 39 minutes and 35 seconds of 'Earth time'. Let each sol be fastened to the coordinates 189.400°E 40.670°N upon the Martian surface and be unburdened by the actions of the Earth in its independent renditions.

[25] Wittgenstein, *Major Works*, 117.

DEFINITION 3 (PERFORMATIVE ACTION). Let *performative-action* be an enumerated set of acts that occur within a given p*erformative-day* — an ordered sequence of events discretised on an interval of p*erformative-time*. May the length of the p*erformative-action* be determined by a cycle of accord — an amount of time required for *time itself to diverge and return* — for clocks to refract then reflect. Every occurrence between these intersecting points is known as the *performative-action*. Let these actions also be known as life.

DEFINITION 4 (SYSTEM OF STANDARDS). Let a *system-of-standards* be founded in an alternate metric, recalibrated according to the experimental conditions of the *performative action*. Let these standards be the standards lived by, and allow this system to sit in friction with the standards of the Earth (the *standard* standards). Let that friction be what is documented, collected, collated and preserved as part of the performative process.

DEFINITION 5 (MARS). Let *Mars* be defined as the fourth planet of our solar system, located 251 million kilometres from the Sun. Let Mars be a physical thing but also an abstraction, a function of a *system-of-standards*, and also an apparatus — demonstrating the conceptual limitations inherent within the universal system of time. Let Mars imply another narrative, an alternative. May this alternative displace the authority of the clock and the Sun — becoming instead *the actual* rather than *the other*.

3. MECHANICS OF THE STUDY

> *The problem is how to make time explicit as it comes into being and makes itself evident, time at all times underling the notion of time, not as an object out of knowledge, but as a dimension of our being.* [26]

Renouncing time is not as easy as one might think — for a rejection of time is also a rejection of temporal experience. Adapting to a local solar time on Mars *while on Earth* is to resist what is seen and recalled. It is to accept an intangible motion, a concept of time that is an abstraction — a perpetually shifting external system that cannot be experientially validated or certified. This study was conceived to embrace such temporal dissonance and exhaust this motion, engaging the full spectrum of temporal shifts that occur until the clocks return briefly to synchronisation after 37 Earth days or 36 Martian sols. This interval equates to 897 Earth hours or 873 Martian ones.

For this period, Open Source Gallery functioned as both home, studio and experimental benchmark, serving as a normative space where 'Mars-time' was accepted as local time. I lived, worked and slept on site, maintaining Martian hours for all daily activities, which were conducted as routinely as possible given the unique variance against time on Earth. The local solar time utilised by the study was determined by the time at the coordinates 189.400°E 40.670°N on the Martian surface, a bearing that roughly matched my geographical position on Earth. The latitude was calculated by the arbitrarily determined start time of 9:00 am EST on July 15, 2015, and the longitude was equivalent to the gallery's own location in New York City. Like the vast majority of the Martian

[26] Maurice Merleau-Ponty, *Phenomenology of Perception* (London: Routledge, 2002), 482.

surface, these coordinates represent an area unknown and unexplored — mirroring the experimental landscape of the project itself.

This experimental space was conceived to produce time in synthesis and study the abyss that formed in between. Constructed to simultaneously display and isolate, time in the gallery was a time in friction, often at odds and operating against the physical environment. As an 'artwork' the study was designed to fulfil a dual purpose: to generate an immediate performative test (activated by both live and virtual exchange) and to produce data for retrospective analysis, collated from the act of doing. All actions in the gallery were considered as a potential data source for further investigation: interactions were logged, ideas explored, thoughts and emotions documented. In this way, I, as principal investigator, became the subject and object of my own study, *observed* and *observing* simultaneously.

While the timing of an activity was dictated by time on Mars irrespective of the time on Earth, the activities themselves remained thoroughly un-extraordinary — actions of day-to-day (to-night) existence that are the foundations of any daily routine in 'regular life'. Activities included:

Wake up 7:00 am.

Exercise 7:30 am.

Breakfast 8:30 am.

Work 9:00 am.

Lunch 12:30 pm.

Work 1:30 pm.

Free Time: 5:00 pm.

Dinner 7:30 pm.

Sleep 11:00 pm.

As time shifted *against time,* maintaining these mundane exertions became increasingly difficult. To demonstrate this shift in relation to Earth-bound metrics, two mechanisms were introduced: (i) a record of wake-time/sleep-time was documented via a time-stamp clock, capturing the shifting position of these recurring activities (in an act that dually referenced the durational work and performative legacy of artists Tehching Hsieh and On Kawara); and (ii) a photograph was staged every day at 9 am MT (Mars Time) that captured the transition of time on Mars in relation to time on Earth. Further acts of data collection were also undertaken, including a record of all personal interactions, outings and daily experiences. Many of these can be accessed through the project website www.howthestarsstand.com, while others have become part of the exhibited work post-performance.

The gallery maintained its hours of operation irrespective of my schedule, resulting in periods where visitors would encounter the space with me sleeping in it. When the gallery was closed and I was awake, the space (and I) could be continuously observed via a live stream feed that ran for the duration of the project.[27]

[27] This was available at http://livestream.com/opensource/htss.

4. SELECTED RESULTS

A sequence of log book entries created during the project are presented here, serving to document the cumulative dissonance affected by temporal dislocation.[28]

STARTING SOMETHING: July 29, 2015

You start something not knowing what it will be.

You have a sense that it is something but you can't be sure. The only way to know is to do it and that is terrifying. You try to have no expectations but that is impossible. You want so desperately for it to work and even more desperately not to fail. You want to it to *be perfect* — to record the experience honestly (yet beautifully) — you live in constant fear of fucking it up.

You hope the data that you have is enough — that there wasn't another way — *a better way* it could have been collected, because it is already too late now — you have created a system and you are stuck with it.

You want it to be more than just about failure — but everywhere you look it's the first thing you see. You are somewhere between the past and the future but not quite in the present — always a beat behind — a fraction off — hoping you will eventually catch up with yourself.

[28] The following log book entries were first published on the *How the Stars Stand* project website, http://www.howthestarsstand.com/log.

You are tired.

You ache.

You wish to god you could sleep but its only 3 pm and you have another eight hours.

It's hot — stifling hot — like day // like night // like purgatory

It would be all better if you slept but you are already sleeping eight hours a night (well, maybe six — which is not less than you normally would) — yet those hours feel thinner — watered down and waking in the twilight only makes you tired again.

It's nearly 1 am (on Earth) and you maybe have two more productive hours before the walls come crashing down...

And while this really isn't news to anyone you come to realise you could never be an astronaut.

Aside from the scientific skill — the mental acuity — physical dexterity and general composure you simply don't function without sleep and coffee and light, and plants…[29]

IN-BETWEEN: August 10, 2015

It's day. It's night. It's something in-between.

Does time even matter anymore?

You move forward. You move back.

You are propelled by measures you are no longer marking.

[29] "How the Stars Stand – Log Book," 2015, http://www.howthestarsstand.com/log, with internal reference to Heidegger, 6E.

Your hope turns on a dime, it quivers and dissipates.

You are once again restless, anxious, uncomfortable.

And as energy morphs into listlessness and your emotions ricochet — the inexorable march of the clock ticks on and on and on and on regardless.

You want this to be over now.

You are tired of waking in darkness and sleeping through light.

You are tired of documenting and being documented.

'You I measure, as I measure time' becomes an indictment on your character.

You no longer measure up — time has got the better of you.

You don't know what things look like — nor what they mean.

Just what exactly are you? *A human clock? An occupier of time?*

You check your watch incessantly but still never seem to quite know what the time is. Is that success or failure?

'What is this now, the now as I look at my watch?'

You genuinely consider giving up.

You're tired and kind of over it. You're not sure this crazy thing is worth it.

A technical failure mars everything.

The isolation gets to you.

As does the constant accounting for time.

Time often passes and nothing happens, yet now every second past is a second wasted // one second longer than the other, and that one cuts the deepest.

An hour passes. Two.

Time no longer counted by a clock or by light, but instead by a series of transitions.

Another routine based upon action. *The system isn't gone, it's just replaced by another.*

Time drifts past dreamlessly and you feel suspended.

You understand that the end is closer now but not close enough to count on *yet.*[30]

CONFESSION: August 19, 2015

I officially acknowledge that I'm adrift at sea.

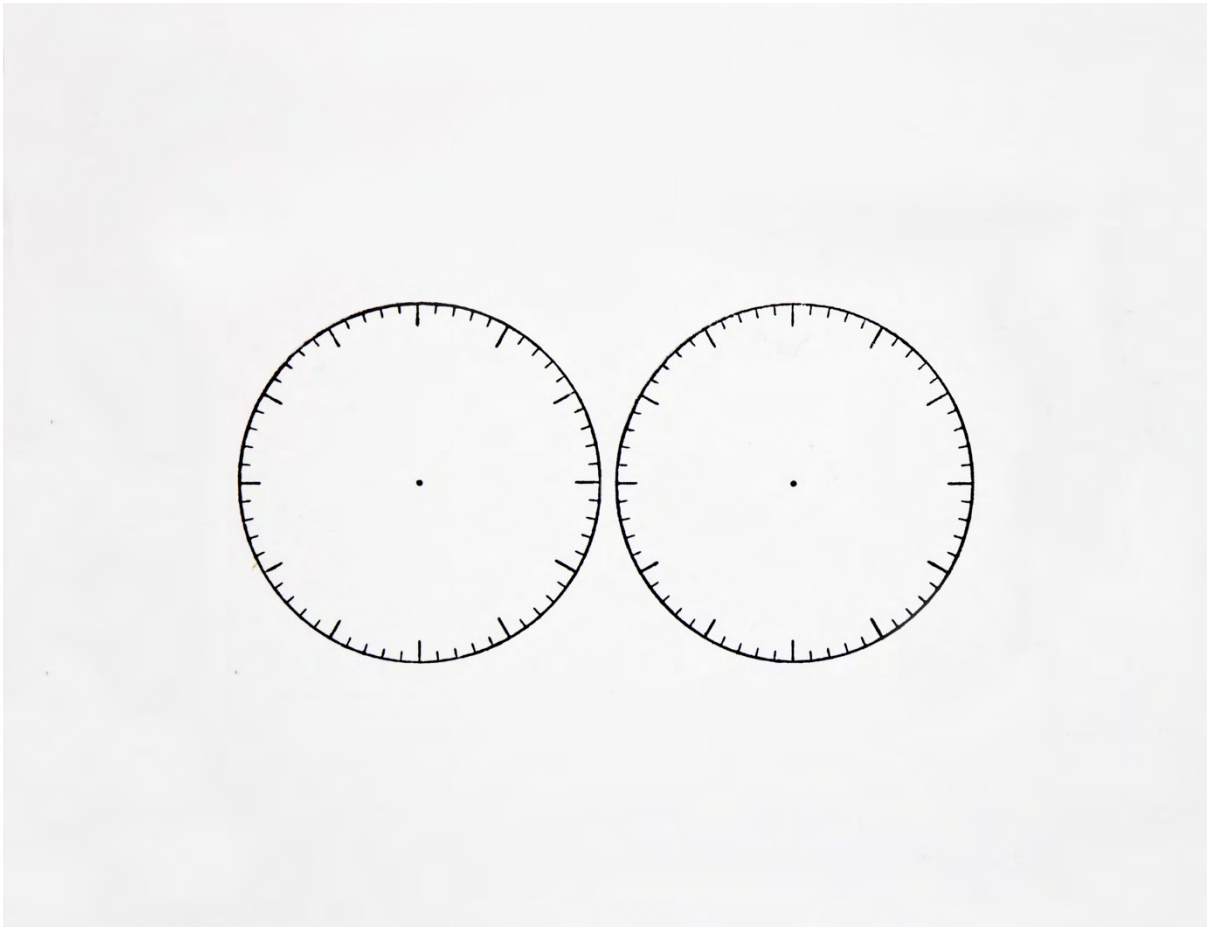
If I was supposed to do something / say something / be somewhere in the past two months and haven't — please know that it was not intentional...

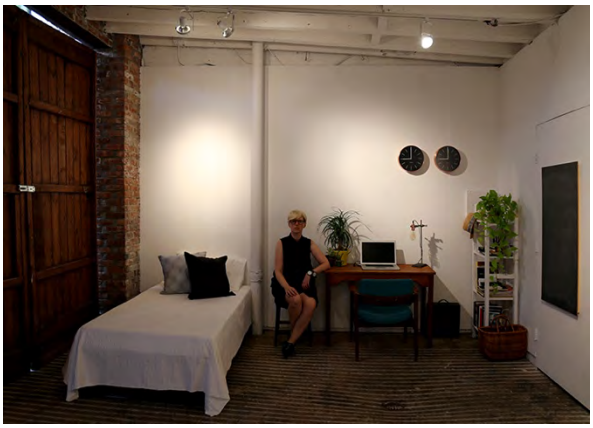
I have been in another time — another place — somewhere in between Earth and Mars // awake and asleep... transitioning through thoughts — ideas — feelings in a real time that is entirely of my own creation.

I have no idea what it means or what I will make of it, but it is nearly done now...

and that's all I have right now.

[30] Ibid, with internal reference to Heidegger, 5E.





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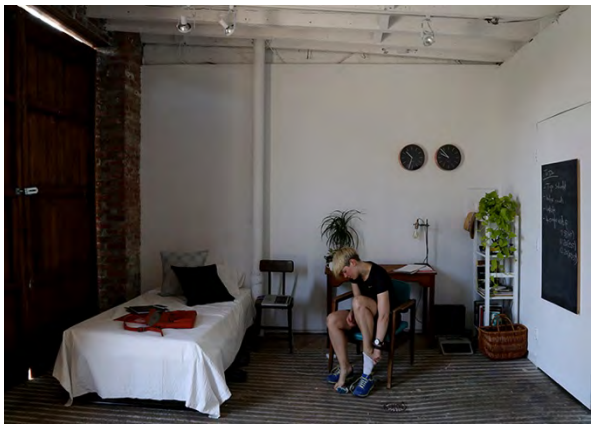
09:00 ET // 09:00 MT



SOL 01
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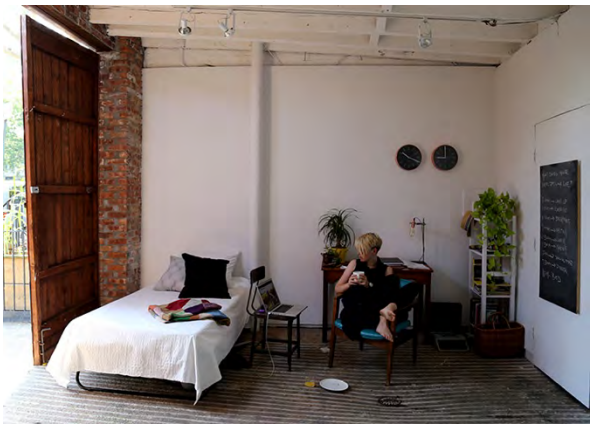
[EARTH TIME // MARS TIME]



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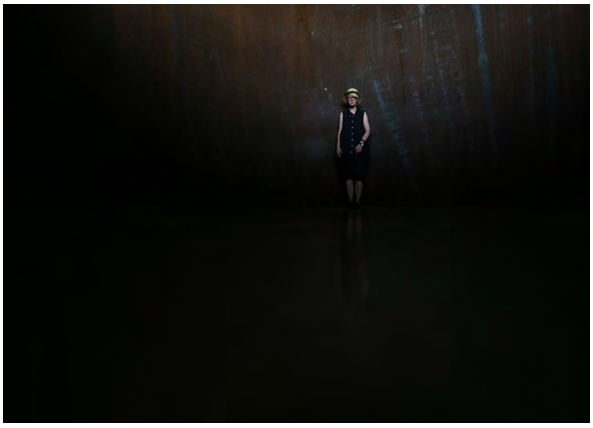
SOL 03
10:59 ET // 09:00 MT



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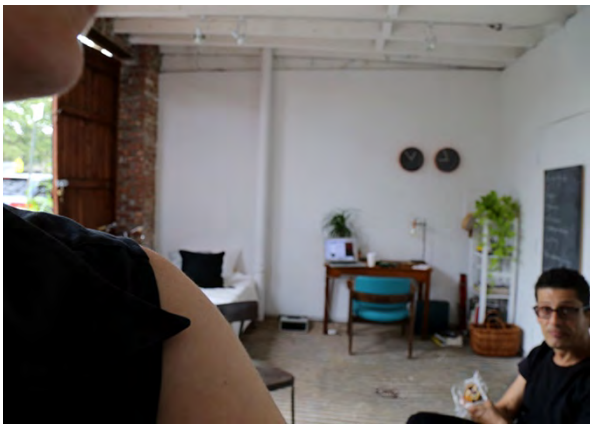
SOL 05
12:18 ET // 09:00 MT



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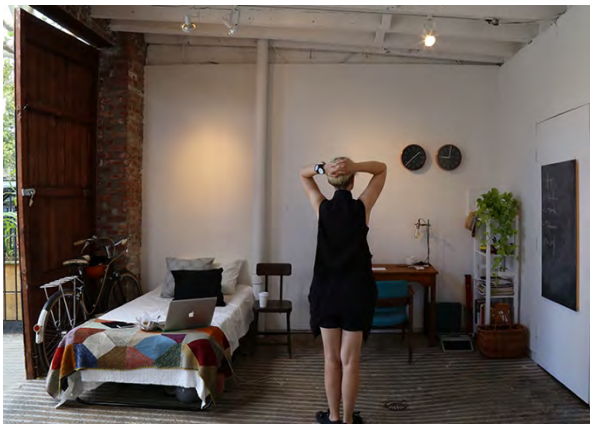

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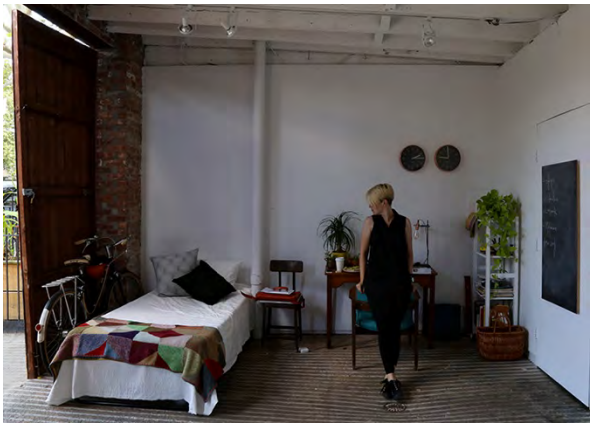

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SOL 09
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SOL 10
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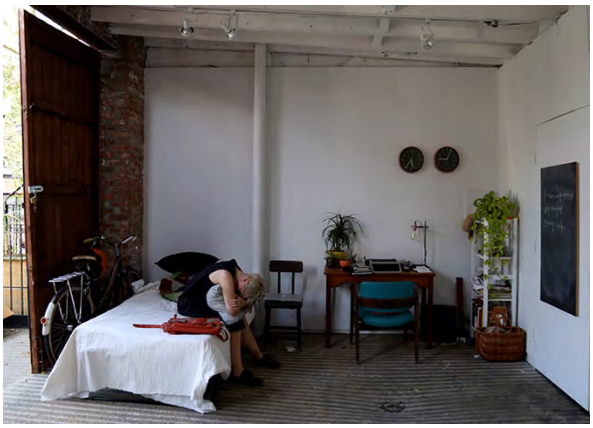
SOL 11
16:16 ET // 09:00 MT

SOL 12
16:55 ET // 09:00 MT



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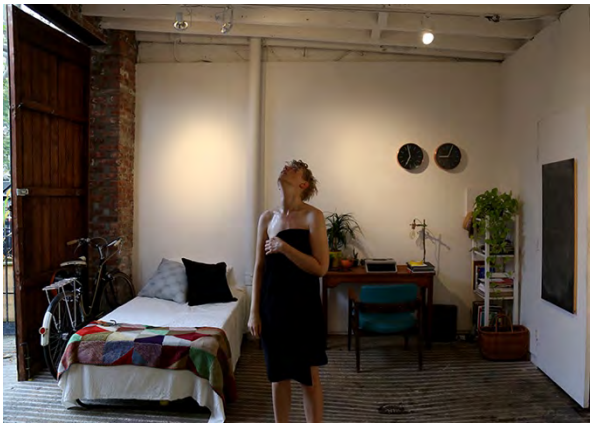
SOL 14
[9 AM SWALLOWED BY SADNESS]



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SOL 16
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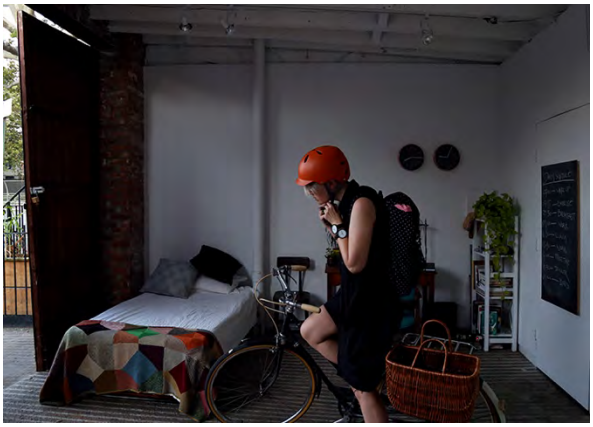

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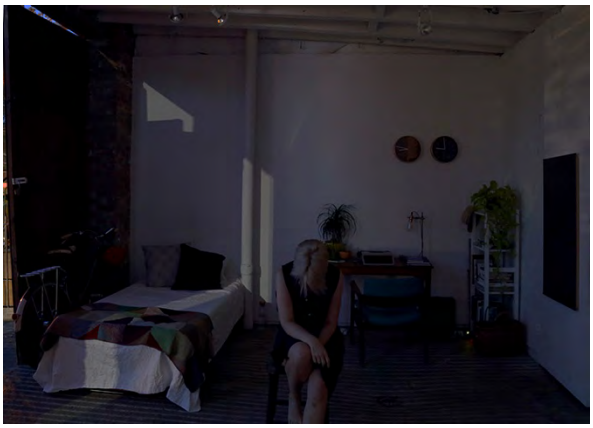

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20:53 ET // 09:00 MT

SOL 19
21:32 ET // 09:00 MT

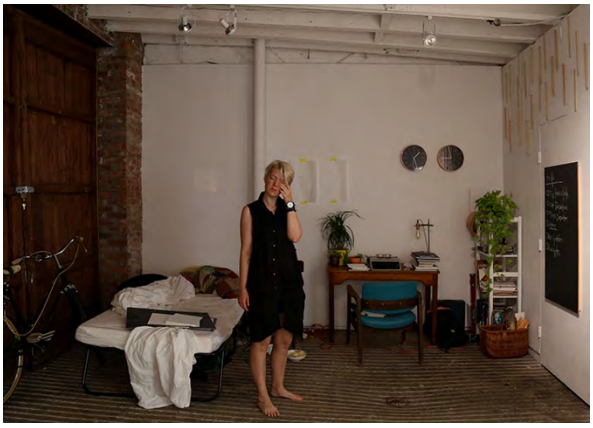
SOL 20
22:11 ET // 09:00 MT

SOL 21
22:51 ET // 09:00 MT

SOL 22
23:30 ET // 09:00 MT

SOL 23
00:10 ET // 09:00 MT

SOL 24
00:50 ET // 09:00 MT



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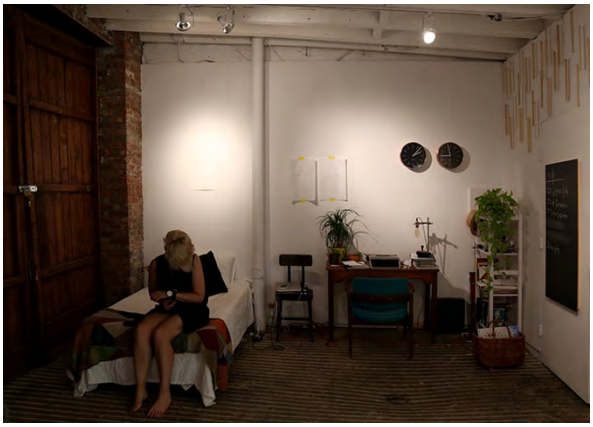

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SOL 27
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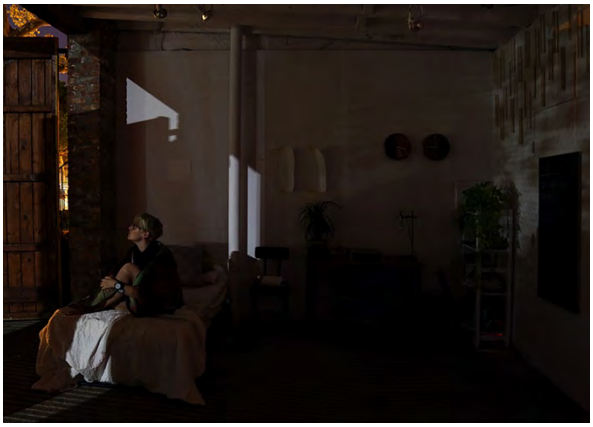

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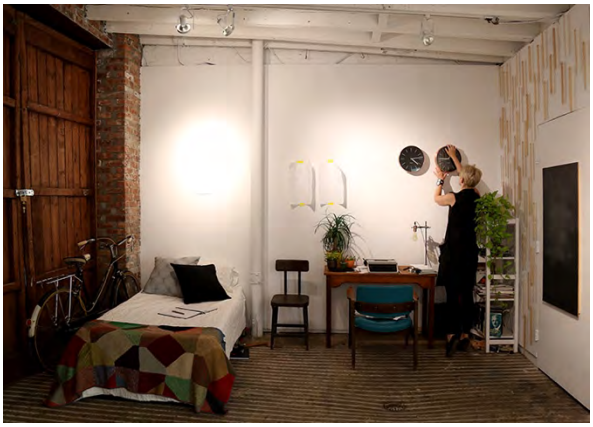

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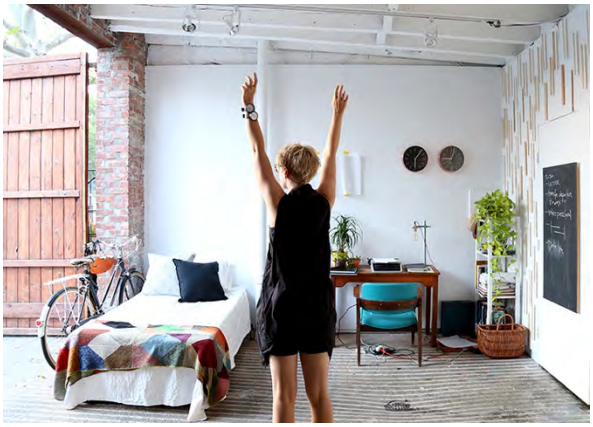
SOL 30
04:48 ET // 09:00 MT

SOL 31
05:27 ET // 09:00 MT



SOL 32
06:06 ET // 09:00 MT

SOL 33
06:46 ET // 09:00 MT

SOL 34
07:25 ET // 09:00 MT

SOL 35
08:05 ET // 09:00 MT

SOL 36
08:45 ET // 09:00 MT

SOL 36
18:00 ET // 18:00 MT

Sara Morawetz
OPEN SOURCE GALLERY
306 17th Street,
Brooklyn, NY, 11215

Earth date: August 3rd, 2015

Dear NASA,

I'm hoping for your assistance.

I'm currently conducting an experiment in which I've abandoned Earth time and am instead living according to time as it is measured on Mars.

This is proving somewhat difficult.

Aside from being disconnected from the physical reality of day and night, I'm finding that my mood is suffering. I must admit that I'm getting a little emotional and am only halfway through my 36 sol cycle.

Are there any coping strategies that you can suggest? How do your astronauts deal with this kind of thing? How would 'space-sleep' be conducted for long durational space voyages, like an actual journey to Mars?

Thanks,

Sara Morawetz

04:06 Earth time // 16:02 Mars time

Sara Morawetz
OPEN SOURCE GALLERY
306 17th Street,
Brooklyn, NY, 11215

Earth date: August 17th, 2015

Dear NASA,

It's me again. It's sol 32 of 36 and my time is slowly coming back into phase with the Earth's.

I know you are busy, but I have a couple more questions and they are the kind that only you would know the answer to.

During my sols I have been thinking a lot about time and exactly what one does with it. Divorced from the steady beat of the Earth's solar cycles, I have begun to question the inherent value of our system of time - even the very concept itself. It really doesn't seem to generalise well to planets other than our own and this has all been a little concerning to me.

Among the things we have to do and the things we like to do, there is a lot of in-between time where not much is done at all. Without the passage of the sun to guide us, how exactly does one define 'a day' and what one hopes to achive with it?

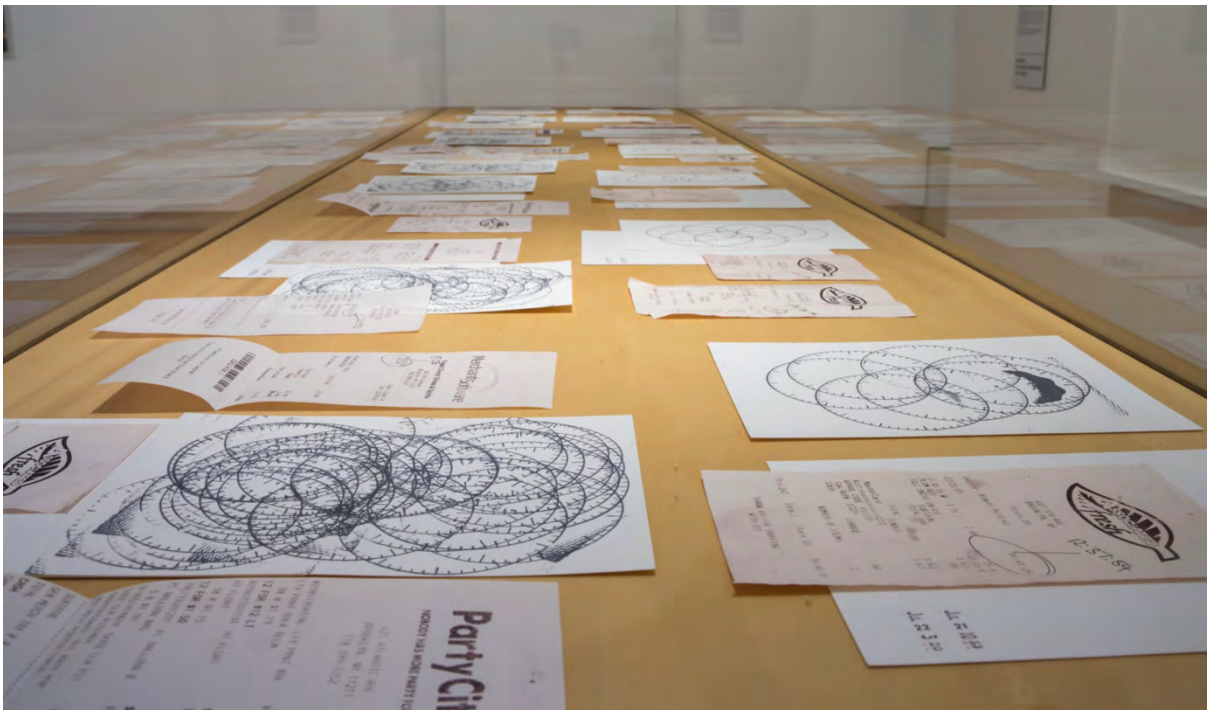
When weightlessness and the expanse of the universe become commonplace, how do astronauts remain grounded? How do you construct a routine that provides purpose in proportion to our need to 'day'dream? (And more abstractly, as our thoughts drift up to the stars, do the thoughts of astronauts float back down to Earth instead?)

With thanks,

Sara Morawetz

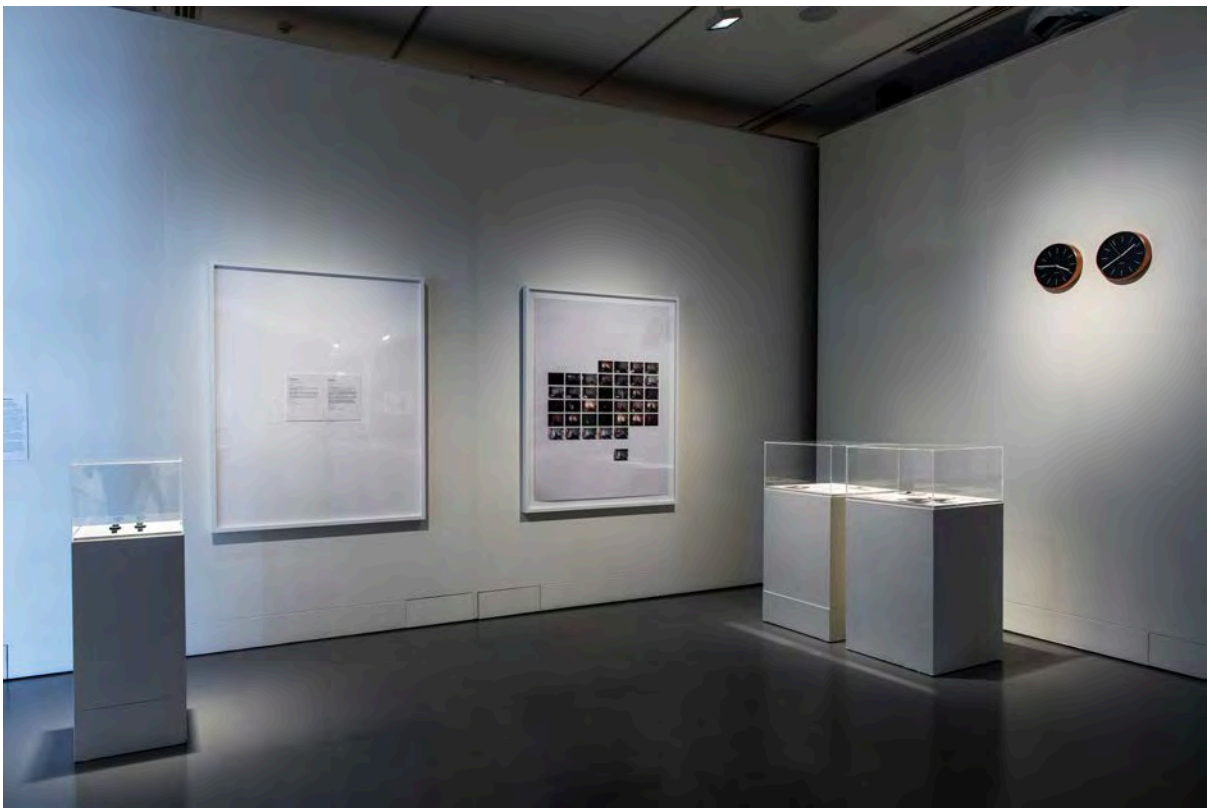
14:36 Earth time // 17:16 Mars time

INSTALLATION VIEW
FOR *TIME IS A FLUID CONSTRUCT*, 2016
VERGE GALLERY
PHOTOS BY DOCUMENT PHOTOGRAPHY

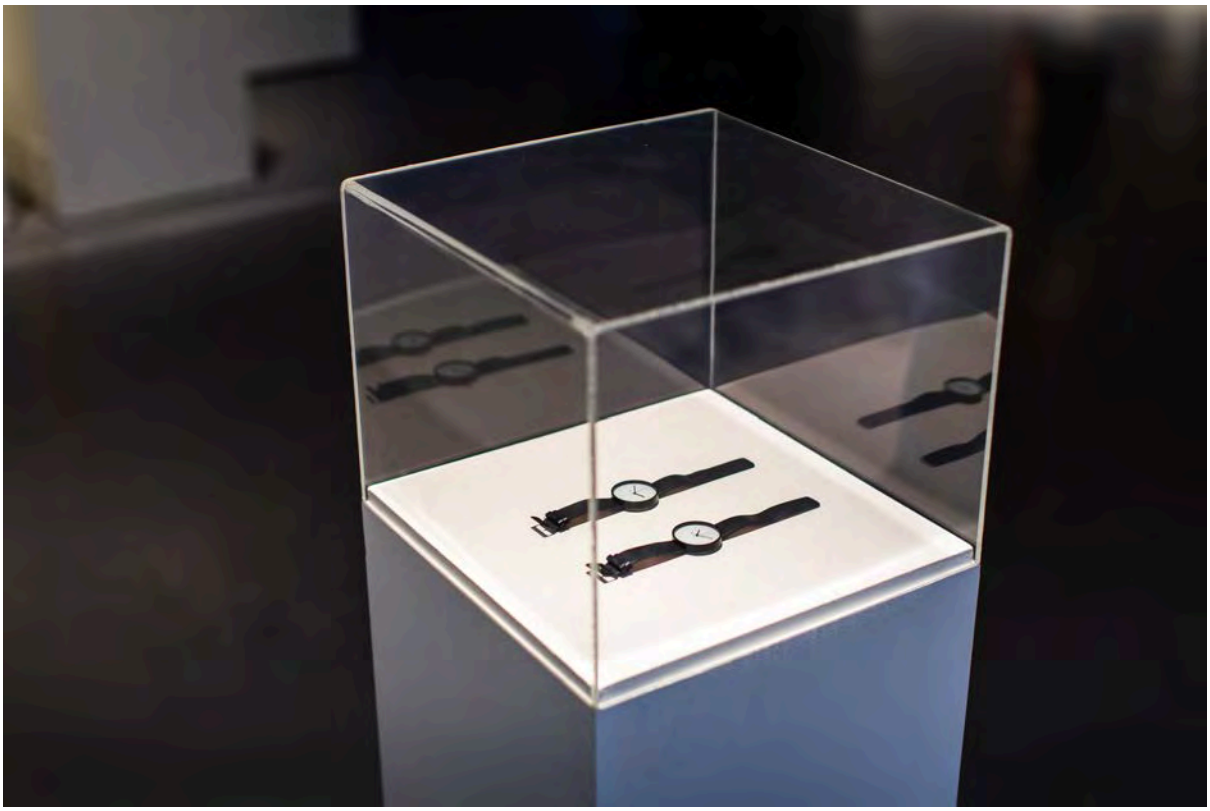


INSTALLATION VIEW
FOR THE CHURCHIE NATIONAL EMERGING ART PRIZE, 2016
PHOTO BY CARL WERNER

INSTALLATION VIEW
PRINCIPIA, 2019
DOMINIK MERSCH GALLERY
PHOTO BY JESSICA MAURER



INSTALLATION VIEW
PRESENT COMPANY, 2020
MUSEUM OF ART AND CULTURE, LAKE MACQUARIE
PHOTO BY BEN ADAMS



INSTALLATION VIEW
PRESENT COMPANY, 2020
MUSEUM OF ART AND CULTURE, LAKE MACQUARIE
PHOTOS BY BEN ADAMS

TIME, MEASUREMENT AND RECIPROCAL DYNAMICS: THE INTERPLAY OF EARTH, MOON AND LEAP SECONDS

ABSTRACT

This paper outlines a set of investigations pertaining to time and measurement, examining the reciprocal dynamics of the Earth and its Moon. It considers the inevitable contradictions that arise when seeking to standardise a quantity that is itself in flux, examining ideas of reciprocity within systems in motion. Specifically, measurements of *time* and measurements made *through time* are discussed, quantifying the divergence induced by the contextual biases of the observer. This study describes two experimental systems: *Departure* and *61/60* — parallel inquiries that seek to evaluate the underlying tension in the Earth/Moon dynamic — capturing the interplay between the slowing rotation of the Earth and the gradual recession of the Moon from our orbit. These dynamics, sympathetic in nature, are explored in detail — illustrating the interconnectedness of space, time, measurement and their standardisation.

1. INTRODUCTION

Our daily actions are governed by a set of basic assumptions that impart context to experience. These conditions are defined to provide a set of inductive propositions: a framework of predictive outcomes upon which the more unreliable aspects of human existence can be juxtaposed, measured, and ultimately graded. We seek neat, orderly divisions — a quantisation of experience designed to deliver a sense of emotional assuredness, affirming that what comes next will be equivalent to that which has come before.

It is upon such structural foundations that all else is built — the definition of these principles provide the basis for our broader perceptions of societal development and interaction. We implicitly cleave to these ideas so stridently that it is now difficult to perceive and acknowledge their subscriptive power. Deeply embedded in our cultural fabric, these assumptions appear as absolutes — reliable and steadfast invariants, resolved quadrants of philosophy. *Our notion of time is one such postulate*.

By our own account, the procession from light to dark conforms to a reliable pattern, one we have come to refer to as a ‘day’. By convention, each day is a division of this physical transition into 24 equal partitions known as ‘hours’, that, divided further, constitute a succession of 1,440 segments known as ‘minutes’ and 86,400 even smaller units known as ‘seconds’. Thus ensues an infinite cascade of sub-division — a hierarchy of smaller and smaller parcels of time that delve down toward the infinitesimal. From an emotional perspective, it is a system of symmetry, of order, one that is calculable and regular.

It is also wrong.

The motion of the Earth and its relationship to the Sun is not constant. The Earth is, in fact, *slowly* slowing down — its rate of rotation about its own axis faltering, leading to a gradual lengthening of our solar day. Such dynamics imply a fundamental ambiguity: what do we mean when we speak of 'time'? Is it a fixed and invariant quantity, unyielding and universal, or is it a heliocentric metric, bound to our passage around the Sun?

The perception of the Earth as a perfectly regulated system — conforming to a uniform trajectory in time and space — denies the planet its agency and independent motivations. The motion of the Earth is not bound by our expectations of structure; rather, it heeds to cycles that are born of a broader dynamic. That the Earth's rotation (upon both its own axis and around the Sun) is discordant and unyielding to our temporal manifestations should come as no surprise — *the Earth does not move for us*. Our presumption of compliance is representative of our own ontological failings and the folly of our humanistic desire to preference contextual experience. We should not expect that time be subservient to our current trajectory or, if we do, we must accept it as a limited metric, one that is irrevocably tied to an arbitrary epoch.

In this way, the ideology of standardisation offers a false narrative — that we can compel time to be both reflective of our current context and satisfy the constraints of universality. We must instead face the dichotomy that its standardisation presents: time can either be a concept that exists as a definable integer (devised for universal order and accountability) or an indivisible and rolling entity (one that shifts in accord with the machinations of our planetary dynamics).

This paper deals with ambiguities that emanate from the dual-valued nature of time — pitting notions of scientific specificity against our ingrained sense of cultural sensibility and societal inertia. In this, I do not seek to dismiss the rigours associated with the standardisation of time, but to instead acknowledge the limitations and consequences of doing so. A different type of time is contemplated, one that is far less deterministic — being governed instead by the perturbations of the planet itself.

Where and how these systems overlap exposes a complex network of seemingly unrelated constructs — invisibly bound and surprisingly bent to each other's will.

2. RECIPROCAL DYNAMICS

The Earth is not spinning in isolation — it heeds and acquiesces to the influence of other astrophysical objects. These bodies, in turn, are bound to it — an expression of the fundamental reciprocity imbued in our governing dynamics. Such symmetry is expressed by Newton's third law: "To every action there is always opposed an equal reaction; or the mutual actions of two bodies upon each other are always equal and directed to contrary parts. Whatever draws or presses another is as much drawn or pressed by that other. If you press a stone with your finger, the finger is also pressed by the stone."[1]

The intransigence of the Earth's orbit is thus a complex interplay of forces, a function of the myriad contributions from various bodies in motion throughout our solar system. Here we focus on one such interaction: that of the Earth and its Moon.

[1] V. F. Lenzen, "Newton's Third Law of Motion," *Isis*, 27, no. 2 (1937), https://doi.org/10.1086/347244.

The Earth and Moon exist in an anaclitic state that outwardly suggests constancy and stability — a motion of two equals engaged in a divine and unending dance. Yet in truth, this supposed act of enchantment is a waltz in tension — an asymmetric partnership in which the steps of one inexorably alter the passage of both. While entwined, they maintain autonomous agendas, suspended within a delicate balance of dependency and opposition: the Moon may be tethered to the Earth but it is a celestial partnership that it pushes against, and while the Earth holds the Moon within its bounds, it is concomitantly slowed down by its presence.

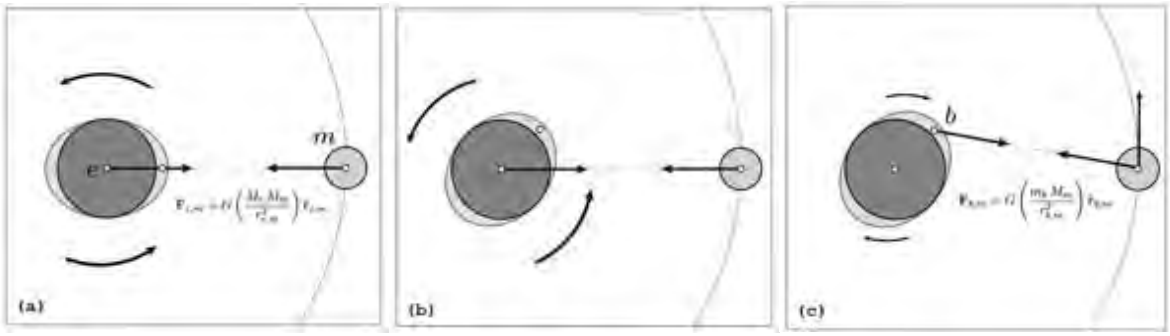


Figure 1. *Reciprocal Dynamics of the Earth-Moon system.*

A description of the Earth-Moon system is presented in **Figure 1.** In (a), the pairwise gravitational force $\mathbf{F}_{e,m}$ acting between the bodies is depicted, with this force proportional to the product of their masses, and acting along a vector $\mathbf{r}_{e,m}$ oriented between their centres of mass. This is an independent yet symbiotic relationship, with both the Earth and Moon responding to each other's influence. The Moon is thus implicitly tethered to lie in orbit around the Earth, making approximately one transit for every twenty-seven rotations of the Earth underneath it.

The Moon's gravity does not only tug at the Earth's centre — its influence is felt

uniformly over the planet's surface. Specifically, the Earth's oceans are made to bulge and swell in accordance with its passage, and it is this interaction that returns us to the subject of time. In **Figures 1(a)** and **(b)**, the Earth's tidal 'bulge' is represented, with the peak of the deformation initially aligned with the Moon's gravitational pull in **(a)**, and then accelerated by the Earth's rotation in **(b)** to lie 'ahead' of the Moon's orbital passage. It is in this state that a slow transfer of energy occurs. The Earth, distended and unbalanced, peers back toward the Moon, yielding to its influence. The Moon, in turn, is propelled forward, hastening to catch its partner.

This configuration is described in **Figure 1(c)**, illustrating the additional gravitational attraction $\mathbf{F}_{b,m}$ due to the tidal bulge of the Earth's oceans. Because this force acts in opposition to the Earth's own rotation, it can be seen as a 'rotational drag', acting to slowly arrest the spin of the Earth itself. The Moon, by Newton's arguments of reciprocity, is pulled forward by a component of this same force — accelerated into a higher orbit. *Two results follow*:

REMARK 1. The Moon is slowly receding from the Earth, moving to an ever-higher orbit as the Earth slows. This *departure* is made neither in haste nor in anger — it is a simple consequence of the reciprocity that binds our dynamics.

REMARK 2. Our experience of a 'day' on Earth is gradually shifting — lengthening as our rotation is tempered. Thus it is demonstrated that time is a variable construct — *time itself is subject to change*.

3. THE SECOND ISN'T QUITE LONG ENOUGH[2]

As per **Remark 2**, the gradual slowing of the Earth's rotation leads to a lengthening of our solar day, with the Sun appearing to linger a little longer in its arc with each passing cycle. This effect manifests as an increase in the interval of 'absolute time' between subsequent periods of light and dark, disrupting the correlation between our clocks and the Sun's transit. For time is not a heliocentric quantity — *at least not any more*. Our modern system of timekeeping has moved beyond our relationship with the Sun and is defined instead by the oscillation of individual atoms. This is the system of 'atomic time' — an absolute and universal metric that pays no heed to planetary dynamics.

Atomic time is a relatively new metric, widely adopted as a standardised system in the 1950s.[3] It is the first system of timekeeping not tied directly to astronomical observations, and thus provides a truly universal measure that is standardised across all points of space and time unambiguously. Specifically, in systems of atomic timekeeping, the length of the standard second is defined to be 9,192,631,770 transitions of an unperturbed Caesium 133 atom held at zero degrees kelvin.[4] This figure was chosen to set the length of the second equal to 1/86,400 of the mean solar day, as measured by detailed astronomical calculations carried out throughout the nineteenth and twentieth centuries.[5] The atomic second is a resolved and deterministic quantity — unmoved by place, context or emotional argument. *It is a scientific measure for a scientific age*.

[2] Michael Allison, personal communication, May 2014.
[3] Fiona Auty, "A Brief History of Atomic Time," Laboratory News, 2008, October 30, 2016, https://www.labnews.co.uk/article/2029226/a_brief_history_of_atomic_time.
[4] Dennis D. McCarthy and P. Kenneth Seidelmann, *Time: From Earth Rotation to Atomic Physics* (Cambridge: Cambridge University Press, 2018), 221, https://www.cambridge.org/core/books/time-from-earth-rotation-to-atomic-physics/0636D6999E53E483357CCD9B8D870EBF.
[5] Ibid.

Society, though, is not a strictly scientific system, and immediately there were issues with the new atomic metric. Historically, time had represented our relationship with the Sun — heliocentricity is the slow metronomic beat that has ordered our behaviour, standardising experience as a quantisation of light. Such ideas were not to be so readily abandoned, and by the early 1970s, noting that atomic and astronomical time had diverged by over 10 seconds, a new mechanism was created to address this bifurcation.[6]

The 'leap second' is the quantum of time irregularly added to our global clock — Co-ordinated Universal Time (UTC) — to keep our temporal systems in sync with the Sun.[7] These new seconds are designed to overcome the inherent contradictions between the specificity and precision of atomic timekeeping and the irregularity of the Earth's own physical movement. Coordinated Universal Time is thus a hybrid system, advanced through the steady tick of atomic clocks and then calibrated retrospectively against the Sun. Specifically, it allows for occasional one-second adjustments — the addition (or deletion) of ephemeral seconds in order to minimise the difference between UTC and a mean astronomical time metric, known as UT1.[8] Such a combined measure seeks to leverage the best features of both systems, interleaving the rigorously calculable with the indeterminate.

What then, distinguishes a leap second? Is it that it is new time? (*although, isn't all time new?*) No, it is that it emerges from the darkness, a culmination of infinitesimal slippages — of time tripping on itself by the narrowest of fractions. These fragments of astronomical divergence are allowed to accrue until reaching a predetermined threshold

[6] R. A. Nelson et al., "The Leap Second: Its History and Possible Future," *Metrologia* 38, no. 6 (2001): 517.
[7] Ibid.
[8] Ibid.

(± 1/2 second divergence between UTC and UT1) at which point the International Earth Rotation and Reference Systems Service (IERS) decrees that a new leap second should occur, recalibrating the length of our day to match our motion.[9] Leap seconds are scheduled six months in advance and occur after the final second of the last minute (UTC) on June 30th or December 31st of a given calendar year.[10] Since the introduction of leap seconds in 1972, twenty-seven have been added, resulting in twenty-seven minutes within that span of time that have comprised not of sixty seconds, but have instead consisted of sixty one. Thus far, no fifty-nine second minutes have been required.[11]

3.1 FUTURE TIME

The leap second has always been a controversial concept, achieving temporal synchronicity at the expense of scientific determinism. Each new second added represents a discontinuous 'leap' — distorting the basic continuity of our measurements of time. Yet modern technology does not yield easily to such vagaries, and there is currently a movement of scientists and technologists working to 'abolish' use of the leap second entirely.[12]

It is tempting, perhaps, to pursue such thinking — assuming that each individual adjustment carries little resonance. Each second is, after all only one second long — a tiny rupture in the measurement of time that passes before it can be uttered — merging with, and indistinguishable from, the other 86,400 seconds that occur on any given day.

[9] "Leap Second," International Earth Rotational and Reference System Service, accessed March 25, 2017, https://www.iers.org/IERS/EN/Service/Glossary/leapSecond.html?nn=14894.
[10] Ibid.
[11] Nelson et al., "The Leap Second" 510.
[12] David Yanofsky, "The Origin of Leap Seconds, and why they should be Abolished," Quartz, updated June 30, 2015, accessed May 26, 2017, https://qz.com/432787/the-origin-of-leap-seconds-and-why-they-should-be-abolished.

However, the culmination of leap seconds is none other than the temporal 'force' by which the Sun is held overhead at midday, and without it, our time would become unfastened from the solar cycles in which it is steeped. Our time would inevitably drift significantly, and in the distant future we would find that the passage of the Sun bore little relation to the movement of our clocks. If left uncorrected, a wholesale recalibration of time itself would eventually be needed. The atomic second is simply *not quite long enough*.[13]

Since 2003, the international scientific community has engaged in substantial debate concerning the ongoing use of leap seconds, and despite *four formal attempts* to reach global consensus, no resolution has been forthcoming.[14] Regardless of the obstacles that leap seconds present in our age of systematised technology, heliocentricity remains a powerful narrative — one not lightly disregarded. For if the sun is no longer custodian to our waking life, the moon our twilight sentinel, our entire history and philosophy *of time* and *with time* must be reconsidered.

4. THEORETICAL APPARATUS

PROPOSITION 1 (ACCEPTANCE I). The standardisation of time is an ill-posed problem. Constraints of invariance and heliocentricity are mutually exclusive.

PROOF. Consider three points **A**, **C** and **F** suspended in time.

[13] Allison, personal communication, May 2014.
[14] Auty, "A Brief History of Atomic Time."

Let point **C** denote our current time, the time that we inhabit and collectively refer to as now. Let point **A** denote another time, an *ancient time*, millions of years prior to this point of now (lying approximately X years before the period defined by point **C**). Let point **F** represent a *future time*, a time far beyond the now (projected forward a span of **C** - **A** years) and in doing so, may points **A** and **F** be seen as equi-distributed about the current epoch **C**.

Given any point **P** in the set {**A,C,F**}, let time be defined as a local heliocentric metric **Mp = (hp,mp,sp)**, a linearisation of the motion of the Earth about its current epoch. Here **hp** defines the *length* of an hour, **mp** the *length* of a minute and **sp** the *length* of a second. Note that this definition implies localised *perfection*, with each day discretised into exactly 24 hours 00 minutes 00 seconds. It is this form of perfection that the face of a clock reflects — a *uniform symmetry* that we are both conceptually and emotionally bound to.

But how then do we consider time at *different points of time*? How should the measurement of relative intervals of time across epochs be considered? And how do the metrics defined at point **C** relate to those defined at points **A** and **F** and vice versa?

Let us introduce a universal invariant, **t** — an infinitesimal quantum of time, unambiguously countable and deterministic. The quantity **t** may even be considered an atomic fluctuation — a regulated pulse by which all others may be set. Thus, let the heliocentric metrics be comprised of *units* of **t**, such that at a given point **P**, an hour is defined as **hp** x **t**, a minute as **mp** x **t** and a second as **sp** x **t**.

Noting that the Earth's rate of rotation decreases from point **A** to point **C** and onwards to point **F**, we must therefore acknowledge that each local metric is in fact distinct. Specifically, the (absolute) length of an hour at point **A** is known to be shorter than that of an hour at point **C**, based on the relative difference in the Earth's rotational speed at each epoch. An hour at **C** simply comprises of *more units of* ***t*** than that of an hour at point **A**, even though, in both cases, each is assembled of 60 local minutes. That a local observer based at either point **A** or **C** would be correct in noting that a day always consists of 24 hours, 00 minutes and 00 seconds (when measured according to the local metrics), but that each day is also known to be of unequal length (in an absolute sense), enunciates the fundamental contradiction.

As a consequence, the following relations hold:

ha < hc < hf, ma < mc < mf, sa < sc < sf,

thus invalidating the assumption of invariance.

Heliocentric time is therefore not a linear invariant, but is instead an *accordion* — it billows and exhales with the variability of the planet as experienced in each instance. The fundamental futility of temporal standardisation is thus exposed — one cannot seek to standardise a quantity *in time* when that same substance is known to change *over time*. (That the quantity in question here is time itself is all the more paradoxical.)

COROLLARY (ACCEPTANCE II). Time is a continuum beyond comprehension.

PROOF. Standardisation is an inherently human construct, providing a framework upon which we ascribe value to experience. Comprehension then, suggests the establishment of a system of standardised analysis — contextualising experience into a set of measurable indices.

Given that in **Proposition 1 (Acceptance I)**, the standardisation of time was shown to be inherently flawed, our ability to comprehend time as a well-defined quantity is thus irrevocably inhibited.

To perceive of the vast narrative of time is to perceive of our own impermanence, and to thus be consequently humbled. It is to understand that time, and the universe it supports, is an unending expanse — our existence within both is diminutive and finite. In this space, only the relative value of time can be questioned. One second, one million years — it is simply a matter of context.

COROLLARY 2 (ACCEPTANCE III). An engagement with time is a life-long event.

PROOF. From **Corollary 1 (Acceptance II)**, it follows that only through life-long performative gestures can one begin to contemplate the immensity of planetary timescales. To accrue data for such dynamics one must age — surrendering to the passing of time and documenting it. By cataloguing time though action over years (then decades), a broader narrative can be revealed. Yet even this act remains limited. One lifetime is incapable of addressing the scale of the motion of the planets — an axiom

only proven in the attempt.

5. EXPERIMENTAL APPARATUS

5.1 DEPARTURE

The moon is slowly receding as the Earth's rotation falters — a consequence of the inescapable symmetry and reciprocity in our underlying dynamics. As a result, the distance between us expands by approximately 3.78 cm each year.

On December 14, 1972, at precisely 5:55 pm EST, Apollo 17, NASA's final Apollo mission, successfully lifted off the lunar surface, marking the end of our last manned expedition to the Moon.[15] Since this departure, forty-four years have passed, and we are still yet to return. Every year we wait the journey becomes a little *longer*.

In honour of this relationship and the moon's gentle migration, *Departure* is a life-long drawing/measurement series, documenting the additional distance that would need to be travelled should we choose to return.

Each year on December 14, a new drawing is added to the collection.

As of June 2021, there are forty-eight drawings that collectively measure 1 m 81.44 cm.

[15] "Apollo 17," NASA, 2011, accessed October 30, 2016 https://www.nasa.gov/mission_pages/apollo/missions/apollo17.html.

5.2 61/60

61/60 has been conceived as a performative action, designed to commemorate the introduction of leap seconds within Universal Coordinated Time (UTC) with a one-second action coincident with each leap second's introduction.

The principal investigator, poised with a pair of orchestral symbols, waits for the new second in a demarcated area. At precisely 23:59:60 (UTC) the cymbals are struck once before being returned to their cradle. Each performance is staged with a new pair of cymbals that are only struck once, then 'retired' post-performance — holding the resonance of each new second ad infinitum.

The first iteration of this series *(026)* was staged in Times Square, New York City, USA, coincident with the introduction of the 26th leap second on June 30, 2015, at precisely 19:59:60 EDT (23:59:60 UTC).

The second iteration *(027)* was staged at Lick Observatory, Mount Hamilton, California USA, concurrent with the introduction of the 27th leap second on December 31, 2016, at precisely 15:59:60 PST (23:59:60 UTC).

All subsequent *61/60* performances are subject to the rulings of the International Earth Rotation and Reference Systems Service (IERS), the agency that regulates the passage of our time.[16] *61/60* is, therefore, as much a conscious act of waiting as a physical action,

[16] Brian Luzum, "The Role of the IERS in the Leap Second," https://www.iers.org/SharedDocs/Publikationen/EN/IERS/Documents/IERS_Leap_Seconds.pdf?__blob=publicationFile&v=1.

and can be staged only when the Earth tarries sufficiently in its orbit. It is the intention that this performance will occur for as long as there are leap seconds — it is a life-long act, simultaneously the shortest and longest action that the investigator will undertake.

5.3 61/60 (IN WAITING)

In November 2015, a group of international delegates met in Geneva, Switzerland for the World Radiocommunication Conference (WRC) where they were to debate and vote on the future of the leap second.[17] This was the fourth of such meetings to take place, with scientific and industry partners hoping to resolve questions related to the ongoing nature of time.

Their decision would mark a subtle and yet important philosophical shift. By continuing leap seconds our current paradigm would be maintained, protecting our state of heliocentricity through intermittent interventions. Or should they choose to abolish the leap second, it would initiate a divergence that would mark time as an independent construct, unswayed by the perturbations of the planet itself.

In recognition of this historic moment, a series of twenty-six single-second performances had been conceived to occur concurrent with the conference — intending to mark each of the leap seconds that had occurred (at that time) and serve as either a celebration of their continuance or as a eulogy for their end. Just prior to the work's commencement the WRC announced that no decision would be reached.[18] Instead, any adjudication concerning the leap second would be deferred for a further eight years until the World

[17] Konstantin Bikos, Anne Buckle and Vigdis Hocken, "The Future of Leap Seconds," accessed March 26, 2017, https://www.timeanddate.com/time/leap-seconds-future.html.
[18] "Press Release: Coordinated Universal Time (UTC) To Retain 'Leap Second,'" ITU, updated November 15, 2015, accessed March 26, 2017, http://www.itu.int/net/pressoffice/press_releases/2015/53.aspx#.WPfkNVPys_V.

Radiocommunication Conference of 2023.

In response, this project has also been deferred and is now a project (*in waiting*).

6. DEFINITIONS

DEFINITION 1 (RECIPROCITY). Let *reciprocity* be defined as an act of accord, an acknowledgement of symbiosis — an invisible thread that tethers seemingly independent bodies and systems across motion, space and time. It is a codified relationship: a contract. [One that is not always harmonious.] Let *reciprocity* be the compound that binds a partnership — a negotiation of concession, restraint and expectation. As the Earth and Moon must acquiesce one to the other, so to must the artist/investigator — surrendering the *performative action* to the constraints of planetary dynamics. Consequently, may *reciprocity* be recognised as both a physical action [both equal and opposite] and an interval of the in-between — something observed through the act of *waiting*.

DEFINITION 2 (WAITING). Let *waiting* be defined as every second that is not the *performative action*. The second prior to the *performative action* is *waiting*, as is the second directly after. The duration for which we must wait is defined by all the seconds that occur between those two points — also known as an interval of *time*. And in the interim, there is waiting to be done, inactive yet attentive — aware that every second passing brings the *performative action* closer. Given the task of waiting, let the sole constraint be an awareness of this fact — that it is only a *matter of time* until the Earth slows down. A *performative action* will occur in due course [*neither Earth nor Moon can be rushed*].

DEFINITION 3 (A SECOND). Let a *second* be a quantisation of time, a measure of light or a fragment of experience — a unit that occurs again and again (and again and again)… and yet never twice. Let it be singular and an endless repetition. May it be inflexible enough to be counted unambiguously, yet malleable enough to be queried. *May it never be quite long enough* — somehow always coming up short. Given an additional second in the metric of a minute, let a *performative action* occur. May this sixty-first second be known as a *leap second*, and while identical to the one before it and the one after, may this second be inimitable — an *exceptional* exception to the standard known as *time*. This *second* should be documented during the *second* that it occurs, with an action lasting a *second* in length. The action conducted should be known as art and repeated for every sixty-one second minute until leap seconds [or the investigator] are no longer.

DEFINITION 4 (TIME). Let *time* be defined by the motion of our clocks and the motion of our planet — even when these motions clearly contradict each other. May *time* be an allegiance to either sun or science — this fealty altering the value of *time* itself. Existing as both a fleeting fraction and an expanse beyond physical perception, allow time to inhabit multiple states and allow us to experience multiple states of *time* simultaneously. It is this oscillatory parlance that the artist/investigator seeks to analyse, for it is here that a *performative action* may occur. Let *time* be defined as the union of two disjoint sets — that of *performative action* and action in *waiting* — and may this interaction with *time* continue ad infinitum.

DEFINITION 5 (STANDARD). Let a *standard* be a mechanism of measure, employed to determine the variance of speed, distance and *time*. Let the existence of a *standard* indicate there is indeed something to measure: that there is a material we call

‘speed’//‘distance’//‘time’ for which we hope to obtain a collective understanding. May this *standard* operate as a universal metric but never actually be one, always remaining a contingent entity — subject to scrutiny and experimental inquiry. Let a *standard* be an instrument of our judgement. Given a *standard*, may it be the role of the artist/investigator to hold that *standard* to account — testing its limits and conditions of application. This analysis is not intended to eliminate the function of the *standard*, but rather to accept it as an imperfect artifice, an arbitrary benchmark that is useful but not universal, constant but not constantly correct.

DEFINITION 6 (PERFORMATIVE ACTION) Given the failure of a *standard* to represent *time*, let a *performative action* occur. May this *performative action* be a single *second* in length and occur on the occasion of a sixty-one-second minute at the precise moment the sixty-first *second* occurs. Let this be a sharp punctuation to what is otherwise a deterministic metric, and may the *performative action* reflect this short yet vibrant rupture in the continuum of *time*. Given that this *performative action* is dictated by planetary motion, may the artist/investigator be bound to its whims, responding only when the Earth and Moon permit. In the interim, the artist/investigator must steadily *wait*, performing the ongoing and unseen action of *waiting* for *time* to pass and *waiting* for a *standard* to *fail*. [Let this action also be known as life.]

DEFINITION 7 (DEPARTURE). Let *departure* be defined as an act of physical and conceptual abandonment, characterised by trajectorial deviations of planetary motion and human will. May it delineate both a continuum and an epoch, charting the Moon’s listless passage outward and our mortal deflection inward [in which an ambition to explore the stars was all but relinquished]. Let these twin *departures* imply longing and

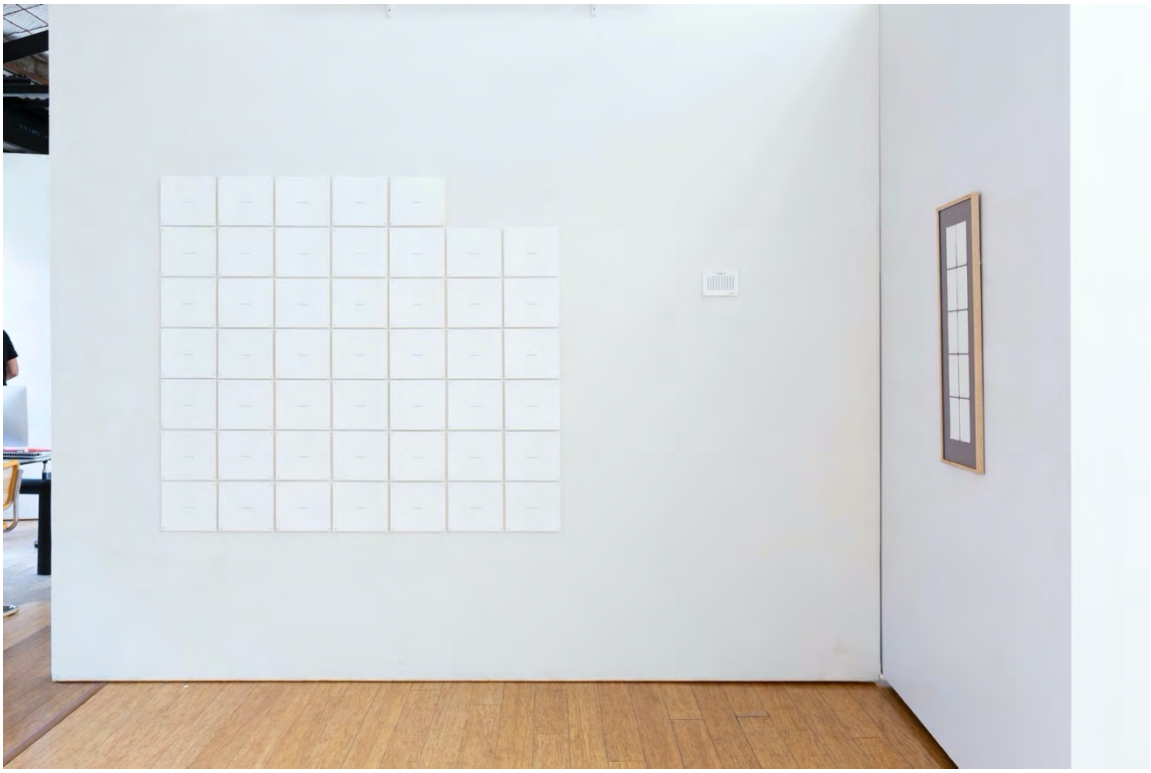
regret — a melancholy conveyed through a single line [an empty space] equivalent to the Moon's migration. May each line act as a marker of *time* and a symbol of reciprocity — a *performative action* that continues until the Moon [or the investigator] become unbound from Earth.

DEFINITION 8 (FAILURE). Let *failure* be defined by our inability to conceive of the limits of our language — our perceptual constraints — our systems of *standardisation*.[19] Let this *failure* be one of our own making. May the *failure* be understood as one of presumption, as well as incapacity — a flagrant disregard for the mutability of *time* and the futility of seeking to *standardise* a non-standardised system. Let our *failure* to account for a system in flux hinder all systems of standardisation, most notably that of *time* [right down to the *second*]. May this omission [in pursuit of invariance] speak to a contextual bias for predictability, and of reassurance. May this *failing* then be recognised as an emotional one, a desire to accomplish the impossible task of suspending the stars [and with them ourselves] in a fixed ether.

[19] Wittgenstein, *Tractus Logico-Philosophicus*, 5.6.

7. EXPERIMENTAL RESULTS

7.1 DEPARTURE



DEPARTURE – INSTALLATION VIEW
PRINCIPIA, 2019
DOMINIK MERSCH GALLERY, SYDNEY, NSW
PHOTO BY JESSICA MAURER

DEPARTURE – DETAIL
PHOTO BY JESSICA MAURER

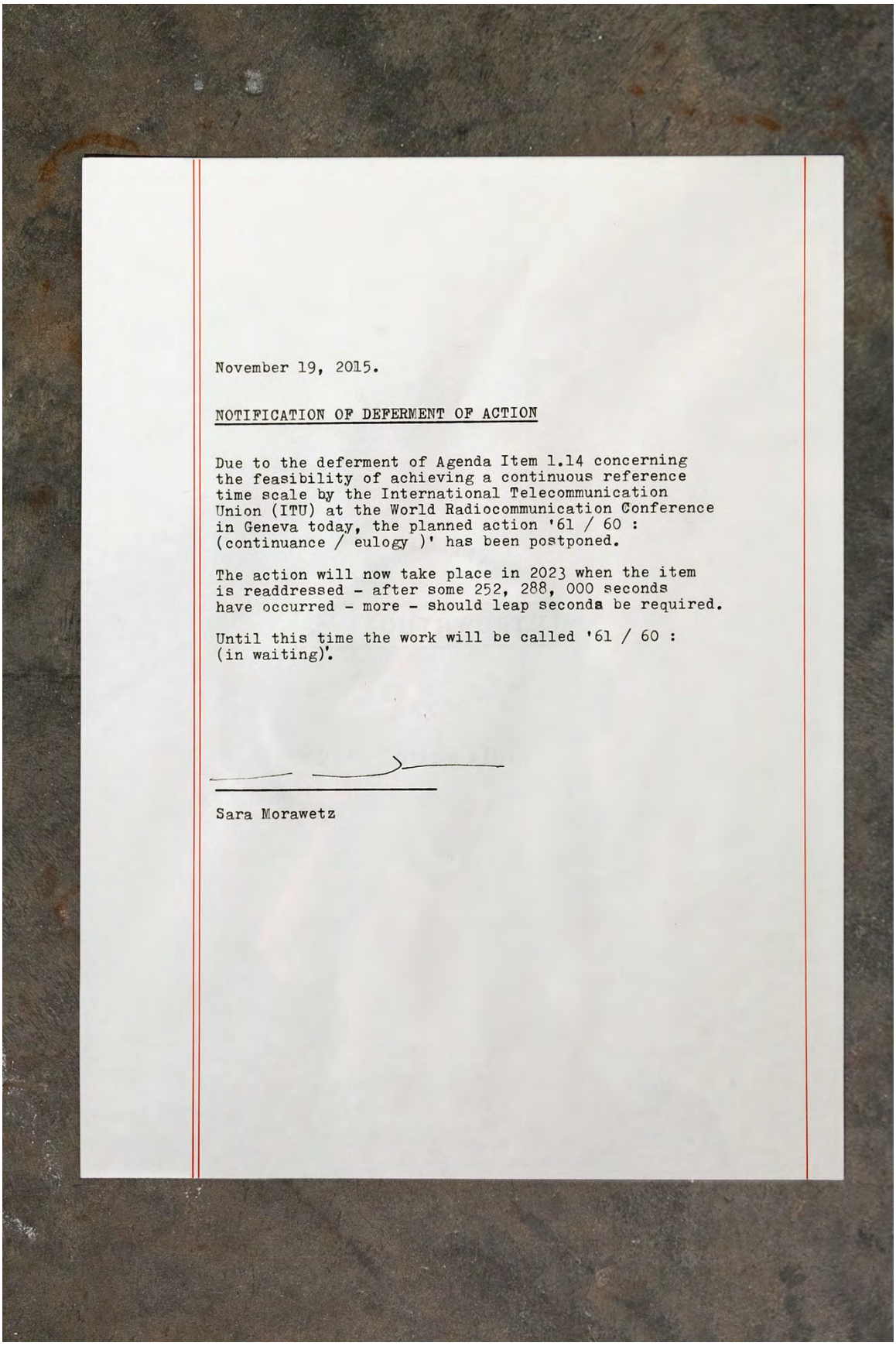
7.2 61/60 (026)

7.3 61/60 (027)

7.4 61/60 (IN WAITING)

61/60 (IN WAITING) – INSTALLATION VIEW
TIME IS A FLUID CONSTRUCT, 2016
VERGE GALLERY, SYDNEY, NSW
PHOTO BY DOCUMENT PHOTOGRAPHY

61/60 (IN WAITING) – INSTALLATION VIEW
TIME IS A FLUID CONSTRUCT, 2016
VERGE GALLERY, SYDNEY
PHOTO BY DOCUMENT PHOTOGRAPHY



November 19, 2015.

NOTIFICATION OF DEFERMENT OF ACTION

Due to the deferment of Agenda Item 1.14 concerning the feasibility of achieving a continuous reference time scale by the International Telecommunication Union (ITU) at the World Radiocommunication Conference in Geneva today, the planned action '61 / 60 : (continuance / eulogy)' has been postponed.

The action will now take place in 2023 when the item is readdressed - after some 252, 288, 000 seconds have occurred - more - should leap seconds be required.

Until this time the work will be called '61 / 60 : (in waiting)'.

Sara Morawetz

61/60 (IN WAITING) – DETAIL
PHOTO BY DOCUMENT PHOTOGRAPHY

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INDEX OF THE EMPIRICAL

[A CATALOGUE OF THE ARTIST'S WORKS]

1:1 (AFTER UMBERTO)

2016 – ONGOING

1:1 SCALE MAP ON CANVAS
PERSPEX

PERFORMATIVE ACTION +
VIDEO DOCUMENTATION

1:1 (AFTER UMBERTO) is a realisation of Umberto Eco's 1982 essay "On the Impossibility of Drawing a Map of the Empire on a Scale of 1 to 1," an absurdist 'thought-experiment' designed to explore the provably invalid nature of representations on a 1:1 scale. The essay itself was created in response to Jorge Luis Borges' short story "On Exactitude in Science" (1946) that, through farcical exposition, explored the inherent complexities and logistical absurdities of such an undertaking. Eco's essay is clearly not intended to be an instruction manual, but in a digital world where maps have been reduced to the size of our screens and have lost all sense of physicality, the impossibility of representing the real becomes an alluring proposition.

The act of making a map on a scale of 1:1 is clearly a useless exercise, for it is an object that serves no real function. Yet in physical form, a map of this scale forces us to confront the boundaries between the real and the representation – challenging our expectations of objects that signify.

The first instalment was commissioned for the exhibition *The Fraud Complex*, curated by Peter Johnson and Denise Thwaites and presented as part of the 2016 *Next Wave* Festival, as a depiction of 'Frontspace' at Westspace (Melbourne, VIC) and the second was shown at FELTspace (Adelaide, SA) in 2017.

The accompanying video features Umberto Eco's essay "On the Impossibility of Drawing a Map of the Empire on a Scale of 1 to 1," from *How to Travel with Salmon*,[1] narrated by Julian Day.[2]

[1] Umberto Eco, *How to Travel with a Salmon & Other Essays* (New York; London: Harcourt; Brace, 1994).
[2] Project description from personal website: https://saramorawetz.com/one-to-one.

1:1 (AFTER UMBERTO) – VIDEO STILLS
THE FRAUD COMPLEX, 2016
WESTSPACE, MELBOURNE, VIC

ACTS OF INEXACTITUDE

2017 – ONGOING

PERFORMATIVE ACTION
VIDEO DOCUMENTATION +
PERFORMATIVE ARTEFACT

Acts of Inexactitude is an ongoing performance series that documents the iterative process of measuring, remeasuring and marking an interval, which continues until successfully measuring a one metre distance exactly. The trace of this process is marked on paper in charcoal, the surface smudged and worked-over until the desired precision obtained.[1]

[1] Project description from personal website: https://saramorawetz.com/inexactitude.

PERFORMANCE DOCUMENTATION AND ARTEFACT
S.T.E.P., 2018
QUEENS MUSEUM, NEW YORK

ALL MY ANXIETIES

2017–ONGOING

PERFORMATIVE ACTION
ARTIST BOOK +
DIGITAL WORK

ALL MY ANXIETIES is an ongoing personal periodical – a continuing performative action and emotional archive designed to catalogue my flaws, failings and insecurities one month at a time. Conceived prior to the COVID-19 pandemic (yet produced in its wake), this iteration of *All My Anxieties* presents a methodical analysis of my internal monologue at a unique moment of isolation and uncertainty. With titles including *All My Failures, All My Petty Grievances, All My Unforced Errors* and *All My Minor Victories, All My Anxieties* is an unfiltered exposition of my raw, neurotic and routinely conflicted sense of self and the internal metrics by which I measure the world around me.

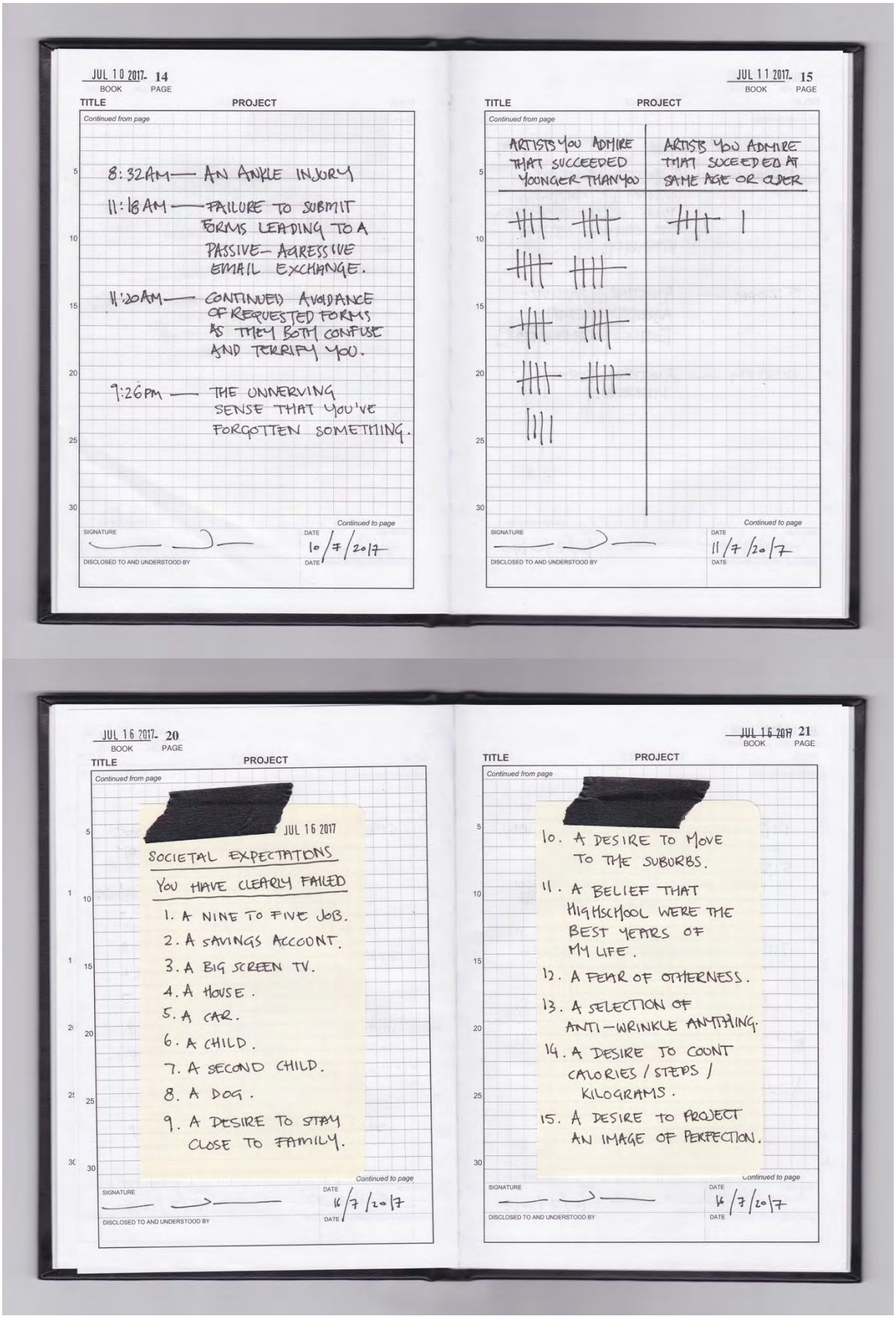
The first work in this series, *All My Failures*, was published in *Runway Journal* no. 34, edited by Luke Letourneau, Sarinah Masukor and Talia Smith.[1] The expanded work, *All My Anxieties*, was exhibited in the 2021 John Fries Award, curated by Miriam Kelly.[2]

[1] Sara Morawetz, "All My Failures," *RunwayJournal*, no. 34: Failure (2017), http://runway.org.au/all-my-failures.
[2] Project description from personal website: https://saramorawetz.com/all-my-anxieties.

DETAIL AND INSTALLATION VIEWS

JOHN FRIES AWARD, 2021
UNSW GALLERIES, SYDNEY
PHOTO BY

PERSONAL BEST, 2018
VERGE GALLERY, SYDNEY
PHOTO BY ZAN WIMBERLEY



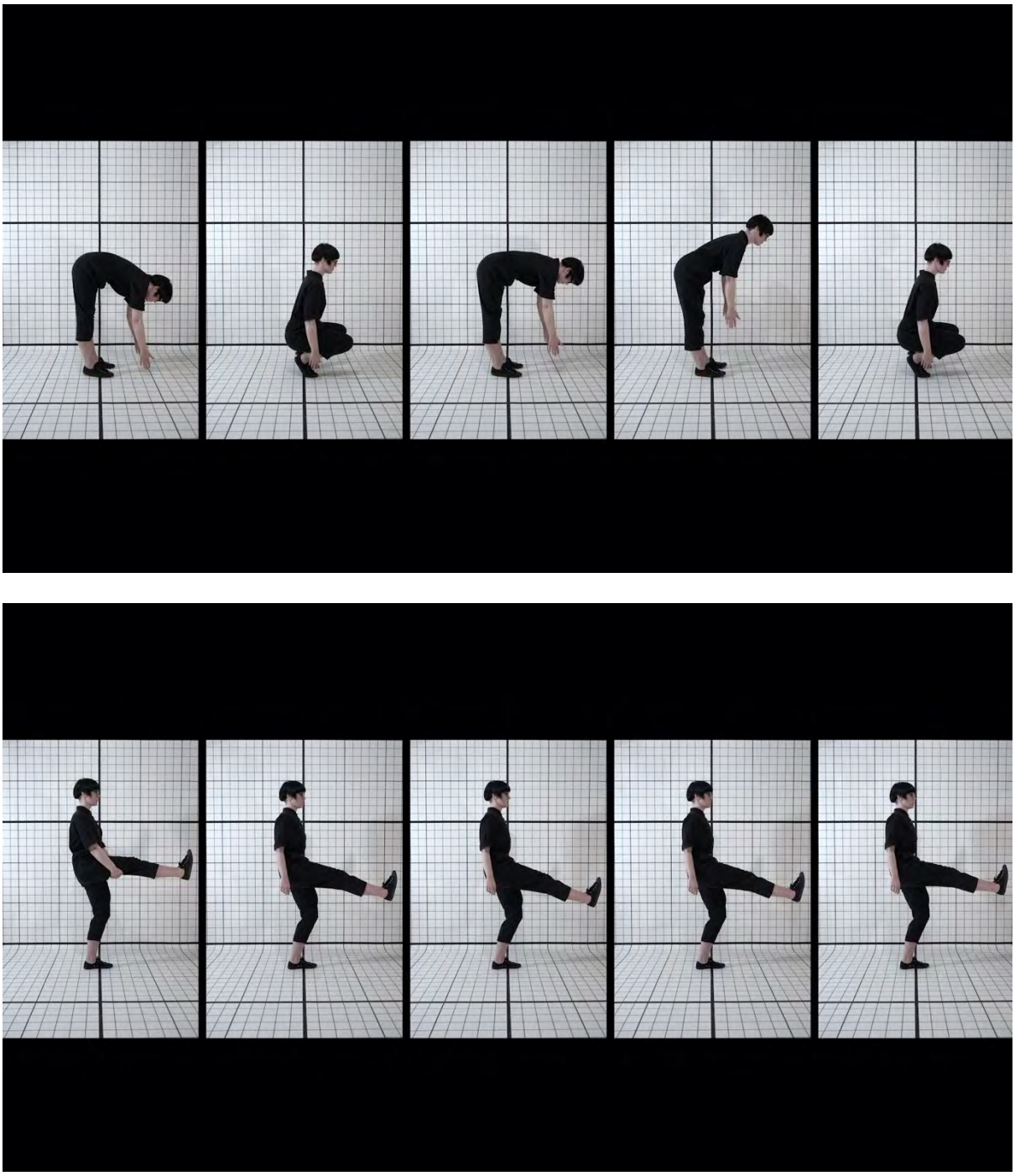
ALL MY FAILURES – DETAIL

AN INDEX OF ARBITRARY MEASURES

2019
SINGLE-CHANNEL VIDEO WORK
DURATION: 24 MINUTES 28 SECONDS

An Index of Arbitrary Measures examines the body as a site of measure, considering the history and inherent absurdity of calculating measures on individualistic terms – exploring and extrapolating from historical measures such as the hand, the foot or the arm's length. With playful reference to early experiments of Etienne-Jules Marey and Eadweard Muybridge, whose pioneering photographic techniques intersected with scientific studies of motion and measure, *An Index of Arbitrary Measures* contemplates the inevitable abstraction of self that acts of measure mandate.[1]

[1] Project description from personal website: https://saramorawetz.com/arbitrary-measures.



AN INDEX OF ARBITRARY MEASURES – VIDEO STILLS

APPARATUS

2014

1 M X 1 M
MASKING TAPE

APPARATUS – INSTALLATION VIEW
YET THERE IS METHOD, 2014
ACCELERATOR GALLERY, SYDNEY, NSW

ÉTALON

2018

112–DAY / 2,100 KM PERFORMATIVE ACTION
ONLINE PLATFORM
[TO FOLLOW: EXHIBITION INSTALLATION, PUBLICATION AND 'METRE' BAR]

WALKING COMPANIONS: Boni Cairncross, Alex Pedley, Kath Fries, Laura Hindmarsh, Lucy Parakhina, Magali Duzant, Connie Anthes, Chantel Meng, Sharne Wolff, Stephanie Brotchie, Angela Lopes and Darren Engwirda.
SCIENTIFIC COLLABORATOR: Darren Engwirda

In 1792, Napoleon gave two French astronomers an ambitious task: to traverse an arc inscribed on the surface of the Earth and create a new "universal standard" – *le métre-étalon*, the metre. The pair, Delambre and Méchain, travelled the length of the meridian arc from Dunkerque to Barcelona surveying both the land beneath and the sky above to measure the curvature of the Earth. Using this data, they defined the metre as a "natural" standard: one-ten-millionth of the distance from the North Pole to the Equator. This was a new kind of metric, borne neither of politics, nor the aristocracy – it was instead drawn from the Earth itself.

In the summer of 2018, I staged a performative walk along *la Méridienne de France*. Accompanied by a team of female artist, I retraced this expedition, walking 2,100 km over 112 days to observe and document the Earth's characteristics, and derive a new "metre" borne of physical action and endurance.

Walking, by design, infers time and motion as experienced on a human scale. It can reduce a formidable task (such as crossing a country or contemplating a metric) to the simplest of human gestures: the positing of one foot in front of the other. Through this action I attempted to embody the metre (slowly // thoughtfully // introspectively), allowing the imperceptible arc of the Earth to curve beneath my feet.

étalon was devised as an encounter with the metre as a physical, emotional and conceptual postulate, experienced over an expansive terrain, and viewed from multiple perspectives. Each step was an act of (re)evalutation and (re)consideration – examining the performativity of science, exploration and the creation of a standard through a female gaze. The world *étalon* denotes both "standard of measure" and "stallion" –– a breeding horse, a male exemplar. This work was designed to privilege a perspective distinctly lacking within historical narratives, subverting the masculine framework often entrenched in scientific discourse and discovery.

Formed by a collective of voices and crystallised through tactile experience, the new "*métre-étalon*" is something more than a fixed and immutable construct – it is a shared phenomenological encounter; an assemblage of time passed and distance travelled; a measuring of self against the limits of our own domain.[1]

[1] Project description from personal website: https://saramorawetz.com/etalon.

ÉTALON[2]
[ɛtəlɒn]
Masculine noun

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1. A unit, a measure, an assignment of length. A definition of fixed bounds [known as a standard] that performs an act of calibration for the purpose of reference and referral.

2. A materialisation, an apparatus; an object that signifies. An instrument of given proportion [arbitrarily set] that defines a standardised sense of scale. A societal totem. A yardstick.

3. A communicable language, a knowledge system. A set of rules provided for practical convention: an everyday accord.

4. A connection between two points; a recognition of space in-between. An understanding that the distance spanned from the 'here' to the 'there' is comparable, quantifiable; calculable. A knowing of space [and self] through the determination of an unyielding metric.

5. A natural measure and an enduring proposition; an integer extracted from the physical scale of the Earth, divested from [although not evading entirely] man, court and country.

6. A compliance; a social contract. An instrument that facilitates measure by measuring against. A notion suspended by use and application. A construct that now constructs: *we shape our tools and thereafter our tools shape us*.

7. A masculine noun, a male assertion; a stallion (literally). An implicit possession of scientific output by a patriarchal structure. A dissemination of knowledge by a self-identified elite.

8. A walk, a counter-measure; a remeasuring for arts' sake. A physical, emotional and mental gesture in search of the metre one step at a time.

9. A feminine verb, a female action. An attempt to recover an implicit tactility, misremembered and overlooked – to know a metre as one knows oneself. An honouring of unseen and hidden labour. A physical connection, an embodied sense of time and place.

[2] *Étalon* definition originally published on project website: https://www.etalon-walk.com/what.

ÉTALON (DAY NINE)
PHOTO BY BONI CAIRNCROSS

ÉTALON (DAY THREE)

ÉTALON (DAY THIRTEEN)

ÉTALON (DAY SEVENTY-FOUR)
PHOTO BY CONNIE ANTHES

ÉTALON (DAY FORTY-SEVEN)
PHOTOS BY LUCY PARAKHINA

ÉTALON (DAY EIGHTY-NINE)
PHOTOS BY CHANTAL MENG

ÉTALON (DAY EIGHTY-SIX)

ÉTALON (DAY ONE HUNDRED AND ONE)
PHOTOS BY STEPHANIE BROTCHIE

ÉTALON (DAY ONE HUNDRED AND TWELVE)
PHOTO BY LUCY PARAKHINA

INSTRUCTION EXPERIMENT

2014 // 2015

2 DAY [16 HOUR] PERFORMATIVE ACTION

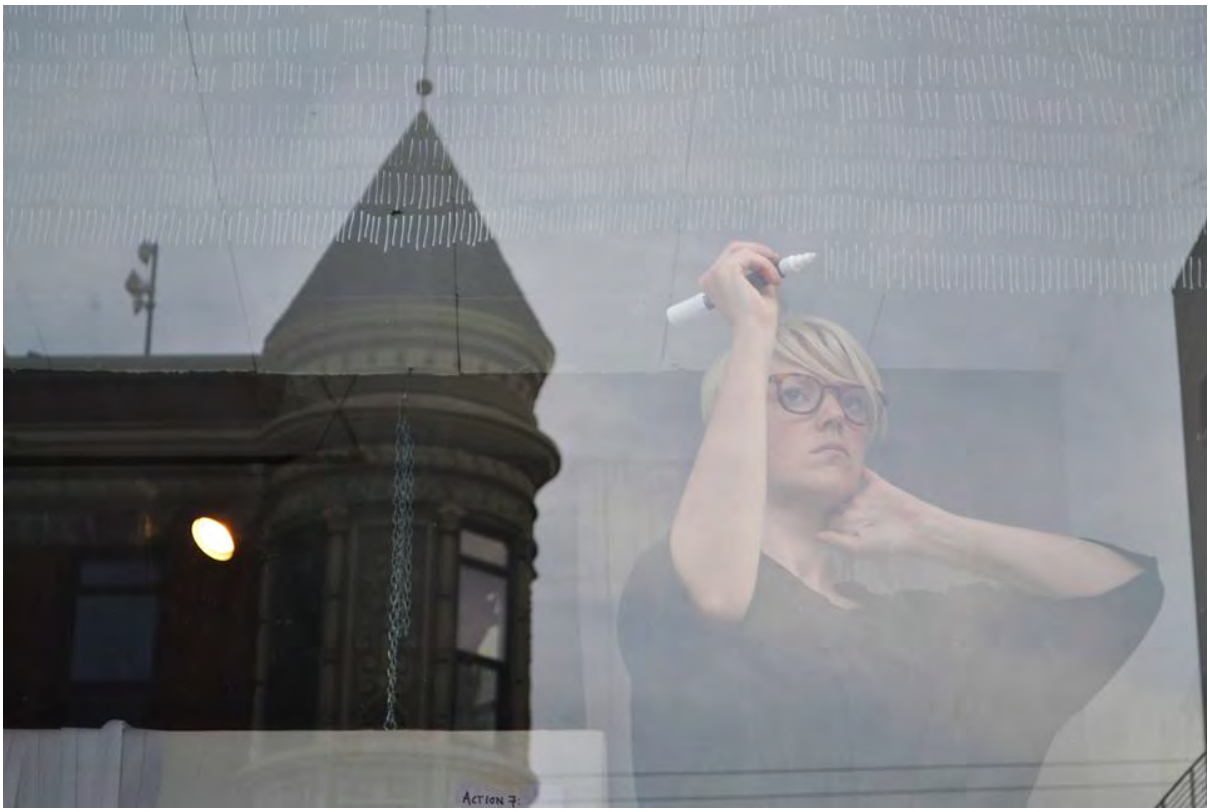
Instruction Experiment invites an audience of both digital and physical spectators to send an instruction / action / thing to do that I would enact / interpret / subvert within the confides of a gallery window space. These instructions were gathered both prior to and during the performance via several online platforms and were also contributed by audience members viewing the performance live.

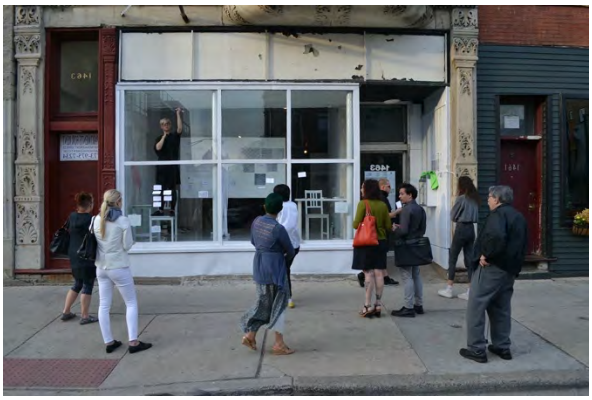
Equipped with a selection of standard art supplies and office materials (along with introduced materials on a case-by-case basis) I was tasked with performing as many of the submitted instructions as possible – the evidence of each action visually recorded in the space as well as being documented via social media to create a virtual record. Throughout the course of the performance the window space acts as an observational viewing platform where I and my methodology can be constantly observed, as well as a site of performative detritus that in its cumulative effect exposes patterns, processes and method within my experimental practice.

The first iteration of this work was staged in 2014 as part of Critical Animals in Newcastle, Australia and the second was performed in 2015 at RAPIDPUSLE International Performance Art Festival in Chicago, USA.[1]

[1] Project description from personal website: https://saramorawetz.com/instruction-experiment.

PERFORMANCE DOCUMENTATION
THIS IS NOT ART FESTIVAL, 2014
NEWCASTLE, NSW





PERFORMANCE DOCUMENTATION
RAPIDPULSE INTERNATIONAL PERFORMANCE ART FESTIVAL, 2015
CHICAGO, IL

METRIC UNITS FOR THE SOLAR SYSTEM [METRE SCHEMATIC]

2019

CUT VINYL
VARIABLE DIMENSIONS
[EXACT ARRANGEMENT DETERMINED BY POSITION OF PLANETS AT TIME OF INSTALLATION]

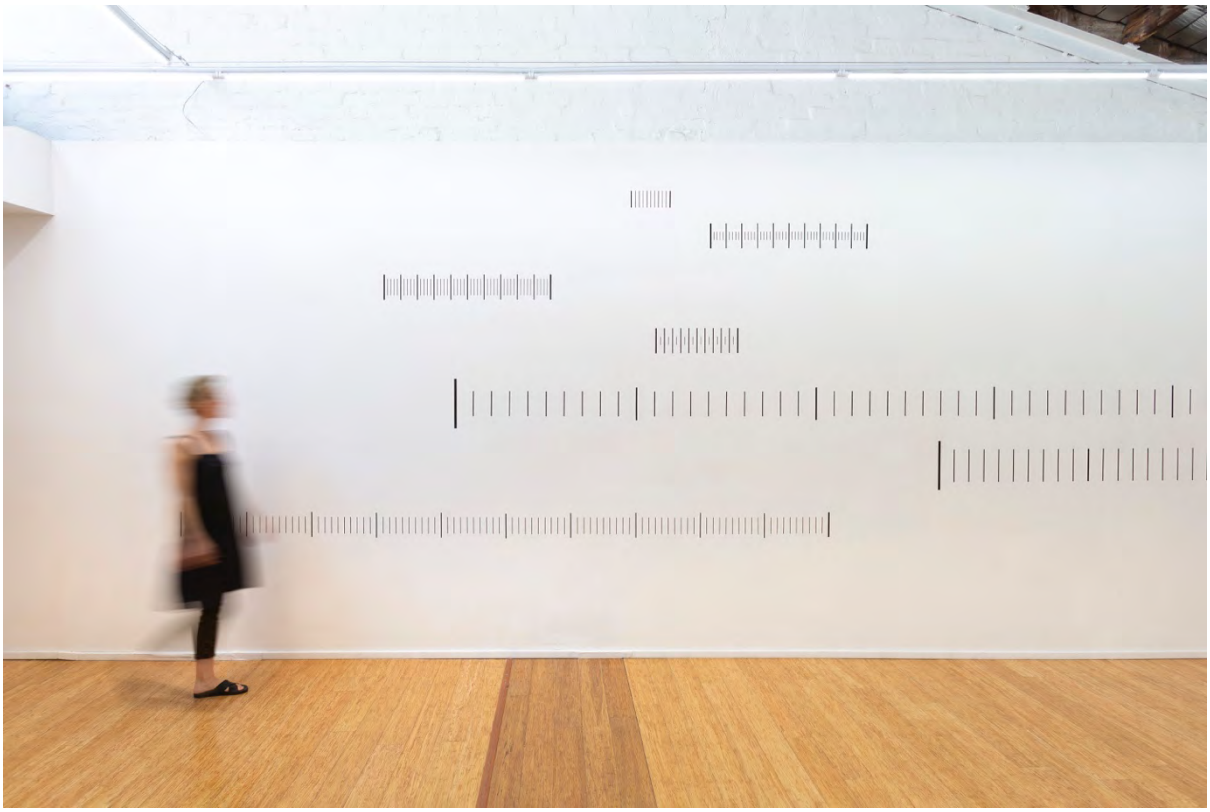
Measurement is not so benign an act — it is inevitably bound up in ideas of judgement and comparison. Of how one length or scale measures-up to another, whether one is more precise or correct, or ultimately better. Measurement is not impersonal — it is a human construct, reflective of our desire to order and control. To break space into a discrete and manageable set of containers, to enumerate and account for each of them individually, and to sum them up as a whole.

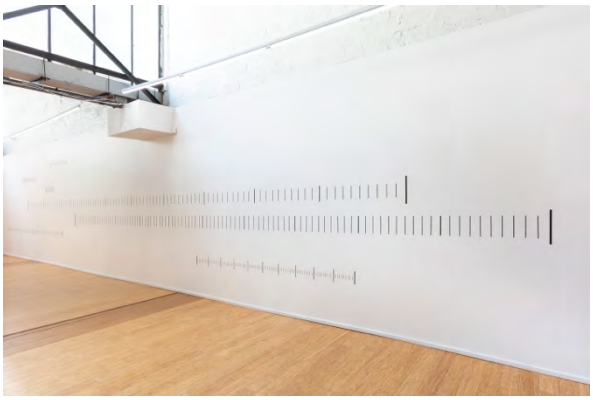
How then should we measure beyond the Earth? Do we take our existing Earth-bound metrics with us, or offer other worlds agency in the determination of their own systems and standards?

Metric Units for the Solar System is an expanded body of work that considers measurement as a scientific and societal construct informing our daily lives and shaping our perception of the world around us. It explores the fundamental properties of measurement, the physicality of the act of measuring and underscores the philosophical possibility for measures to adapt, evolve and change.

Metric Units for the Solar System [Metre Schematics] presents a set of metre lengths derived from the characteristics of each planet in our solar system. Contrasting the length of planetary metres with her own physicality, this work attempts to confront the scale on which the universe operates and our place within it.[2]

[2] Project description from personal website: https://saramorawetz.com/metre-schematic.





METRIC UNITS FOR THE SOLAR SYSTEM [METRE SCHEMATIC] – INSTALLATION VIEW
PRINCIPIA, 2019
DOMINIK MERSCH GALLERY, SYDNEY, NSW
PHOTO BY JESSICA MAURER

METRIC UNITS FOR THE SOLAR SYSTEM [METRONOME]

2016 – [EARTH // MARS ITERATION]
MULTI-CHANNEL VIDEO

Metronome (Earth // Mars) is a video installation conceived during the staging of *How the Stars Stand* — setting a black and white pulse to the speed of the 'second' as experienced on Earth and on Mars. The video drifts in and out of sync as 'time' passes — representing the dichotomous relationship between these two planetary standards.

The expanded version of Metronome (due for completion in 2022) will sit within the larger body of work knowns as *Metric Units for the Solar System* as a representation of the standard 'second' on each planet.[1]

[1] Project description from personal website: https://saramorawetz.com/metronome.

METRIC UNITS FOR THE SOLAR SYSTEM (METRONOME EARTH // MARS)
INSTALLATION VIEW ARTBAR, 2016
MUSEUM OF CONTEMPORARY ART, SYDNEY, NSW
PHOTO BY LESLIE LIU

REPEAT REPEAT

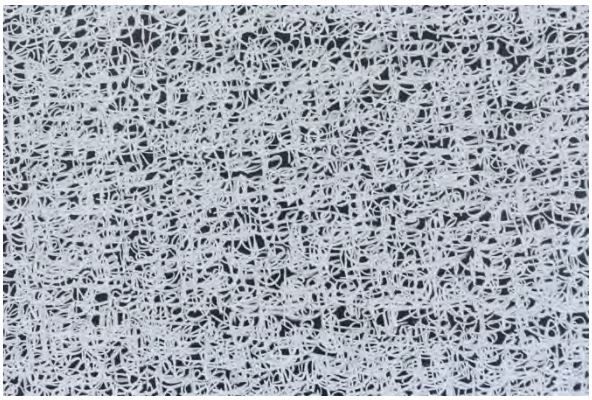
2014 / 2019

PERFORMATIVE ACTION
CHALK ON CHALKBOARD
VIDEO DOCUMENTATION

To an artist the experience of the lab is at once complex yet clear — foreign yet familiar — an endless series of discrete tasks, transparent in isolation, but that collectively conceal a degree of consequence that only a lifetime of study could truly reveal. The lab itself is an organism, a system in play — things are moved and manipulated, tested and tested again. An endless succession of repeats that both compel and mystify. In this impenetrable system of rigour and repetition nature reveals its abstruse beauty — an unintended emergent entity.

repeat repeat is an acknowledgement of the singular repeated act required of scientific research so often obscured by the vast complexities of a broader investigation. Completed in chalk to signal the re-education process that is implicit in their research, these works are a tribute to the microenvironment and the impact an individual element/action may have on their composition.[1]

[1] Project description from personal website: https://saramorawetz.com/repeat-repeat.



REPEAT REPEAT – PERFORMANCE DOCUMENTATION AND INSTALLATION VIEW
PRINCIPIA, 2019
DOMINIK MERSCH GALLERY, SYDNEY, NSW
PERFORMANCE DOCUMENTATION BY HOSPITAL HILL
PHOTOS BY JESSICA MAURER