ATADO CON ALAMBRE

—Repairing and reconstructing my crafts practice through practice-based research—

Pablo Mariano

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by

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Pontificia Universidad Católica Argentina, 2013

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A critical and process documentation thesis paper submitted

in partial fulfillment of the requirements for the degree of

Masters of Design

Emily Carr University of Art + Design

2022

Atado con alambre, which translates in English as *tied with wire*, is an Argentinian expression for referring to a temporary, precarious and improvised solution, a stopgap. Sadly enough, examples of things or situations being “fixed” that way and remaining like that—exceeding that provisional feature—abound.

It is not my intention to revindicate those situations at all. However, I think I might have come across some positive aspects about tying things up with wire.

This work is for sharing those findings.

Abstract

This practice-based research addresses my crafts practice to redirect through design my professional activity as a woodworker and metalworker. The thesis documents and reflects on my work and findings over the course of a one-and-a-half-year process of engaging with reflective practice and practice-based research. The work approaches creative and expressive-related concerns through thematic forms, repetition, and reinterpretation, and inquiries about the affordances and distinct mindsets of designing and making through productive perspectives as contrasting as lo-fi hand-making and the use of digital means for designing and fabricating. The design outcomes range from small objects produced in domestic settings as part of weekly assignments, to months-long, self-driven projects producing big pieces of furniture at the shops in the university.

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Acknowledgements

To my supervisor, Hélène Day Fraser,
for the continuous support and help to make this research what it is, for the insightful feedback every time, and for all the hours of engaging conversations that went by really fast.

To my internal reviewer, Keith Doyle,
for the thoughtful input, the wide perspective, and the wise and kind words every time.

To the inspiring faculty and technicians at Emily Carr University who taught me so much.

To the 2022 MDes Cohort,
for being such an awesome group of people.

To Gabriela, Pablo, Andrea, and Zelmira,
who are always there for me, even on the distance.

To Ariana and Eduardo,
who were so welcoming, loving, and supporting since the first day we met.

To Guillermo, Marcos, and Sebastián,
for making the shop possible, for the work, for the friendship.

To Agustina,
for being how she is, for the endless support and encouragement, and for being the inspiration for me to do this.

A designer's statement

I am from Argentina, where I first learned to do most of the things I like to do. I started playing and studying classical guitar when I was 12 years old. Following the steps of my dad, who studied guitar in a conservatory, I began by reading music, studying solfeggio, and playing études and short pieces. But what had driven me into music in the first place, though, was quite different from all that: Aerosmith, Led Zeppelin, Stevie Ray Vaughan, and Jimi Hendrix—what I really wanted from the beginning was playing loud, raging electric guitars recklessly as they all did. With time, I started learning songs by ear and picking more things from my long-haired idols than from sheet music. I got my first electric guitar, started playing in bands, and music became more spontaneous and alive, in sharing with other musicians.

Through high school, I became more interested in writing my own music and learning more about the fundamentals of music from an academic and theoretical perspective, so I decided to enroll in a Composition program. Within my undergraduate, I studied composition, harmony and counterpoint as understood by the Western academic music tradition, particularly within the frame of the Common Practice Period—which encompasses the music written between the 1600s and the 1900s during the Baroque, Classical and Romantic eras, respectively—, and reaching into some of the early and mid-20th century's currents and methods. My music practice had expanded by then into two different and complementary directions: playing guitar as the immediate, raw, and unrestricted expression (solo or within a band); and composing as a way to organize and develop my creativity rationally. Music had shaped my thinking.

By the time I was finishing my undergraduate, my love for electric guitars and my insufficient budget, in combination with my curiosity, led me to start making guitars in my old apartment by using the balcony as a shop.

When things started to progress—and with the apartment becoming riskier and dustier—I moved my operation to a venue that could be called a shop. Things kept getting more serious, the shop became bigger, and some friends joined the enterprise. With time, the shop evolved into our full-time job; we were no longer making guitars but we were doing woodwork and metalwork, making furniture, millwork, repairs, and custom projects.

In August 2019, after almost nine years running, the shop, worn out from navigating the tides of the prevailing adverse economic context, came to closure. Shutting down and selling the tools meant for me, at that moment, no longer being able to do that work, that way, in the foreseeable future. Moving away to a more promising destination became, then, the next big plan.

The hunch that first brought me to this program was that perhaps I could transit within Design, a similar path as the one I did within Music—but hopefully with better chances of seeing any money, though :). The rationale behind my suspicion was that I had distinct creative practices with some points of connection, and perhaps by digging further, I might find more underpinnings. I have often experienced comparable sentiments and states of mind in those creative fields: I associate the affects in playing guitar with using my hands and tools when making, and akin mindsets and mechanisms between composing and designing. By playing/making, I can create something out of the blue; through composition/design, I can approach things in more depth and access further creative possibilities.

In my experience, I would say that trying to earn a living with a small shop and an independent rock band often felt very comparable. Both were spaces for me to do creative, personal, and enjoyable work, but they also entailed attending to many peripheric tasks. Often less expressive, sometimes administrative, or simply out of the strictly crafty/artistic, all the extra chores were necessary to profit through the vocational pursuit.

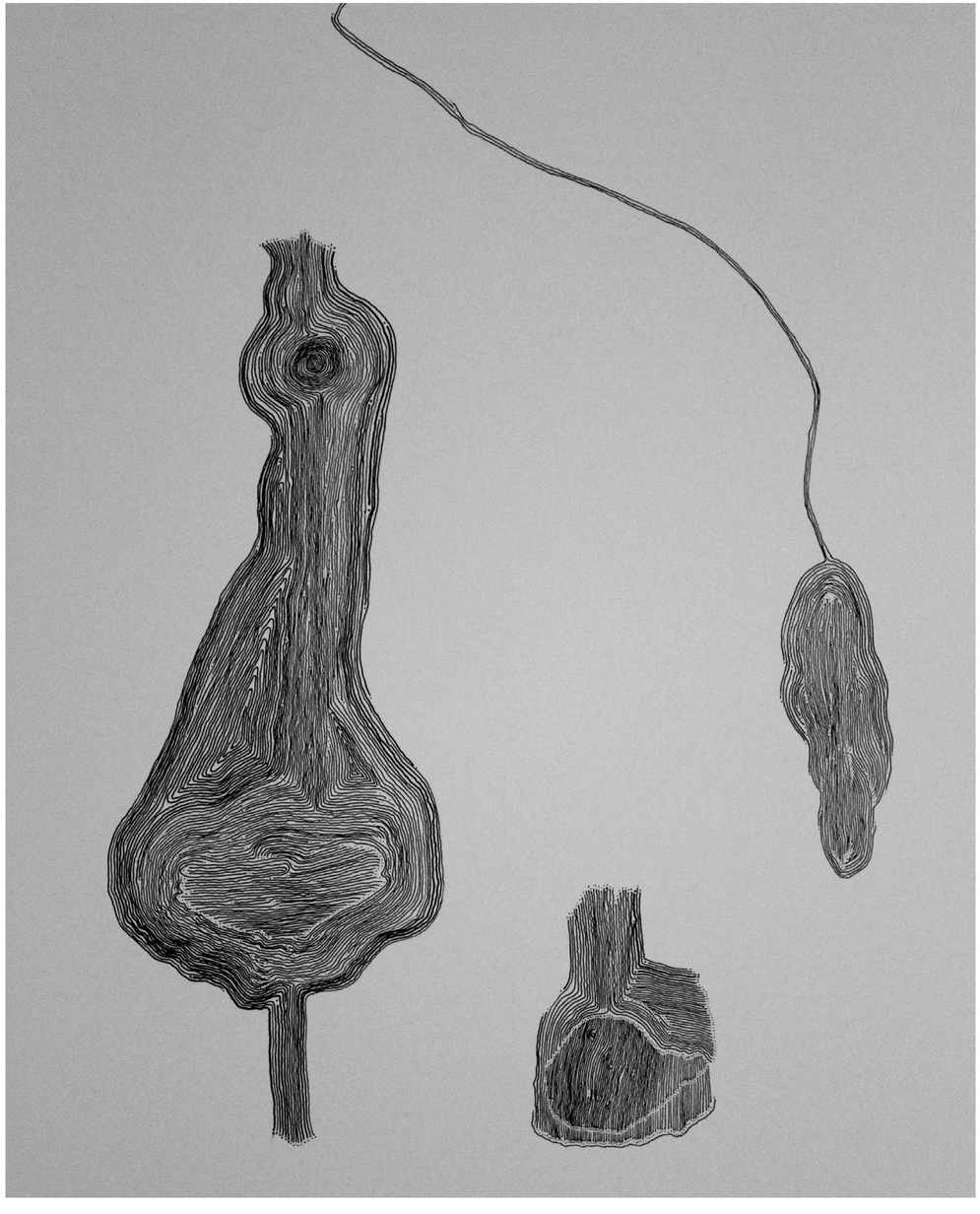
If I were to describe this thesis in terms analogue to music, I could say this work is an EP containing two finished songs and some demos as bonus tracks. The songs would be two pieces of furniture, and the demos would be a set of material and technique explorations. Some parts made the cut, and others might be resumed in the future. I could say that I wrote all the lyrics/text and that I played every instrument/tool, except for one occasion, where I did program the samples/toolpaths though. I could say that I did the artwork, took the pictures, and designed the booklet of this album/document. The melodies/forms in the songs/furniture are mine, and I did the mixes/finish on them as well. I should give credit to my artistic and executive producers (my supervisor and internal reviewer) for lending me their eyes, ears, and thoughts, and helping

me with the arrangements and production of the material. I should also mention the featured technicians collaborating during the recording/making at the studios/shops from ECUAD, the record label distributing this work.

Parallelisms on the side, through this research, I’ve identified that my approach to work will very likely be the same whether it’s a matter of craft, design or music. I will always try to work on what I really enjoy, dedicating as much time and energy to it as possible. I will put on the task intense thinking as needed, but I will probably try to use my hands to make the ideas come true.

Figure 1.

Illustration: ink on paper (pen)



Introduction

This graduate thesis is the consequence of an active process of observation and reflection—mainly, but not exclusively—on my work and my professional practice. Its purpose is to reveal the creative path I transited throughout, highlighting a process that built upon my work and life experiences to redefine and develop new nuances in my creative practice.

This research became a medium for reconstructing my professional practice. I left Argentina in January 2020, intending to enter the MDes program that started in September that same year at Emily Carr University of Art + Design in Vancouver. In the months between, I lived in Copenhagen, Denmark. There, I did woodworking and millwork for a few months until the first term of the MDes started (online, due to COVID 19). In December, I arrived in Canada. The route between South America, Scandinavia and North America has informed the different narratives integral to my research. Making experiences in scenarios with distinct economies and shades of entrepreneurship, production, and consumption provided me with many chances to observe and reflect on the outcomes and the dynamics between creative possibilities and the availability of resources.

The design outcome of this work consists of a collection of objects that drive, materialize, and reflect my research process from the initial stage of engaging with new ways of making, through skilling, to developing my design and making language and identity.

As a designer, this research led me down a richly formative path from intuition to intention. As a craftsman, the process opened the doors for considerations and ways of making I wouldn’t otherwise have imagined. As a creative practitioner—and as a person—, the whole experience widened my perspective, perception, and reflective capabilities. Throughout this document, I will share some of the things I’ve learned along the way, at different stages of this process.

1. CONTEXT AND FRAMING

1.1 Background and Intent

My creative production started within the field of music and is now developing into the field of design. Over the last ten years (to the moment of writing this thesis), my career has developed in the crafts field. However, even with woodworking and metalworking as a substantial part of what I've done for a living, my thinking and making has always extended well beyond the trades. Craft is the link between the realms of music and design, and the vehicle for most of my explorations.

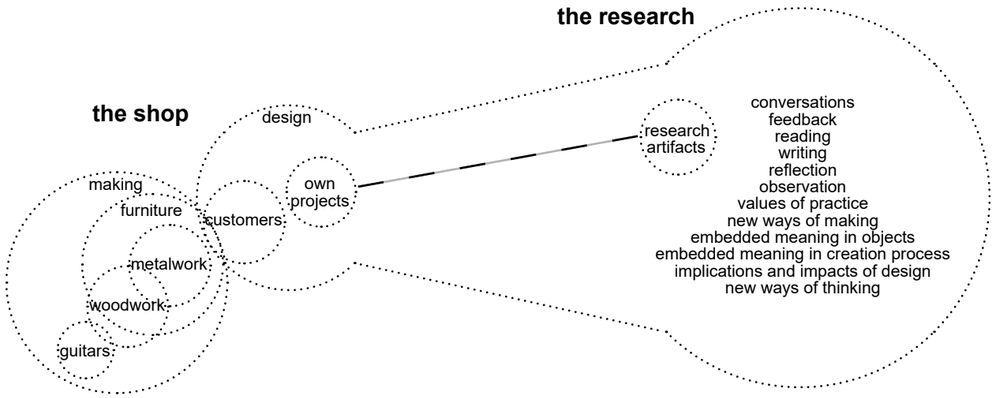
The main drive behind the body of work I will discuss below has been to develop and strengthen the intellectual and creative aspects of my making through practice-based research. Most of the inquiries and explorations I have taken on over the past 18 months entail observational and reflective processes that are intimately bound to my background and my professional work with wood and metal. In a similar fashion to my learning process with music, this is a quest for building theoretical and technical understanding of the experiential and tacit knowledge that grounds my making. Prior to this point in time, my training of the crafts I practice was, essentially, hands-on, and by trial and error. Observing and analyzing my practice through practice-based research has allowed me to grow a more encompassing mindset and a more robust understanding that undoubtedly strengthened my work. Throughout the program, my awareness when working intensified. My perception and understanding of my own body have refined; observing how I move at work and what the work produces in my body has become a constant exercise for me at the shop. The techniques I choose to use, and the decisions I make when designing and making, are now more intensely informed by considering my body and the work settings.

In need of new creative approaches, renewed energies, and a strong focus to fully restore my practice, I began my master's at just the right point in time. Stepping back into an academic setting and taking on an investigative approach to producing my work, was an opportunity to reinterpret and crystallize my previous experiences while further investigating my creative processes and looking for new production methods, inspirations, and technical resources. While my research through making was instrumental for understanding so many things about my background, the work produced was very specific and tightly bound to the context and time

frame of the program. This investigation is both a culmination of the trajectory that brought me to this point and a process that allows me to think and reshape my practice looking ahead.

Figure 2.

Design research amplifying my practice



1.2 Contribution to the Field

This practice-based research draws on my design and crafts practice as the subject of its study and addresses creative, technical, and entrepreneurial concerns regarding my evolving professional activity as a maker of furniture. My thesis contributes to the field of practice-based research through the sharing of my experience. The findings I uncovered through my research are relevant to me as they directly relate and inform my work and circumstances. My concerns and quests as a practitioner, and the methods I used as a researcher are also relevant to others—they are relatable and appropriate for other designers and makers within the field who are seeking to address shifts in their professional practice through research. As Candy and Edmonds note, “the attraction of this form of research for creative practitioners is that by connecting closely to existing practice, it provides a means of exploration that extends that work in a personal sense as well as contributing to the wider picture” (2018, p. 63).

Over the past year and a half I have investigated my own professional activity by engaging with different design practices. Doing so provided me with a framework for inquiring and gaining new knowledge and understanding about the way I work—which allowed me to further expand my creative practice. The production of artifacts became the core of my research. Making was a method to explore and gather insights, a means of “knowing through immersive sensory experience”, as Nimkulrat (2012, p. 3) states. It was also a means for me to question and support the outcomes of my research. Generative, it provided the door to new explorations and possibilities.

The objects I produced within the frame of this thesis embody and represent the state and evolution of my creative practice at this point in time and provide concrete applications for what I learned throughout this process. Nevertheless, the research in its whole encompasses more than just the artifacts. This thesis is a means to externalize and communicate my inquiries, struggles, and findings as a creative practitioner, and an attempt to articulate and make explicit—through words and visuals—the tacit knowledge that comes with making things by hand. This reflective document, like a little window to my mind, is my contribution to the field of practice-based research, a way to share what I have come to know as an intuitive maker who has

stepped into design academia to become a practitioner at the intersection of craft and design.

1.3 On Craft

I have addressed and reconsidered my practice predominantly through making, reflecting on outcomes and self-reflection. An extensive body of work—forms, ideas, writing—by other people has also informed this research process at every stage. My work has drawn on the history and theory of crafts, aesthetics, design, and art.

From the onset and frequently over the course of my master's studies, I have asked myself how I define my practice. I have found this query a particularly difficult one to respond to. I did not pick up my craft from a mentor, instructor, or training program. Because of this I've never felt that my practice was connected to a community, tradition, or field of expertise. This feeling of not belonging has brought with it an unease with labels; in the past I wouldn't refer to myself as a carpenter or metalworker. Instead, "I do woodworking and metalworking" would be my default answer. Beyond my reluctance to have my work pinned down by a category, moving away from a familiar place to different countries has led me to realize that the labels I was evading were also too broad. Terms such as woodworker and metalworker mean little in places with different approaches to craft and with markets and industries that enable and require higher levels of specificity and specialization—e.g., cabinetry, millwork, joinery, carpentry, smithing, welding, ironworking, machining, etc. The more variables I threw into the equation, the more challenging answering the question became. I realized that to provide others with clarity, I had to understand what craft means in different locations and cultural circumstances.

1.4 Hegemony of the discipline, heterogeneity of the fields

Crafts are not practiced the same way and they do not mean the same things everywhere. Crafts are highly contextual and the definitions, deeply informed by context and personal circumstances, can be multiple and fluid (Howe & Dillon, 2001). I would say that the word "craft" seems to imply different things in different places. Through my own experience in Canada and Argentina, for example, I know that the approaches to the practice and the level of specificity

differ in education, training and the certification offered; resources, infrastructure and access to technology; the characteristics of each market, patterns of consumption; and the valorization and monetization of the work. I have a hunch that all of these differences may probably apply to other places as well.

The field of Craft, with so many practitioners in so many different places and contexts, seems to offer uncountable approaches and characteristics. The definitions of what craft is, seem to reflect that as well. Nevertheless, there's concurrence in some general principles, values and notions of what craft can stand for, and there is a meaningful amount of literature approaching it from different angles.

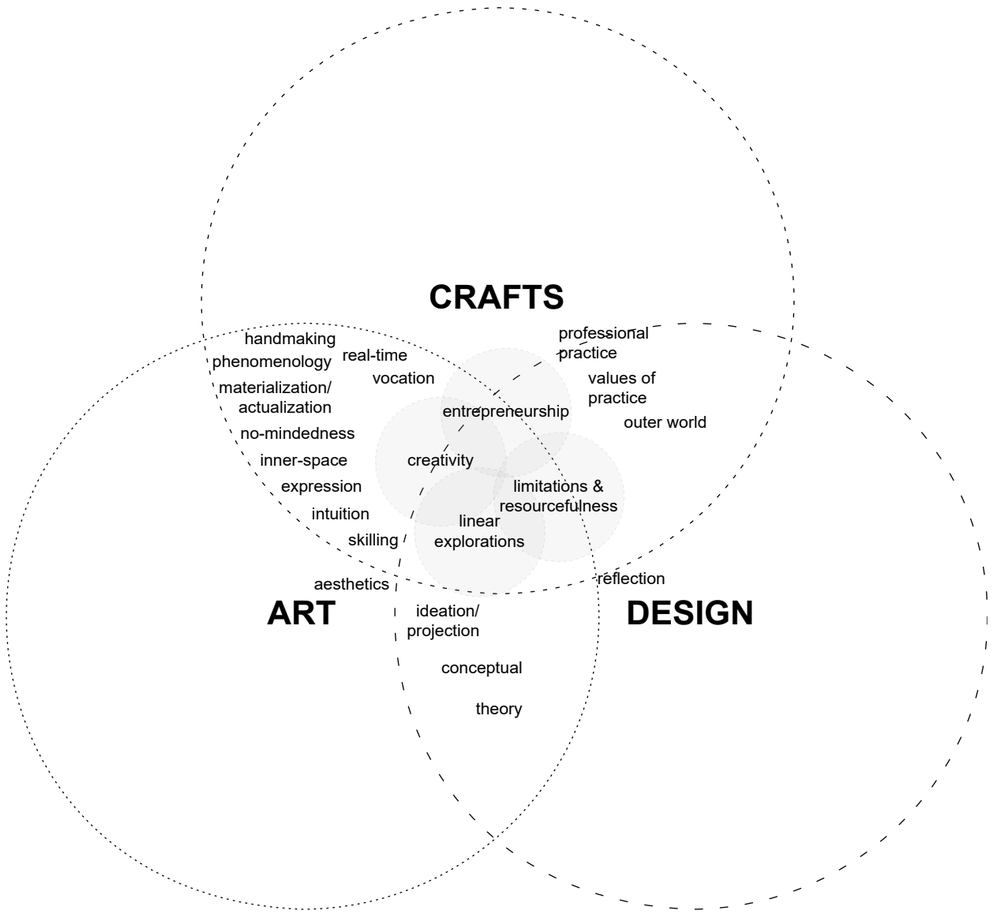
Craftsmanship implies dedication and an impulse to do a job well for its own sake. The satisfaction found in labour becomes a reward in itself, which moves craftspeople to engage with the process and further develop their skills (Sennett, 2009). Because of its vocational nature, craft allows and nurtures ways of working that enable personal, diverse and unstandardized processes and outcomes (Pye, 1968). When it comes to work and modes of production, crafts have long had a political standpoint and a complex relationship with industry, counterweighting/co-existing with mass-production, mechanization and the division of labor menaces at the workplace, and usually adapting and reshaping to survive and resurge (Adam- son, 2018). The hand-made object can then have an added value and become a representation with layered meanings, embodying an aesthetic statement, a testimony of the people's work or even becoming a vehicle for preserving tradition (Yanagi, 1972). In research, craft can appear as a medium for reflection and articulation of practical knowledge in practice-based/practice-led works while acting as well as a link between the professional and academic practices (Nimkulrat, 2012).

My–current–understanding of craft is not bound to a specific material, a set of procedures or specific tools. Perhaps, my interpretation of the concept isn't defined either by the degree of mastery over a technique and being a dexterous virtuoso. For me, craft can be a space located at the intersection of art and design. Craft includes creative activity that moves a practitioner to the actualization of ideas with active participation and involvement in the materialization process. It can be vocational or ritualistic, a form of personal expression or a vehicle

for tradition. It is a connection with the material through the haptic and the experiential, but also through consciousness and valorization of labour. It is a set of values that revolve around work and dedication. As Bruce Metcalf observes, “Craft is defined by a series of attributes. None are necessary, but the more you find in an object, the more craft it is” (Metcalf 2018, as cited in Lovelace 2018).

Figure 3.

Disciplines, themes and inquiries of concern of the research



1.5 The Research Question(s)

The questions I have asked during my research have not been static or stable. Rather they were fluid and dynamic, shifting according to the evolution of my investigation. Throughout the work, different questions would arise as a consequence of the findings in my explorations. These would suggest new quests and point toward new directions. However, if I were to articulate my main motivation ultimately it would be:

“How can design reshape my thinking—what tools can the design mindset give me to redefine, develop, and strengthen my creative practice?”

Although this question might appear somewhat open-ended and nonspecific, it has, in essence, been the core quest underlying every query and driving my work at any given time over the past year and a half. Throughout the different stages of my research, there were themes, narratives, and specific motivations branching out of this mother question; each provided new nuances to the project. At the same time, the topics I explored were related to and influenced by my personal and professional circumstances; with the contexts interlaced, progression in any of those ambits was potentially a trigger for a new line of exploration.

Figure 4.

Secondary level research questions: the "whats" and "hows" throughout the phases and contexts

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
What's my practice? What's left of it? *Will I be able to keep working with that?* *What's the meaning of the illustrations and objects I've been working on? What are those explorations about?*	*The explorations last term suggested interesting possibilities. How can I keep investigating that path of explorations with lines?* *What do those objects mean?* *How could I develop a facet in my practice that allowed me to create at home, without requiring big tools and infrastructure?*	*How can I further develop the explorations and challenge the technique to produce bigger and stronger structures for using in furniture/functional objects?* *How do I relate the readings and theory to my making practice?* *Why do I always struggle with theory?*	*How can I model and prototype different production approaches to make my practice more versatile, feasible, and contextually fluid?* *How can I direct the research more intentionally toward the goal of opening a new shop?*	*Through writing and in hindsight, what are the findings and meaning I can make of this process?* *How can I make this intellectual experience useful right after school?* *How can I apply the academic mindset to the practicalities of the shop? How can I put to work my renewed practice in a way that these learnings and nuances fuse together into the everyday shop practice?* *What am I going to produce, how, and who my target clients/customers would be?*
• Fall 2020. • A year gone by since closing the shop. • Working as a freelance woodworker, after a year of almost not even using any tools. • Living in Denmark and waiting for COVID-19 health protocols to change and allow moving to Canada. No chances of stepping into the school's shops for a while.	• Spring 2021. • Moved in to Canada. • Finally being in a place I knew I would stay at for a long time. Feeling the need to settle down and spending time at home. • Not working.	• Summer 2021 • Feeling more like "at home". • Looking for shops to work at in Vancouver and having job interviews. • Started to work as a freelance woodworker again in a shop with great people and feeling very comfortable. • Spending long hours at the shops at school regularly and conducting my explorations in such inspiring settings.	• Fall 2021. • Working regularly and having a more varied (and normal) routine. • Starting to feel that opening my shop might not be such a distant scenario after all.	• Spring 2022. • Working, writing, and planning strategies to open my shop after finishing the program; the goal feeling closer.

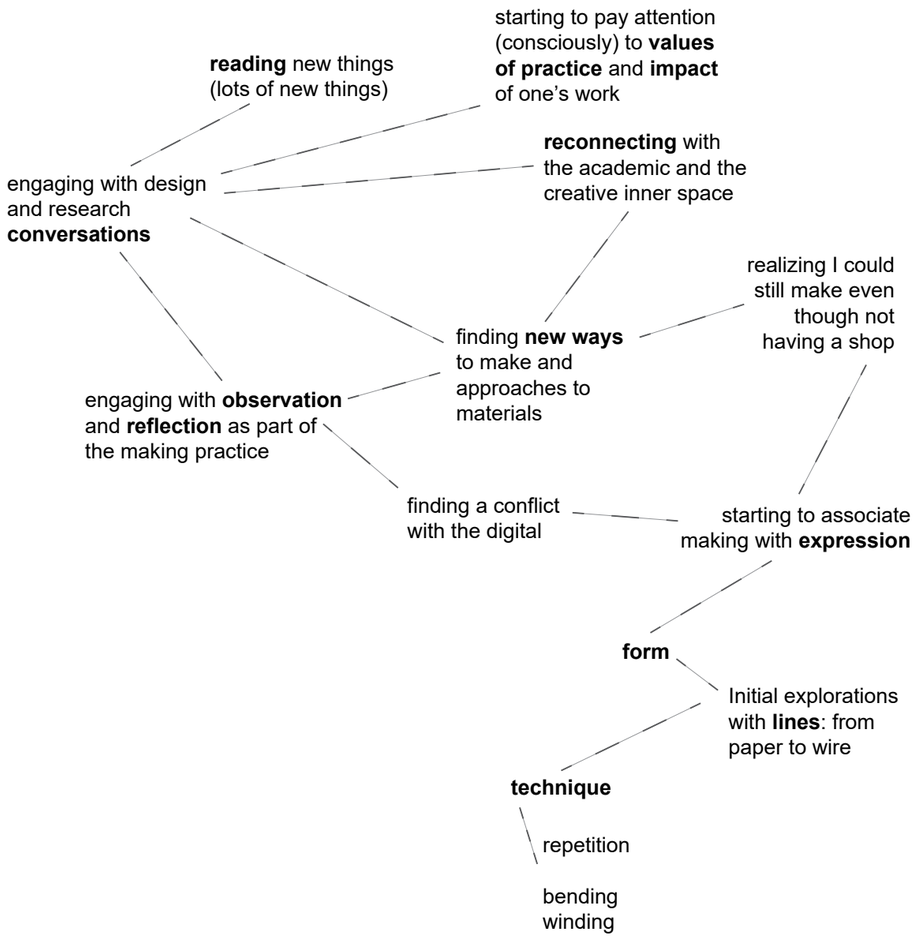
Questions driving explorations

Context

2. MATERIAL AND TECHNIQUE EXPLORATIONS

Figure 5.

Phase 1 inquiries and context



2.1 Phase 1 - A New Field of Practice

My work throughout this first phase was driven by intuition but fueled by observation. In the format of weekly explorations, I addressed concerns and states of mind that I could identify through the making, like pursuing the inspiration that new findings and approaches could provide to my hands. The process developed naturally and, often, one exploration would generate queries to address on a subsequent one. However, the relations between each and all the explorations weren't completely evident to me from the beginning. Sometimes, my reasons to explore a specific technique or material had more to do with curiosity and finding joy in the making than with a predetermined goal as part of a larger picture. The concrete application of those explorations wasn't clear to me at the time; I was mainly concerned with making as a means to discover new things. I was able to perceive these explorations as parts of a whole just by the end of the term. Analyzing and reflecting on my work, I identified I had undergone a process that turned around making things by hand, the outputs being usually illustrations and wire objects. Those outcomes were consequences of investigating the line as a formal element—a theme that became recurrent—in explorations where I was consciously observing myself while making.

2.1.1 The expressive in the making

After closing my shop in Argentina in 2019, almost a year went by until I did some woodworking again—while in Denmark. That lasted for around three months until the MDes started in September 2020. By that time, I wasn't sure what the future looked like for my practice, and I would even ask myself if I could still perceive woodworking and metalworking as my practice.

The first term in the program was a rich experience of getting back into an academic setting and engaging with conversations and literature about design and other disciplines, with an intensity and depth surpassing my expectations. Among all those new things, I quickly found something particularly revealing: in this context, my making could have a purpose very different from the one I knew; Instead of making things for selling, I could make to explore, observe, and reflect.

Making as an introspective practice turned out to be just what I needed at that time.

Phase 1

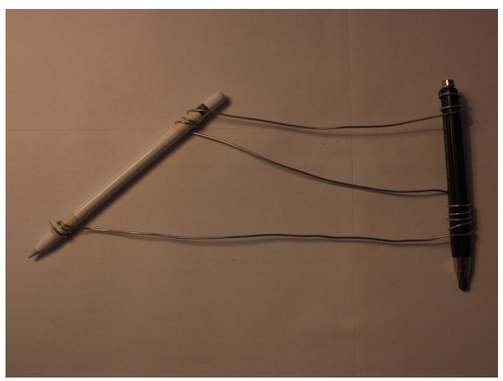
The process that led to the closure of my shop had been discouraging and wearing, and it diminished part of the enjoyment I used to find in making things. Doing woodwork in Denmark was a meaningful experience that I enjoyed, but it didn't produce in me a burst of inspiration or a vocational rebirth. Within the MDes, though, I found that there could be so much meaning and implications behind making things. That would quickly befriend me back with my practice—even if working at home instead of in the shop[1].

2.1.2 Lines, drawings, and wires

During this first stage, I realized that my making practice had an expressive and emotive side that I hadn't identified before. The first hint came after doing a set of illustrations on a tablet with a digital pen for an assignment during week two of the term. When observing those drawings, I wouldn't feel identified with them whatsoever. The traces in there, smoothed by the software, didn't look as drawn by my hands. Analog drawings made by me would certainly look rougher than what those did—and less colourful and cheerful as well. I did those traces, but the lines didn't belong to me.

Figure 6.

"The Honestizator"



That discomfort with my illustrations through digital means quickly moved me to explore drawing in ways that felt truer to me in expressive terms. To represent that transition from the digital to the analogue, I did a rudimentary wire structure that would hold a digital pen on one end, and a regular pencil on the other (see "Figure 6."). I would focus on drawing something on the screen with the digital pen (see "Figure 7."), letting the graphite do its thing on paper to capture the movement of my hand with no digital

1 Because of COVID-19, back at the time classes were online, access to the university was restricted, and I even wasn't in Canada (as most of the cohort).

mediation (see "Figure 8."). I called this contraption "The Honestizator". To complete the passage from the digital to the analogue and materialize those lines, I did a reproduction of the illustration in wire (see "Figure 9."). After that, I could claim those lines as mine.

Figure 7.

Digital lines

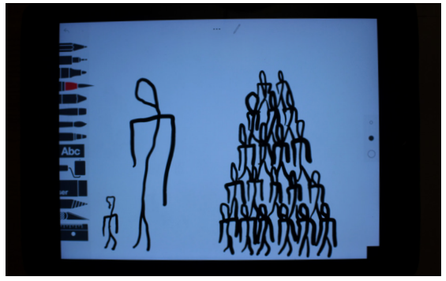


Figure 8.

Pencil lines

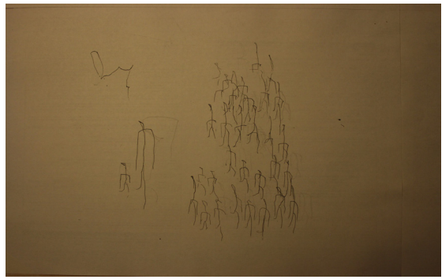


Figure 9.

Wires #1

While working on that exploration, I realized that the Honestizator allowed me to observe things slightly differently when drawing. While using the gadget, my attention was only on the screen. I wasn't looking at the paper and the outcome—neither distracted by it—and I was only focusing on moving my hand consistently so that both ends would produce a complete drawing. On every little segment, eyes still on the screen, and mind observing the hands.

I continued that thread of observation through illustration in my subsequent exploration, using the Honestizator again, but in a slightly different way. I used the digital pen turned off—so that it wouldn't draw—to trace the contours of figures on the screen and produce an illustration only on the paper. The lines there revealed which parts were more interesting for me to follow (see "Figure 10."). My next step was removing the gadget and the digital pen to do blind contour drawing, the method popularized by Betty Edwards in "Drawing on the Right Side of the Brain" (Edwards, 1979). My exercise was to keep my attention on the object of my observation uninterruptedly for a few minutes while my hand would

draw what I was contemplating (see “Figure 11.”).

Figure 10.

Photo to illustration. With the Honestizator

As I kept exploring illustration as an observational exercise, I found an immersive and almost meditative aspect in drawing things like tightly adjacent, fine lines, wrapping or imitating each other to form figures that grew through repetition (See “Figure 12.”). I identified an interaction between my hands, the pen, and the paper, and by observing that, I could reflect on my

Figure 11.

Photo to illustration. Blind contour drawing

technique and approach the skilling process from that angle. Small details during the drawing could provide me with additional information and aspects to observe as part of the experience: the haptic and sounds of the pen against the paper, or how light could interact with the illustrations (see “Figure 13.”), for instance, were interesting events to observe that could also spark new creative ideas. The repetition of a simple element within an appropriate state of mind of slowness and concentration enabled me, in this case, to produce something with a distinct character to things I did in the past.

My last exploration during the first term synthesized previous exercises and was an initial contact with something I wanted to investigate and develop. I continued working with linear forms and repetition, using wire to generate surfaces. My goal was to try a technique that could help me train my skills with wire and expand my creative possibilities with the material. Ideally, that technique would also allow me to keep exploring the introspective and meditating aspects I

Figure 12.

Ink on paper + light

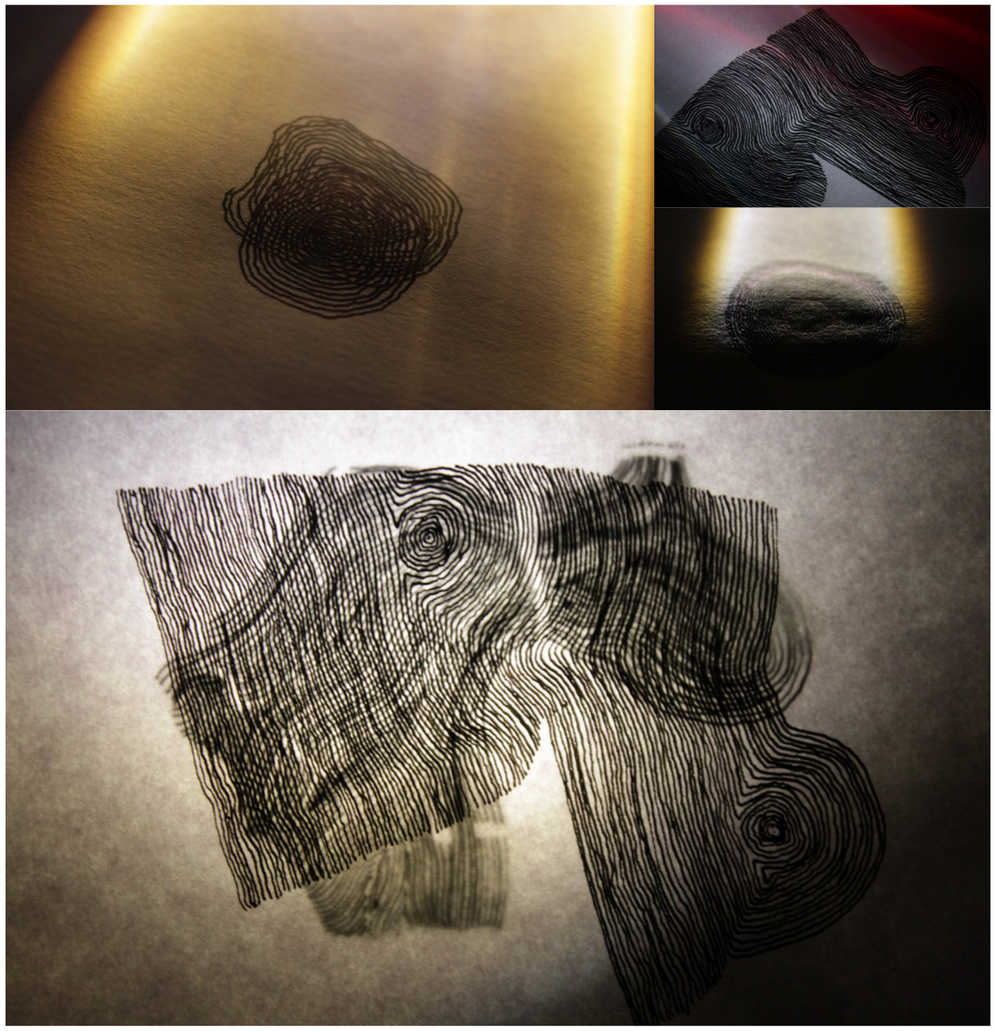
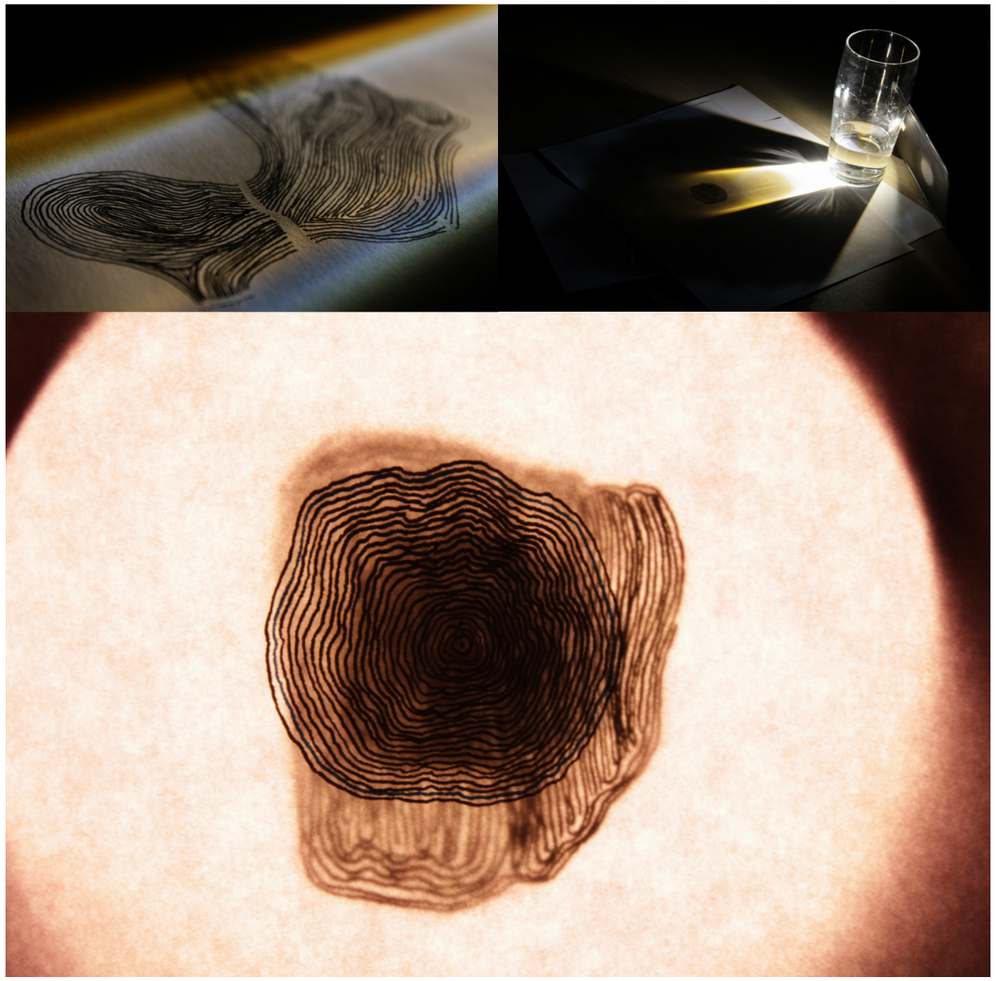


Figure 13.

Ink on paper + light



had recently discovered. My making was slowly becoming more intentional.

Interested in how to generate meshes, textures, contours, and movement, I began by bending and winding wire to explore gestures and forms. Looking for literature and references, I found examples of wire winding/weaving jewellery techniques used for making bracelets. It only took bending a thin wire around two thicker ones a few times for that exploration to begin (see “Figure 14.”). That initial exploration lasted only for a few hours, and even though I expected to come back to that technique to make something with it at some point, I never anticipated how that would evolve. From there on, I would repeat that winding gesture countless times, for hours straight, and that gesture would become a very relevant element in my research.

Figure 14.

Winding the wires

Figure 15.

Wires #2

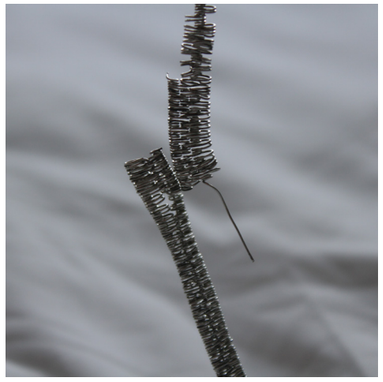


Figure 16.

Wires #3

2.2 Phase 2 - Home as the creative space

By the time Spring Term 2021 started, I was identifying some early elements of my research. My work from the preceding term had given me a direction and particular concerns to address in future explorations. Compared to the previous stage, the phase 2 projects were fewer and longer, to allow deeper exploration and reflection. The work approached inquiries around techniques that allowed me to make things in my apartment instead of demanding the infrastructure and tools of a shop.

I wanted to keep exploring the making at home. The modality adopted in the previous term had presented me with a way of working different from what I knew. Using lo-fi materials and almost no equipment or tools was compelling, and a suitable alternative for my circumstance at the time. My rationale was that perhaps, to resume my practice and start again from scratch, starting small could make things easier and more feasible.

Could I develop a side of my practice that allowed me to create things at home?

Which materials and tools could I explore and use in a domestic setting?

What type of objects could I make? What would the outcomes of my work look like?

Home as the workplace, or a studio instead of the shop, felt opportune at that time. I had just arrived in Vancouver, and I finally was in a place where I knew I would stay for a long time. Setting up a creative space in my apartment was essential for me to settle and feel at home. Working at home, I had found, made it possible to find the right mindset for engaging with the reflective practice. The home studio was also relevant, naturally, because of the experience I lived with my shop: after the closure, my practice froze, and without a place and no tools, there was no more making. Redesigning my practice through research was a goal from the beginning. Developing more flexibility and autonomy toward the resources I need to produce my work, became a big part of my quest.

Through the new work, I continued my previous explorations from Wires #1 and #2 and some of the practices and methods that I had found revealing during Phase 1. I stuck to

hand-making and using a reduced toolkit. I explored in more depth the winding technique, still using the line as the formal element and theme. I didn't expect to produce a concrete, functional object, and I didn't preestablish any form. Many of the artifacts were, in fact, incomplete, as they were many times small, isolated technique tests. I worked slowly, by repetition, and giving time for the making to develop in the right conditions for me to reflect in action. The interaction with new materials allowed me to investigate new formal possibilities and haptics.

Figure 17.

Home as the workplace

2.2.1 Strings

My first project in this phase consisted of applying the technique of Wires #1 and #2 to cotton cords and exploring other types of loops and knots that came up from working with the material. The starting point was the alternate winding between parallel segments I used with those wire objects (see "Figure 14.").

The gesture was the same with both the wire and string. Although, due to the cotton's lack of rigidity, the overall structure compressed more in this case. The loops would lace tighter between each other, and the forms were, from the beginning, bulkier and denser. The haptic was, naturally, different, and the response to tension and compression was more nuanced. As if the threads were cooperating, small interactions such as twisting one cord a few turns would generate fluid and organic internal tension and movement in the whole object. The cotton offered a friendly hand working experience that allowed wrapping stress-free for more time.

That malleability and softness contributed to my overall mindset more than I had expected. My hands—chronically stressed by sports injuries, work, and playing guitar—wouldn't go through any type of discomfort when working with the cotton strings. The experience was enjoyable and free of disrupting pain impulses, which positively contributed to my concentration and immersion in the work.

After a few small exercise bits testing different types of loops and patterns (See "Figure 18."), two objects came out as the result of combining diverse fastening alternatives: Strings #1 (see "Figure 19.") and Strings #2 (see "Figure 20."). Both are consequences of interacting with the tension and movement generated by two strings of different diameters when alternating different wrapping patterns.

Strings #1 and #2 have been hanging from the ceiling as decorative elements at home since I made them. Those were the first explorations in my research that I acknowledged as finished objects rather than just explorations or exercises bits. That was also the first time I made sculptural, light, and delicate artifacts. In the past, I would usually produce sturdy and enduring functional pieces of furniture that anchored their weight on the ground. Strings #1 and #2 serve an ornamental purpose instead, and they swing with a breeze.

Figure 19.

Strings #1

Figure 18.

Twisting the cotton

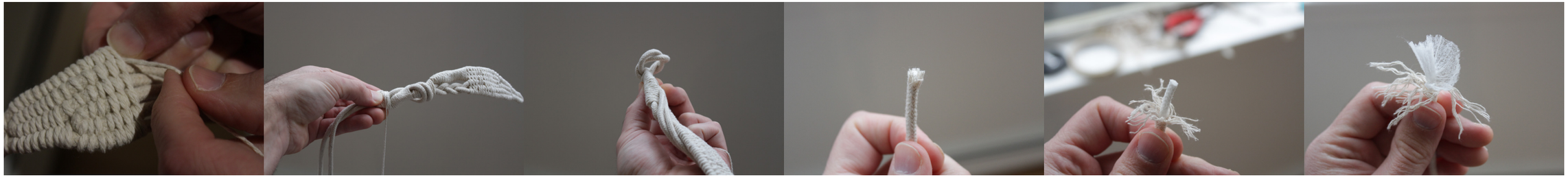


Figure 20.

Strings #2

My second project explored the replication and reinterpretation of Strings #2, working by repetition and variation through different materials. The first variant used 14- and 26-gauge wires, and the second one, jute and waxed cotton twine (see “Figure 21.”).

The wire object (Wires #4), resulted in an artifact similar to the textile one in some respects, and completely contrasting in others. The criteria applied to replicate Strings #1 was straightforward: following the loops count and the disposition of the strings as strictly as possible.

Figure 21.

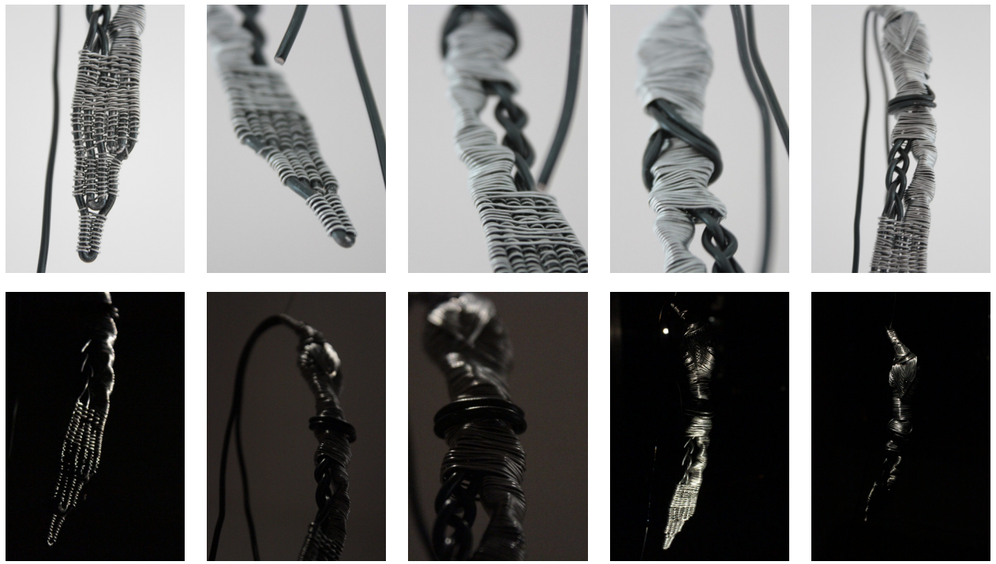
Variations

Wire #4 was smaller than Strings #2 (28.9 cm / 11.4” vs 48.2 cm / 19” respectively), as the wires used were thinner than the twine cords. In terms of the form, Wire #4 quite resembled the original, although the wire, being stiffer, made some of the loops and curves look somehow less fluid than in Strings #2.

My state of mind while working on this piece was very different from that of making Strings #2. Unlike with the cooperative twine, every wrap with the wire felt forced, as if I was constantly asking the material to respond in ways that were not quite part of its nature. Making Strings #2 was a creative process in interaction with a material that seemingly suggested its possibilities. Conversely, in Wire #4, the process felt more like imposing a form to a material that wasn’t completely friendly to the hands.

Figure 22.

Wires #4



Jute #1 was made using jute and waxed cotton twine. Because of being made with cords, this object was more related to Strings #2 than to Wire #4 in the form-determining aspect

and the haptic experience.

To make this piece, I approached ply-split braiding in addition to the winding. The change of technique impacted the final form, aesthetics, and size of the object as, instead of winding around the cord, I went through it (see “Figure 23.”).

The loops in Strings #2 became stitches in this iteration; 1 loop = 1 stitch. Strings #2 was a combination of different winding patterns that I had to reinterpret with this technique, and I represented those changes by varying the length of the stitches accordingly. That, along with the jute’s stiffness, produced changes in tension that provided the piece with a spiralling motion lengthwise. Because loops would pile tightly against each other, and stitches would need a minimum space one from another, the dimensions changed considerably, and Jute #1 ended up being twice longer than Strings #2.

Using this new technique in a slightly different cord gave this process a sense of novelty, as it allowed different situations and outcomes to happen in the making of an object that was already familiar to me.

Figure 23.

Ply-split braiding jute

Figure 24.

Jute #1

2.3 Phase 3 - Bending Rods

Phase 3 is a transition stage from home to the shop. After approximately eight weeks of exploring the exclusively domestic creative setting, I started to use some of the shops on campus. Part of my last project during the Spring Term 2021 elapsed at the metal shop, where I found a new technique that would be fundamental for the development of my research.

I first stepped into the metal shop with the idea of investigating casting and bending metals to continue with my reinterpretations of Strings #2. Ian Rhodes, the technician at the shop, introduced me to hot bending with an oxyacetylene fueled torch. The method was the right one for continuing my research process (see more about the technique in “3.2 Case Study #1: the ∞ Chair”).

I wanted to use hot bending to reinterpret gestures and forms from Strings #2 and scale up the explorations in wire to create bigger and sturdier objects using steel. The rods were yet another derivation of my early linear explorations.

The first bends I did, produced Rods #1. I began bending two ¼” round steel rods by half to start a sequence that imitated some of the wraps and braids in Strings #2 (see “Figure 25.”). The object resembled Strings #2, although inverted and sitting on the floor firmly (see “Figure 26.”).

Figure 25.

First bends

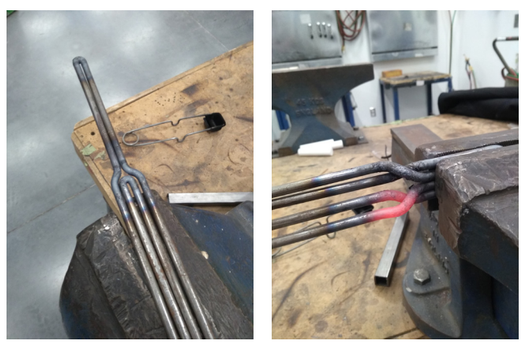


Figure 26.

Rods #1

Rods #2 came out as an elongated standing object by exploring angular bends, straight lines, and concentric, tight bends (see “Figure 27.”). Next, I did Rods #3 to keep practicing the wrapping in the style of Strings #2 (see “Figure 28.”). #3 could balance on the little hook of Rods

#2, giving more weight, stability, and interest to the piece. Rods #3 was the antecedent for the resolution of a critical joint in the ∞ chair (see “Figure 45.” on page 75).

Figure 27.

Rods #2 + #3

Figure 28.

Rods #3

Figure 29.

Winding around rods

In Rods #4 and #5, I used two rods as guides for the bending rod to wrap around (see “Figure 29.”), replicating the method and gesture from Wire #3 (see “Figure 14.”). These forms would also become fundamental later when making the chair (see “Figure 42.” and “Figure 44.” on page 74). As an additional feature that I didn’t anticipate, Steel #5 would produce rich bell-like tones, which I captured as a bonus track for my exploration:

Figure 30.

Link to video

link

The investigations with rods in Phase 3 allowed me to take the previous explorations a few steps further and incorporate gestures and details of those small-scale objects into a material that I could use to make structures or furniture. The technique enabled me to inform a material like steel with great control and smoothness, through a process that was highly interactive, haptic, and forgiving to my hands.

The hot bending offered great possibilities, and I thought I could develop a creative identity with it. I wanted to train my skills seriously and test the practical applications I could find for this technique. During the summer, I started working on the pieces for a rest chair, using what I learned with the “Rods #” objects. The project started during this phase as a practical exploration I would run on my own during the summer. However, as the making progressed and

Phase 3

my engagement increased, the project grew, generating a series of inquiries that would soon start informing my research. The chair was the transition between phases 3 and 4 and a big step forward for me from intuitive, exploratory making, to designing intentionally.

Figure 31.

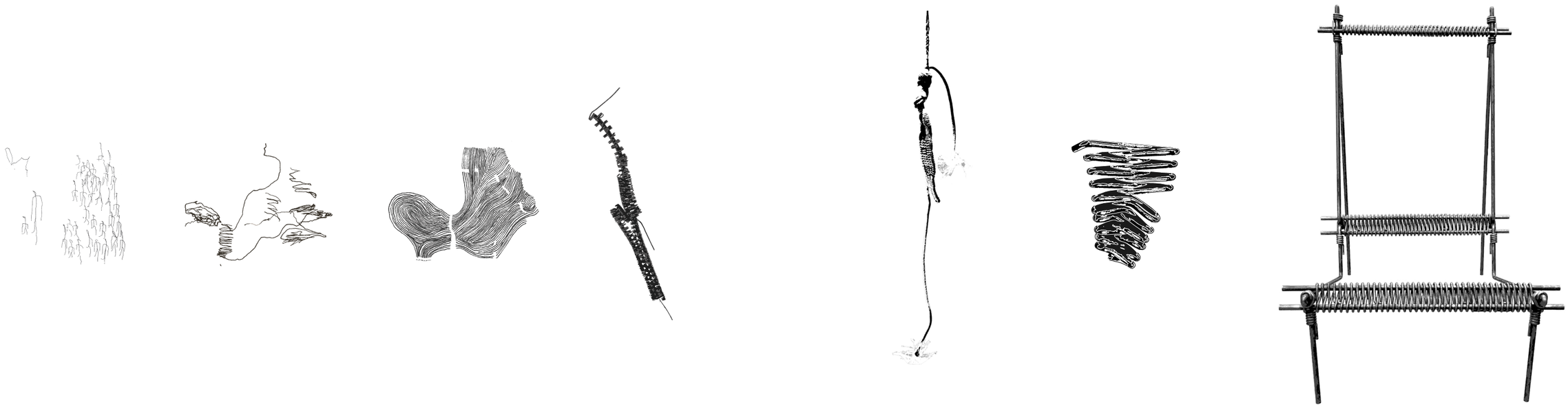
Rods #4

Figure 32.

Rods #5

Figure 33.

Genealogy of material and technique explorations



3. CASE STUDIES

3.1 Introduction to the Case Studies

The following case studies synthesize my craft practice and my nascent design practice coming together. In both cases, the design and the making were intentionally driven and framed by a distinct narrative and set of rational motivations. Unlike their precursory explorations (see section 2 above), I envisioned these outcomes as concrete, functional objects—a chair and a desk. My engagement with the materials and process of building these two pieces of furniture was strategic. Prototyping two different work scenarios became a means for evaluating and considering possible approaches and methods I could use to produce my work. Each provide me with a distinct perspective on how I might approach my practice of designing and making of furniture when I move onto my next venture—the shop that I am now considering establishing here in Vancouver.

These projects represent a stage in this research where I identify increasing intentionality in my inquiries. I envisioned the design experience and the making experience of both cases to prototype two production scenarios for producing two distinct pieces of furniture as design outcomes that would allow me to reflect on the process. I designed the experiences to develop previous findings and explore new possibilities while making two objects that helped me visualize my professional practice in the coming future. With these two cases, I felt that I was actively and comprehensively designing, considering aspects that I hadn't approached in the past. I committed to making every decision throughout the process by prioritizing what I believed was the best option in each case. That way, I could feel represented by the work, regardless of the material outcomes. Because designing allowed me to envision and project ideas in the future, the projects became meaningful and formative for me from the early stages, even when they appeared incomplete and indecipherable in the eyes of others.

Case study #1: Chair investigates a design process developing purely in the shop. A crafts-based approach with a preponderant handicraft character, it privileges my interactions in the shop with the materials, the tools and the techniques of making/assembly. Drawing on personal past experiences working in Argentina, the work develops around a narrative of designing and making that embraces dealing with limitations and reduced resources. *Case study #2: Desk*

addresses design through a more rational lens. A piece of furniture is imagined, conceived of, and produced through a screen. Computer-aided design (CAD) software and computer-aided manufacturing (CAM) machinery help realize this object; an approach closer to industrial design and a scheme now possible for me in this new setting.

While the methods and mindsets explored in each case—Chair and Desk—could be interpreted as ideologically and technically opposed, they sit together complementarily as resources for broadening the range of possibilities within my practice. Offering distinct perspectives, they have provided me with new strategies to develop my activity in different settings. Chair explores an approach that allows the production of a furniture item in a context of scarcity, in which the equipment and materials used are inexpensive and easily acquirable. The prime resources required are working time and skilled handwork—the features that, at the same time, give added value to the piece. The project prototypes a type of practice that seems appropriate for the initial stage of my future business. Such an approach wouldn't require a substantial and risky seed capital for setting up a shop, and it would also enable me to keep my production costs low. Desk addresses a design perspective that turns around digital fabrication, relying on complex technology for core parts of the project. The approach requires access to a bigger infrastructure and more expensive materials than the ones used in Chair. Desk explores outsourcing fabrication and delegating a whole stage of the making process in which I would usually participate actively. Access to resources is a key element of the case. However, the rationale behind it is paradoxically still linked to limitations; the response to my budgetary limitation comes, in this case, from the possibilities that this new context offers me.

These projects were also a means for producing work on my own terms, in a very enjoyable way, and focusing on things that matter to me while working. Within this setting, I was able to work slowly and with a mindset attentive to the small details in the process. Having enough time and not rushing has always been crucial for me, and that was certainly the case in the context of this research: time would not only improve the outcomes of my making but, more importantly, it would allow me to observe, analyze and reflect on my making in real-time.

On reflection, the outcomes of both pieces have unique aesthetics, and each has distinct

natures and attributes. They explore different formal possibilities and interactions with volume and space: Chair explores linearity through steel rods, while Desk explores surface through the use of plywood. Chair has a raw and unpolished feel and a finish that reveals the material through different moments of the making process. Some parts of the structure will show the steel rod as it is on its own when not intervened. Other sections—where I did work—will show different colorations, textures or even rust and burn marks, like scars or traces left from the process. I put the long hours of work and my attention to detail in giving form to the object. For me, the beauty of Chair lies in that process, and putting paint on top of the material would have meant hiding all that. Desk contrasts in this respect too. Although I spent a considerable amount of time in the form-giving stage, I didn't have to deal with the material in that process; it was all done for me. However, I did spend many days assembling and sanding every part by hand to make the surface as good as I could make it. I spent long hours working on embellishing details such as the screws covers, I spent weeks looking for the right finishing techniques and products, and, after that, weeks working on the finish.

Chair is about linear form and Desk is a lot about making the material look beautiful—to my taste. However, no matter how different the processes and outcomes were with Chair and Desk, in the end, they do share commonalities in the long hours of work and the required patience, attention to detail, and care.

3.2 CASE STUDY #1:
THE ∞ CHAIR

Figure 34.

Chair - leg detail

3.2.1 The ∞ Chair - an Introduction

Chair was the first functional object and the first outcome-based project I would produce for my research. Initiated with the goal of creating a specific piece of furniture that addressed working with reduced resources, it was also a creative strategy for training skills and developing resourcefulness through limitations. It was an opportunity to design and make with steel rods and cords, using as few and affordable tools as possible. As a synthesis of the exploratory works preceding it, and as a model, it offers up a possible productive approach for reshaping my creative and making practice. Working on Chair has enabled me to consider practical applications of my explorations in my professional practice outside the academic space.

The sections below draw upon documentation, observations and reflections of an ten months design and making process, which ran from June 2021 to April 2022.

3.2.2 Process, Rationale and Inquiries

The project originated organically as a subsequent step of the material, technique, and form explorations that I started back in September 2020 (see “Figure 33.”). The Summer term of Emily Carr’s MDes program is intended for self-guided research with fewer courses allotted. Running from May - August, it provided me with the time and opportunity to locate myself in the metal shop and embark on a larger and more demanding project informed by my earlier explorations. My most recent studio work (see “2.3 Phase 3 - Bending Rods”), which had an exploratory and non-outcome-based nature, informed some aspects of the summer work but not all. This time I would work in the metal shop with a defined goal: making a chair.

While I have made many articles of furniture in the past, this was the first time I would design and manufacture a piece consciously focusing on the meaning, implications, and possibilities within the object I was making. This project was one where the creative and productive decisions were driven by a set of research questions and imperatives. I set myself the aim to find a way to get the most out of a limited set of materials, tools, and infrastructure. My intention was to prototype a scenario of scarcity within the setting of the University (which offers some of the best shops I’ve ever seen) as a strategy for testing the notion that a lack of infrastructure

and resources, combined with an intense self-training of a handicraft skill, gives rise to innovative new techniques and possibilities for the maker. I set in place an equation that would combine conceptual, technical, and practical challenges. It was also the opportunity to set in place an appealing and challenging creative project for myself.

Figure 35.

First bends on 1/2" steel rods

3.2.3 Contextual Limitations Informing the Process

Completing training courses is required to use many of the tools in the Emily Carr shops. When I first stepped into the metal shop in March 2021—as increased access to the campus was being afforded—those courses were not yet available. This meant that using tools such as the welders, for instance, was not an option. This limitation, however, was not an issue for me as part of my plan was to keep developing my earlier explorations with ¼" steel rods. Turning to themes of limitation and resourcefulness that were arising in my work, I decided I would design a metal chair[1] that did not rely on welding to put the structure together. The timing was right, as my questions around the technique were starting to inform my approach:

1 For me, chairs can be very challenging objects both to design and to make, and interesting objects to convey expectations and possibilities. Through a chair I can make an aesthetic statement, and I can offer my perspective on what seating comfortably might feel like for me. By making a chair I can engage with the creative, the expressive, the practical and the productive aspects of my practice, and I can challenge the designer and the maker in me. On top –or above– of all that, a chair is still an object that has a function and a structure that must work properly, and an artifact that should be inviting for others to use. A chair is, then, an object I enjoy using and a challenge I enjoy facing.

How could I make an enduring metal structure without welding?

Could the wrapping technique work for holding the pieces together?

Could this limitation be used as an opportunity to test, improve, and put the technique to work?

My idea was to make the chair as an intensive training exercise on adaptation. Working under constrained conditions was compelling and related to the thread of exploration that I had been taking on: means for recovering and reconfiguring my practice. The resources needed to produce the chair would be few, inexpensive and probably very easy to source anywhere. These constraints highlighted a new nuance in my practice. On top of the technical inquiries, I was approaching my making through a conceptual perspective. That also generated new future-facing questions for me, ones concerning an entrepreneurial aspect of making furniture:

What are the resources needed to make this chair?

If this chair is effectively possible to produce using so few resources, might it be, then, a

Figure 36.

Legs finished

sustainable strategy to relaunch my practice and open my shop in this new setting (Vancouver)? Could this chair work as a model for prototyping a productive approach that does not demand a substantial seed capital and investment in tools (which I will probably not have in the near future)?

3.2.4 Self-Imposed Limitations as a Creative Strategy

If I wanted the design outcome to properly embody and reflect the inquiries guiding my work, the ideation and materialization processes had, then, to be coherent between each other. As the chair was an exercise to (a) continue a series of explorations that relied entirely on hand making and (b) explore a stripped-down approach to production, the creative resources and criteria would have to be limited and pursue austerity as well.

To materialize the chair, I decided I would follow a set of simple but non-negotiable creative rules involving technique, formal, aesthetic, and productive aspects, essentially summarizable as the following:

- Basic infrastructure and just the essentials: The chair had to be done using as few materials and tools as possible, just those necessary to produce a functional object.
- Welding was banned (even if I had access to the training courses later).
- The only way of joining or holding different pieces would be by winding them together.
- The structure had to be as functional as possible with just the essential components. Only necessary parts would be used, and I would not add any pieces to reinforce the structure.
- As the interaction between the technique and the material would play such a dominant role, the form would be a consequence of the process and not a predetermined imposition. Intuition would lead the way: the decisions would be made in the shop, and design and making would happen simultaneously, almost as a single process.

As the list of self-imposed limitations and questions kept growing, the chair became more and more intentional in every aspect, and the project became something more encompassing and prolonged.

3.2.5 Design and Making

My set of self-imposed limitations demarcated my infrastructure, resources, and course for producing the chair. A modest shop setting (see “Figure 38.”) would be enough to make the steel structure for the chair, as long as I responded to and worked with the material affordances, and as long as the bending technique I developed was effective for creating an enduring structure. The ability to build a frame capable of holding my weight would depend on how consistently I wrapped the steel rods, and how I positioned the parts and bends in the layout.

Figure 37.

The equipment for making Chair

The success with my project was contingent on a tight interdependence between hand-tool-material. Because of this, the possibilities of predicting how well the bent joints would work were considerably low. My design decisions, ruled by the affordances of the material and my skills as a maker, could only be made in the shop. Under these circumstances—privileging materials and the actions of forming and assembling material—what I might envision rationally and outside of the shop space was of low relevance.

On most occasions, the making and designing occurred at the same time during my sessions in the metal shop. In these circumstances, faced with simultaneous physical and intellectual demands, I often found the process more intense and challenging than any other project I did in the past. The work required constant patience. Long hours of work would produce small advances. Happily, the feeling of reward and accomplishment at the end of the day would usually be enough to renew the motivation to step into the shop again the next time and

go about repeating the same tasks.

Figure 38.

List of tools and materials used for making the ∞ chair

tools	materials
a workbench	(9) 1/4” mild steel round bar, 10’
(1) bench vice, (4) c-clamps and (1) spring clamp	(3.5) 1/2” mild steel round bar, 10’
a torch running on oxy-acetylene	(1) hardwood lumber, 12 sq ft
a grinder or a hacksaw	(1) ≈ 122 m/ 400’ of cotton cord
a hammer, a file, a steel brush and pliers	finishing wax
earmuffs, safety goggles and leather gloves	rags for applying the wax
a square ruler and a tape measure	
some wire, and some chalk	

3.2.6 The Technique

To build Chair, I found an alternative to welding. Using the winding technique trained throughout the earlier phases, provided me with a means to make pieces of steel wrap and tie together. Bending ½” and ¼” diameter rods through hot bending became my primary process for making this object, as the bends would both give form to the parts and fast them together.

Heating the workpiece alters the metal on a molecular level, enabling changes in the material to be produced more easily and with less stress. “An important consequence of softening occurring during hot working is a reduction of the stress required for deformation, an important ramification of which is that less powerful metal working equipment may be used” (Beddoes & Bibby, 1999). By working at the right temperature and applying the forces correctly, I could produce the tight loops that I needed to fix the pieces firmly together. The challenge, though, was being capable of repeating the action consistently many, many times over.

When treated with fire steadily for some time, steel starts heating and, hence transforming. One manifestation of that process happens through light emission: at around 1000°F/538°C

the metal will first turn a dark shade of red, and with further heating, orange, then yellow, and eventually white. The usual working temperatures for forging—as observed when the hot metal piece is in the shade—is within the range between the reds to yellow phases (see “Figure 41.”).

For heating, I used an oxyacetylene fueled torch. The torch provides a consistent and localized flame that allows focused heat in small areas. Although this process allows for great control over the affected surface, it demands concentration. Slight variations in the heating time or the distance between the flame and the piece can produce inconsistencies or even burns within a few seconds.

The torch also provides the ability to apply heat and exert force over the piece to be bent simultaneously. When using a forge, heat is first applied, then the metal is removed from the flames and taken to the working zone. But with the torch, one hand holds the heat source as close as needed, while the other hand acts to move and shape the rod (see “Figure 39.”). The torch allows for constant work on small segments uninterruptedly.

This process involves coordinated eyes and hands work and requires attention to the

Figure 39.

One hand holds the torch, the other bends

Figure 40.

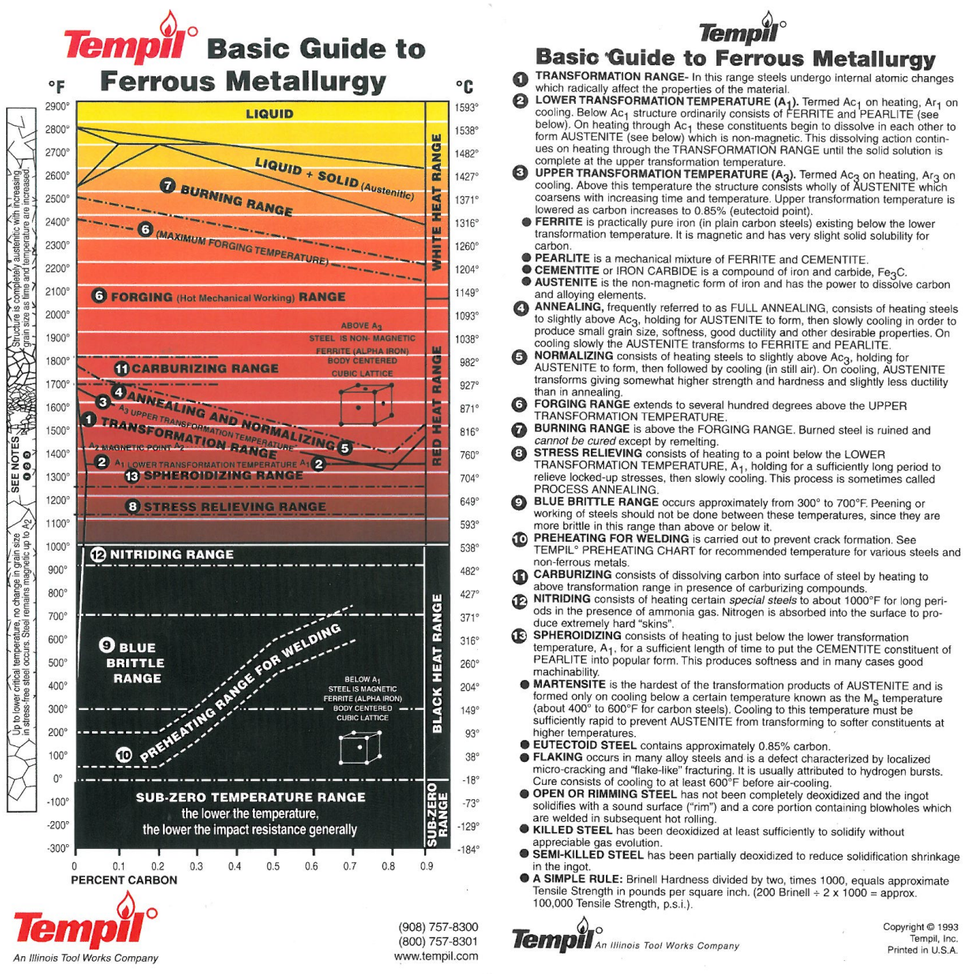
Link to video

link

sensorial phenomenon. In addition to colour, the touch is a crucial indicator for identifying the right moment to start, continue or end the bending. Each curve is a combination of visual and haptic stimuli and responses. Eye rules the torch hand—the right in my case—in the multi-di-

Figure 41.

Tempil's Basic Guide to Ferrous Metallurgy



Tempil
An Illinois Tool Works Company

(908) 757-8300
(800) 757-8301
www.tempil.com

Tempil
Basic Guide to Ferrous Metallurgy

1. **TRANSFORMATION RANGE-** In this range steels undergo internal atomic changes which radically affect the properties of the material.
2. **LOWER TRANSFORMATION TEMPERATURE (A_1).** Termed Ac_1 on heating, Ar_1 on cooling. Below Ac_1 structure ordinarily consists of FERRITE and PEARLITE (see below). On heating through Ac_1 these constituents begin to dissolve in each other to form AUSTENITE (see below) which is non-magnetic. This dissolving action continues on heating through the TRANSFORMATION RANGE until the solid solution is complete at the upper transformation temperature.
3. **UPPER TRANSFORMATION TEMPERATURE (A_3).** Termed Ac_3 on heating, Ar_3 on cooling. Above this temperature the structure consists wholly of AUSTENITE which coarsens with increasing time and temperature. Upper transformation temperature is lowered as carbon increases to 0.85% (eutectoid point).
   - **FERRITE** is practically pure iron (in plain carbon steels) existing below the lower transformation temperature. It is magnetic and has very slight solid solubility for carbon.
   - **PEARLITE** is a mechanical mixture of FERRITE and CEMENTITE.
   - **CEMENTITE** or IRON CARBIDE is a compound of iron and carbide, Fe_3C.
   - **AUSTENITE** is the non-magnetic form of iron and has the power to dissolve carbon and alloying elements.
4. **ANNEALING,** frequently referred to as FULL ANNEALING, consists of heating steels to slightly above Ac_3, holding for AUSTENITE to form, then slowly cooling in order to produce small grain size, softness, good ductility and other desirable properties. On cooling slowly the AUSTENITE transforms to FERRITE and PEARLITE.
5. **NORMALIZING** consists of heating steels to slightly above Ac_3, holding for AUSTENITE to form, then followed by cooling (in still air). On cooling, AUSTENITE transforms giving somewhat higher strength and hardness and slightly less ductility than in annealing.
6. **FORGING RANGE** extends to several hundred degrees above the UPPER TRANSFORMATION TEMPERATURE.
7. **BURNING RANGE** is above the FORGING RANGE. Burned steel is ruined and *cannot be cured* except by remelting.
8. **STRESS RELIEVING** consists of heating to a point below the LOWER TRANSFORMATION TEMPERATURE, A_1, holding for a sufficiently long period to relieve locked-up stresses, then slowly cooling. This process is sometimes called PROCESS ANNEALING.
9. **BLUE BRITTLE RANGE** occurs approximately from 300° to 700°F. Peening or working of steels should not be done between these temperatures, since they are more brittle in this range than above or below it.
10. **PREHEATING FOR WELDING** is carried out to prevent crack formation. See TEMPIL® PREHEATING CHART for recommended temperature for various steels and non-ferrous metals.
11. **CARBURIZING** consists of dissolving carbon into surface of steel by heating to above transformation range in presence of carburizing compounds.
12. **NITRIDING** consists of heating certain *special steels* to about 1000°F for long periods in the presence of ammonia gas. Nitrogen is absorbed into the surface to produce extremely hard "skins".
13. **SPHEROIDIZING** consists of heating to just below the lower transformation temperature, A_1, for a sufficient length of time to put the CEMENTITE constituent of PEARLITE into popular form. This produces softness and in many cases good machinability.
    - **MARTENSITE** is the hardest of the transformation products of AUSTENITE and is formed only on cooling below a certain temperature known as the M_s temperature (about 400° to 600°F for carbon steels). Cooling to this temperature must be sufficiently rapid to prevent AUSTENITE from transforming to softer constituents at higher temperatures.
    - **EUTECTOID STEEL** contains approximately 0.85% carbon.
    - **FLAKING** occurs in many alloy steels and is a defect characterized by localized micro-cracking and "flake-like" fracturing. It is usually attributed to hydrogen bursts. Cure consists of cooling to at least 600°F before air-cooling.
    - **OPEN OR RIMMING STEEL** has not been completely deoxidized and the ingot solidifies with a sound surface ("rim") and a core portion containing blowholes which are welded in subsequent hot rolling.
    - **KILLED STEEL** has been deoxidized at least sufficiently to solidify without appreciable gas evolution.
    - **SEMI-KILLED STEEL** has been partially deoxidized to reduce solidification shrinkage in the ingot.
    - **A SIMPLE RULE:** Brinell Hardness divided by two, times 1000, equals approximate Tensile Strength in pounds per square inch. (200 Brinell ÷ 2 x 1000 = approx. 100,000 Tensile Strength, p.s.i.).

Tempil An Illinois Tool Works Company

rectional movement around the heated area, according to what the rod manifests through incandescence. Simultaneously, the hand controlling the rod—my left—pushes or pulls with varying intensity and speed accordingly to what the material allows. As the steel undergoes the transformation from red to orange, the holding hand can perceive the steel starting to expand and soften to the point when the sole weight of the rod would be enough, or more than enough, to create a bend. At this point, the hand starts working in a more refined and gentle way than just pushing or pulling, simply by holding or accompanying the movement suggested by the rod. The work becomes more about control and release than brute force.

By picking a starting point and following the imaginary trajectory that the rods suggest, one could infer part of the motion involved in producing the chair (see "Figure 42."). The movements that materialize a bend start from the left fingertips and palm, and expand through the wrist, which rotates complementarily to the elbow while dictating the shoulder's action (see "Figure 40."). The kinetic wave that the left arm produces then replicates through the shoulder blade and torso to hit the waist, contorting to accompany the upper trunk's amplified impulse. The knees, in turn, flex and orbit over the undulating and pivoting ankles that rely on the proximal, middle and distal phalanx to ground the whole body to the floor. Like a buoy over the bodily tide, the head floats and dodges the rod, centrifugal when softened by the persistent right hand that works under the command of the eyes, fixed on the flame. This choreography around the workpiece (the steel rod) and the workbench, represents just one single bend.

The sequence reprises (with more or less variations) in every loop, and there are more than 345 loops in the chair. Although the moves can become automatic after so many repeats, the line between fully focused repetition and distraction/boredom/exhaustion can be thin. With that comes the error—something to avoid, as repairing without leaving trails is not an easy task at all. The process demands constant concentration to reproduce the right combinations time and again, and awareness to observe and deal with the potential error in real-time. To reach the right mindset, a certain amount of time is required. Hands and body will also ask for a warm-up: I found that muscle memory would not instantly reappear at the beginning of each workday, even when I was working on the project for several days in a row. Longer working sessions

would always work better as they afforded time to resume, gain momentum, and confirm. Through the combination of concentration and repetition, I found a way to make the chair and train myself in this new skill. This form of meditative making in the shop I hadn't experienced before.

Figure 42.

Chair - repetition and change

3.2.7 Determining a Price Tag

Chair originated as a design outcome of my research, and I didn't conceive it as a product with commercial purposes. However, I am assessing if I could adopt this production approach as part of my practice in my future shop, and the economic factor is essential in that evaluation.

This is an exercise to (a) determine costs and a potential price tag for this chair and (b) address some of the questions I would ask myself when appraising my work:

How expensive would this chair be? How to determine a price tag
honest and fair both to me and the customer?
Does it even make sense, from a practical perspective, to produce something like this?
Does it make sense to pay this money for a piece of furniture?
How do we value things? How do we value our/others' work?

The price tag here is hypothetical. Nevertheless, the calculations are based upon actual numbers I do count with: costs of materials through local suppliers from Vancouver; the number of hours I worked on the chair; and the cost of my work, considering my current hourly rate as a freelance woodworker in Vancouver (as of April 2022).

Table 1.

Chair - costs of supplies

	ITEM	$ PER UNIT (AFTER TAXES)	QTY	$ SUBTOTAL (AFTER TAXES)
	1/4" mild steel round bar (10')	6.68	9	60.12
	1/2" mild steel round bar (10')	20.73	3.5	72.56
	1/2" Birch dowel (1')	12	2	24
	4 mm cotton cord (roll x 45.7 m / 50 yd)	14.55	2	29.10
TOTAL $ (CAD)				185.78

Figure 43.

Chair - hours worked

85	hs with steel structure
+ 9	hs stringing
3	hs woodwork
97	hs total

Table 2.

Chair - price calculation

	ITEM	$ PER UNIT	QTY	$ SUBTOTAL
	Cost of materials (Table 1)	185.78	1	185.78
	Hourly rate x work hours	26.5	97	2570.5
TOTAL $ (CAD)				**2756.32**

If I were to make this chair for a second time, I would have many parts of the process figured out already. My hour count would reduce sensibly as I already know what to expect throughout the process. My skills are already trained and more refined than when I first started, and I'm familiar with the technique now. I wouldn't have to spend hours to figure out the following steps as I already designed the chair, and the working days in my shop would be longer, more often, and more consistent than they were this time. If I had my shop for making this chair, I would have templates, jigs, and my setup prepared for replicating the chair easier. If those things happened, I would make the chair faster.

On the other hand, there are many factors and specifics that I can't estimate right now, as I don't have my shop yet. I'm not paying rent—although I paid for tuition—; I'm not buying equipment or supplies; and I'm not considering transportation and logistics costs, services, or any other of the expenses that come with running a shop.

For those reasons, for the purposes of this exercise, I made my estimations based just on the actual circumstances under which I made the chair. These numbers give me, at least, a reference price point to contrast with furniture of similar characteristics in the market where I work now.

I often find putting a price on my work difficult, and I struggle to find the line between under and overpricing. I want to earn my living doing what I like without grappling to enjoy my work; underpricing puts all that at risk. Handcrafting can be very appealing, sell, and monetize more than well in the right circles—something that favours the makers. However, I believe overpricing just because one can is not honest and is not fair to everyone. My exercise in that regard is simply trying to quote responsibly and estimate the costs the best I can; just that amount of speculation and no more.

In a case like this, my chair would sale for around 2750 CAD (see "Table 2."), which is a lot of money. Some people might pay that, and some people might charge even more for making something like this. For me, that's money I couldn't afford for a chair, and making things I couldn't buy is something I usually debate with myself. This is probably one of those questions I will keep addressing for a long time.

Figure 44.

Chair - leg detail

Figure 45.

Chair - leg detail: a joint inspired by “Rods #3” (see “Figure 28.” on page 49)

Figure 46.

Chair - seat detail

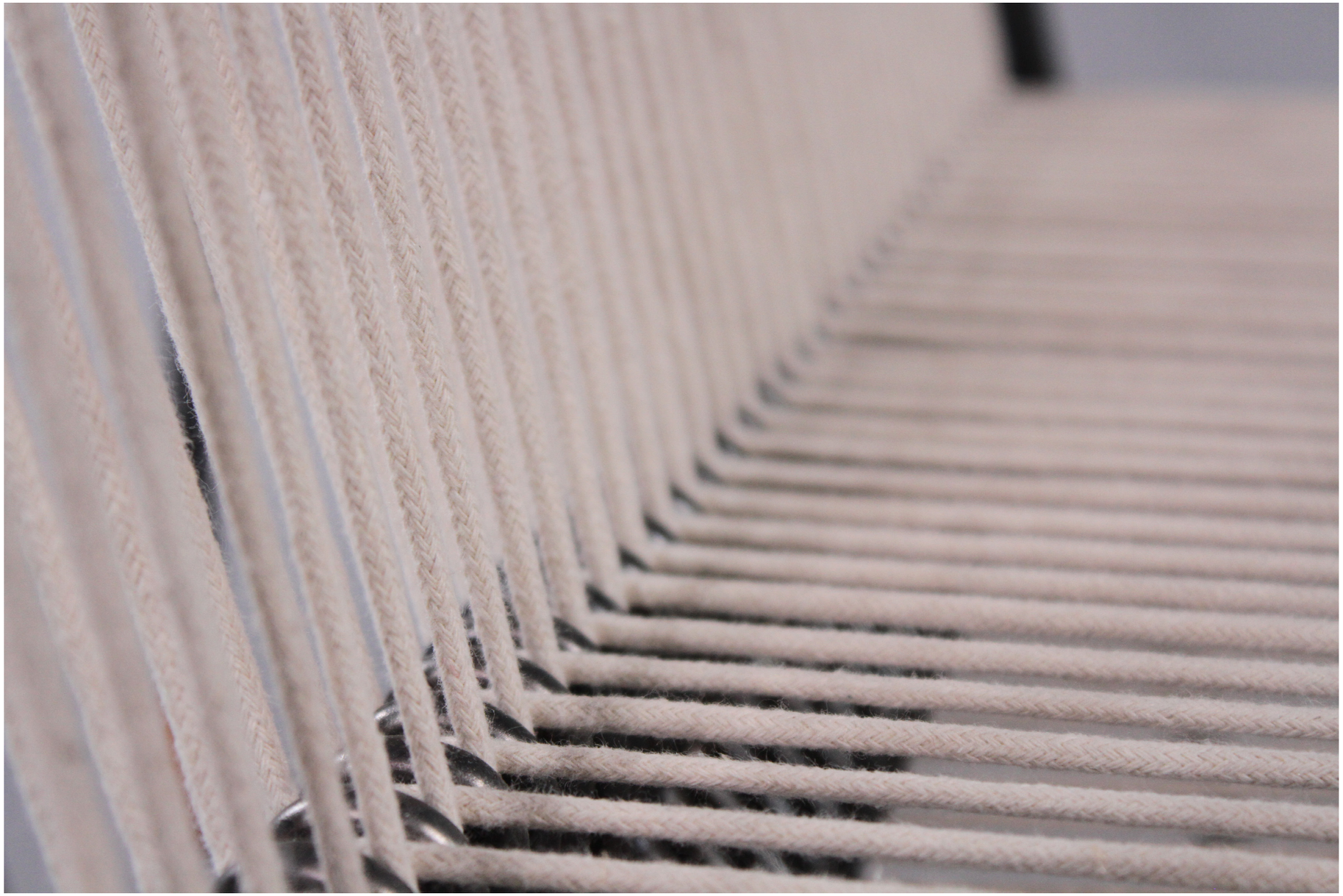


Figure 47.

Chair - seat and legs detail

Figure 48.

Chair - leg and rail detail

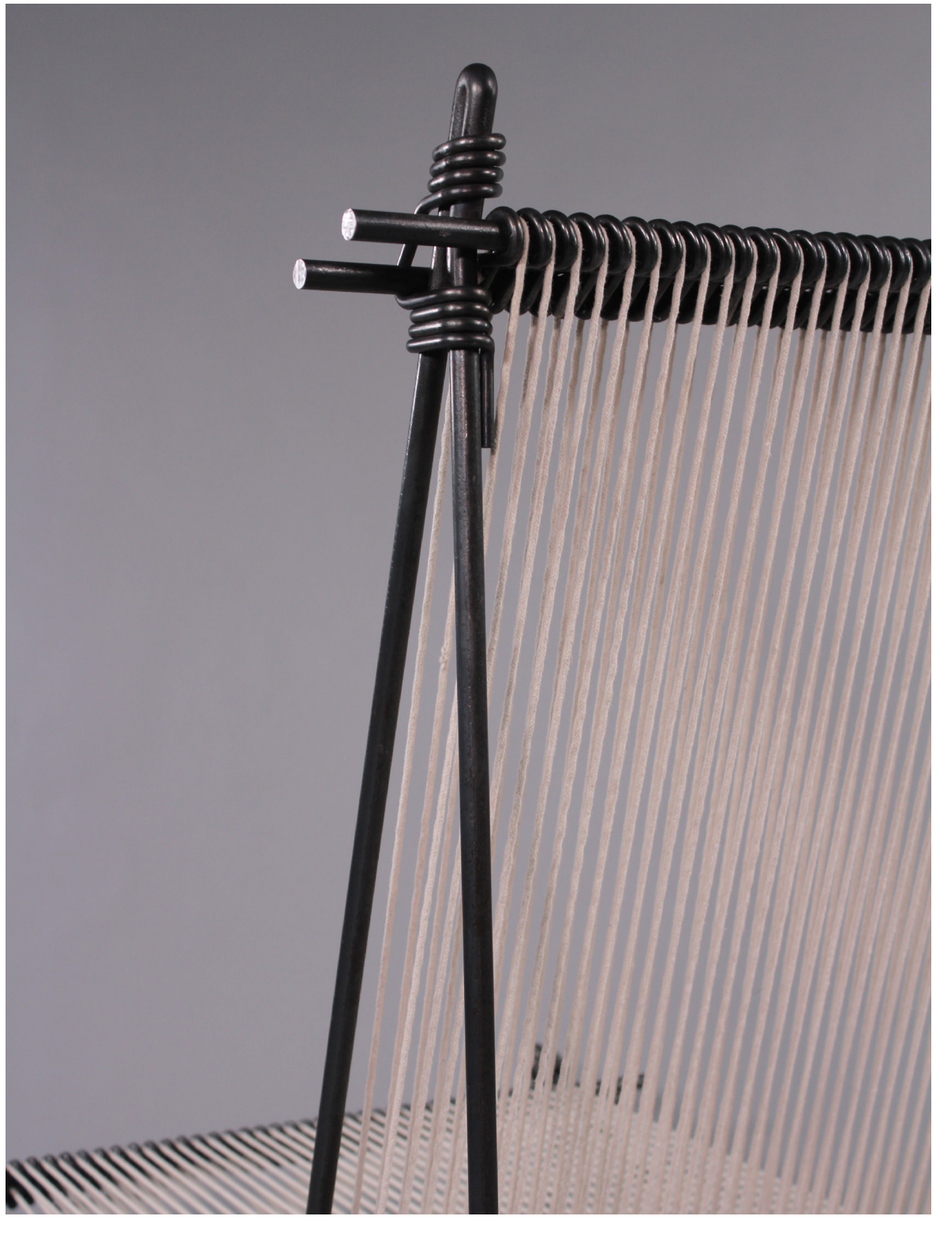


Figure 49.

Chair - side detail

Figure 50.

Chair - rear

Figure 51.

Chair - front

3.3 STUDY CASE #2: THE DESK

Figure 52.

Desk - Render

3.3.1 Inquiries and Rationale

Desk is the most intentional project in this thesis. Chair was born as a culmination and synthesis of an exploratory process that evolved organically throughout this research. I conceived Desk, instead, from a more rational perspective: a counterpoint to the methods I used to create Chair, for training a different type of skills and working within a different frame.

As an intellectual exercise, I planned Desk to challenge some of my tendencies as a craftsman and designer. I intended to question my assumptions on training resourcefulness through limitations—to contrast the design-through-making approach that I had employed up to that point in my research. The initial questions suggesting this investigation thread originated early in the Fall 2020 semester—when I started to perceive limitations + resourcefulness becoming the predominant narrative in my research.

May my angle on limitations and resourcefulness be a romanticization of crafts and (more than necessary) handwork?

I closed my shop feeling worn out by limiting factors and tired of having to be resourceful every day. I wanted to live and work somewhere I could access more resources. But now that I'm in a privileged and comfortable academic setting, I'm building a big part of my research around a simulated scenario of limitations and scarcity. I didn't appreciate those impediments when I was in the midst of them (back in Argentina), but I do now. Is that only due to the process I have made throughout the program? Am I reaffirming convictions, or might I also be reconciling with my background and experience, and romanticizing about it now that I'm no longer there?

Is my bias toward handwork impeding my ability to explore other valuable alternatives for doing my work? Am I to stick with only one way of doing things? Would that really be good for me as creative?

My decision-making when designing is intimately linked to my making capabilities; I design things that I know I can feasibly make. In my timeline as a practitioner, the craftsman precedes the designer. That is probably one of the reasons why I so often lean toward design

through making instinctively. The bias of being able to make informs my design perspective.

Intent on shifting in my approach, I decided that the critical parts in the creative process of Desk had to elapse outside the shop. I intended the design and making stages to occur separately. By doing so, I aimed to isolate the craftsman and the designer perspectives as much as possible. Even further, I wanted this process to rely more on the designer's end and reduce the maker's preponderance.

I chose to investigate and use digital means of design and production to explore my inquiries. My assumption was that using CAD and CAM would allow me to spend a healthy amount of time focusing only on the design stage and very little on the manufacturing. I would get an insight into using impressive technology to render and reproduce models by applying different methods to those I would use when in the shop. Even more so, a CNC—set up and operated by a technician—would take care of machining all the pieces for me with remarkable accuracy, which meant that I wouldn't need to spend any time cutting the parts for my desk at all. I would only work on the pieces during the assembly and finishing stages.

My interest in Digital fabrication stems from the flexibility it might afford me in the future. Working in CAD and CAM provides the capacity to outsource parts of the making process if need be—a very relevant possibility, I find, in this new setting of Vancouver. Here, unlike in Argentina, this digital production resources are easily accessible via a range of local fabricators. Looking to the future, the possibility of outsourcing could help me deal with the limitation of not having a fully equipped shop. Based on my previous experiences in Argentina I know that setting up a modest wood shop to make wood-based furniture requires more equipment and infrastructure than a low-key metal shop set up to create furniture with steel. It is also more extensive and expensive and inherently requires more storage space for supplies. Considering this, establishing a new shop herein Vancouver to produce metalwork seems most likely initially, with woodworking being postponed for a later point in time. Outsourcing appears, then, as an approach and answer to my question:

How could I produce wooden furniture without having the means to set up a proper infrastructure?

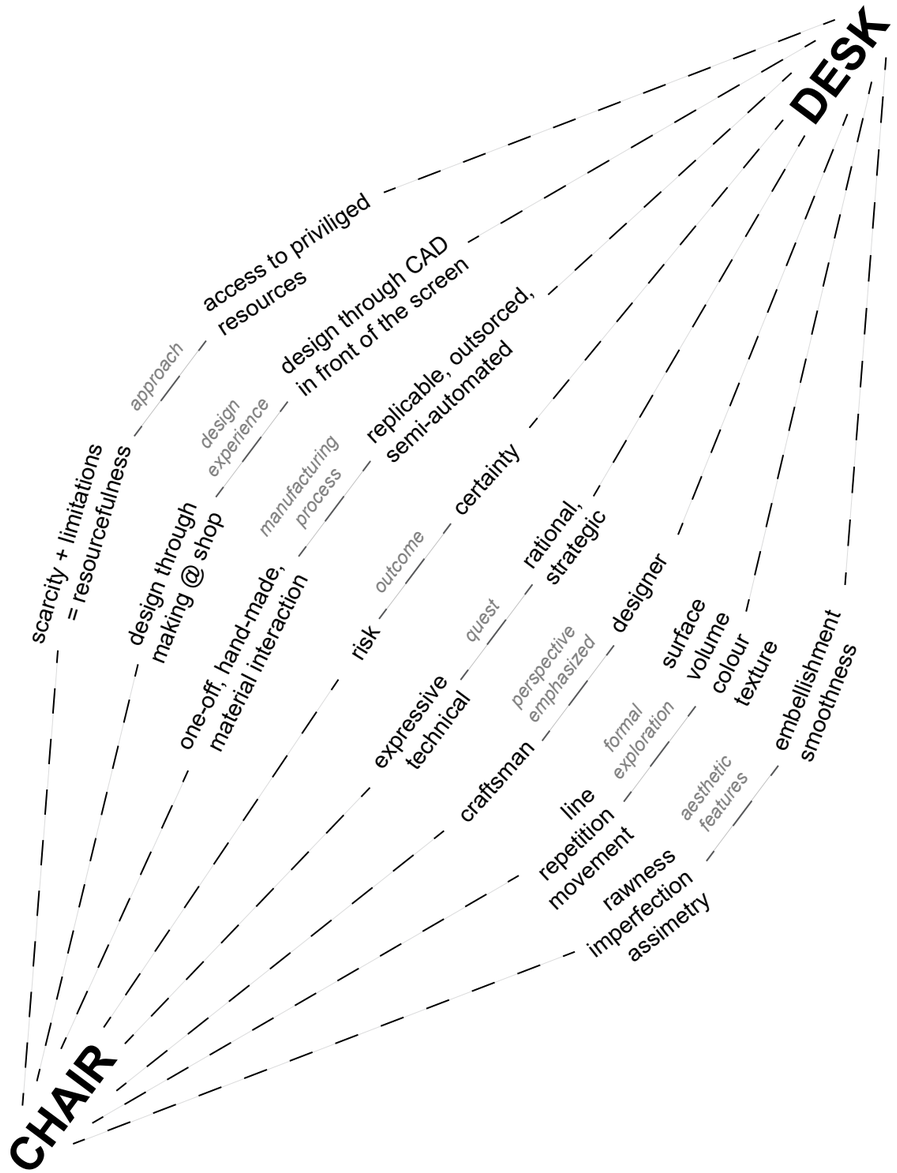
From a professional development standpoint, I wondered if engaging with a design approach more akin to industrial design's methods would provide me with knowledge that could open new doors. I could certainly use these new possibilities to produce objects within my own business. My newly acquired digital proficiencies could also enable me to approach the job market differently. If looking for employment, this new skill set could allow me to develop my practice as a designer independently. With a degree in design and some acquaintance and skills with CAD and CAM to go with my work experience, it would be easier to apply to designer positions that were out of my reach before.

From a creative perspective, I presumed that designing through a computer, with no physical interaction with materials and gear, would enable me to access different reasonings, ideas, forms, and aesthetics. With this new skill set I could model objects beyond wooden and metal products of the likes of what I'd previously done. I wouldn't need to limit myself to only routing wood furniture parts on a CNC. I could also model objects to be produced through 3D printing, opening further technical possibilities and a new logic thinking the material as melted and added in layers instead of being cut off, for instance.

Throughout this project—working on Desk—I found multiple instances to reflect and assess my inquiries and assumptions. On most occasions, I felt things developed similar to what I had anticipated. But I did get on one thing utterly wrong: I expected the making of the desk to be quick, as I had planned to keep the maker in me from interfering as I moved along and through the process of designing. When assembly and finish time came, I found myself delaying everything due to the craftsman's bias of working slowly and getting lost in the details (e.g., making custom brass embellishing screw caps and inlays; sanding everything by hand only, to avoid scratches in the wood; or making endless color tests by layering dyes, stains, and clear coats). I started this project thinking that I would be writing my thesis while sitting at my new desk, but now I can say that the furniture will arrive home once the writing is over.

Figure 53.

Desk - creating from complementary contrast



3.3.2 Design experience

I prompted myself to design this project entirely—from the initial sketches to the final iteration—on the software Fusion 360, by Autodesk. I wanted to avoid hand sketching or prototyping/modelling with materials, to design purely on the computer through the software I wanted to learn.

I anticipated my design experience to be similar to other platforms I had used in the past, perhaps something as a combination of Sketchup and AutoCAD. I expected to find extensive features for 2D drawing along with advanced extrusion capabilities and workspaces for manufacturing, producing layouts, etc. I began exploring the software and designing the first few iterations of the desk by using that logic and those features.

But, as the design progressed and the successive iterations allowed me to refine the concept, I discovered and tried new features and possibilities in the program. The real breakthrough happened when I realized that I could use several drawing and modelling methods, within the same application, amongst which there was parametric design. I knew very little about parametric design, and what I did know was mostly through oblique architecture references.

After some research and seeing a lot of potential in the approach, I restarted my project file from scratch, using the parametric design capacity of the application. Initially, I found writing parameters before designing somehow extraneous yet interesting. But, with time, once I set the parameters and started using them, the process became more immediate and relatable. To my surprise, I even found that in some cases, I could apply a logic similar to something I would do in the shop:

When needing to determine a dimension, I would often use pieces of material as spacers instead of measuring. If using plywood, for instance, I can use the edge of an offcut (which is the same as the thickness of the board) as my unit of measure. By stacking several pieces of plywood face to face, I know I have a total thickness = x times the thickness of the plywood board. That simplifies the task of equally distancing parts by using spacers and stop blocks instead of measuring and marking each time, saves time, and helps me avoid mistakes.

To extrapolate these tactics to the software, I would need to define my first parameter. I

would require the same information I would need to know when working with my wood blocks in the shop—basically, how thick the material is. I could, for instance, define “plywood_thickness” as the name, “mm” (millimeters) as my unit, and “18” as the expression. Then, whenever I applied the parameter “plywood_thickness” on an element, 18mm would be the value used as its dimension. By using the expression [“plywood_thickness”*x], I would accomplish with my parameter the same as I would with my wooden spacers.

And that would only be the start, as I could also define other parameters in relation to the first one. I could set, for instance, [“desktop_width”=”plywood_thickness”*120] if I wanted the width of my desk to be 216 centimeters—or 18mm*120. And I could go on then and set the height to be [“desktop_height”=”desktop_width”/3] if I wanted the desktop to be 72 centimeters high, or (18mm*120)/3.

Just like that, I could create a list of relational values that defined the dimensions of every segment in the desk. With all the sequence of parameters following that logic, only by changing the expression of the first one, I would modify the whole piece of furniture proportionally.

When I finally had the plywood ready for the machining, Steven Hall, the technician at the CNC lab on campus, let me know that the boards were actually 17.82 mm thick instead of the nominal 18 mm. That discrepancy of 0.18 mm was easy to correct, as the CNC at ECUAD has an accuracy of 0.0254 mm/0.001”. Had I wanted to adjust the dimensions in my file for a tighter fit of parts, I would only need to modify the parameter “plywood_thicknes” for all the related measurements to adjust accordingly.

I went through around 25 different files until getting the final iteration of my design ready for machining. I found the learning process compelling and promising, even when I barely scratched the surface and used only a fraction of the available features. Still, I would often find myself frustrated and burnt out in the lack of success with a procedure because of my limitations when using the software.

The approach of learning by making worked to some extent but only up to a point. In the earlier iterations when producing partial sketches of quite simple components, this approach

was feasible. After a few hours, though, I had to jump into forums and tutorials to replicate and practice procedures that I would adopt for my project. The learning curve was steep and intensified as the project file grew. The process would often appear unintuitive to my logic, and contrary to what I usually experience when learning a new craft or skill that involves using my hands. The software had a method, asking me to follow specific sequences of commands to produce the expected outcomes. After so many files, restarting from scratch, over and over again, I had to adapt to that.

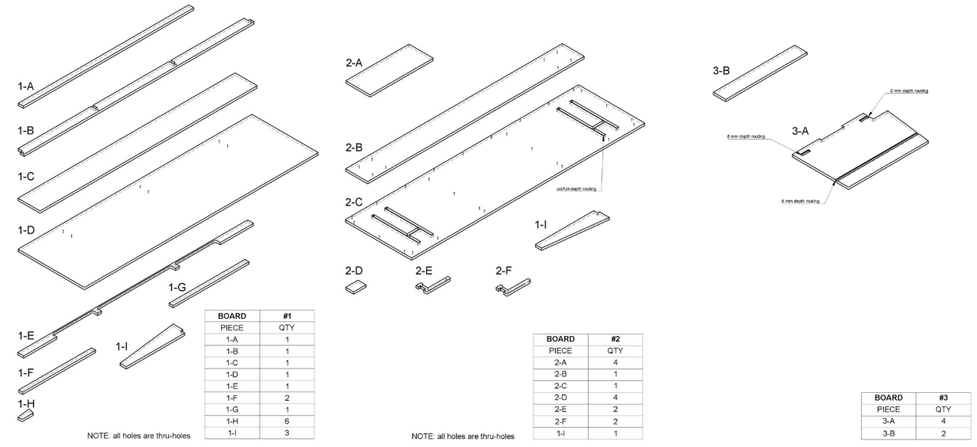
I feel that perfection becomes a reasonable expectation when using CAD and CAM means. For designing, CAD software offers unlimited edition and refinement, with the possibility of undoing and going back in time. It allows to model and observe from impossible vantage points. The software allows me to create through math and geometry that I don't master and that I can't apply by my own means. On top of that, CAD inspires certainty, backed up by the impressive precision and accuracy of reproduction that CAM means can achieve. This capacity for replicable precision is, I think, a remarkable and tremendous advantage to have on the maker's side. Within only a few weeks of work, I had wider a wider scope of creative resources. Desk was the first step to engage with new possibilities for designing and making things that I might not be able to conceive, with a precision that I couldn't achieve with my hands. However, with the aim for perfection somehow becoming a more reasonable pursuit, in my case, some obsession and loss of perspective can also come. On a few occasions, as I was getting closer to the final iteration, I realized I was spending hours on details so small (and sometimes embarrassingly superfluous and irrelevant) such as having a clean file, with layers systematically organized and labelled. I would be like that in that digital space, but I'm not at all like that in the analogue world. I don't expect my shop to be a surgery room and my clothes and hands to be clean while working. I try to get things done the best I can when I'm at the shop, but In the shop I know imperfection is the norm and that's how it will always be, and that's completely fine. Realizing these contrasts, I have begun to think that perhaps, the two different practices—digital and analogue—might be used to contrast, balance, and feedback creatively.

Figure 54.

Desk - early sketches and iterations

Figure 55.

Desk - pieces list for manufacturing



BOARD	#1
PIECE	QTY
1-A	1
1-B	1
1-C	1
1-D	1
1-E	1
1-F	2
1-G	1
1-H	6
1-I	3

BOARD	#2
PIECE	QTY
2-A	4
2-B	1
2-C	1
2-D	4
2-E	2
2-F	2
1-I	1

BOARD	#3
PIECE	QTY
3-A	4
3-B	2

Figure 56.

Desk - renders

3.3.3 Manufacturing experience

Watching the CNC cut the pieces I designed was exciting. This was my first experience fabricating through digital means, and although I knew how the process worked and what to expect, witnessing a machine doing my work for me impressed me. It only took 1 hour, 29 minutes, 33 seconds for the CNC, and 1 hour, 24 minutes for Steven (the technician) to prepare the cutting file. 2 hours, 53 minutes, 33 seconds total. It would probably have taken me one to two full working days to make those pieces in the shop.

A CNC router like the one at ECUAD consists, basically, of a router (a tool that cuts by rotating a cutting bit), a gantry, and a table/bed that acts as the workbench. A motor moves the router from side to side on the gantry (along the X-axis), a second motor moves it up and down (along the Z-axis). The gantry, in turn, can move longitudinally to the table (along the Y-axis). The CNC at ECUAD also has an automatic tool changer that changes the cutting bits as required without intervention from the technician (see “Figure 57.”). A computer runs the process established by the technician in the digital file that contains the toolpath instructions.

Figure 57.

Link to video

link

If I were to make the same cuts in a moderately equipped shop I would need: a circular saw, a jigsaw, a hand drill, a table saw, and a hand router. I would have to trace all my pieces on the plywood boards and roughly cut them out. Once done, I would have to refine my cuts to the final dimension, this time using the table saw where possible. In harder-to-access areas or curves I’d have to use a hand router. The hand router is technically the same as the tool in the CNC—and it would allow me the same results in a case like this—but I wouldn’t be able to operate it freehand, I’d need to set up each cut individually every time. The hand router has a base that sits flush on top of the material to be cut and holds the tool perpendicular to it. This set up assures that the cutting bit will cut an edge at 90° with the face surface—if using a straight bit. When using a template and pushing the edges of the router’s base against it, the bit will produce the cut offset and parallel to the guiding piece.

The cuts made by the CNC were surprisingly clean, leaving my pieces with smooth

edges, no burn marks, and cutting the wood without any tears (see “Figure 58.”)—thanks to both machine and technician. While I could accomplish the equivalent in a low-tech shop it would require time, concentration, and patience, and that would always entail the risk of tearing the wood anytime throughout the process.

Figure 58.

Desk - CNC cuts on a board

Machining using the CNC router saved me considerable physical demand and also reduced risk of minor injuries that sometimes occur using the base shop equipment I list above. An 8’x4’ / 2.44 m x 1.22 m and 18mm thick, Russian Birch plywood board, like the ones I used, weighs approximately 70-80lbs / 31.75-36.3kg. I used three boards for making the desk. Machining the parts by myself in the shop would have implied moving boards of such dimensions and weight between different rooms, through many doors, and over several tables. Doing that on my own would have been very inconvenient and probably risky. I’ve done that in the past too many times, and I know how that can harm my body. Anything that helps me avoid risks like those is worth considering.

Reducing the impacts that wood/furniture work has on my body became one of my main concerns since I resumed woodwork while in Denmark. I have an extensive record of sports-related injuries, and some as a consequence of woodwork as well. One of my injuries, from when I was 24 and playing football/soccer, is a double fracture in my right forearm with bone displacement of both radius and ulna, which has left me with ongoing nerve damage and is something I have to deal with constantly.

This injury has affected my guitar-playing, restricted my ability to practice sports, and has limited my work and everyday life for the past 11 years. It hurts even when lifting light weights or

doing gentle movements. I have been told not to expect for it to get better in the future. At this point, I know I can’t afford further injuries if I want to keep doing what I do for a long time. The digital manufacturing method of the CNC proved positively beneficial in this regard, and it would certainly make things easier and safer for me while working alone.

In Art Under Plutocracy, William Morris discusses the role of labour-saving machinery in the decline of art, stating:

[...] I have seen a quoted passage from one of the ancient Sicilian poets rejoicing in the fashioning of a watermill, and exulting in labour being set free from the toil of the hand-quern in consequence; and that surely would be a type of man’s natural hope when foreseeing the invention of labour-saving machinery as ‘tis called; natural surely, since though I have said that the labour of which art can form a part should be accompanied by pleasure, no one could deny that there is some necessary labour even which is not pleasant in itself, and plenty of unnecessary labour which is merely painful. If machinery had been used for minimising such labour, the utmost ingenuity would scarcely have been wasted on it; but is that the case in any way? [...] The phrase labour-saving machinery is elliptical, and means machinery which saves the cost of labour, not the labour itself, which will be expended when saved on tending other machines (Morris, 2020, p.41).

I am well aware that the context for Morris’s words and my context throughout this research differ in so many ways. While I do resonate with his writings—and share some of the old concerns about automated technology and employment—I can’t avoid associating his words with my experience with Desk. In this particular case, I can say that a labour-saving machine did help me as a worker. It alleviated my workload, and it saved me some pain. It saved me time, enabled me to focus on what I needed to focus on, and, ultimately, it allowed me to find more pleasure in the work I was doing. Forgive me, Mr. Morris, but the machine is fine!

3.3.4 Preparation, Pre-Assembly, and Finishing

The third stage of the process led me back into the shop for the assembly and finishing. My plan—outlined during the design stage—was to assemble mainly by gluing and reinforcing

with little strips of wood located in the internal intersections between parts. The wood strips would screw to the pieces of the desk, and the screws would remain hidden from the visible surface. For the finish, the idea was to dye and stain most of the pieces of the desk to a dark brown in contrast with a few pieces that would remain light-coloured, within the range of the Russian Birch's natural hue. According to the plan, this stage would elapse quickly, but the details got in the way.

Once I started to work with the pieces for the desk, I finally came against some of the logistics, practicalities, and physical demands that this part of the project would entail. I decided then to reinforce the joints between parts by using screws and glue differently, mainly because of all the handling I would have to do by myself. Each working day I would have to carry the parts from my studio to the shop and back again to the studio, as I was working in shared spaces at the university's woodshop, and I couldn't just leave all my things there until the next time. That added a lot of additional maneuvering to the usual, and I would have to do that alone every time, which meant that the handling wouldn't be as delicate and careful as when counting with help. The Russian Birch plywood was dense and heavy, and I needed extra guarantees from my joints for moving everything around so many times with confidence.

Relying more on the screws meant making the structure sturdier and easier to assemble, but the decision would have an aesthetic impact on the design. My most trustworthy fixing option was doing butt joints by gluing and screwing the faces of the outer pieces to the edges of the structural parts. That required making holes in the faces of the most visible surfaces of the desk. The question, then, was what to do with the heads of the screws and the holes: a) leave them visible, b) try to hide them, and c) use them as an intended aesthetic detail.

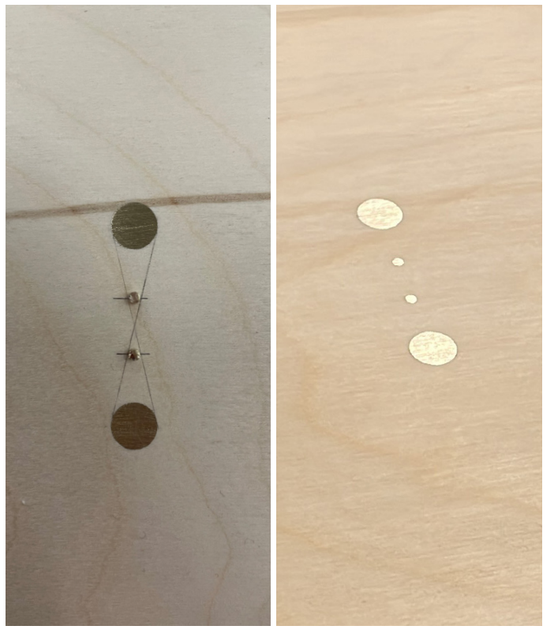
- For a), I only had to be thorough with the countersink—the enlarged upper part of a hole where the screw head sinks into—and fasten the screws flush to the wood.
- For disguising the holes—option b)—I could use wooden dowels/caps made from Birch, trying to match the colour and grain of the surfaces of the pieces as much as possible.

- Option c) would require contrast to highlight the extraneous element in the wooden texture. The contrasting component could be a material with different colour, different texture, or both.

Given that the holes would already be there, I wanted to highlight them; after all, they were part of the design as well. The screws by themselves would provide the contrast required, but they would give the desk an aesthetic feel that didn't match my idea for this furniture, given its form, material, and finish. I used brass instead, cutting 4-5mm thick discs out of round bars, which I used as caps on top of the screws, and later sanded flush to the surface (see "Figure 59.").

Figure 59.

Desk - brass inlays, before and after



As little more elaborated—and accessory—details, I added smaller inlays between the screw holes in the shelf (see "Figure 59.").

The brass inlays in the desk had an aesthetic impact on the piece. However, they originated from practical resolutions of details that I didn't consider at full during the design stage and which I had to solve after the manufacturing. Maybe I relied on my experience for solving those details later at the shop, or perhaps I just failed to anticipate something that, in the end, would affect how the desk looks. I don't know exactly how that happened, but it did, and I needed to fix that gracefully. The additional and unplanned work for the brass inlays took a few hours of my schedule. Had this happened in a working context, it would have cost me a small amount of money and some time allotted to other projects. However, within the context of

my research, I could afford the time for it to be just a learning experience through which I could also explore a material and an application that I hadn't used before. In the end, I think the inlays provided the desk with elements that make it more interesting to observe—and maybe trying to find where the next small brass dot will interrupt the woodgrain; if the inlays create protuberances or changes on the surface, etc. Those small details added to the piece some information and character that my 3D model and renders didn't have in the first place.

Once the inlays were ready, I spent several hours sanding every piece entirely by hand. Using electric sanders is remarkably faster, but it can leave many scratches on the surface if not carefully removed. I would finish the desk by using dyes and stains to colour the wood, and with those products, scratches across the grain highlight easily. The pigment particles found in stains lodge in the pores, scratches, and defects in the wood, making them appear darker than the surrounding wood (Flexner, 2021).

Finding the right combinations of colours took a long time. I did multiple tests (see "Figure 60.") with water-based and alcohol-based aniline dyes; pigment stains, wiping stains, oil stains, water-based stains, gel stains, and varnish stains for the colours. I tested them separate and combined—by layering coats. As for the clear coat, I did tests with shellac, wipe-on polyurethane, and varnish. After many tests, I decided to use aniline dyes and shellac.

Figure 60.

Desk - some colour test pieces

Aniline dyes are easy to apply (by brushing or wiping), provide an intense and even

Figure 61.

Desk - test piece: dyes and stain + shellac

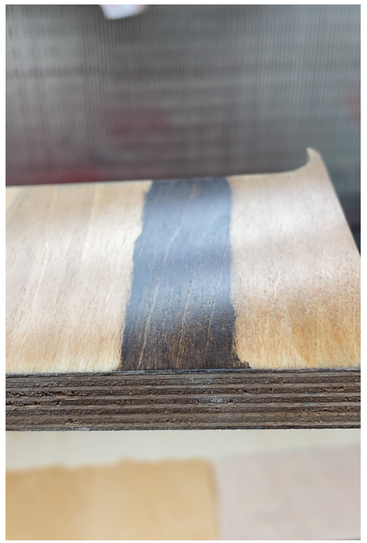


Figure 62.

Desk - left side sanded, right side full dye

colouring, and offer great control over the colour and saturation. The ones I used dissolve in water, thus safer, cleaner, and more sustainable than anything requiring chemical solvents. Shellac is a natural resin secreted by lac bugs that dissolves in alcohol. Although it isn't as resistant as other finishes, it provides excellent clarity, depth, and warmth, and is easy to apply and repair (Flexner, 2021). Shellac doesn't require a lot of preparation in advance to apply, and it dries quickly, for what it was a very good option to use when I was in a hurry or between tasks. Also, shellac builds a thin film with a type of gloss and texture that—I think—can look and feel natural and subtle.

For the light-coloured pieces, I used the dye to accentuate the wood grain while maintaining a big part of the Birch's natural appearance. For that, I brushed an amber-toned aniline to add colour to the pieces. Once dry, I sanded off all the finish from the surface carefully, leaving only the colour in the deeper grain (see "Figure 62.")—a method analogue to erasing graphite with a rubber. This sanding during the finishing added around 10 hours to the process. Once done with that, I applied shellac to start building the clear coat (see "Figure 63.").

The finishing process for the desk was an opportunity to investigate and try out products and application methods I hadn't used before. I had done some small test pieces with shellac flakes in Argentina and occasional work with stains when making guitars—although the

Figure 63.

Desk - raw Birch (top); dyed and sanded (center); one coat of shellac (bottom)

variety of options there is considerably more limited than in Canada. However, this was the first time I could apply these methods and spend such a long time working on a piece of wooden furniture; it even was the first time I painted using a paint booth—a dustless, fume-free environment. Compared to Chair, where the finishing method was only rubbing a little wax, this process felt endless. By the time of submitting this thesis, the desk wasn't finished yet. But, although the process was very time-consuming, I'm positive this was only the beginning, and I will probably use this method many times in the future.

Figure 64.

Desk - front

Figure 65.

Desk - detail

Figure 66.

Desk - detail

A Few, Last Words

Through the program and this research, I found new directions and possibilities to redefine my practice. This experience renewed my interest in what I do and provided me with more clarity about why that matters to me and how I want to approach my work moving forward.

At the time I started in the program, my design approach was purely intuitive and pragmatic. I would make design decisions based on aesthetics and practicalities of the making, driven by impressions and experience. Designing was, for me, defining criteria to give order and coherence to the hunches and expertise. My approach to making was intuitive too; I knew that I liked to make objects, and I had skills that allowed me to do that. For a long time, I just did that as a job without questioning much further.

Through practice-based research, though, I started asking myself why I like making objects, and began to recognize that there was meaning behind the things I make. Within the MDes, I realized that design wasn't only about criteria for making cohesive decisions but also finding and creating meaning through the things that I make. By exploring and reflecting on my practice, I found I understood the relation between the things I made and my own actions of making. The more I repeated that cycle, the more I learned and the more my creativity grew. I began to develop new ideas. Acknowledging the meaning in the making became a key purpose and drive in my design practice.

During my MDes, my first projects were driven by my experience and intuition as a maker. With Chair, I reached an all-time personal peak in my hand-making practice thanks to the motivations, purpose, drive, and direction that my research practice provided me. In Desk, I approached the creative process from a more rational and intentional angle, adopting digital methods frequently used within conventional industrial design practice. During that journey, I found new ways of thinking, creating, and making. In this document, I have tried to identify, observe, reflect, analyze, and externalize my findings and learnings in as much detail as I could. The objects and the thesis are the design outcomes of a research that portrays my experience to communicate the knowledge and understanding I gained throughout the process. The artifacts and everything in this document are my contribution to the field—for other practitioners who might find my work relatable and relevant. My hope is that my shared experiences will be useful to others, something to build and expand on. This, for me, would make all this work all the more meaningful.

What comes next for me—I hope—is opening my shop to resume my practice and continue to develop what I have started here. I want to further many of the explorations that I started in the frame of this research and incorporate my new exploratory and reflective practices into my everyday work setting. That way, work will also be about vocation, joy, and learning. During the last few weeks of writing this thesis, I started exploring some jewellery techniques with brass and copper. My next steps will probably include some of that as well. Time will tell.

Figure 67.

Brass pin (7 cm / 2 3/4")

Figure 68.

Small plate - copper (7 cm / 2 3/4")

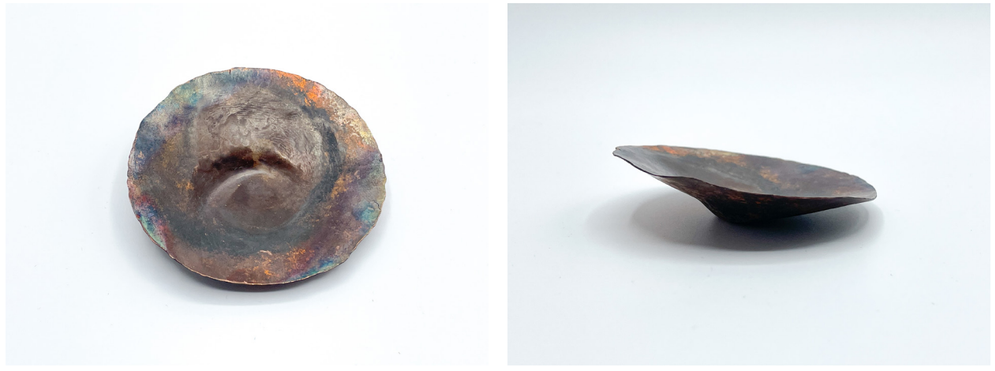


Figure 69.

Pendant - brass and copper (9,5 cm / 3 3/4")

Figure 70.

Plate - copper (12,7 cm / 5")

Figure 71.

Brass and copper (14 cm / 5 1/2")

References

Adamson, G. (2018). Craft and the industrial revolution - Section Introduction. In G. Adamson (Ed.), *The Craft Reader* (pp. 43–47). Bloomsbury Visual Arts.

Beddoes, J., & Bibby, M. (1999). *Principles of Metal Manufacturing Processes* (1st ed.). Butterworth-Heinemann.

Candy, L., & Edmonds, E. (2018). Practice-Based Research in the Creative Arts: Foundations and Futures from the Front Line. *Leonardo*, 51(1), 63–69. https://doi.org/10.1162/leon_a_01471

Edwards, B. (1979). *Drawing on the Right Side of the Brain* (1st ed.). Tarcher.

Flexner, B. (2021). *Understanding Wood Finishing*, 3rd Revised Edition: How to Select and Apply the Right Finish (Fox Chapel Publishing) Practical & Comprehensive; 350 Photos, 40 Reference Tables & Troubleshooting Guides (Rev. ed.). Fox Chapel Publishing.

Howe, T., & Dillon, P. (2001). Cultural Niche and the Contexts of Craft, Design and Fine Art. *The Design Journal*, 4(3), 50–57. https://doi.org/10.2752/146069201789389629

Lovelace, J. (2018, October 1). Craft: Seriously, What Does the Word Mean? *American Craft Council*. https://www.craftcouncil.org/magazine/article/craft-seriously-what-does-word-mean

Morris, W., Holland, O., & Hatherley, O. (2020). *How I Became A Socialist* (Revolutions). Verso.

Nimkulrat, N. (2012). Hands-on Intellect: Integrating Craft Practice into Design Research. *International Journal of Design*., 6(3), 1–14.

Pye, D. (1968). *The Nature and Art of Workmanship*. A&C Black.

Sennett, R. (2009). *The Craftsman* (1st ed.). Yale University Press.

Yanagi, S., & Leach, B. (1972). The way of craftsmanship. *The Unknown Craftsman: A Japanese insight into beauty* (pp. 197–215). Kodansha USA.

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