

Material Heuristics in the Humanities: A Year Between the Center and the Lab

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Republics of Letters publishes occasional dispatches from the front lines of scholarship, where new methods are explored and projects undergo rethinking. In the following essay, Ariel Stilerman (Assistant Professor of East Asian Languages and Cultures, Stanford University) discusses what he learned moving between the Stanford Humanities Center (2023–24 Fellow) and the Product Realization Lab, where he experimented with fabricating facsimiles of objects of medieval Japan such as illustrated scrolls and woodworking saws, as part of an exploration of “critical making.”



HOW DO WE come up with new ideas in the humanities? We have time-honored tools to evaluate arguments: interrogating evidence, identifying logical gaps, and uncovering hidden biases. There’s less clarity on how arguments are born in the first place. The process often feels as mysterious as alchemy: a hunch during a morning walk, a flash of insight over coffee, or a breakthrough amid cross-disciplinary chatter.

In this essay I argue that crafting objects can function as a powerful heuristic device in humanities research. I discuss Matt Ratto’s notion of critical making, Pamela Smith’s craft epistemologies, and my own experiences in what I call material heuristics to argue that making, and in particular analog making, can harness material construction and intellectual exploration to foster our understanding of texts, images, and meaning.

These insights emerge from a year spent thinking and making at the Stanford Humanities Center and the Stanford Product Realization Lab. During this time, my focus was on creating physical facsimiles of medieval objects - not exact replicas or meticulous historical reproductions, but affordable artifacts that could be handled regularly, showcased in lectures, and explored

collaboratively with colleagues and students. These objects were meant to do their work somewhere between the rigor of experimental archaeology and the inventive freedom of structured play.

Fifteen years ago, digital media scholar Matt Ratto introduced critical making as “a way of drawing connections between thinking and conceptualization on critical social issues and shared practices of material construction.”¹ In one project, Ratto built infrared-communicating devices from pre-coded components to explore how individual agency and participation in networks can modulate social interactions.

More recently, the *Critical Making Collaborative*, inspired by Ratto’s work and led by Stanford faculty Shane Denson and Matthew Smith, has curated talks on compositions for haptic instruments by D/deaf and hard-of-hearing musicians (Lloyd May), the use of biometric data to refine operatic pedagogy (Westley Montgomery), the intersection of generative artificial intelligence and psychoanalysis (J. Louise Makary), textile-supported LED-style displays (Hideo Mabuchi), and a Midjourney-assisted graphic novel (Matthew Smith).

While critical making has lent itself particularly well to digital ecologies, others have explored analog forms of making. Pamela Smith’s *Making and Knowing Project* at Columbia University, for example, focused on a sixteenth-century French manuscript detailing technologies like dyeing, casting, and woodworking. Smith’s team of scholars and students recreated in a modern lab environment the materials and techniques described in the text to unearth new insights about the role of making in the production of knowledge during the early scientific revolution.

The project’s chief deliverable was a digital object: a critical edition that layered facsimile, diplomatic, normalized, and English versions of the French text.² And as part of the project, codicologist Marc Smith and conservationist Alexis Hagadorn collaborated to reconstruct a physical model of the original bound volume as a way to explore the “author-practitioner’s intentions, actions, and experience in creating the manuscript.”³ By bringing together the traditional tools of the humanities, such as paleography, philology, annotation, and commentary, with the methods of experimental archaeology, Pamela Smith and her team opened a dialogue between textual hermeneutics and material fabrication.

I applied to spend a year at the Stanford Humanities Center as I was finishing my book *Court Poetry and the Culture of Learning in Japan* on how writing about court poetry in a variety of medieval genres (professional guides, advice for personal success, Buddhist essays, and parodic fiction) brought knowledge about the culture of the aristocracy to other social classes. My second project, *How to Know Everything*, I set out to examine encyclopedic and technical works created in the aftermath of violence and disaster.⁴

At the Center, I had the opportunity to receive feedback on this second project from scholars of many other disciplines. It was during the weekly research lectures and daily communal lunches that I first heard the words “critical making.” Across the street from the low,

¹ Matt Ratto and Stephen Hockema, “FLWRPWR: Tending the Walled Garden,” *Virtueel Platform* (2009): 51.

² Pamela H. Smith, Naomi Rosenkrantz, Tianna Helena Uchacz, et al., eds., *Secrets of Craft and Nature in Renaissance France*, A Digital Critical Edition and English Translation of BnF Ms. Fr. 640 (New York: Making and Knowing Project, 2020), <https://edition640.makingandknowing.org>.

³ Alexis Hagadorn, “The Physical Construction of Ms. Fr. 640,” in *Secrets of Craft and Nature in Renaissance France*, https://edition640.makingandknowing.org/#/essays/ann_328_ie_19.

⁴ Ariel Stilerman, *Court Poetry and the Culture of Learning in Japan*, (Harvard University Press, 2025).

exposed-beam architecture of the Center stands the brick building of the Product Realization Lab. There, alongside modern fabrication technologies like laser cutters and 3D printers, stood woodworking lathes, milling machines, and forges. The ability to move back and forth between office and shop was crucial to enable an iterative process that cycled between making and writing, much like that of Smith's author-practitioner.

The outcome of this year's research is a reimagining of my second project, now titled *Meet the People Who Built Japan: The Culture of Work in Early Medieval Japanese Literature*. It explores discourses on technology, community, and affect in connection to the lives of working people. Here I would like to discuss two making experiences that helped me find my argument.

One of them involved making a physical facsimile of medieval illustrated scrolls. These works carry the earliest representations of carpenters building temples and shrines. The illustrations showed individual tools and techniques with surprising technical detail, but they also felt crowded and haphazard.



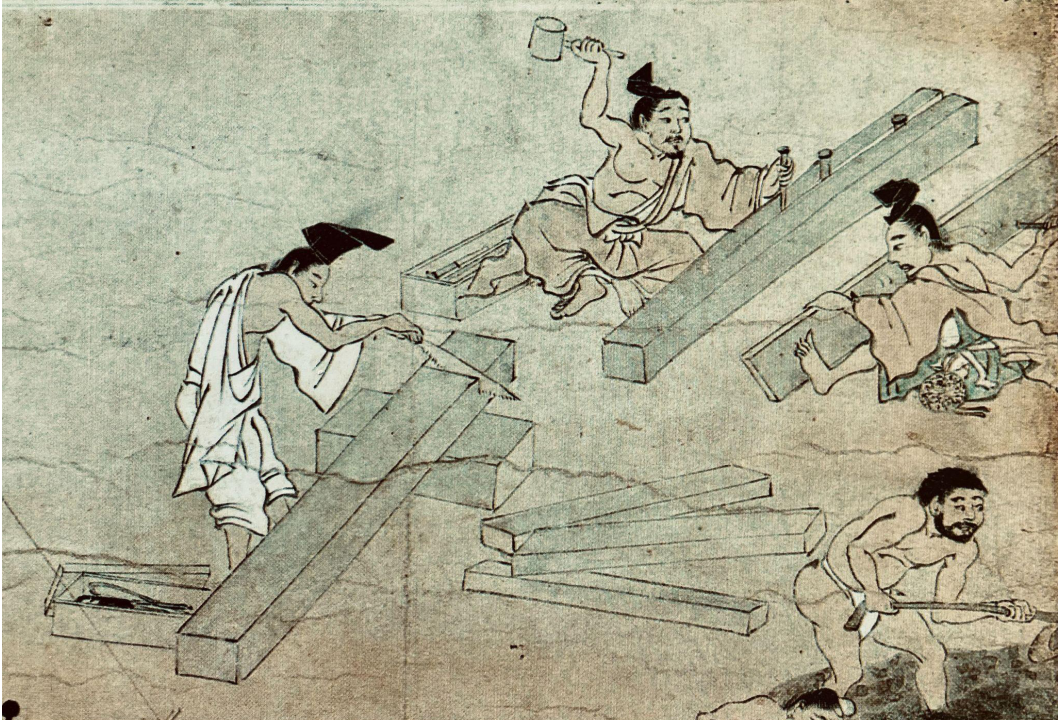
Scene depicting the building of Ishiyama Temple in the eighth century, from Illustrated Scrolls on the Origins of Ishiyama Temple (Ishiyamadera engi emaki, 1324–1326), scroll. Reproduced from Aizawa Masahiko and Kuniga Yumiko, eds. *Ishiyamadera engi emaki shūsei*. Tokyo: Chūō Kōron Bijutsu Shuppan, 2016.

Medieval scrolls were produced by pasting together several pieces of rice or mulberry-bark paper or sometimes silk, which was then glued onto lacquered dowels and decorated with fabric wrappers and woven string. Constructing accurate replicas would have been complex and costly, so I had to make do with a physical facsimile. Starting from images available digitally or scanned from books, I edited them on a graphic design app, made hard copies on the office's printer on standard 11 × 17 paper, and then pasted them together with Elmer's glue. The dowels I made on a woodworking lathe.⁵ The cost of each finished scroll was under \$10.

The scrolls were unexpectedly unwieldy. If I tried to unfurl one fully, it spilled off my desk and onto the floor, then out of the office and into the hallway. It was impractical to view them in their entirety. Instead, I had to read them section by section, unrolling one end while rolling up the other. This physical interaction revealed something remarkable: The narrative structure of the illustrations was designed for this mode of viewing.

I came to understand how to parse one of the illustrations into three sections, each with a different theme: first the installation of pillars, then the milling of beams and rafters, and finally the social life of carpenters. Another illustration similarly devoted sections to the logging, the transportation, and the milling of lumber. I realized that beneath the chaos was a structured representation of complex technological processes. The narrative ratio of the scrolls was defined ergonomically, as the shoulder span of a reader!

⁵ Lupita Rodriguez (East Asian Languages and Cultures) helped with the image processing and pasting.



Earliest depiction of Japanese carpenters at work, from *Illustrated Scrolls on the Origins of the Mandala at Taima Temple* (*Taima mandara engi emaki*, second half of the thirteenth century). Reproduced from Komatsu Shigemi, ed. *Taima mandara engi*. Nihon Emaki Taisei 24. Tokyo: Chūō Kōronsha, 1979.



The author holding a facsimile of *Illustrated origins of the Kasuga deity* (*Kasuga gongen genki e*, 1309) at Stanford University in 2025.

The other making experience involved a saw that appeared in many different illustrations but looked like nothing one could have found in a medieval Chinese or Korean toolbox. Known today as “broadleaf,” it has a narrow blade with a serrated edge and a pointy tip. Historians of technology believe the broadleaf was invented shortly before the illustrations were made. One blade with this shape was dug out of a contemporary archaeological site. Through the original



Functional facsimiles of “broadleaf” saws produced at the Stanford Product Realization Lab in 2024.

excavated blade was severely deteriorated, but I found that a group of experimental archaeologists in the 1980s had made six replicas to determine its likely tooth geometry and thickness.⁶

Using their blueprints, I set out to make my own facsimile. They had laminated their own steel, but I started with a sheet of old carbon steel, which I cut to rough shape in a heavy-duty hydraulic metal shear and then brought to size on an industrial belt sander. The teeth I cut by hand, using a triangular metal file, in the geometry they specified. Using a tooth setter, I gave each tooth a little push in alternating directions, to keep the blade from binding.⁷ Once a wooden handle was attached, the saw was ready to use.

It was clear that this saw could be used only to cut on the pull stroke. Before the medieval era, by contrast, saws had been designed to cut on the push, and thus much thicker. This new, thinner blade cut better, but it was much harder to produce. This got me thinking about the integration of different trades, such as carpenters and blacksmiths, into wider networks of craft. Tracing their connections in the work of social historians, I learned that they were commonly related by blood and marriage to each other but also to painters who made illustrated scrolls.

My goal was never to test hypotheses about the historical techniques used to create the original scrolls or saws. What interested me were the haptic and embodied dimensions of the objects and the opportunity to convey to others the social and cultural meanings of tools that are today obsolete but at the time represented the thrilling state of the art.

Given that Pamela Smith’s groundbreaking project already integrated making into both research and teaching, it should not be surprising that many courses at Stanford offer analog making experiences. Liisa Malkki’s students engage with a dozen different media (paper, acrylic, fabric, thread, natural dyes, leather, and so on) to explore multimodal ethnography

⁶ Hoshino Kinya et al., “Wa ga kuni chūsei no iwayuru ko no hagata nokogiri ni tsuite - shutsudohin wo sankō ni shita keijō fukugen to kinō tsuikyū,” *Takenaka daiku dōgukan kenkyū kiyō* 1(1989): 1–13.

⁷ Craig Milroy (director, Product Realization Lab) supplied the old stock metal and helped me with the construction.



Last stage in the production of a "broadleaf" blade. The blue tool in front is a tooth setter, which bends each individual tooth slightly outward in an alternating left-right pattern. This creates a wider cut than the blade itself, preventing the saw from binding or pinching in the wood.



Turned wooden bowls resting upside down inside a traditional wooden cabinet at the Stanford Product

(Anthropology 344A) and creativity (Anthropology 351D). Li Liu's course on the archaeology of food (Archaeology 124) involves experimenting with fermentation to brew ancient alcoholic beverages such as chicha and beer. Elaine Treharne's students learn calligraphy from an expert scribe in a course on the materiality of medieval handwriting (Division of Literature, Cultures, and Languages 122Q). In Kathryn Starkey's new course on "Making the Middle Ages," students explore the meaning of objects for makers and users and create their own "forgeries" of historical artifacts (German 160/360). Furthermore, Treharne and Starkey co-teach a course where students learn medieval Germanic languages and create and inscribe their own medieval objects (English 255/German 255). Charlotte Fonrobert's students prepare meals to learn about dietary laws and mysticism in a course on Jewish culture (Religious Studies 129). Hideo Mabuchi's students grow indigo and use it to dye textiles (Applied Physics 100Q), learn to weave on a manual shaft loom (Art Institute 100B), and synthesize historic pigments (Archaeology 189). Jesse Rodin's students cook the food and sing the songs of the great banquets of fourteenth-century France (French Studies 166). Similarly, in my courses on the tea ceremony (Japan 188) we share a bowl of tea in a traditional tearoom, visit Japanese gardens, make ceramic bowls, harvest flowers, compose poems, and so on. In a course on early modern craft culture (Japan 126) I co-designed with Hideo Mabuchi and Craig Milroy, students learn to shape clay and to turn and lacquer wooden soup vessels.⁸

As I heard from graduate students at the Center and the Lab who expressed interest in incorporating making assignments into their future courses, I prepared a short essay—forthcoming from Yanai Initiative at UCLA/Waseda—reflecting on the ways courses can maximize these unique opportunities. I also started the working group Material Pedagogies for East Asian Studies (MPEAS, pronounced *em-pēs*) as a venue for humanities stu-

⁸ To research this course I traveled to Yamanaka, Ishikawa Prefecture, to consult with craftspeople such as turners Kawagita Ryōzō, his son Hirohiko and grandson Hiroshi, turners Nakajima Takehito and Rabea Gebler, base lacquerer Ishikura Masatsugu, and *makie* artist Yamazaki Mushū.

dents to make and think about objects. Together we studied early modern manuscripts on craft, examined items in the collection of the Cantor Arts Center, and made objects at the Product Realization Lab.

James Wronowsky, a PhD student of Japanese literature, wrote about his experience as a member of MPEAS:

In the same way that Heidegger's hammer is experienced as "ready-to-hand" when we are absorbed in the realization of its function, a profound phenomenology emerges from our engagement with the lathe, the gouge, the table saw, the slab of untreated pine, and also the book, the archive, the natural world broadly.

As more people on campus expressed interest, MPEAS first became Make Analog, a venue to explore object making as a heuristic tool in premodern humanities research and an opportunity for students, staff, and faculty to engage with historical modes of fabrication. In the fall of 2025, Make Analog merged into the new Graduate Certificate in Making & Creative Praxis. This graduate certificate, offered jointly by the Ph.D. Program in Modern Thought and Literature and the Stanford Arts Institute, established a formal framework for doctoral students to integrate making practices into their humanities research, while conversely welcoming scientific researchers seeking to explore artistic practices.

There is something delightful in making objects with one's own hands, in sharing them with others, and in seeing what they have made in turn. Perhaps this is why so many researchers and instructors have felt drawn to exploring ways to bring thinking and making together. I am looking forward to learning how Making & Creative Praxis will continue pushing forward the field that Ratto's *Critical Making* and Smith's *Making and Knowing* have opened for us. There is no better way to illuminate our sources than to bring them back to life. A