MADE

BY

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Abstract

A chasm instigated by technological advancements has divided architects from the construction industry and is alienating architects from the construction process. This detachment of architects from the arms of the construction industry leaves them displaced from the realities of construction. Concurrently, this detachment changes the architect's relation to material culture. Similar symptoms have become apparent in creative fields that have been subject to industrialization where the role of the maker is divided between those who design and those who fabricate, meanwhile being driven by an industry that demands inhuman speed and efficiency. In contrast, the values set forth by craft-centric ideologies oppose this model in favor of laborious care and skill. Consequently, this ideology becomes perceived as luxury, and often cast aside.

Navigating this landscape, I begin to question the role of making within architecture. Do ideas of craft maintain relevance in a technological era? Are our tools becoming so complex that they enslave those they were meant to empower? Through research into how craft and tools exist today, this thesis aims to redefine fundamental values in making-culture by engaging acts of critical observation and experiential making.
Acknowledgements

First and foremost, this work would not have been possible with the guidance of my advisors Federica Goffi and Sheryl Boyle, whose guidance instilled the courage to forge into extremely complex topics and whose expertise grounded my interests.

Equally vital to the outcome of this thesis are the minds supporting the physical production of these works. Mark Mcguigan and Rob Wood, the two technicians that run the Azrieli School of Architecture woodshop, are responsible for my hands-on knowledge of carpentry and woodworking, and without whom none of this exploration would have been possible. In addition, they have provided invaluable feedback on how craft and tools are perceived and are vital players in the importance of making at the Azrieli School of Architecture and Urbanism.

Josh Van Noy of Van’s School of Blacksmithing has been the driving force behind all my metallurgic and blacksmithing experience, instilling both practical and historical knowledge of the art of metalworking. His instruction has empowered the making of tools and a fundamental understanding of their inception.

During this study several interviews were conducted that were instrumental in developing ideas on craft and tools. Several figures, whose passion in their crafts are exemplary in their respective fields, contributed greatly to pushing my own discourse around the subject. First of these conversations was had with Ozayr Saloojee, Associate Professor and Associate Director of Graduate Programs at the Azrieli School of Architecture and Urbanism, whose embrace of the work and openness allowed expansion beyond the realm of architecture. Second of these interviews, translated and mediated by Federica Goffi, was with Maurizio Varratta, a practicing architect from Italy, whose detail conscious design sense placed understandings of craft and quality within the reality of construction. Last of these conversations was with An Te Liu, Professor in the Master of Architecture Program at the Faculty of Architecture, Landscape, and Design at the University of Toronto, who also practices as a sculptor. His passion not just in making, but in its underlying reasoning, inspired a reverence for the discourse around why we make.
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Fig. 01:  Maker - Made Relation Diagram
A dialogue binds the maker and made through a feedback loop that informs and is transformative in nature. This relationship has implications in how we define the self, and how we interact and connect with both natural and artificial environments. This connection varies depending on the types of tools used, and the maker's level of embodied experience with said tools. Craft emerges through the maker's engagement with the tools (and ultimately the made). This thesis contends that the level of engagement defines the level of craft, and that to understand how something is crafted, one must understand the process of craft. To fully understand a process, one must also be familiar with the tools.

Craft occupies a unique position within the creative fields in that it seemingly is known and appreciated by all levels of the profession and academia, but is it fully understood? In the realm of architecture, the idea of craft is conveyed as an ever-distant ideal which we strive to achieve by understanding and practicing the utmost attention to detailing and assembly. Many equate craft to quality, skill, and care that exudes from work; however, once unpacked, this definition dissolves. We can observe this not at the apex of craft, but at its margins, where the ill-made are categorized as poorly crafted. How do we understand quality? What boundaries exist to define the well-made? Using several examples, this thesis reconsiders the boundaries of craft culture, and what designers value in project making.

There is a strong tendency in the discourse of craft to put traditional practices on a pedestal above modern processes of making. Traditional arts and trades, such as carpentry, sculpting, or blacksmithing, maintain a closer bond with material reality through a direct connection to the material at hand. Therefore, understanding making through engaging traditional methods is the most accessible form of connection with craft and provides the most potent exposure to the making process. These examples help in establishing and understanding craft. I pursued a tactile exploration of this phenomenon through a series of woodworking exercises. The practical application of making as part of this research is, in my view, compulsory for establishing a grounded understanding of the relationship between the maker and the made. Set alongside processes of industrialized making, concepts of craft are tested in a search for understanding how craft manifests across methods of creation. This thesis aims to question whether craft can expand outside the strict boundaries of traditional practices.

In order to understand craft, it is important to explore what it means to have embodied
experiences of craft. These craft practices involve purely the use of your body. However, there are instances where science has broken associative connections between the mind and body. The famous “rubber hand” experiment demonstrates our ability to ‘embody’ objects that are completely artificial, and not even physically connected to our bodies. Anil Seth, a cognitive neuroscientist, goes so far as to hypothesize that our reality - and by extension our perceived tools - are a controlled hallucination, running off feedback and information provided through our senses, but also easily manipulated. If what can be considered ‘embodied’ is more complex

in nature than the extent to which we have control of our limbs, is there a method to inform ‘embodied’ practices using tools that are not hand tools? We can observe a connection to inanimate objects that transcends the corporeal to connect mind and tool. I would like to note that it is not my intention to propose a utopic tool that is neurally connected to the mind of the maker so that he/she can ultimately utilize machinery with his/her thoughts. While it would be an interesting avenue for exploring mechanized embodiment, it is not productive to push a conversation about how people engage with their tools, and in what ways we can alter the current system (now) to accommodate and empower the maker.

When the complexity of the tool increases, so too does the amount of separation between the maker and the made. Consider our bodily tools (hands, eye, mouth), and their uses as the most natural and intuitive tools we have. Craft manifests most easily from this relationship because it is the most straightforward form of engagement with the made. The mind and hand communicate tacitly with materials to instantaneously interact with their behaviors to generate forms. In return, the material also feeds back information to the maker through touch, sight, smell, etc. The made is always a result of a dialogue between the maker and the material.

As the complexity of these relationships increases, the feedback loop that was formerly instantaneous becomes convoluted to the point of complete disjointedness. This increased complexity is spurred by a need for increased scale and efficiency in our systems. Society has developed with relative unawareness of these relationships and this semi-uniformed development has spawned issues now deeply embedded in cultural roots. Ivan Illich writes about how tools enslave the people they were meant to empower, and how these issues take hold in manufacturing, education, and healthcare. I believe that a portion of these problems have risen through a lack of understanding and analysis of the relationship between tools, makers, and the made.\(^1\)

\(^1\) Seth, Anil K. “Interoceptive Inference, Emotion, and the Embodied Self.” (Trends in Cognitive Sciences 17, no. 11 (2013)), 569-571

The two primary ways in which tools have increased in complexity are the technological and the anthropomorphic. The technological development of tools has increased to such intricacy that we have become alienated from them. Although recently we have broken into new technological tools that will surely question the ways in which we interact with our reality, we can trace the technological tool back to its roots in hand crafting. The development of hand tools derived from a need to hone and enhance functions of the hand. To speak further to the embodied nature of hand tools Juhani Pallasmaa writes:

"when an axe or sheath knife is being used, the skilled user does not think of the hand and the tool as different and detached entities; the tool has grown to be a part of the hand, it has transformed into an entirely new species of organs, a tool-hand"\(^3\)

Through this sense of embodiment, a maker can have a similar, albeit more restrictive, connection with materiality that one would have working directly with their hands. Through tactility one can feel the material interaction between the cutting edge of a chisel and the material, guiding it and informing its movements.

At what point did tool technology advance far enough to carve a swathe between the maker and made? We will begin to analyze the evolution of the embodied experience of making to inform our understanding of the alienation of the maker from the tool. As tools continued to evolve and become more powerful, but also more specific in their function, our engagement with them drastically changed. Our ability to connect with tools, and ultimately the made, begins to disconnect as our methods of making become increasingly intangible and disembodied.

Hand tools evolved to power tools, and recently progressed to automated tools. The drill is exemplary of this development. What started as a hand boring tool soon developed into a power drill. Now the drill is used in all manner of automated machinery, most notably CNC machines. Through this evolution the embodied aspect of the tool's use is diminished to the point of non-existence, which fundamentally changes the relationship between the maker and the tool. Because the use of this tool is no longer a corporeal exercise, it is incapable of allowing for an embodied experience. How then, can we begin to repair this severed connection between the maker and the tool?

In the anthropomorphic sense, our tools have grown simply because the scale of knowledge needed to operate more complex tools becomes too overwhelming for

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an individual. A prime example are the structures that govern construction. With specialization, communication between moving members, whether between tools or between people, become increasingly important. The issue is not that the growing complexity of architectural projects requires the knowledge of an increasing number of professions; rather, the ways in which communication links and guides these other arms is vital to the success of any project. As the tools and systems become more intricate on both macro and micro scales, what was once a singular profession breaks down into finer areas of specialization. The result is a slew of new professions that need to be coordinated to perform what used to be the task of one profession. This new condition implies the necessity for a new form that operates at such a scale, physically and organizationally, that it demands a new understanding of how it is meant to be used. An example of this is the advent of BIM (Building Information Modelling). Already ubiquitous in the construction industry, it is an extremely powerful tool for organization and design. Because it has so many functions and its operation are so complex, it has spurred the creation of new professions specializing in its use. Administration has become vital to the coordination of these various professions and the integrity of project execution can drastically be affected by it. Through this organizational and administrative structure, people have become part of the tool as it is used by others.

Being aware of the feedback loop that occurs through tools, and the made, also means to understand these systems. So how can we begin to bridge this gap? How does the convivial tool manifest in our current landscape? How do we empower makers by connecting them more closely with tools, and in what ways does this happen?

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4 “I choose the term “conviviality” to designate the opposite of industrial productivity. I intend it to mean autonomous and creative intercourse among persons, and the intercourse of persons with their environment; and this in contrast with the conditioned response of persons to the demands made upon them by others, and by a man-made environment. I consider conviviality to be individual freedom realized in personal interdependence and, as such, an intrinsic ethical value.”
How - To

This thesis has followed two simultaneous paths of exploration into the realm of making to further understand the nature of our relationship with the natural and built environment. These two explorations are presented in alternating page sequence and were experienced in parallel. There is a long-standing separation between the doing and the thinking when considering methodologies of research. In this thesis I attempt to trace this discourse to understand issues that lay at the root of this condition.

The pictoral side of the thesis document displays the making process undertaken throughout the thesis year. To fully immerse oneself into the study of craft an engagement with the act is imperative. As such, I partook in an improvisational program meant to probe and open perception to making. While offering some procedural insight as an introduction to each project, this documentation goes largely unnarrated. In contrast to the verbalization of concepts presented on the right side of this thesis document, making usually occurs in silence, and manifesting this silent process of making through writing would be a disservice to the meditative qualities of action. Thus, the written portion of the thesis document represents a formal meditation on making. Distilled into two parts I investigate making through the lenses of craft and tools.
Fig. 02: Assembly Room Wood Preparation
Richard Sennett briefly describes “craftsmanship” as “an enduring, basic human impulse, the desire to do a job well for its own sake.” He continues through his book, *The Craftsman*, in an anecdotal manner, painting an image of craft nature through the stories of master tradesmen throughout history. Many if not all his stories are vocational, identifying craft as it manifests through different aspects of professional practice. The array of professions he touches upon ranges from glass blowers to surgeons. This method proves a useful strategy for portraying craft because so much of the subject is non-verbal, and experiential. In fact, only through post-analysis do we recognize something as well-crafted.

What makes a project ‘well-crafted’? A high level of skill and proficiency is conducive to craft; but even a skilled craftsman, under certain circumstances, can produce ‘poorly-crafted’ work. This occurs frequently in the economy driven-manufacturing processes of today. Rather than scrutinizing the skills of the creator, focusing instead on the process and the product would reveal more about the variations in quality. As previously mentioned, Sennett simply defines craft as “doing a job well for its own sake.” ‘Doing a job well’ infers depth of knowledge on said job, but also the attention and awareness needed to perform it accurately and correctly. In this the maker is fully engaged with the work, putting necessary attention into every aspect of the project. It is here I propose that craft manifests through the levels of engagement with any said project. To make through an engaged process is to craft. To further probe this idea, we can observe how craft occurs in the act of making.

Craft is observed as an embodied skill, frequently associated with traditional practices. Within the realm of architecture, ‘well-crafted’ buildings are tied with trades and practices that have been passed on for generations. On the other hand, the word ‘craft’ is now used to describe actions and objects that are not necessarily physical in nature. Sennett writes about craft in the realm of software engineers, showing how code is ‘crafted’ and admired by people in the industry. In an interview I conducted with Mark MacGuigan, the shop keeper at the Azrieli School of Architecture and Urbanism, he talks about craft manifested through design work. Design certainly takes many physical forms but is not limited to the tangible. For the sake of understanding this phenomenon

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Fig. 03: Mortise Details
we need a more appropriate lens in which we view craft that encompasses more than purely corporeal practices.

These divergences between traditional and contemporary qualities of craft reveal contradictions within not only the nature of craft, but in the act of intellectualizing it. This treacherous academic terrain demands investigation into the methodology in which we documented and convey these ideas. An important distinction to make when scholars attempt to push the discourse about making, is between the study of, and the study with. Tim Ingold depicts this difference in terms of the separation between anthropology and ethnography. This fundamental distinction between theory-driven research and research through making lies at the heart of craft discourse, and understanding it is vital to understanding craft as a contemporary phenomenon.  

Craft | Tradition

When one mentions craft it is usually followed by an example of a traditional art; carpentry, pottery, blacksmithing, etc. These practices demonstrate, and in many cases have become the poster child, for a high-level skill. An obvious way to initiate this search would be to begin with understanding these practices and why they embody craft.

Hired for free-lancing work, I had the pleasure of visiting several Japanese businesses for a project spotlighting Japanese diaspora within North America. The first place we documented was a furniture and interiors shop, Miya Shoji, located in New York, and established in the late 1940’s. This shop adhered to a traditional practice of carpentry tied to the owners’ Japanese heritage. Their woodshop was a treasure trove of woods all at different stages of finding their form at the hands of a master carpenter. Smells of wood lingered in the air, the entire shop littered with finely detailed pieces, some by human hands, but all by nature. The carpenter did not speak English well, but from his few words he relayed that carpentry ran deep into his family’s history, comprised of generation upon generations of wood workers. Surely when one contemplates the hand-made, their contemplations come to rest in an environment such as this. The work exemplified not only a mastery of tools, of the hand, and of process, but also an acute awareness and dialogue with materiality whose presence could be read in the grains of their assembly. The precision and sensitivity practiced by the woodworkers

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Fig. 04: Tenon Process
here was a tribute to generations of accumulated knowledge and tradition.

However, this carpenter was not the face, nor the owner, of the shop. The shop was owned by a father and son, Hisao and Zui Hanafusa. Hisao, the father, also trained as a carpenter, albeit for a shorter duration, but whose first profession was that of an artist. His son, Zui, was raised in New York City, and studied business. Both owners and the shopkeeper spoke modestly of their work and of their processes. Although they understood the values of preservation not just of wood working, but of Japanese culture that was maintained in their practice, they seemed unconvinced of the intellectual depth of their work. The reality of their practice was first and foremost a business, although humbling to observe, it questioned the reverence craft holds in the design community.

Practice

To concretize ideals of the embodied and traditional aspects of making I undertook several projects of my own. The first project was a bench. This bench consisted of several simple joints that could be constructed without the use of fasteners or adhesives. The purpose in this exercise was to understand this knowledge through tactile and practiced experience. As Ingold would say, I was setting out to learn from the inside rather than from the outside. The desire was to improve my capacity to design at minimal proximity to the material. To understand the process of designed and built furniture there were several resources at my disposal. The woodshop at the Azrieli School of Architecture and Urbanism, and those responsible for it were instrumental in any success in this venture. In addition, several books on traditional woodworking were consulted to understand not just the steps to build the bench, but also how to wield the tools. As a luxury afforded in today’s culture, much research was done through the internet as well; in the contemporary dissemination of knowledge, the internet as a resource cannot be understated. I had to cover basic material understanding, posture control, and techniques.

“One can work, think, and discover without any strategy at all”

- Michel Serres  

Fig. 05: Mortise Paring Process
The selected material for this project was poplar. It is considered a hardwood, but among hardwoods, it is relatively soft, and it was an excellent type of wood to learn with. My choice in working with wood chronicles from my long-standing interest in the material. During my formative years as a designer, enticed by the complex variance inherent in wood, I began shaping small projects. Trinkets, rings, small utensils, it was an exploration into shaping the most basic forms from wood. As time passed this interest evolved into an obsession. In architecture school we are taught to revere materiality as a vital component of design, but it is never mandatory to physically engage with it. This fetishization seeded a desire to understand how we have come to manipulate the material reality around us. Prior to writing this thesis I enrolled in basic carving classes to understand the use of hand tools and reading materiality. This project is a continuation of these desires.

Craft | Engagement

False Binary

How can we begin to unpack preconceived understandings of making into a coherent framework from which to analyze a core value in the creative industry? To map even the most complex of operations we must first reduce the scale of making to its most fundamental idea. Making generally falls under a scrutiny not appropriate for fully viewing it. In academic realms, understanding and measuring quality of product is an act of post processing that is counterproductive to genuinely recognizing craft. This generates a sort of linear scale, which brings us to an assumption of the existence of well-made, and poorly-made objects. Casting aside ideals of quality for gauging the importance of making allows a broadening of, and fuller comprehension of essential qualities inherent in making. When these are broken down, we can then understand making simply as an act of engagement.
Fig. 06: Bench Pre-assembly
To explore the concept of this false binary, we can observe how measuring quality fails in achieving the very goal it sets out for itself. The obvious upper limits, things considered well-made, are easy enough to appreciate, but looking at objects that would fall under the category of ‘poorly made’ becomes a much more tenuous exercise. For instance, within the realm of architecture, the explosion of condominium tower construction has made it the poster child for ‘bad architecture’. This is because it foregoes many important design considerations that buckle under a necessity for speed and efficiency. Ultimately governed by pre-existing standards and the modularity offered by a competitive construction market, everything from the organization of floors to the size of the windows, to the lighting fixtures, are selected in a rigorous process of product selection. The consequence of this efficiency is that the entire condominium industry begins to settle into these systems and projects can be churned out at inhuman pace. However, to claim these as poorly made and to be without quality, would be a gross misunderstanding of the processes behind its conception. The construction of such a project is bound tightly to heavily regulated systems because the scale and potential economic and social liabilities are so great. In these systems, and behind every component therein, are legions of engineers, law makers, designers, financiers, and consultants who work to master an understanding of the safest ways to erect these towers. Every system, and every detail, expresses a management and anticipation of natural and manmade forces that would act on said building. If we look at a fenestration detail, we can see the amount of calculated precision that is required to not only understand but also execute the production of these systems.

This demonstrates a developed skill that can easily be categorized as ‘well made’. At closer inspection what seemed to be ill-made exudes a careful attention to detail. If this is the case, then what really can be considered ill-made? Defining the extreme cases (well or poor) are easy enough, but in drawing assumptive conclusions the definition falls in on itself. While architecture exists as one of the more complex situations this contradiction can manifest, we can observe this phenomenon at any scale of making.6

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6 Take, as an alternate example, a macaroni drawing done by a child. While by the standards of professional sculpture or art it may seem trivial, from the perspective of someone exploring the use of this medium, of expression, for the first time, one could argue that it exudes a skill and care, and that it is well-made. Although their mastery of paste, card, and macaroni are infantile, they practice these skills to the full extent of their ability.
Fig. 07: Rig Joint Sawn with Ryoba Saw
Many of these contemplations (re: the ‘well-made’) arose from my own attempted practice in woodworking. I was a novice and in trying to conceive simple joinery, inexperience made itself apparent. Displayed in the reserved off-cuts from my first attempts, the joinery was not well-made. The sides were not straight, and the faces were at different angles. It was paramount to the exercise that everything be done by hand, and so things that would have been done more accurately on a machine took on cruder forms. This exercise was a demonstration of the dexterity and skill required to manually conduct these tasks and to engage with this knowledge through practice. Trying to distill the value in what I was exploring, as an avenue to understand craft and its importance, I frequently asked one question: is what I am producing ‘well-crafted’?

Linearity

If linear scales of quality fall short in understanding the made, how then do we address this phenomenon? Not only is this measurement inadequate, but it also attributes false value to objects that can fall victim to fetishistic tendencies. Whittled down to its fundamental ideal we can analyze making through the acts of engagement that occur through the project. Rather than measuring on a scale, we remove the scale altogether. Once one begins to engage with more involved aspects of their project, their process can be seen to be increasingly crafted. From this lens we can trace the claim of something as ‘ill-made’ to reveal where and why these statements originate. In our example of the condominium tower, the perception that it is ‘ill made’ comes from the perception of a ‘lack of engagement’. 
Fig. 08: Removal of Rig Joint Wood
Drawing an analogy between engagement and our understanding of temperature helps describe this understanding of engagement and craft. The most common measurements of temperature are Celsius and Fahrenheit. Attributed to both these measurements is the capacity to have negative values. Our understanding of these scales can be simplified as: if it is above a certain measurement it is hot, and below it becomes cold. This gradient is like the measuring of quality, but as we discussed earlier the idea of ‘ill-made’ is subjective, as is the idea of cold. We have a perception that ‘cold’ is not just an absence, but also the opposite of hot. In reality heat exists not just at warmer temperatures, but in colder temperatures as well. The thermodynamic temperature scale of Kelvin more aptly represents measurements of heat. Zero degrees Kelvin (roughly equivalent to -273 Celsius) is the absolute absence of heat and is technically the lowest temperature possible. In this scale even temperatures perceived as cold are all still measurements of heat. Similarly, even when a project is perceptually ill conceived, there exists engagement and well-made elements. Rather than use ‘craft’ as an umbrella term to vaguely encompass the total quality of a subject, it is better used as a catalyst for understanding the process of how the subject comes about, how it is made.

In dismantling forms of measuring quality, we establish that the well-made can manifest in any engagement with a project. This understanding of engagement brings us into a philosophical impasse in the execution of a thesis. Traditionally to write about, or intellectualize, requires an observation from a distance. But as established, this too is an act of engagement. This dualistic view of needing to be from within and from without questions the methods in which we can engage, from an academic standpoint, with this topic. Navigating this intellectual terrain demands both an openness and exploration into the lenses with which we document and record making.
Fig. 10: Rig Assembly
Craft | Methodology

The methodology of documentation is vital to making because the ways in which it is traditionally discussed and shown prove to be not only insufficient, but detrimental to its discourse. Paradoxically, the traditional study of craft has difficulty in consolidating thinking and doing, yet both are vital to its understanding. To write about making is to externalize yourself from it thereby creating a distance from the making with the writing; whereas making demands an immersion and engagement with the process. Because of this distancing, the intellectualization of craft tends towards fetishism or romanticism.

Thinking & Doing

Tim Ingold writes similarly about the differences between anthropology and ethnography. “Anthropology is studying with and learning from; it is carried forward in a process of life, and effects transformations within that process. Ethnography is a study of and learning about, its enduring products are recollective accounts which serve a documentary purpose.” Both have the potential to uncover hidden truths in the realm of making but this is not to say that one methodology trumps the other. In fact, the point Ingold makes is that they are different, and it is vital to understand this difference. The ‘studying of and learning about’ methodology is well established in the academic realm (as it is the dominant form of study) but ‘studying with and learning from’ is more difficult to justify because the results do not always manifest as product, written or otherwise. As such, its lineage becomes harder to trace. An example of this are practices that are taught through apprenticeship, which are not always recorded, and are passed on orally. Despite this, many believe, and are discovering, the potentials of this form of study. In her essay “Curious Methods”, Karen Lutsky recounts her expedition in practical and tangible methods of research, advocating for their legitimacy not in its ability to establish known forms of knowledge, but to explore new ones.

“We didn’t come here to extract meaning but to ask questions, to probe the environment. We came to meet the mud, not as a thing, but as a material condition. … Proving glorifies a finite “truth” and shuts down the process of inquiry by which knowledge grows deeper and changes over time. Probing, on the other hand, involves active engagement with ambiguity and instability. It implies both a curiosity and a situated context for that curiosity. It requires engagement and experience.”

The former is obviously important for the concretization and furthering of collective knowledge, but the latter proves to be equally vital in the advancement of any study by opening new avenues of discovery. This separation between the learning from within and from without are defined in Ingold’s understanding of anthropology and ethnography, but it becomes more contentious when discussing making. This is because the act of learning from within equates to engagement, in other words doing; and learning from without, ‘the study of’, or to intellectualize, relates to thinking. This ‘thinking’ correlates to a Cartesian idea of contemplation when it is divorced from the act of making.

In the discourse of making there remains an animosity between the discourse and the making. Inherent in the thinking of making we infer onto an object’s meaning that which lays outside the realm of making. In Karen Lutsky’s essay she quotes a polemic position by Michel Serres who demonizes the academic practice for its distance from the reality of their study.

“Criticism has white hands. For a long time, it has been described, rightly, as always at its ease. It’s better to do than to judge, to produce than to evaluate. Or, rather, it’s in mining coal that one learns if it is gray or black. It’s better to create than to criticize, to invent than to classify copies.”

Just prior to this quote, Serres briefly talks about the position of academics as judges who separate themselves from the topic at hand for the sake of removing bias. Several times during this interview with Bruno Latour, Serres conveys a strong aversion towards the academic institution and methodology.

Fig. 12: Sanding of the Handle (above) and the Chisel (below)
He demonstrates the importance of engagement as a form of research and learning. While I agree with Sennett’s justification of engagement as a viable form of research and learning, it is challenging to agree with his disdain for the academic institution.

Theatrics

“all the world’s a stage, and all the men and women merely players.”

-William Shakespeare

Where the methodology of this paper becomes entangled is in how we have come to establish craft as engagement, which stands in opposition to the perceived separation between the academic and the craftsman. To practice craft is to engage with the subject, but to theorize demands a distancing. To observe or study implies space between the subject and the viewer. Richard Sennett uses theater, and the division between actor and critic, as an analogy for this separation. He describes the performer evolving into a group that acquired skills of costume, speaking, and movement, and the audience developed their own skills of interpretation. But there is a craft in writing and in research. So, we are ‘crafting’ while studying craft. This ‘schizophrenic view point’ means that to write a thesis we are obliged to externalize ourselves from an inherently interior perspective. How do we draw this division then between the actor and critic, or the academic and the craftsman? Sennett ties the realm of thought and performance in recalling ancient Greek theatre. The archaic theater housed a “little divide between spectator and performer; seeing and doing; people danced and spoke, then retired to a stone seat to watch others dance and declaim.” Intertwined, these two realms represent crucial aspects to the study of making, and neither holds more value than the other. I maintain that the goal of this is not to externalize oneself; in fact it is not about being in one place or another, internal or external. Rather, it is in looking at the relationship between these ‘worlds’ and understanding the divisions or overlaps that one can better grasp the nature of making. Creating a paper on craft is both thinking through making and making through thinking.

Inevitably concepts of concealment interplay within these theatrics. The spectacle of theatre can equate to the spectacle of making. To an observer, the performance (either of theater or making) is a display of the seemingly impossible. This ‘illusion’ is

10 Shakespeare, William. “Julius Caesar, Act III, Scene II [Be Patient till the Last]
12 Ibid
Fig. 13: Truing Chisel Surface using Diamond Stone 100 grit
guided by structures, either smoke and mirrors, or just years of practice and technique, that are hidden to the observer. This is a dimension that is latent in all creative fields. For my process, what is revealed in my work happens through documentation, since the readers of this thesis are not observing me make directly. It was important to avoid altering the process of making to accommodate its documentation, thus contaminating the process to cater towards said documentation. My response to this issue was the creation of a rig, that could mount a time lapse camera and record the process of carving without having to interrupt it. My focus in making these epistemic objects was to forward my own contemplations on the topic, and my understanding of craft and tools. It would have been problematic to constantly be removed out of this stream of making-thinking. Tim Ingold better describes this form of investigation:

“here every work is an experiment: not in the natural scientific sense of testing a preconceived hypothesis, or of engineering a confrontation between ideas ‘in the head’ and facts ‘on the ground’, but in the sense of praising an opening and following where it leads. You try. Things to see what happens. Thus, the art of inquiry moves forward in real time.”

In this same passage Tim Ingold points to anthropologist Hirokazu Miyazaki and what he coined a ‘method of hope’.

“To practice this method is not to describe the world, or to represent it, but to open up our perception to what is going on there so that we, in turn, can respond to it.”

Although most discourse tends towards either the thinking or the doing, both are vital to research. Doing, and engaging with making, allows an openness that expands our perceptions of a subject, while the thinking—the intellectualization of aids in formalizing ideas. Especially in discourse on craft, many thinkers find themselves defending field research as a viable form of study. This exacerbates the division between thinking and doing. Ultimately, it is unproductive to neglect either side as both have a role in the study of making. To engage with this study is to contend with this dual nature, and it is imperative that consideration be given to the condition of this discourse to navigate it properly.
Fig. 14: Turning Chisel Handle on a Metal Lathe
Book II: Tools

The embodied practices of making cannot be understood without also understanding tools, how we use them in relation to our body, and how these tools act as an extension of our limbs. A desire to fully engage with tools spurred the making of my own chisel and prongs.  

The tools I created at a blacksmith’s shop are prongs (above) and a chisel (below). The prongs are used to grip objects for heating in the forge. The V tipped prongs specifically allow for a holding of objects with a certain radius and profile, optimized for objects such as chisel tangs, or knife blades. These prongs were used to hold the tang of the chisel while heating it. The chisel was formed by forge welding two different steels, one layered on the other. Using borax (a glass compound) to draw out the oxygen between the layers, it was heated then hammered to bond the two materials together. Afterwards, the tang was quenched in oil and annealed at lower temperatures to harden and preserve the steel’s durability. The rest of the chisel was formed and finished on Carleton campus. The tang was shaped with a combination of belt sander and hand grinding on a diamond stone. The bloodwood handle, a species of hardwood native to South America, was turned on the metal lathe. The ferrule, which keeps the wood from splitting when doing impact intensive tasks, was purchased from Lee Valley Tools.

To gain knowledge and access to resources needed to undertake this project, I registered for a fundamentals blacksmithing course at Artist Blacksmith located in Cargill, Ontario. This program covered basics in managing forge temperatures, gauging steel temperature by eye, and primary shaping techniques. In this course the students produced several decorative ornamentations, but also created tools for blacksmithing.
Fig. 15: Red Cedar Blank on Bench
To understand making it is imperative to understand the connections between the maker and the made. This zone between the two is the domain of our tools. But the domains of maker, tool, and made overlap in ways that give insight into how we interact with the world. How have we come to define tools in proximity to the body and as their own made objects? In this section I explore the character in which tools mediate between the maker and made.

Tools | Embodiment

The embodied practices of tradition are indicative of quality and thorough familiarity with said practices. Many of these traditional practices involve handmade processes. Some would say that there is no more intimate form of making than working with your hands. The proximity between intention, hand, and material allows the maker complete fluidity in wielding form and provides a direct feedback to and from the material world. Forms of this feedback are exemplified in many types of practice that extend beyond the handmade. Embodied skills are perceived to be an internal phenomenon, a practiced skill nurtured in one's self, but embodied knowledge is only exercised in the body's relation to external reality. For this reason, we must understand embodied practices not just as 'bodily' practices, but as a connection and understanding of material reality.

“To know how to touch type is not, then, to know, the place, of each letter among the keys, nor even to have acquired a conditioned reflex for each one, which is set in motion by the letter as it comes before our eye. ... It is knowledge in the hands, which is forthcoming only when bodily effort is made, and cannot be formulated in detachment from that effort”

-Merleau-Ponty

Souheki, owner of Setsugekka, is a tea master who immigrated to the United States and performs tea ceremonies in New York. She was trained in a traditional setting in Japan, and observes the strict ritualistic practices of the Japanese tea ceremony.

15 This implies minimal obstruction between hand and material, which points to traditional forms arts and trades such as pottery, carpentry, or blacksmithing.

Fig. 17: Roughing Shapes with Hammer Chisel
In her shop, her art lays not in the object, although the product of this ceremony can be considered art, but in the act of making. In this we find quality in the engagement with the ceremony. Pure concentration and performance embody these ideals of quality to produce something that is reflective of its process. To understand how something comes to be ‘well made’ it is imperative to be equally sensitive to the processes by which things are made. In her process, full awareness of the most minute motions and sensations dictate the height of her craft; not just in comprehension of the technical aspects of the tea ceremony, but in how those steps are executed, which determines the success. During the ceremony there is a heightened awareness of the moment-ness while both observing preparation and drinking of the tea. To be fully immersed in this the tea master must exercise awareness of her posture, awareness of her technique, awareness of the participants, and awareness of the atmosphere around her, all while being fully present in the performance of this ritual. Its elegance manifests in its simplicity but masks an intensely intricate concentration.

Embodiment | Internalized Tools
(how the hand is a tool)
Setsugekka demonstrates not only that the tea master’s skill in ‘wielding’ tools of the tea ceremony, but also in ‘wielding’ the body. Both these elements (the tool and the body) are internalized and act as extensions of each other. In this ceremony we can observe tools not only as extensions of the body, but as being instrumental to dissolve the segregation of objects, tools, and the body; tools are not separate from us in the process of making. Beatriz Colomina goes so far as to pose that one of the defining traits of humans is our interdependence on tools and vice versa.\textsuperscript{17}

In the exploration of body tools, I constructed a bench that consisted of fourteen mortise and tenon joints. Made up of basic hand cut joints, this bench was designed not just as functional furniture but as an exercise in learning wood carving techniques. Some of the most basic moves include boring holes, then flushing the corners of the mortise joint, and measuring and paring down the tenon’s so that they fit precisely into the mortises. The fit must be snug for the joint to have the strength to hold without fasteners.\textsuperscript{18}

\textsuperscript{17} Colomina, Beatriz, and Mark Wigley. Are We Human? (Ennetbaden: Lars Müller Publishers, 2017), 23

\textsuperscript{18} Having taken carving classes I was familiar with using tools to sketch in wood, but to challenge my own capability I wanted to refine my hand and push the sensory responsiveness experienced when interacting with wood.
Fig. 18: Rounding Surface with Hammer Chisel
As I produced more joints and accrued a comfort with the tools, I began to focus less on how I was wielding the tool and more on how the wood was being manipulated. This resulted in two things: I was faster, and I was less conscious of the tool, as an extension of the body, and more so of the material. Pallasmaa quotes Serres to eloquently describe this phenomenon: “The tool is an extension and specialization of the hand that alters the hand’s natural powers and capacities. When an axe or a sheath knife is being used, the skilled user does not think of the hand and the tool as different and detached entities; the tool has grown to be a part of the hand, it has transformed into an entirely new species of organs, a tool-hand. Michel Serres, the philosopher, describes this perfect union of an animate and inanimate element eloquently: ‘The hand is no longer a hand when it has taken hold of the hammer, it is the hammer itself, it is no longer a hammer, it flies transparent, between the hammer and the nail, it disappears and dissolves, my own hand has long since taken flight in writing. The hand and thought, like one’s tongue, disappear in their determinations [...]’

There are many other phenomena that are exemplary of the blurred boundary between the external and corporeal realm of tools. Anil K. Seth, a professor of Neuroscience at the University of Sussex, has explored in his research ways in which the mind perceives bodily experience through external objects. Citing the famous ‘fake arm’ experiment, he shows how, through strictly ocular means, the mind is tricked into perceiving tactile sensation through a prosthetic limb. In this experiment, one of the

Fig. 19: Refining Geometry
subject’s arms (which are laid to rest on a table) are removed from their view via a black screen, and in its place, a rubber arm. Through a series of exercises the subject begins to experience tactile sensations ‘through’ the rubber arm.20 Although conducted in a sterile manner, this phenomenon isolates the sensation of the internalization of objects to the body. This, like many other ‘phantom limb’ experiments, further reinforces and recontextualized the relation between a craftsman and his/her tools. In Beatriz Colomina’s book, are we human?, she points to the growing paradigm of prosthetics becoming part of the human body, as we see in the growing interest in body altering technology.21

Embodiment | Externalized Thinking

(importance of externalized ways of thinking)

It is easy to mistake embodied knowledge as a focused understanding on how knowledge is practiced within the body and its operations. Crucial to portraying this concept is the relationship between bodily knowledge and the external reality on which it practices. We can understand embodied knowledge not as an internalized phenomenon but as one of fluid connection between maker and made. Pallasmaa writes in a chapter titled ‘embodied thinking’ about our ability to think and gain knowledge through a probing of the physical world and essential thinking through tactile means.22 He makes a case for the practice of embodied exercise not just as performance, but as a form of cognition, and exploration. Ingold makes a case against the internalized aspects of embodied knowledge, which is supported by Pallasmaa’s portrayal of interaction as vital not just to making, but also to design processes. “Of course, we have bodies – indeed we are our bodies. But we are not wrapped up in them. The body is not a package, nor ... a thing into which movements settle like sediment in a ditch. It is rather a tumult of unfolding activity. As such, ... it is something to think from rather than about.”23 He continues to rebuild an understanding of embodiment by reinterpreting the body by its object qualities, as a thing, and implied, as a tool from which we think.

21 In the chapter “The Unstable Body” Beatriz Colomina writes about this phenomenon. Starting with bodily prosthetics but expanding to social media and other consciousness-expanding tools. She continues to explain how these tools have become part of the human condition. Colomina, Beatriz, and Mark Wigley. Are We Human? (Ennetbaden: Lars Müller Publishers, 2017), 23.
22 Pallasmaa. The Thinking Hand: Existential and Embodied Wisdom in Architecture, 106-120.
Fig. 21: Sawing off Excess with a Ryoba Saw
This evolves the conversation of embodied knowledge as:

1) not a static pool of knowledge, but rather constantly growing
2) less about corporeal ability, and more so about how we externalize our thinking processes

Using prime examples such as Setsugekka provides insight into the world of embodied knowledge in practice, but having made things in my own terms, and having chosen to conduct research into the topic, has painted the object-nature of tools in a different light for me. It is important to recognize embodied practices not as something internalized and isolated in nature, rather, embodied practice is a strengthening of the way the body interacts with material reality. Beatriz Colomina goes so far as to say that the basis for humanity stems from this interdependency with the things we make.\(^{24}\) This concept poses not only our connection with the objects we make, but our own necessity in making. Making, as a connection to material culture, becomes a crucial part of our cognition. To perceive thinking as an act of the mind divorced from the environment is to neglect the essential synergistic connections to the external world.

Tools | Field of Intent

The understanding of tools through their materiality and form – their object qualities - represent only a fraction of its totality. It is important to investigate other elements vital to understanding how tools operate within the world. This categorizes tools as something separate from our bodies. What defines a tool, beyond its object qualities, is its use. Moving forward I interpret this ‘use’ as ‘intent’. I make this distinction because the term ‘use’ implies a unidirectional relationship between the maker and the tool. Whereas ‘use’ implies an externality - a result of some preemptive motive. ‘Intent’, in turn, IS that motive. This motive that precedes the action is important to understand as also reactionary to feedback given by tools and material.

The debate of whether intention is premeditated, or a result of unfolding processes leads back to investigations of some of the oldest known tools. Ingold traces this discourse to an example of the prehistoric Acheulean hand axe. These are the oldest

\(^{24}\) Colomina, Beatriz, and Mark Wigley. Are We Human? (Ennetbaden: Lars Müller Publishers, 2017), 23.
Fig. 22: Removing Excess with Gouge
known hand axes found throughout the world, some of which date as far back as 1.6-1.7 million years old. In referencing the genesis of this tool, Ingold poses a debate surrounding its inception. He questions whether Homo erectus had preconceptions of its form and thus brought it forth into reality; or, whether its form could have been a result of routine, and an 'expression of instinct.\textsuperscript{25} His conversation of preconception and making extends into different realms of discourse: theories of evolution, watchmaking, and architecture. Through this discussion, he champions a union of design (preconception) and the making; advocating the necessity of both in creative fields.

Intent naturally has a preemptive connotation. Its use is predefined by some consciousness or individual and it is assumed to live in the mind of the maker; some divisive design. However, this thesis has established that what resides in the maker can bleed into the definition of tools. To analyze its use, one needs to recognize that any tool is governed not just by the intent of the individual, but also its latent characteristics and materiality. The feedback of the tool, and of the material it is acting on, and the attributes of both, affect, bend, and intertwine with the actions of the maker because both the tool and material have biases that act on the maker as much as he/she does with them. The marriage of these three elements -maker-tool-material- forms a field of intent; this field mediates between maker and made and comes to define the tools.

Intent | Object

Materials are the reality that coalesces around intention, embodying forms through acts of will and the ingenuity of human intention. The axe head, made from a melding of iron and carbon (in its most basic composition), is brought to form through precise processes of heating, impacting and folding of the steel. The handle is then carved from a domestic hardwood. These materials come together to form the object of the axe, but the nature of these materials must be considered prior and post use/intention. The constituent lifespans of the metals, carbon, and wood exist beyond the use of the object, an axe, and will carry on long after. For this brief time in their eternal history, they meet to become an axe. This is not to say that the material is completely at the whims of human intention, for the material is latent with its own nature and intention.

When woodworkers say that they must be able to read the material or sculptors say that they ‘revealed’ what the marble block wanted to be, this is an attunement that the

\textsuperscript{25} Ingold. Making: Anthropology, Archaeology, Art and Architecture. 36.
Fig. 23: Sharpening Chisel on 4000 grit Waterstone
maker has with the material. As a renowned furniture maker, George Nakashima writes on the awareness that is demanded of skilled woodworkers. Displaying a sensitivity to this material process he reflects on the life of wood, and the role of the woodworker within this realm.

"Man can participate in the world of silent nature. To take part is to join in a creative process. ... To care for the woods is to witness all: nature unfolds, the seasons pass, creatures make their livings, the footprints of nature’s great variety appear on the new fallen snow."\textsuperscript{26}

Nakashima continues to recount the goings-on in the woods, following natural processes that constitute the life of a tree. He underscores the nature of material both in the charge of woodworkers, but also as its own existence.

Ingold references Gilbert Simondon, a French philosopher, who recognized this material process even within more mechanical procedures. In specific reference to brick-making, the act of imposing form onto the clay is separated wholly from the process of woodworking because the clay is more malleable and thus is accepting of an externally applied control. Simondon argues against this hylomorphic\textsuperscript{27} perspective in breaking down the concept of clay and of molds saying, “respectively building the mold and preparing the clay, - to a point at which they reach a certain compatibility: the clay can take to the mold and the mold can take the clay.”\textsuperscript{28} Further reflection on materiality reveals its transformational nature at the hands of a craftsman. What’s more is that this nature remains even after the object is made. In an economic and industrial design landscape material is rarely considered after the fact of conception. The nature of the material is expressed in its enduring quality, which exceeds far beyond these considerations.

\textsuperscript{26} Nakashima, George. The Soul of a Tree: A Master Woodworkers Reflections. (New York: Kodansha USA, 2011), 102.

\textsuperscript{27} Hylomorphism is defining in Ingold’s book as ‘represent [ing] at once ideas that have been made material, and natural substance that has been rendered cultural. ... from the Greek hyle (matter) and morphe (form). Whenever we read that in the making of artefacts, practitioners impose forms internal to the mind upon a material work ‘out there’, hylomorphism is at work.” Ingold. Making: Anthropology, Archaeology, Art and Architecture. 21.

\textsuperscript{28} Ingold. Making: Anthropology, Archaeology, Art and Architecture. 25.
Fig. 24: Mask 01 Near Completion
Intent | Non-Object

The hand is human for what it makes, not what it is.

-André Leroi-Gourhan

Although it is important to understand the nature of tools beyond their physical traits, looking at how they coalesce as objects, and in turn are used to manipulate other objects, gives insight into the transitory states of material and maker. A strong misconception about tools is to define them purely by their object. This interpretation focuses too heavily on the physical traits of the tool, on what it IS rather than what it does. The view is informed by a surface understanding of how objects and tools come to exist. Rather, to fully understand how tools appear we must look deeper into the transitory existence of objects both in material and cultural reality. Tools exists as a marriage between intentionality, and the state of the material world that forms around this intention. In his book Being and Time, Martin Heidegger understands this relationship as the appearance and revealing of objects to us through encounters. In his ideas of ready-to-hand and present-to-hand he begins to mold an understanding of the ways in which we interact, and encounter, things in the world. He puts emphasis on the using of the tool and this appearance that merges the user, the tool, and the material into a single happening. The use of the tool is generated by the intention of the user, but insofar as that intention is inspired by the tool. Thus, we can expand this thought by investigating how the object becomes inseparable from the human.

Does intention lie within the maker/user or is it inherent in the object itself? Abraham Maslow famously wrote “I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail.” This implies that the intention of the hammer is imposed on the user, and can prescribe not just its use, but change the perception of reality. Heidegger’s propositions of ready-to-hand and present-at-hand similarly attributes intention to the tool.

Fig. 25: Preparation of Mask 02
For Heidegger the tool appears or reveals itself to the user, depending on the circumstance. Present-at-hand represents the nature of objects as they exist, untethered to intention. But as we engage with, and in turn are engaged by, these objects, they acquire their readiness-to-hand. This concept depicts tools not as dominant objects as Maslow or Illich's discussion does portray them. The issue with understanding tools as forms that are separate from us, and that appear to us, is that the use of the tool becomes unbound. One could use an axe to chop wood, for sport, or to murder someone. The ways in which someone can use a tool, as governed purely by the intent of the user, can range between creating beautiful objects, to committing terrible atrocities. This broad definition blurs, rather than clarifies, the nature in which we interact with tools. Because of this it becomes much more practical to observe and understand tools for how they are used, rather than define them by their object qualities. Under this premise, the axe that is used to chop wood, and the axe that is used to harm someone, are different tools, and thus the nature in which we enact/react with these tools is fundamentally different.

Intent | Four Causes

The understanding of intent as a phenomenon intertwining the maker, and the tool, with the material can be further observed through the relationships between these elements in specific examples of making.

![Fig. 28: Hand Carving of Mask 01](insert pic of making some stuff from catalog)
Fig. 26: Carving of Mask 02
We can draw connections between these elements with Aristotle’s Four Causes to further investigate how intention comes together through making. The first of these causes, the Material Cause, displays intent through the ways the material responds to being altered. In the case of carving, the characteristics and temperament of the wood change the types of cuts one can make. The grain, moisture, density, species, etc. all affect the paths in which tools travel along or through its surface and the ways in which it can be assembled. The Formal Cause, the form, is informed by the maker’s intent and fused with the material. Form is constantly informed by the feedback given by both the material, and the tool. Some sculptors refer to their process as a revealing of what the material communicates to them. This is representative of the artist’s acuity towards the material, and demonstrative of how form can be, in part, dictated by material. In this relation we observe how intent can be an accumulation of these causes. The Efficient Cause, often attributed to the maker as the primary source of change or rest, is also attributable to the realm of tools. It is the maker and tool that are the primary movers. Similarly, to the material cause, these tools provide feedback to the maker. In the example of an axe, the use of this tool is dictated by its capabilities. What the maker wants to do is altered by what the tool can do. The tool informs the maker with its own intent. Unlike the material, tools mediate the connection between maker and material, and so plays a vital role in this relation and is worth differentiating from the maker within the definition of the Efficient Cause. The Final Cause is the summation of the making process, and the result of the intent. From this point on, a made thing can continue to be used. These four causes represent crucial aspects that inform the intent which comes to define tools. It is important to note that tools mediate between maker and the made, and a marriage of these four causes, which represent one very important aspect of making: it is the means by which we transform the world around us.

Aristotle’s four causes sets a framework that other philosophers have used to talk about technology, tools, and making. Rather than set out to define a unique definition, the four causes provide a structure from which to build other ideas. An example is that Martin Heidegger uses this framework to further understand the nature and potential consequences of technology in his essay “Questions Concerning Technology”.

Note that it is intent, married with the material object, that comes to define tools. The matter and the material do not solely come to define tools. Intent is intrinsically and fundamentally connected to the maker and made which enables tools to mediate between them.
Fig. 27: Mask 02 with Marker Guide Lines
Intent | Field

Tools, as additionally defined by their use, form a field through which our engagement travels and in which this intertwining of maker, tool, and material intent occurs. Tools are constituted into this ‘field’ not to grant spatiality to the idea of tools, but to emphasize the relations between them. Akin to Stan Allen’s understanding of field conditions, we draw parallels between how he re-defines ‘the field’ to lift ties to space and ground and establishes an area of causality and connection between individual elements.

“To generalize, a field condition could be any formal or spatial matrix capable of unifying diverse elements while respecting the identity of each. Field configurations are loosely bound aggregates characterized by porosity and local interconnectivity. Overall shape and extent are highly fluid and less important than the internal relationships of parts, which determine the behavior of the field. Field conditions are bottom-up phenomena, defined not by overarching geometrical schemas but by intricate local connections.”

- Stan Allen

Fig. 30: Mask 01 Complete

During the making of this thesis one sentiment has made itself abundantly clear to me: I engaged with a wide variety of tools, to further my understanding of my relations to them. To understand how I am connected to the things I made, I must also understand how the diverse tools used to achieve these constructions mediate between myself and the objects I made. The use of a tool does not only connect the maker and the material, it is used in conjunction with other tools.

Fig. 29:  Mark 02 w/ Carpenter’s Axe
Therefore, the continuum of action and use is also dependent on interactions within a field of tools. For the mask (above) it was necessary to engage with an array of tools to accomplish the result. We can start with the power tools used to prepare the wood blank from a log. From this spurred the use of a collection of hand tools: saws, hammers, and chisels varying in size and shape to accomplish different actions, and all in the service of this one making. Auxiliary tools such as rulers and markers were used not for the forming, but for setting and preparing.

![Carving of Mask 01](Fig. 32: Carving of Mask 01)

The tools I engaged with mediated my relationship with the red cedar. In most cases, it is not a simple interaction between me, a tool, and the wood. Further dissecting this relationship reveals multiple tools being used even in singular actions. At its most local, even with hand tools, the body is used in conjunction with objects to give form to the wood. Even the processes of performing an action with hand tools involves the interaction with multiple tools. To envision a collection of tools as a field applies a relational understanding to how one partakes in the process of making, both between the tool and the maker, and the tools themselves. The more tools that lay between the maker and material, the more indirect the connection between the maker and the made.
Fig. 31: Point Cloud Scan
Tool | Complexity

The growing complexity of tools is becoming increasingly at odds with modern discourse on making because of the unknown implications and nature of these new tools. This virgin territory is often attributed to the exponential technological development that has swept the globe over the past two centuries. We can observe this complexity through the lens of the technological and the cultural. While the obvious technological complexity offers insight into this growth, the political or cultural dimension is intrinsically tied to the properties that separate the maker from the material. The philosophy of technology reaches far beyond the scope of this paper, but to understand how growing complexity alters the relations between maker, tools, and material, this field of study becomes vital.

Complexity | Cultural Dimension

In exploring how intentionality exists in the relations between maker, tool, and material, we can observe the transitory and eclectic nature of intention. Intentionality has cultural implications, for the obvious fact that people use tools that they did not make, and so use is understood through another's intention. In a critique of Tim Ingold's work, David Howes, anthropologist and professor at Concordia University, emphasizes the importance of cultural influences upon our perception and practices.

“Not the least of the reasons why is because cultural values and symbolic representations constrain the ways in which people act in the world. This becomes immediately apparent if we consider, for example, how cultural constructions of gender have shaped the particular practices engaged in by women and men in Western history. It is also the case that many acts and beliefs that people hold to be deeply important, such as those based on religious values, are not centred on practical activity. Perception may be a sacred act, a moral act, a political act, as well as a practical skill.”

As I have engaged with increasingly complex tools, I reflect on these experiences to pose the nature of growing complexity as an added dimension in how we use tools. This is not to say that this framework is without gaps.

Fig. 33: Mouse & Keyboard
This cultural dimension similarly impacts the perceived use and our learning about tools. This purpose-driven reality of an object is transferred, translated, and learned by users. The purpose of a tool becomes re-appropriated as this object is used by a different hand. One person’s hand axe may be used by another to hunt, harm, or kill, but it stands that to use certain tools one must learn to wield it. Through this wielding, one can also adopt the intent of another maker. As the process to use complex tools becomes more specific and relies on an increasing number of components to operate, the distance between maker and material is increased. This is not, however, attributed to a technological complexity, rather to an increase in this endowed intent. This concept arose from engaging with the process of building my own tools.

Undertaking the didactic process of making woodworking tools deepened my understanding of how we connect to tools. In the case of making a chisel, it proved to be a more fluid connection than with other chisels I have used before, which had been manufactured and purchased by me. To a trained eye my chisel is by no means adequate. The bevel is uneven; the tang, unaligned. The unfinished corners are sharp and cut into the hands. The length of the tang and handle fit well into my grip. I quickly grew to work with the off-kilter angles embedded in the shape. This connection between maker and tool is enhanced when the tool is made for the maker. This is not about some psychological or mystic connection between man and material, but it can be attributed to a fuller engagement with the process of making, and not just using tools. In the procedural chronology of chisel making, I was involved, and thus informs, every shape, angle, hardness, and subtle nuance in the form. Not only is the hand forming the tool, but in turn the hand is metonymically shaping the tool throughout the making process. Every move is performed with the hand as the generator and of which it becomes a proponent. The result is an imperfect tool, perfectly suited, for my hand.
Fig. 34: Tool Pathing for CNC Machine
As stated, more complex tools consist of increased cultural intent that distances the maker and the material. In the process of making tools, I was replacing the intent normally endowed by another (i.e. someone else would normally make these tools). The tool becomes more-so an object of my own intent; although imperfect, its use becomes more fluid, and provides less resistance while engaging in the field of tools. This framework is constructed to illustrate the changing relation between maker and made as their tools become more complex.

Complexity | Technological Dimension

A common perception of technology is that it stands apart from being human; but as discussed it is impossible to disregard the humanistic qualities innate in machines and tools. I pose that it is precisely these qualities, which create this distancing from technology that alienates people from machines. My contemplations on technological complexity manifest in a mask that was almost completely digitally perceived. To garner insight into the process and relationship in contrast with hand tools/power tools, through carving I explored the use of technological tools.

Fig. 37: Mask 03 Complete

This is not to say that technological tools are indistinguishable from human ones, but that there is deep rooted humanistic intent embedded in the technological.
Fig. 36: CNC Carving of Mask 03
The making of this piece involved several tools that demonstrate this distancing of the maker (myself) from the made. Using a Microsoft Xbox Kinect, I scanned my own face from which a digital model was created. From this model a CNC router carved the negative into the block of red cedar. In tracing the minutiae of the process, we can begin to understand how this perceived distancing happens. Levels of tools exist between me and this carving; at a surface reading you can break down the workflow to: Scanner (Kinect) - Computer - CNC - Wood: but this is only a broad depiction.

We can dissect every step in this process to reveal how this cultural intent distances us from making. Take, for example, using a computer that we access through our body, and our hands. This warrants the use of a mouse and keyboard, both things that must be used in very specific ways. In addition, every component needed for a computer to run, the monitors, the motherboard, the GPU, the CPU, power supply, RAM, hard drives, case, etc., all designed, all with intentions. Even these, are made of smaller components, and so on and so forth. All these parts coalesce into a singular perceived tool in which now we can no longer decipher intent or lineage. Juxtaposed to the construction of a hand tool, whose intent is evident on its surface, the complexity of a computer’s inception becomes illegible to the user. To the maker using these tools, this external intent (embodied in every one of the computer’s individual components) distances him/her from their work.

This distancing between man and machine has been references throughout the history of technology discourse. A camera was used to document my own process of making, and although not explicitly about this topic, it is relevant to note in this this discussion that in “Towards a Philosophy of Photography”, Vílém Flusser paints an image of the knowledge and engagement gap that manifests when we use technologically complex tools, in this case, the camera. Although using this tool, we are unfamiliar with the internal operations of this machine and so are completely separated from the product, the photo. Flusser equates this to magic, and through this separation our understanding of the photograph becomes an abstraction. Illich points to a similar condition when we engage with complex tools that separate us from the result, or the made, only he amplifies his scale to cultural and urban scales, referencing healthcare, education, and transportation in his essay “Tools of Conviviality”.

He warns of the inherent danger of enslavement to these ‘tools’ because of the general lack of awareness of how they operate.\textsuperscript{41} It is important to attempt to bridge these gaps to more fully appreciate the ways in which these tools have the capacity to change the ways we live. Technologically driven tools exist in, and interact within, a ‘field of tools’. To illustrate this, we can compare how technologic and hand tools come to exist together in this field.

This axe was made from raw wood, iron, and coal. Every element is discreetly of the earth, and all parts come to be at the intention of a single maker. The head, the handle, the wedge, all made from raw materials whose intents are singular in nature. Compare this with the software used to make this scan (right), which we can understand as a tool, but which also has no bearing in the material world. Being completely divorced from materiality further reinforces that the technology’s intent is guided by another maker, or collection of makers.\textsuperscript{42} The nature of technological tools is perceived to be apart from human, but it is a humanistic element latent in these technologic tools which further distances a maker from his work.


\textsuperscript{42} To further the anthropomorphic qualities in technologic tools, in my making of these objects I often had to consult experts, or those more knowledgeable than me, in how to use these machines. The CNC machine was only accessible to me through a technician, whose expertise was necessary to be able to operate it.
Fig. 39: Shaping of Axe Head
Conclusions

The past year’s work has brought me to a deeper understanding of making and its relevance within the creative industry. While exploring the values of craft through exploring traditional methods of making, it is important to specify that it is not the focus of this thesis to enforce traditional methods of making over mechanical or industrialized making. Movements that have championed traditional crafts and trades failed to integrate their ideals with a modernizing industry, often rejecting industrial methods of making. Many of these movements, such as the Arts and Crafts movement of the late 1800's arose out of a response to the industrial revolution. A symptom of this separation of craft-centric movements and technological ones can be seen in the divergence of discourse on craft and technology. What I have learned through exploration into several forms of making is that whether one works with hand tools or automated tools, many core values remain consistent. If values established in traditional forms of making are to carry into the future, rather than neglect emergent forms of making, it is vital to find connections between them and establish a theory that is inclusive rather than segregated.

If we understand craft as the summation of engagement and tools as a field through which this engagement traverses, we can observe many types of making through a unified lens. Placing diverse forms of making onto a single playing field allows us to draw correlations and new understandings of how they operate and how our relation to these operations works. This accomplishes different things. On one end it allows us to transition values from traditional craft into contemporary frameworks by being able to draw connections between traditional and contemporary forms of making. It also allows a dissection of complex making processes, those which we deem ‘technological’, and to gain insight into the operations and nature of this form of making. All of this exploration is in search of the role and condition of making within the design industry today.

There are many gaps that exist within our understanding of making, but recognition of these issues within the realm of architecture range widely. We can observe a shift in mentality as architectural standards migrate from hand made representation to digital production. To keep up with the demanding pace of the profession, academia similarly pursues the most contemporary forms of representation. These forms are curated for a growing universal stage: the internet.
Fig. 41: Coal Fire at Forge Welding Temperature
As such, the field's capacity for physical making is waning, and with it, the discourse around it. Exploration into making methodology reveals making not just as a form of representation, but as a process for thinking and exploration. This is an important form of cognition because it is linked to a material culture that responds and informs the maker.

We can observe this same phenomenon when working with more technologically complex tools. What I have learned, and hopefully conveyed through this paper, is that this material/maker feedback occurs at even the most automated levels. It is important to recognize that this feedback changes as tools become more complex but is nonetheless present in this cycle. As such, the ways we ‘think through making’ also change but is still vital to the designing process through having the design process connect to a material culture.

It was this work’s intent to reinvigorate my own acuity towards these issues and dive into understanding the discourse that surrounds making. In pursuing this thesis, I did not set out to resolve these issues. Rather, the purpose was to engage and experience the conditions that give rise to our ability to make, as a fundamental form of practice. What I have proposed in this thesis is alternate ways of structuring our relationship to making through the reinterpretation of craft and tools. These perspectives are in no way final or concrete. Rather, they can be used as a heuristic to open avenues for contemplation and discussion on these topics.

Exploring the nature of making has revealed a discourse surrounding the ‘how’ and ‘why’ that designers contend with on a regular basis. It’s not important that we ‘solve’ craft or fully comprehend our relation and the implication of tools. It is unclear if that will ever be possible. But it is crucial to wonder, inquire, and engage with these topics to further understand our role as designers. One of the privileges that this foray has garnered is the surfacing of ideologies in the form of conversation with many prominent designers and thinkers. This alone shows a modicum of success in being able to forward my own thoughts on the subject and allow space for others to share their knowledge.

(As a means to understand our place within society as designers)
It is our responsibility as designers to tirelessly contemplate the implications of our interventions.
Fig. 42: Mask 04 To be Continued...
Though this contemplation, both self-reflected and through discourse, we continue to grow and understand our place as creators, as interveners in this world. Beatriz Colomina emphasizes the influence of design not just to solve problems, but to envision new forms of humanity.\footnote{Colomina, Beatriz, and Mark Wigley. Are We Human? (Ennetbaden: Lars Müller Publishers, 2017), 23.} Ivan Illich’s tracing of how tools have evolved to be detrimental to creative freedom underscores the value of our relationship to them.\footnote{Illich, Ivan. Tools for Conviviality. (New York: Marion Boyars, 1973), 19.} These considerations accentuate the need for inquiry into these fields.

Many writers, thinkers, makers, and craftsmen have explored the realm of craft and tools and have found significance in trying to decipher the complex relation we share with them. Through exploration they opened avenues into making discourse, new conceptions of how we interact with material culture. One example of this would be Stephen Kieran’s dissection of the manufacturing process. Delving into the minutiae of industrial production, he poses alternate modes of manufacturing by strengthening the professional relationships between trades. In his investigation and engagement in the process he informs a new structure to change the way we may think about design and production.\footnote{Kieran, Stephen, and James Timberlake. Refabricating Architecture. (New York: McGraw-Hill, 2003), 14.}

As much as we look outward to solve issues of the world, it is equally important that we reflect inward. Design education is messy in that there is no one way to teach it, or to distill its value. In this, much of the design ethos is garnered through exposure and experience, and not through a course mandated curriculum. It has been my interest to focus on the foundations that define design methods and to reflect/reimagine these conditions. With this thesis I hope to have forged an investigative methodology as a means towards underscoring my knowledge-in-the-making as an architect, designer, and maker.
Bibliography


Maslow, Abraham H., and Arthur G. Wirth. The Psychology of Science: An Reconnais-

Merleau-Ponty, Maurice. Phenomenology of Perception. Translated by Colin Smith. Lon-


Pallasmaa, Juhani. The Thinking Hand Existential and Embodied Wisdom in Architec-


Seth, Anil K. “Interoceptive Inference, Emotion, and the Embodied Self.” Trends in Cog-
tics.2013.09.007.


Serres, Michel, and Bruno Latour. Conversations on Science, Culture, and Time. Translat-

you-it-act-ii-scene-vii-all-worlds-stage.


Wrigglesworth, Sarah. “‘WLTM Caring Contractor’: The Dating Game of Design and Build Contracts.” Contemporary European History 16 (November 3, 2012): 210-16. Ac-
Appendix A

Making

My choice in working with wood stems from a long-standing interest in the material. During my formative years as a designer, enticed by the complexities in woodworking, both sensual and technical, I began shaping small projects. Trinkets, rings, small utensils, it was an exploration into shaping the most basic forms from wood. As time passed this interest evolved into an obsession. In architecture school you are taught to revere and respect the materiality as a vital component, but it is never mandatory to physically engage with full scale construction. This fetishization seeded a desire to understand how we have come to manipulate the material reality around us. Prior to writing this thesis I enrolled in basic carving classes to understand the use of hand tools and reading materiality. This project is a continuation of these desires.
To practice traditional aspects of making the first project undertaken was a bench. This bench consisted of several simple joints that could be constructed without the use of fasteners or adhesives. The purpose in this exercise was to understand through making. As Tim Ingold would say, learning from within rather than from the outside. The desire was to improve my capacity to design at the minimal proximity to the material at hand. To understand the process of designing and building furniture there were several resources at my disposal. A woodshop was available at Carleton University was instrumental to any success in I had in this venture. In addition, several books on traditional woodworking were consulted to understand not just the steps to build the bench, but also in how to wield the tools. I covered basic material understanding, posture control, and techniques. The material I selected for this project was poplar wood. It is considered a hardwood, but among hardwoods, it is relatively soft and so made an excellent material to learn with.

I designed this bench to consist of fourteen mortise and tenon joints. As one of the most basic hand cut joints this bench was designed not just as functional furniture but an exercise in learning wood carving techniques. Some of the techniques include boring holes, flushing the corners of the mortise joint, and measuring/paring down the tenon's so that they fit precisely into the mortises. The fit must be snug for the joint to have the strength to hold without fasteners. Having taken carving classes, I was familiar with using tools to shape wood. To challenge my own capabilities, I sought to refine my hand and push sensory responsiveness to shape calculated and measured joints. Cutting a flat surface, or corners with specific angles requires much more coordination than shaping sketched forms. As I produced more joints and accrued a comfort with the tools, I began to focus less on how I was wielding the tool and more on how the wood was being manipulated. This resulted in two things: I was faster, and less conscious of the tool and more so of the material.
Rig

Concerned with the issues of documentation, this rig was conceived to open alternate avenues of recording process. Flexibility and mutability were important aspects to the design, allowing it to act as a framework on which varying apparatuses could be attached to allow for maximum experimentation in how the act of wood working could be documented. It acted as a stand to which a time lapse camera was mounted.

Using techniques learned through research, theoretical and practical, this rig was designed for construction without the use of fasteners or adhesives. To save material, and utilize features of the studio space, the rig is mounted to a partition that closed one side of the workspace. Using a collection of hand tools, including the chisel constructed earlier, joints were carefully cut so that they fit precisely together. This friction fit is vital to the structural integrity of the framework, slightly too loose and the whole rig would be useless. The project consisted of six cross joints, each initially cut with a ryoba saw and then the excess was chiseled out using a paring chisel.

As a continuation of the bench project, similar techniques were employed to construct the rig. After having grown more comfortable with hand tools it became easier and faster to work with them. The construction of the bench spanned over two months, whereas the rig was erected in two days. While I can’t claim mastery over any of these tools, I have grown increasingly accustomed to wielding them.
Chisel

As reviewed, the embodied practices of making cannot be understood without also understanding tools, how we use them in relation to our body, and how these tools act as an extension of our limbs. The making of the chisel was spurred by a desire to fully engage with this phenomenon. I registered for a fundamentals blacksmithing course at Artist Blacksmith located in Cargill, Ontario to gain knowledge and access to resources needed to undertake this project. The Ontario Artist Blacksmith’s Basic Blacksmithing Class covered basics in managing forge temperatures, gauging steel temperature by eye, and primary shaping techniques. In this course the students produced several decorative ornaments, but also created tools for blacksmithing.

The prongs are used to grip objects for heating in the forge. The V tipped prongs allow for a holding of objects with a specific radius, optimized for something like a chisel tang, or knife blade. These prongs were used to hold the tang of the chisel while forging it. The chisel was formed by forge welding two different steels, one layered longitudinally on the other. It was heated then hammered to bond the two materials together using borax (a glass compound) to draw out the oxygen between the layer. Afterwards, the tang was quenched in oil and annealed at lower temperatures to harden and preserve the steels durability. The rest of the chisel was formed and finished on Carleton campus. The tang was shaped with a combination of belt sander and hand grinding on a diamond stone. The handle was turned on the steel lathe out of bloodwood, a species of wood native to South America. The ferrule, which keeps the wood from splitting when using the chisel in impact intensive tasks, was purchased from Lee Valley.
The Epistemic Object

The following continued series of masks is a lineage of epistemic objects used as a conduit to expand my research into making. The role of the epistemic object is as a source of knowledge, as opposed to a representation of acquired knowledge. The process of making these objects have allowed for a 'learning through making' that has informed my ideas about craft and tools. Hasok Chang, an American historian and philosopher of science, quotes Hans-Jörg Rheinberger on the epistemic object describing “the power of material objects – in contrast to ideas or concepts – as driving forces in the process of knowledge acquisition.”1 These made objects are not a summation of my project, nor intentionally communicative of my research; rather, they are the means by which this research occurs, and the sensual and experiential investigation into the making of these objects have solidified the concepts I have presented in this thesis. They are by no means ‘finished’ objects, but traces of my process and learning. Jennifer Whyte, a professor in the Department of Civil and Environmental Engineering at Imperial College London, also writes on the purpose of epistemic objects as records of a thinking process: “Epistemic objects are abstract in nature: they are the objects of inquiry and pursuit. Hence, they are characterized by lack and incompleteness.”

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Constructing the bench and the rig set the stage for further experimentation. I set out a series of assignments to frame the analysis of making to provide some foundation. The limitations set around this making were:

1) All pieces would start at a uniform cube 8”x 8”x 8”
2) The only material used would be red cedar
3) The tools used to alter each cube would be of a predetermined set

I hit a mental block as the making of the first piece started. I didn’t know what to carve. While stunted on progress, my advisor had encouraged me to ‘just start making something, it doesn’t matter what it is. So, per her advice, I started carving. A quick and abstract sketch initiated the cutting. I started by making unbiased and undirected cuts into this block of red cedar. As the form begun to realize itself, I acclimated my carving to it, accentuating curves and edges. At some point during this process I decided it was to be a mask. The major form that emerged resembled a nose. Gravitating to the smell of the red cedar initially, this seemed conceptually aligned. During the process of carving a large portion of the piece snapped off. The wood had splintered at the peak of a small crack in the wood. After a very tough period of deliberation I decided that it was moments like this that should shape the form of the piece and so continued.

I utilized unconventional carving methods for this project. Normally the piece would be fastened to a block that could then be clamped to a table or surface. This is to ensure the safety of the carver. I chose not to do this, but instead use my leg as a mount for the mask. The curvature of the mask fit perfectly around or in-between my legs. This would be frowned on in the carving community because of the risk of injury. Carving in this position meant more of my body was involved in transforming the piece. Although inherently more risk, I also felt more connected, and so had more control over the movements of my tools.
Mask 02

The next piece incorporated a study of Andreas Vesalius, a renaissance physician. This research focused on learning through engaging with manuscripts, in my case *De Humani Fabrica Corporis*, and understanding their process by replicating it. To resume with the making of masks was particularly appropriate with Andreas’ work because of his focus on the human body. Masks are unavoidably associated with themes of identity and concealment. Layered with the revealing of the human that Vesalius’ research engaged in, this piece became reflective of the duality inherent in the methodology of making. Focusing on Vesalius’ understanding of anatomy in the head, this piece maps the musculature of the face.

A carpenter’s axe was used for a majority of this carving, with hand chisels used to refine the forms. Checks had formed in the wood block while drying in the studio. I used a large crack that formed down the middle of the wood to accentuate themes of duality. This split was joined by two hand cut butterfly joints. The mortise for the joints were traced and carved using hand chisels as they were too small to cut using the axe. The first of these joints was too loose, compromising the connection of the two joining halves. I was faster and more accurate in cutting the second joint having learning from the mistakes of the first. I learned that allowing for tolerances in the cuts were vital to successful joinery.

The position of carving on my leg yielded consequences. During the carving of this mask one of my chisels slipped and sliced through my pants into my leg. I often prefer methods of carving that bring the body closer to the material. Unfortunately, every so often, there is a price to pay for this type of practice. But the purpose of these exercises was to experience making in the most tactile approach.
Mask 03

The third piece in this series incorporated technologically inclined tools to explore how the use of technologically complex tools differs from hand tools. It was important to broaden the kit of tools I used to understand how different tools alter our relation to how we make. This project was not only digitally produced, but digitally conceived. I sought to manifest a version of the self as interpreted through digital processes in a continuation with the theme of identity as questioned through masks. The backside of a mask is refined to fit the user, and so this piece was to fit my own face, or a digital version of my own face. The digital reflection of the face is on the backside, not outwardly present on the face of the mask.

I approached peers and experts for access to tools I did not own or could not use. Two methods were engaged for the generation of the 3D model. The first method was photogrammetry. I took photos of myself each with at 10-degree angles between them until a full 360 rotation was achieved. The photogrammetry software (Agisoft) stitched together the photos into a three-dimensional model. The result was a model that looked eerily similar, yet misinterpreted some of the photos, and so was disproportionate and morphed. The second process initiated with a 3D scanner that constitutes part of a video game console, and Xbox Kinect, and Rhino Grasshopper. Not owning one myself, I approached a friend to support with the scan. The Xbox Kinect was operated through Rhino Grasshopper (3D modelling software) scripts that generated point clouds. This point cloud was then processed resulting in a full 3D model. I subtracted the head from a block to create a negative of my face using the generated 3D model. This was brought to Brant Lucuik, the CNC operator at the Azreli School of Architecture, who then translated the 3D model to the red cedar block.
Axe

Having made one hand tool, I wanted to push the level of customization I could achieve with another. The second mask heavily utilized the axe for much of its production and from this grew ideas for an axe head with custom curvatures to allow for alternate grips. The axe I designed had an elongated nose for detail work, and the blade to bend down around the handle so that it could extend past the grip. The back face was to be flat so that it could be hammered. The handle was curved to accommodate several types of grip. These modifications grew out of my experience and desires from having worked with other axes. I wanted to explore the ways in which I would wield this axe differently, especially because it was born of my own two hands. Aligned with the ideas of intent posed in the thesis I sought to investigate how the making process is informed by forging the tools used to carve.

I approached Josh Van Noy, founder of Vans School of Blacksmithing, to teach me to make an axe. He was accommodating to the custom shape I had designed, and in his shop, I forged this axe. This axe was made by bending a 1/4” stock of 1035 steel into a “U” shape. At the mouth of the “U” a thin piece of 1080 carbon steel is placed and subsequently forge welded to the 1035. The forge welding process involves heating the two steels to extremely high temperatures, as is indicated by the colour of flame in the forge, applying borax, and hammering the piece together. This process is repeated a couple times. The head was then shaped through several heating cycles. A heating cycle is one round of heating and hammering; when the steel cools to unworkable temperatures it must be reheated in the forge. From this the cutting edge was ground down on a stone grinder and smoothed out. The handle was made in the woodshop at the Azrieli School of Architecture and Urbanism. A spare piece of oak was given to me for the handle. Oak makes a solid axe handle because it is a hardwood but also quite impact resistant. The form was cut using a bandsaw and shaped to liking on a belt sander.
Appendix B

I was also constantly seeking how to represent process in unconventional methods that may help reveal aspects of making while in production of this body of work. This appendix contains the exercises carried out with this task. Each is a different expression of process to further my own ideas on craft and tools.

Exercise in Parallelism

I preserved the offcuts from the first joints cut of the bench. They are displayed here as a study in uniformity. Ultimately this highlights my hand's incapability to accurately cut identical joints. The theme behind this it that the discarded waste from the making process can be more revealing of the hand than the final product. Often 'finished' pieces seek to cloak any feature that reveals its process, whereas these discards openly convey them.
Steel Discard

Similarly, to ‘Exercise in Parallelism’ this piece seeks to betray the hand through record of what would normally be discard. In this case I placed sharpening stones onto paper while maintaining my tools. The shaved steel mixed with water would splatter onto the page, leaving permanent record of this process. Literally drawn in metal, this piece sought to map potential patterns through the sharpening process.

Red Cedar

Prior to carving the first of 10 wood blocks I scanned each side at a high resolution and then printed a 1:1 copy of the first wood block. This documentation was meant to challenge our ocular-centric understanding of materiality and form. Deprived of every sense except sight, this block exists as a ghost, ephemeral.
Chisel Dissection

This diagram dissects the essential components of the chisel, breaking down not just an understanding its assembly, but the functions of each part. In the same way animals are diagrammed to show different cuts of meat so too is the chisel dissected as something that has its own nature but misunderstood instead as product. This was to highlight the tendency to perceive tools only for their object quality.

Catalogue of Tools

This catalogue consists of a series of flip books, each book demonstrating a different action. This is to say, the tools, as indexed in this thesis, are defined not by their object, but by their action. Each flip book is titled with the name of the tool, and the duration that was filmed for that segment of time. In this I hope to create a library of tools that will begin to consider how we interact and define them.