

Generative Topographies // Liminal Spaces

Author Rana K. Abudayyeh

Assistant Professor, University of Tennessee College of Architecture and Design

Introduction

Time's agency in design has been one of constant impact; affecting the tools, approach, and resolution of design. Situated within the theme of SHAPING TIME - Leveraging the Past, this paper encourages



Figure 1 | A number of laser-cut models done by first year Architecture and Design students at the University of Tennessee College of Architecture and Design [UTKCoAD] based on the analysis of 7 paintings.

the expected diversity of beginning design students while advocating for the implementation of advanced digital tooling as a strategy to evolve design pedagogy.

Design education must equip students with the necessary skills to respond to the complexities, constraints, and demands of the present while working towards a responsible future. Despite a consensus among design educators that technology is an integral component of design, first year instruction has generally steered towards manual conventions. Incoming students are digital natives with unique backgrounds. Building on this diversity while developing the commonality of a digital dialect establishes a culture that encourages students to explore ideas and take risks while providing them with advanced digital and analog tools needed for creative production and communication. This requires introducing design as a process in contrast to a final product. Process is an introduction to the agency of time in design. Here, it is essential that process assumes a cyclical - as opposed to a linear - evolution. A linear model uncouples skills and design thinking while a cyclical one allows for skills and thinking to develop in a convergent manner. Such convergent parameters oblige merging digital and analog workflows and logics. The impact of this approach is twofold. On one hand, it puts the decades-old debate of when to introduce digital tooling to first year design students to rest. On the other hand,

early exposure to integrated digital and analog logics allows for thinking beyond the provisions of the tool to its facilities, actively shifting the dialog from “what the tool can do” to “what could be done with it”. This approach acquires more necessity within the context of current design culture where digital tools cater to a trivial commitment to a product. As such, and in order to develop a robust aptitude for thinking and making, expanding the modalities under which incoming design students operate is requisite.

Representation between Utility and Agency

Representation - at once figural and notational – is the fluid language of the design process.

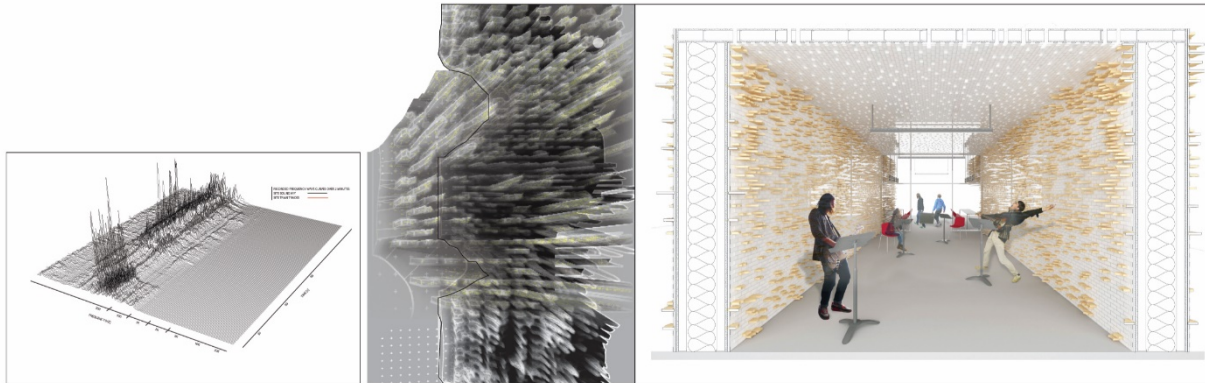


Figure 2 | Left: student work by Paul Bamson, Graduate Landscape Architecture student @ UTKCoAD. Work from an Independent Study course that focused on using visual coding platforms to define and analyze site properties. This image was generated via a sound visualization script documenting the soniferous elements of the site. Middle and right: student work by Heather Shine 3rd year Interior Architecture student @ UTKCoAD. The design of an acoustical interior topography utilizing a

Throughout different eras, representation has taken on different tasks concerning implication and relevance in architecture. Yet, consistently design’s dependence on visual modalities is responsible for the evolution of our perception of space. The emergent comprehension of space continues to expand, always in parallel to practices of representation. This impact has never been as evident as it is in our present time, which is demarking unprecedented access to computational power. Digital modes of visualization are redefining every aspect of the design process from its conceptualization to actualization. Further, they are influencing patterns of practice among students and professionals alike, in as such that we are seeing a noted shift from a singularity of authorship to collective, cumulative making (Figure 2).

While the digital has been a dominant force in shaping current trajectories of visual thinking, it by no means revokes the necessity for analog modalities. Relying on digital and analog tools to advance a hybrid visual tactility expands the rudimentary principles of graphic communication as it prompts their employment towards abstraction and transformation. In the article, “Drawing the Digital: From ‘Virtual’ Experiences of Spaces to ‘Real’ Drawings” (Banou, 2016), Sophia Banou discusses the agency of integrating the actual and the virtual modes of representation. According to Banou, “The abstraction of representation as mere technique foregrounds the operations of architectural design, merging the real and the virtual and therefore expanding both. As a place of action, of dwelling and transcendence, drawing emerges from the post- functionalist cartographic practice as a space just as important as the built space of architecture. Function within drawing concerns not the utility of an external space, but

the act of signification. This involves the ability of the architect to engage in an intertextual cohabitation of spaces, where meaning is derived from a collective subjectivity that is only possible through the transcendence into the virtuality of representation" (Banou, 2016, p.22).

Understanding the utility of design skills and tools is necessary. Representation in its literal sense of illustration will remain central to the craft of design. However, enabling the students to exercise agency in what is illustrated nurtures not only design thinking, but also critical analytical acuity. Unlike practitioners, a student's platform rests entirely on drawings, models, diagrams, visualizations, etc. The impact of this platform relies intensively on the dialogue these representations evoke and/or provoke. To limit those exchanges to the provisions of generic repetitive exercises positioned under the umbrella of requisite fundamentals is at once nullifying to the premise of finding one's unique voice in design and inhibiting to an agenda of design's critical impact. Of course, there is a measure of idealism imparted in such an argument and there will always be a number of students that in every occasion still want to be told what to do and who to follow. Yet, in this time and age, raising a generation of active thinkers and brave makers is necessary for both the evolution of the design profession and the advancement of the designer.

Fertile Grounds: rethinking the methods of first year design pedagogy

Rivka Oxman concludes her essay, "Digital architecture as a challenge for design pedagogy: theory, knowledge, models, and medium", by stating that digital technology is a persistent trajectory in design pedagogy as it is actively re-forming the theoretical discourse (Oxman, 2008, p.117). Not only is this changing discourse, but also transforming design's traditional models and logics. A quick survey of many design programs in various higher education institutions reveals the active integration of digital tooling in curricula. However, with some exceptions, many of these programs refrain from introducing digital tools and representation methods to incoming design students, reserving these courses to consequent semesters. Such approach operates under the assumption that the introduction of the digital will sway the first-year student away from employing analog conventions and will affect the dissemination and utilization of design fundamentals. While there is no evidence to support the latter assumption, closely examining when and how the introduction of digital tooling takes place within the structure of first year design education is essential. As mentioned previously, incoming students are digital natives with a unique set of abilities. We need to build on this further in first year, as this would be the most fertile setting for such intervention. Incoming students have the unique privilege of approaching design with a relatively free palette that is unbiased to stylistic preferences and conventional prerequisites. Free from predispositions, form and space become a realm of possibilities rather than a mere response to requirements. This is not to say that fundamental parameters such as program, site, experience, and impact go unaddressed. Quite the contrary, these issues become integral in a different manner and through a varied sequence. Oxman calls for a shift from the conventional "project orientated" approach to "model oriented" teaching, in which digital processes drive exploration (Oxman, 2008, p.111). Here, form is not a response to program, rather an issue of formal and material explorations that once established, deploys its logic to various functions and settings.

Catering to a metabolism of new forms and processes involves more than the provision of tools and methods, it requires a responsive shift in methodology. In the context of design pedagogy, not only is

the development of visual logic and perception skills integral, but also their employment as generative instruments for formal, spatial, and tectonic exploration and production. Visual acuity in tandem with formal literacy has been an underutilized territory in the educational artisanal; in as such that representation's role in the design process -in most cases- has been reserved for expression rather than exploration. In this context, one can even begin to speculate on the more fantastical possibilities inherent in representing exploration and exploring representation.

Adaptive craft: the evolution of how and what we make

Any significant shift in architectural thinking and making was preceded by a novel representation modality that gave a foretaste of things to come. From Brunelleschi's Peephole and Mirror System (Smarthistory.org, 2011), to Alberti Della Pittura book (Alberti, 1972) and gridded window (Alberti, 1972), to Mies van der Rohe's - Friedrichstrasse Skyscraper photomontage (Phaidon, 2014), to Gregg Lynn's "Animate Form" publication (Lynn, 1999), each employed visualization to reimagine the possibilities inherent in making architecture. Tethered to the adaptability of our tooling and mediums, design visualization has undergone remarkable shifts throughout architectural history; however, none as impressive as in the digital era. These shifts have not only redefined how we see design before its built manifestation, but also how we approach the process of its conception altogether.

Computer renderings along with their predecessors of drafted perspectival drawings, paintings, photomontages, etc., are essential communicative tools used in design education and the design profession alike. Yet, their impact goes much further than their apparent value. Representation modalities have an integral impact on the evolution of form and space. Furthermore, their effects extend to material logic and tectonic sensibilities. As design theories continue to emerge defined by an ever-evolving digital dexterity, there is a pressing need to redefine core design concepts. Oxman states; "In design theory, the decline and transformation of root concepts such as representation, precedent-based design, typologies, and other principles of the past generation are in the process of being replaced today by a new body of design concepts related to models of generation, animation, performance-based design and materialization. These are design concepts deriving from the synergy between emergent technologies, design and architectural theories" (Oxman, 2008, p.105). While some may call for a complete replacement of these root notions, evolution is a more suitable depiction of past and imminent changes to theory and pedagogy, which in turn influence the process and practice of design.

Reanimate Image: redefining the role of precedent in beginning design education

Often, the premise of first year design curricula hinges on fundamentals that are indirectly derived from the needs of the concurrent years of design education. The introduction of fundamentals and their analogous skills has been a topic under constant scrutiny. Worth to note here that the fundamentals themselves change. As a result, the narrative of the debate needs to shift accordingly from questioning what the concurrent years of design education require to addressing what the beginning design student needs to excel within the complexities of an ever-evolving design process. Design programs are responding to this pressing reality through a "hand-me-down" approach; meaning that theories and conventions pass down the line from advanced to primary years. This top down approach is happening with little to no consideration to the comprehensive needs and abilities of incoming students or even

the appropriateness of the subject matter. For instance, parametric design (deemed advanced) is commonly introduced in the third or fourth year of design education, whereas orthographic projection drawing is considered a primary skill and introduced in the first years. The problem with this scenario is that students now are consumers of technology from a very early age. Parametricism is a topic they are familiar with and may have used some types of visual coding even before they begin a higher education path in design. Orthographic projection, on the other hand, is a much more complex concept to understand, let alone master, to a generation who is accustomed to 3D constructs and virtual reality.

To illustrate that digital exploration can augment core concepts; this paper will look at an area of beginning design education considered fundamental to the training of the design student: precedent study. The objective here is not to debate whether to integrate precedent into the design education trajectory, rather to closely examine how its assimilation into the immediate and larger logic of learning design occurs, and gauge its evolution through digital processes. Implementing generative functions into precedent exploration caters to an active integration between core ideas of referencing exemplary design models while using their logic as the base to generate various iterations. As generative processes depend on the versioning of a definitive logic (Autodesk, n.d.), it is possible to couple precedent studies and generative digital processing, to establish a hybrid study. Actively modified, instead of remotely referenced, the precedent provides a re-formed logic through generative computational methods.

The project, *Generative Topographies // Liminal Spaces* (Figure 3), demonstrates the possibilities inherent in precedent study coupled with digital tooling and fabrication. It was the first project assigned to freshmen in the architecture and interior architecture programs at the University of Tennessee in the fall semester of 2017. As an introduction to the design process, it directly aimed to familiarize students with design fundamentals including visual logic and presentation tools. Centered on the theme of process being a valued conclusion to design problems, the project challenged two common pedagogical conventions: the sequence and premise of precedent use in design education, in addition to when and to what end digital tools are incorporated in a design student's first project.



Figure 3 | Example of two first year students Ashley Beckman (L) and Corley Kotler (R) fabricated models analyzing formal and compositional elements of Marcel Duchamp's *Nude Descending a Staircase No. 2*, 1912, oil on canvas, Philadelphia Museum of Art, Philadelphia, Pennsylvania, United States.

In the book *Drawing Futures*, Bryan Cantley calls for “discover[ing] the performance logics of how the ideas/drawings behave as opposed to their pure visual characteristics” (Cantley, 2016, p.187). Building on this premise, the project focused on evolving seven selected paintings into three-dimensional spatial constructs through a series of digital and analog processes. The integral employment of these paintings served as the basis for developing an artificial terrain from which students interpolated spatial possibilities. The process permitted the precedent to transcend the reference modality, and generative digital functions allowed students to graphically dissect the layered surface of their assigned painting and interpolate topographies that are derived from the conceptual and compositional logic of the image. While the digital functions enabled the students to design the complex geometries and liminal spaces, it was necessary that this process start with the analysis of the haptic object (the painting) and work towards deriving from its manual brush strokes and accumulated layers a digital topography that expand on the compositional and formal findings of the original painting.



Figure 4 | Wols, *Untitled*; also known as *It's All Over The City*, 1946 - 47, oil on canvas, The Menil Collection, Houston. One of the paintings used in this study.

The project started with a comprehensive research of seven assigned paintings and their artists (Figure 4). Understanding the circumstantial and formal implications of the work at hand, aimed to give the students a glimpse into the creative process of design. Form, whether haphazard or premediated is rooted in the psyche of its author and shaped by the contextual forces of its time, place, and style. Defining their own scope of work, students were asked to identify a 9-inch circle within their assigned painting (Figure 3). They had the option to zoom in or out on a certain portion of the painting, initiating a basic understanding of scale, proportions, frame, and territory. The introduction of raster and vector graphics allowed for various conversions to occur within the layered surface of their selected area of the painting (Figure 7). Such digital processes facilitated a better understating of concepts such hierarchy and figure/ground. Within weeks, students, building on their initial analysis of the painting as precedent while employing their newfound digital skills, extracted contour lines from the painting and generated complex formal interpolations (Figure 5). While their selected area was the starting point for this process, students moved quickly beyond relying on the painting as they designed the liminal spaces between the interpolated layers. Furthermore, they employed a structural grid that

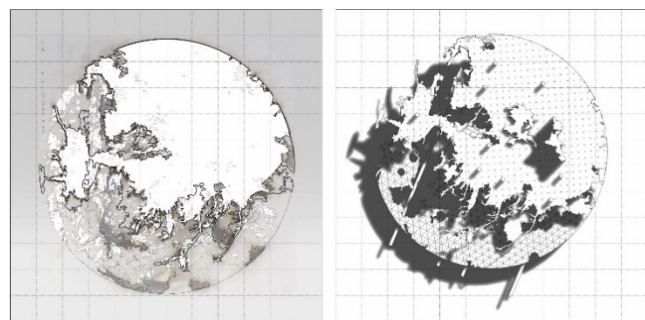


Figure 5 | Student work by Logan Guidera, generative topological study based on Wols painting shown above.

they edited to begin to lift and/or cantilever the components of their generative topographies that they deemed essential to institute the intricate liminality between the emerging forms, folds, and voids (Figure 6).

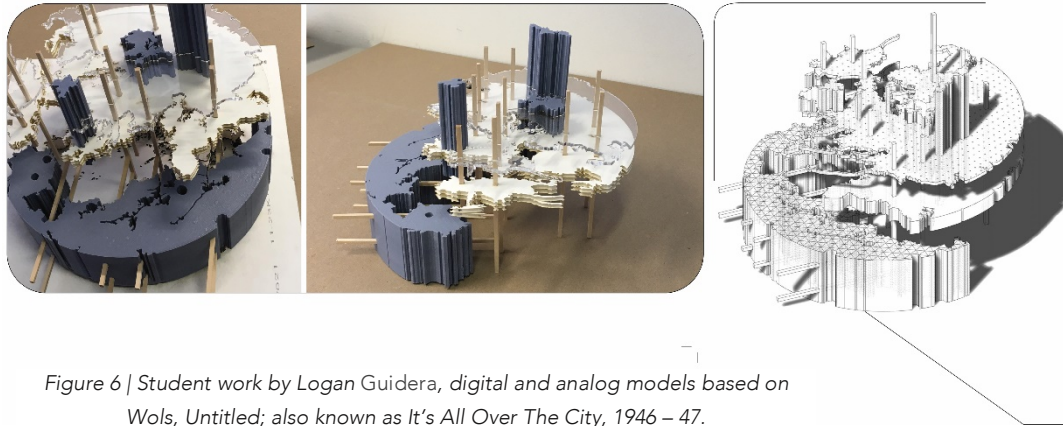


Figure 6 | Student work by Logan Guidera, digital and analog models based on Wols, *Untitled*; also known as *It's All Over The City*, 1946 – 47.

Fabricating a physical output of these studies furthered both skills and design thinking. Developing a tactile formal understanding of their constructs, allowed students to visualize the formal characteristics of the painting while taking authorship of the design. As part of the process, students generated two fabricated models at two integral stages of the project. The first, a laser-cut layered model, utilized vector lines derived from the raster layer analysis of the painting (Figure 7). This demarked the first exposure to the concept of plan and section cuts. In order to be able to laser cut these layers, the vector lines that were extracted from the surface of the painting needed to be entirely well-constructed demarking a closed shape. This is not that different from the watertight cut-lines students are often introduced to when learning orthographic projection drawings. Additionally, understanding and

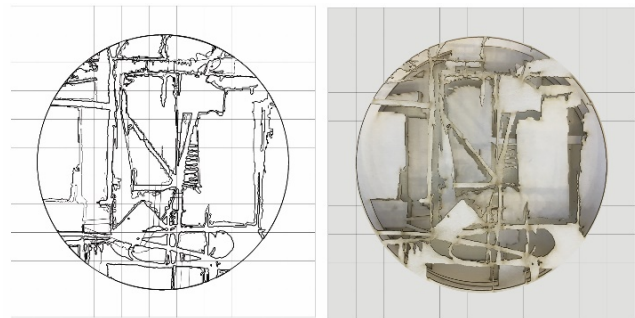


Figure 7 | Student work by Brendan Wallace, delayering the surface of Richard Diebenkorn's *Legion of Honor 7*, 1948. Raster to vector lines study informing a layered analog model.

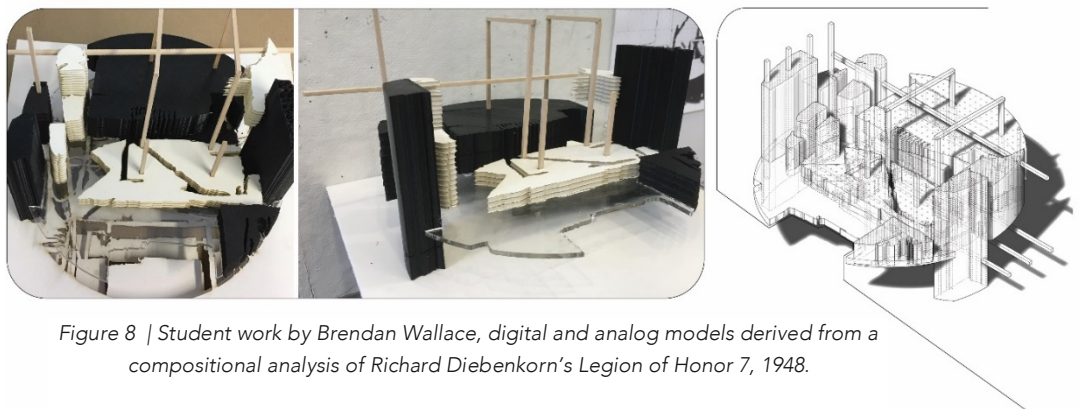


Figure 8 | Student work by Brendan Wallace, digital and analog models derived from a compositional analysis of Richard Diebenkorn's *Legion of Honor 7*, 1948.

utilizing line-weights informed the layers' order and resultant reading (Figure 7). While the second model, a three-dimensional construct (Figure 8), advanced 3D modeling skills and fabrication, its main agenda was to spark a spatial acuity rooted in novel forms and liminality. Often beginning design projects associate with certain forms that veer towards straight lines and pure geometries. Challenging this notion, the project demonstrated that aided by compatible precedents and tools, first year students are capable of metabolizing complex topologies and employing advanced spatial logics.

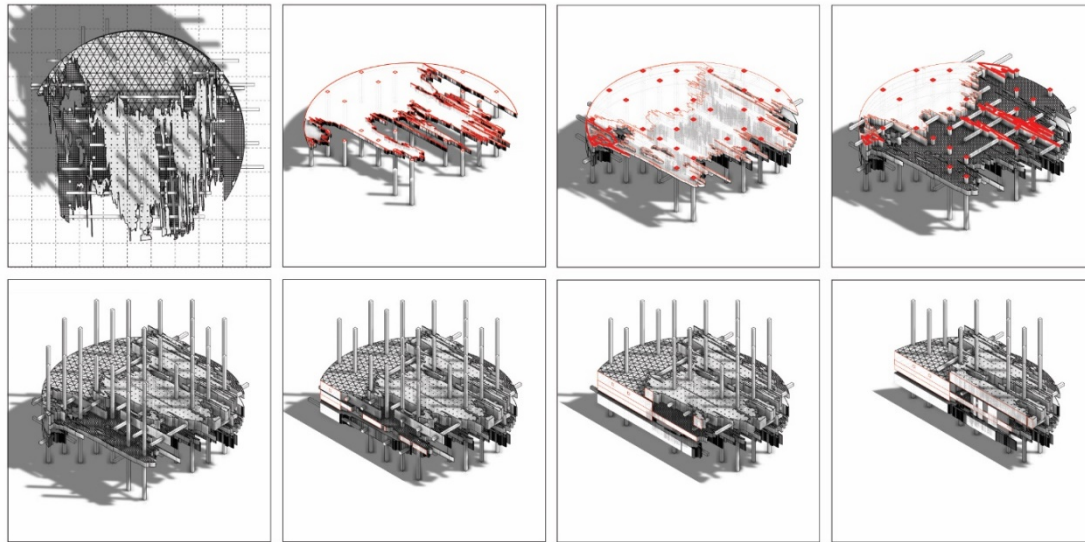


Figure 9 | Student work by Briley Houston, section and plan studies through a digital model generated based on the analysis of Gerhard Richter's FUJI, 1996, oil and aluminum, Dallas Museum of Art, Dallas, Texas, USA

Engaging in this process of analysis, conversation, interpolation, extrusion, and fabrication fostered a comprehensive understanding of design and allowed for the introduction of the more conventional visualization methods such as axonometric views and sectional cuts (figure 9).

Conclusion

The field of design is one that is constantly evolving, as it has to respond to the environments it addresses. Consequently, it is essential that we continually revise the approach to design education and ensure that the structure set in place is one of malleable and responsive properties, constantly subject to review and adjustment. If we carefully examine design and architectural programs leading the educational standards domestically and internationally, one common pattern becomes evident: regardless of the curriculum, objectives revolve around a culture of acute observation, innovative design responses, visionary projections, and dexterity in visual communication skills.

Design students today are amidst an integral transition phase in education and practice. At once guardians of rich design traditions and visionaries of new futures, students find themselves in a globalized setting where the ubiquity of technology is shaping the inputs and outputs of the design process. Within this context, greater responsibility and opportunity rests on design pedagogy. Now more than ever, advocating the active integration of conventions and inventions is essential. The provision of the proper tools needs to take place within new pedagogical approaches that challenge the objectives of first year design education and sets the trajectory and pace for the years to come.

References

1. Alberti, L. B., 1972. On painting and sculpture: the latin texts of De Pictura and De Statua. London & New York: Phaidon Press.
2. Autodesk, n.d. Generative Design. [Online]
Available at: <https://www.autodesk.com/solutions/generative-design>
[Accessed 25 February 2018].
3. Banou, S., 2016. Drawing the Digital: From 'Virtual' Experiences of Spaces to 'Real' Drawings. *Drawing Futures*, pp. 20-27.
4. Cantley, B., 2016. Deviated Futures and Fantastical Histories. *Drawing Futures*, pp. 184-187.
5. Diebenkorn, R., 1948. Legion of Honor 7. [Art].
6. Duchamp, M., 1912. Nude Descending a Staircase No.2. [Art] (Philadelphia Museum of Art).
7. Lynn, G., 1999. *Animate Form*. Hudson: Princeton Architectural Press.
8. Oxman, R., 2008. Digital architecture as a challenge for. *Design Studies*, March, 29(2), pp. 99-120.
9. Phaidon, 2014. How Mies invented modern architecture. [Online]
Available at: <http://www.phaidon.com/agenda/architecture/articles/2014/march/19/how-mies-invented-modern-architecture/>
[Accessed 24 February 2018].
10. Richter, Gerhard, 1996. Fuji. [Art] (Dallas Museum of Art).
11. Smarthistory. art, h. c., 2011. Linear Perspective: Brunelleschi's Experiment. [Online]
Available at: https://www.youtube.com/watch?time_continue=22&v=bkNMM8uiMww
[Accessed 24 February 2018].
12. Wols, 1946-1947. Untitled: also known as It's All Over The City. [Art] (The Menil Collection).