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SPECIAL ISSUE
BUILDING SITES, CRAFTING KNOWLEDGE

Introduction: Building Sites, Crafting Knowledge

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The topic of craft expertise in building and its relation to knowledge, here presented in case studies from China, Japan and France, is a sorely neglected theme in the history of technology. Things are somewhat different for the pre-industrial era, where studying the craft and science of building and the interactions between the heterogeneous skills of the building site has proved extremely fruitful, opening up radical and influential new ways of thinking about how knowledge is made, transmitted, valued and credited.¹ But when it comes to the modern age, historians of technology have perhaps too easily accepted the common assumption that industrialization marks a rupture, that industrial technology displaces craft technique and renders it irrelevant as societies modernize, and that the two modes of practice and regimes of knowledge-making are distinct and incompatible rather than entwined and mutually defining.²

¹ For example, Pamela O. Long, *Engineering the Eternal City: Infrastructure, Topography, and the Culture of Knowledge in Late Sixteenth-Century Rome* (Chicago: University of Chicago Press, 2018); Chandra Mukerji, *Impossible Engineering: Technology and Territoriality on the Canal du Midi* (Princeton University Press, 2009); Jiren Feng, *Chinese Architecture and Metaphor: Song Culture in the Yingzao Fashi Building Manual* (Honolulu: University of Hawaii Press, 2012).

² Pamela O. Long, "The Craft of Premodern European History of Technology: Past and Future

As the four following studies demonstrate, struggles over knowledge and practice on the building site raise key questions about the enduring presence and significance of craft in modern regimes of production—in this case in an industry, namely construction, that fundamentally shapes the material experiences, self-image and cultural values of modern nations.

This special issue originated in an international workshop that we organized on *Craft and innovation in modern societies*, co-sponsored by China's national Institute for the History of Natural Sciences (IHNS) in Beijing, the China National Silk Museum (CNSM) in Hangzhou, and the international Society for the History of Technology (SHOT), and held at CNSM in June 2018. A core aim of the workshop was to explore the crucial but often underestimated role of craft and craft skills in shaping processes of modernization and industrialization in the nations of South and East Asia, regions where—as sketched below taking the examples of India and China—the trajectory of practical, intellectual and political entanglements between craft and industry have followed often significantly different paths from those of western nations.³

Craft as an industrial product: three histories

Clearly political, the category of craft has recently emerged as a key field of study in other contexts—as cultural heritage, sustainable livelihood, or national identity—across differently modern societies. The expansion of scholarly interest in the concept, however, has not necessarily clarified its history, despite craft being commonly portrayed as something old, in the process of disappearing, or at least in need of being conserved or protected. Rendering it as *handicraft* (or in German *Handwerk*) further emphasizes its sense of being tacit skill; a form of knowledge seemingly so intimate and timeless as to be retrievable more through material culture or folklore than written history. Yet craft has also been applied to an increasing number of “new” things and processes, especially hobbies of all sorts, from craft beer-making kits, to needle-point, to even craft computing. In modern usage, a person practicing a craft might be an amateur as often as a professional, or even a child.

This identification of craft with the conservation of age-old practices is actually quite modern. In English as in many other languages around the world (see on China below), while the term or concept itself is ancient, it was revived and re-purposed in response to the industrial revolution, and relatively late at that. In English usage, for example, what we now call crafts were more commonly arts or trades from the eighteenth through mid-nineteenth centuries,

Practice,” *Technology and Culture* 51, no. 3 (2010): 698–714; Annapurna Mamidipudi and Wiebe E. Bijker, “Innovation in Indian Handloom Weaving,” *Technology and Culture* 59, no. 3 (2018): 509–45, doi: 10.1353/tech.2018.0058.

³ The articles by Valérie Nègre, Congcong Ren and Gregory Clancey are all based on papers presented in Hangzhou; Chang-Xue Shu kindly agreed to contribute an article at a later stage.

and their practitioners, *artisans*, *tradesmen*, or even *mechanics* (a term for any user of tools, and not necessarily machinery). Craft had actually fallen out of favor in this period as a synonym for these terms in the English-speaking world, likely because of its other less reputable associations. The sense of craft as a secret set of skills and practices, and therefore potentially devious (preserved in the words *crafty* and *witchcraft*) of course represents an outsiders' view of the artisan's hard-earned knowledge, which was indeed often guarded within guilds or even families lest it be co-opted by competitors. But keeping knowledge secret or mysterious was out of fashion in the age of Enlightenment and the *Encyclopédie*, when literate artisans were even beginning to profit by writing books, as discussed in Valérie Nègre's article (this issue). Thus, it was that the title of the popular British journal *The Craftsman* (1726-52) wasn't meant to attract readers interested in the useful arts, but was rather a satirical sheet dedicated to exposing the "political craft" of its enemies.⁴ The *practical arts*, on the other hand, joined the sciences (as in *the arts and sciences*) in striving to make artisanal knowledge an open book.

Craft as a synonym for artisanship lingered on most insistently around the act of building, though not necessarily among builders. The group most responsible for preserving the term in common English from the late eighteenth through the mid-nineteenth centuries was probably the freemasons. Descended as they were from medieval stonemasons' guilds, the historicity of the term craft and its invocation of secret knowledge suited the Masonic Order well. Though drawn from social elites who only wielded hand-tools symbolically, freemasons referred to themselves as *craftsmen*, met in *craft lodges*, and published newspapers and broadsheets with that word in the title. The secretiveness and imagined power of the order of course made craft, to the ears of masonry's opponents, an even more disreputable term. In a time and place dedicated to "improving" every inherited artisanal practice, expanding democracy, and making all knowledge public, the freemason's preservation of craft rites and rituals (though without actually *crafting* anything) aroused controversy and suspicion.⁵

Freemasonry did contribute, however, to the resurgent use of the term craft by trade unionists later in the nineteenth century, particularly in the United States. As we noted, skilled workmen in the English-speaking world mainly referred to themselves as artisans or mechanics for decades after industrialization began. But in the last quarter of the nineteenth century, the stunning

⁴ Our search through the *Seventeenth and Eighteenth Century Nichols Newspaper Collection*, using "craft" as a keyword, verified usage of the term in the seventeenth century as a synonym for tradesmen and artisans. But such references distinctly fall off in the eighteenth century. The vast majority of hits after the 1720s reference the political journal *The Craftsman* (described above, whose title satirically refers to Prime Minister Robert Walpole). The word is also used disparagingly in "priestcraft." Where craft appears in relation to artisans, it is usually in published sermons quoting the Bible, particularly the story of Demetrius the silver-smith.

⁵ A search of Anglo-American newspapers from the first three quarters of the nineteenth century showed the term craft appeared most commonly—in fact overwhelmingly—in reference to freemasonry. This only changes in the decade of the 1880s, when references to craft unions begin to appear.

growth of trade unionism created what would be a permanent cleavage between masters and journeymen across many trades, including carpentry, masonry, and the others involved in building. The Knights of Labor, the first national American trade union (founded 1869), and which also had branches in the UK, organized its members within *craft unions*, a structure and nomenclature that would survive the eventual break-up of the Knights.⁶ The Knights were explicitly modeled on the masonic order, which likely contributed to their comfort with and attraction to the term *craft*, and its evocation of community, shared interests, and commitment. Although the earlier term *trade union* remained an equally common descriptor (and was always favored in the UK), the turn in language served more than a discursive purpose. Destabilized by an increasingly impersonal industrial regime, journeymen sought respect for unionism by describing themselves as not just trading their labor for a wage,⁷ but carrying forward a *craft*, a term that evoked cultural and material heritage, inherited knowledge, and innovation within the bounds of tradition. It was particularly a rejection of an overly-mechanized future. The term *mechanic* gradually went out of use in the late nineteenth century as a self-description by tradespeople, and particularly by carpenters, masons (actual ones), plasterers, painters, and other building tradesmen whose tools and methods had not changed so radically from the previous century as those used in “sweated” manufactures.

Tradesmen organized in craft unions got both sympathy and censure from late nineteenth century intellectuals. The Arts and Crafts movement, for instance, whose founding post-dated the formation of craft unions, included members like William Morris who were supportive of socialist politics. But he and other members of the movement were gentlemen amateurs who, inspired by John Ruskin, were out to “improve” craftsmanship from above. In the writings of intellectuals *craft* took on a moral and idealizing tone, the *true* craftsman being a person who “stuck to his bench,” found joy in his work, and manifested this passion through objects and materials of great aesthetic appeal. Whereas to *trade* was to strike an economic deal, to *craft* was to exercise a higher calling.⁸ Henceforth, the working-class use of *craft* in the context of

⁶ The union journal *The Carpenter*, founded in 1881, uses the word *craft* on the first page of the first issue to refer to the trade. The earliest use of the word we could find in an English-language newspaper in reference to a trade union was an advertisement for a gathering of the Washington, DC Carpenters in 1883 (*National Republican*, Dec. 14, 1883, p. 3). These and other references seem to indicate that the carpenters, who would form the largest and strongest “craft union” in the nineteenth century, were particularly influential in popularizing the term. On the Knights of Labor, see Steven Parfitt, *Knights Across the Atlantic* (Liverpool: Liverpool U. Press, 2016).

⁷ The term “trade union” always first references a specialist group of artisans, and only then a powerful bargaining group. Membership is based on skill and training as defined by a community. But the association in this period of the word “trade” with “union” and thus the collective bargaining for wages, may have made the term “craft” more attractive as an alternative description of a community of interest, like the freemasons, which transcended economic concern.

⁸ Ruskin wrote in *The Seven Lamps of Architecture* (London: Smith, Elder, & Co., 1849), “I would fain to see the handicrafts themselves urged by the spurs of chivalry” (p. 37).

trade or craft unions—particularly in the building trades—and the intellectual and amateurs’ cultivation of the concept, would exist in some degree of tension. And the building trades/crafts would be under particular surveillance. Ruskin’s three-volume *Stones of Venice* (1851-53), one of the foundational texts in creating the modern image of craft, was after all focused on masons,⁹ and two founders of the Arts and Craft movement of the 1880s-90s, Augustus Pugin and Charles Rennie Mackintosh, were practicing architects. Decades later, Walter Gropius’ Bauhaus would gather educated creatives from all over Europe to modernize *Handwerk*. Most architects would hence hold to a Ruskinian view of craft as something that had flourished in the distant past but was now dead or dying, and needed to be revived from above.¹⁰ Few members of craft unions, however, would share that perspective.

Craft in India

In the colonized world of the nineteenth century and later, notably in India, craft came to have a somewhat different meaning as the category under which almost all indigenous practices or technologies of production were subsumed. This was not always to mark their inferiority. The Western unease with industrialization that was manifest in the Arts and Crafts movement also led to the valorization of the colonial vernacular—village life, the work of country craftsmen, and authenticity in tradition. India became an important site for this movement—the preservation and protection of indigenous artisans—through the work of nineteenth century craft activists such as George Birdwood, Ananda Coomaraswamy and Ernest Binfield Havell.¹¹ Yet the equal importance of crafts—or sometimes *industrial arts*—in Indian economic debates created a particular duality in discussions about their future. As national culture, craft had to be preserved, but as part of national economy it had to be modernized. An orientalist vision of timeless village craftsmanship needful of protection by a paternalistic British government thus co-existed uneasily with agreement between British officials and members of the Indian elite to put “crafts development at the heart of the state’s duty to promote the welfare of its people.” In any case, both framed artisans as subjects, not agents of their own development.¹² At the same time, any fault for the lack of progress in Indian crafts was laid squarely on artisans’ shoulders.¹³

⁹ It is notable that Ruskin uses the word craft (usually as handicraft) less than a dozen times over three volumes of *Stones of Venice* (London: Smith, Elder, & Co., 1851, 1852, 1853), which indicates how little purchased the term had even in literary circles before the last quarter of the nineteenth century. His preferred term for artisan is “workman.”

¹⁰ Wrote Ruskin in *The Seven Lamps*, “from the mass of available handicraftsmen, the power is gone” (p. 166).

¹¹ Soumhya Venkatesan, “Rethinking Agency: Persons and Things in the Heterotopia of ‘Traditional Indian Craft,’” *Journal of the Royal Anthropological Institute* 15, no. 1 (2009): 78-95.

¹² Abigail McGowan, *Crafting the Nation in Colonial India* (New York: Palgrave Macmillan, 2009), 7.

¹³ *Ibid.*, 89.

Central to the idea of craft in the colonial context was its opposition to the mechanized factory production of the metropole. Government officials, local and provincial government bodies, missionaries, artisans, reformers, nationalists and industrialists—all participated in reifying the category of Indian craft in opposition to modern industry. For those who sought to protect craft, the type of modernization they advocated would at once preserve its best elements while adapting them to new contexts. Artisans themselves, however, were usually considered too tradition bound to guide change on their own, thus legitimizing outside intervention to manage the transition.¹⁴ For example, Indian craftspeople often sought to keep knowledge private within kin or caste networks, in contrast to the European strategy of creating information networks in the form of artisanal guilds. This reluctance to share knowledge was perceived by modernizers as lack of initiative. Yet in an era with no protection for intellectual property rights, the urge to retain a competitive advantage by guarding trade secrets was not an illogical response.¹⁵ As such, pressure from the colonial state to make private knowledge public was perceived as an unwanted exercise in power.¹⁶ Yet control of craft knowledge inevitably shifted as colonial authors of surveys, gazetteers and monographs put into public hands what had been the personal heritage of craft groups.¹⁷

Unlike Western trade/craft unionists, Indian craftspeople rarely played an active role in public debates about their futures, remaining objects rather than agents. Yet they provided an important ground on which arguments about Indian development more generally took place.¹⁸ Emphasizing difference and not similarity between traditional crafts and modern industry, Abigail McGowan suggests, was an interpretative choice made in spite of much evidence to the contrary.¹⁹ This was of course particularly true in the building trades, with Indian master-carpenters being not so essentially different from the Western ones in their tools or the products they produced. By the 1880s, public leaders increasingly ignored the possibility of an easy transition from crafts to modern industry in India, however, highlighting instead the essential difference of crafts from western style factory production. For those who valued the later, the demise of Indian crafts was inevitable.²⁰

Indian nationalists, on the other hand, came to thoroughly espouse the crafts as an opposing ideal. In the words of Saloni Mathur, “The actual physical body of the craftsman—ruined,

¹⁴ Ibid., 203.

¹⁵ Tirthankar Roy, “Out of Tradition: Master Artisans and Economic Change in Colonial India,” *The Journal of Asian Studies* 66, no. 4 (2007): 963-91.

¹⁶ McGowan, *Crafting the Nation*, 65.

¹⁷ For detailed discussion on the kind of ethnographic accounts of knowledge generated by the colonial state, see McGowan, *Crafting the Nation*.

¹⁸ McGowan, *Crafting the Nation*, 20.

¹⁹ Ibid., 69.

²⁰ Ibid., 73.

disfigured and enslaved by colonialism—became a powerful metaphor . . . for the state of the national body itself.”²¹ Viewing craft practice and creativity as spiritual revelation embodied in oral and religious texts, Coomaraswamy (1909),²² Kramrisch (1958, 1994)²³ and Yanagi Soetsu (1972)²⁴ all sought to use it as a basis for national unity, and thereby conceptually oppose it to the Occidental scholarly discourse on industrialization.²⁵ Gandhi famously stressed the moral value of crafts—by virtue of thread being spun by hand, as a part of national service, handspun cloth came to represent an alternative cultural arena of a distinctively Indian national development, set in opposition to the modern, industrial West. Whether under Gandhi’s leadership or after, craft initiatives in India continue to structure their responses around the idea of crafts’ difference from industry. Design concerns became development agendas; rejecting mechanization meant insisting on individual autonomy within the limits of larger co-operative structures, and even attempting to circumvent the market.²⁶

Craft in China

Both the history and the historiography of craft in China differ from that of Europe and India in important respects, most notably the prominent role of the state in defining, controlling and documenting craftwork. Imperial Chinese social thinking ranked society into a hierarchy of four occupational groups: the governing elite (*shi*), farmers (*nong*), artisans (*gong* or *jiang*)²⁷ and merchants (*shang*).²⁸ Farming was the material and moral foundation (*ben*) of society: it comprised both the male occupation of growing crops and the female one of making textiles. Thus, *nong* fed and clothed both the family and—through taxation—the state. Artisans

²¹ Saloni Mathur, *India by Design: Colonial History and Cultural Display* (Berkeley: University of California Press, 2007), 46.

²² Ananda Kentish Coomaraswamy, *The Indian Craftsman* (London: Probsthain & Company, 1909).

²³ Stella Kramrisch, “Traditions of the Indian Craftsman,” *The Journal of American Folklore* 71, no. 281 (1958): 224–30, doi: 10.2307/538558; Stella Kramrisch, *Exploring India’s Sacred Art* (Delhi: Motilal Banarsidass Publishers, 1994).

²⁴ Yanagi Soetsu. *The Unknown Craftsman, A Japanese Insight into Beauty*, ed. Bernard Leach (Tokyo: Kodansha International, 1972).

²⁵ For discussion on links between India and Japanese understanding of ‘tradition’ in craft see Aarti Kawlra, “The Tradition in Crafts,” *Indian Folklife* 1, no. 4 (2001): 6–7.

²⁶ Meena Menon and Uzramma, *A Frayed History: The Journey of Cotton in India* (New Delhi: Oxford University Press, 2017); Annapurna Mamidipudi, “Crafting Innovation, Weaving Sustainability: Theorizing Indian Handloom Weaving as Sociotechnology,” *Comparative Studies of South Asia, Africa and the Middle East* 39, no. 2 (2019): 241–48, doi: 10.1215/1089201X-7586764.

²⁷ Imperial regulations often distinguished between *jiang*, master artisans, and *gong*, artisan laborers; Christine Moll-Murata, *State and Crafts in the Qing Dynasty (1644-1911)*, Social Histories of Work in Asia (Amsterdam: Amsterdam University Press, 2018), 46, doi: 10.5117/9789462986657.

²⁸ Dating back to the immediate pre-imperial period, around 300 BC, this categorization endured through to the late Qing dynasty (1644-1911); Moll-Murata, “The artisan’s place,” chap. 9 in *State and Crafts*.

applied their skills and ingenuity to producing useful but less essential goods.²⁹ *Gong* denoted any form of manual work, private or public, a spectrum ranging from carpentry to the building of the Great Wall, from an individual weaving rush mats to the seventy-two specialists whose combined work produced fine porcelains in the imperial kilns of Jingdezhen.³⁰ Textile production, women's work (*nü gong*), had dual status as both an essential occupation and—especially when performed in commercial workshops or imperial manufactures outside the domestic sphere—as craft work.³¹

The state played a key role in shaping the field of craft activities in pre-modern China, employing huge numbers of workers in large-scale manufactures of silks, porcelains and other luxury goods; monopolising the production of essential commodities like iron, salt or tea; building and maintaining the canals and ships needed to transport tax grain; manufacturing gunpowder, supplying the army with armour, weapons and supplies; equipping the Astronomical Bureau with instruments; constructing imperial palaces and public buildings—the central state and its local governments engaged in all these domains, to varying degrees, throughout imperial times. State regulations controlled the status of different craft workers (free, corvée or hereditary), their wages, freedom of movement, material supplies, etc., as well as the quality and design of the goods that they produced, in ways that varied over time.³² There was also a private sector of commercial craft production which expanded steadily as the economy grew over the centuries; professional experts whose craft services were in continual demand included carpenters and smiths; and most farming households engaged in some form of craft production for local subsistence or commodity markets.

When it comes to the transmission of craft knowledge, neither guilds nor craft masters nor merchants habitually committed technical or administrative details, or even accounts or contracts, to paper, although they might pass down sacred texts testifying to their trade's

²⁹ According to a well-known early Confucian work (*Gongyang zhuan*), “Those who have ingenious minds and experienced hands and produce utensils are called artisans (*qiaoxin laoshou yi chengqi yue gong*)” (Moll-Murata, *State and Crafts*, 295). The term *qiao*, ingenuity, craft or cunning, conveys the same moral ambivalence as the English term craft.

³⁰ Anne Gerritsen, *The City of Blue and White: Chinese Porcelain and the Early Modern World* (Cambridge and New York: Cambridge University Press, 2020).

³¹ Francesca Bray, *Technology and Gender: Fabrics of Power in Late Imperial China* (Berkeley: University of California Press, 1997), 183–205.

³² See for example Joseph Needham's series *Science and Civilisation in China* (Cambridge: Cambridge University Press, 1954–); Lothar Ledderose, *Ten Thousand Things: Module and Mass Production in Chinese Art*, The A.W. Mellon Lectures in the Fine Arts 1998 (Princeton, N.J.: Princeton University Press, 2000); Dagmar Schäfer, ed., *Cultures of Knowledge: Technology in Chinese History*, Sinica Leidensia: V. 103 (Leiden; Boston: Brill, 2012); Anne Gerritsen, “Making the Place Work: Managing Labour in Early Modern China,” in *Micro-Spatial Histories of Global Labour*, ed. Christian G. De Vito and Anne Gerritsen (Cham: Springer International Publishing, 2018), 123–45, doi: 10.1007/978-3-319-58490-4_5; Moll-Murata, *State and Crafts*.

ancient lineage and cultural authority.³³ Historians are adept at making artifacts speak, but for textual accounts of the practices, significance or organisation of craft our best sources are invariably official documents, or documents composed by officials, from legal regulations to building handbooks or accounts in local gazetteers. Even today's best-known account of imperial China's crafts, the 1637 work *Tiangong kaiwu* (The works of Heaven and the inception of things), was written by a minor official, Song Yingxing. The *Tiangong kaiwu* was primarily written not with technical but with moral intent: Song was illustrating philosophical-cosmological points about political action in times of crisis. Works on farming technology and rural manufactures, meanwhile, aimed to impress their elite readers with the ingenuity and dedication of the peasants whose hard labor fed and clothed them.³⁴ This is a salutary reminder that in the minds of the Chinese elite, craftwork was imbued with moral and cosmic import: weaving or plowing the correct way was a civilizing action that maintained a harmonious society, cultivated personal virtues and values, and could transform a barbarian into a proper Chinese subject.³⁵ Meanwhile, in everyday life many crafts, notably carpentry or brewing, were seen as requiring skills that were both material and ritual or magical: practitioners were not just building houses for families, they were creating cosmic niches for patriline.³⁶

Chinese official texts on craft technology were typically intended to ensure or enhance smooth and controlled production, and took for granted a division of labor, consistent with the four occupations, that officials organized while workers worked. Yet despite the hierarchy between head and hand, we find no parallel to the *Encyclopédie* and similar European Enlightenment projects to “open up the ‘blind’ practice of the workshop to the eye of the rational philosopher.”³⁷ This changed, however, in several key sectors with the intrusion of the Western powers after China's defeat in the Opium Wars. Starting in the 1850s, the Chinese government's new “self-strengthening” policies introduced industrial technology, organisation, education and values, and we see emerging an ontological dichotomy both between craftsmen and the new, modern identities of engineer or technician, and between handicraft (*shougong*) and mechanized

³³ Klaas Ruitenbeek, *Carpentry and Building in Late Imperial China: A Study of the Fifteenth-Century Carpenter's Manual, Lu Ban Jing*, Sinica Leidensia v. 23 (Leiden: Brill, 1993); Jacob Eyferth, “Craft Knowledge at the Interface of Written and Oral Cultures,” *East Asian Science, Technology and Society* 4, no. 2 (2010): 185–205, doi: 10.1007/s12280-010-9115-4.; and see Congcong Ren's article in this issue.

³⁴ On *Tiangong kaiwu* see Dagmar Schäfer, *The Crafting of the 10,000 Things: Knowledge and Technology in Seventeenth-Century China* (Chicago: University of Chicago Press, 2011). On the moral dimension of works on farming and rural industries, see Francesca Bray, “Agricultural Illustrations: Blueprint or Icon?,” in *Technology, Gender and History in Imperial China: Great Transformations Reconsidered* (Abingdon: Routledge, 2013), 219–52.

³⁵ Bray, *Technology and Gender*, 237–70.

³⁶ Ruitenbeek, *Carpentry and Building*; Francesca Bray, “Technics and Civilization in Late Imperial China: An Essay in the Cultural History of Technology,” *Osiris* 13, no. 1 (1998): 11–33.

³⁷ Eyferth, “Craft Knowledge at the Interface of Written and Oral Cultures,” 200; this process of epistemological appropriation is well described in Valérie Nègre's article in this issue.

production.³⁸ Craftwork was no longer the unquestioned economic foundation of the political order: instead, viewed as a quite distinct regime of action and understanding from industry, craftwork became identified either as folk art, associated positively with cultural tradition and the authenticity of rural communities or ethnic minorities, or negatively, as an inefficient and backward mode of production that must be either modernized or eradicated.³⁹

Under the Republic (1911-1949), with its resolutely modernist ambitions, the technical dimensions of crafts were largely ignored or dismissed. After the establishment of the People's Republic in 1949, official attitudes towards craft techniques and knowledge oscillated. Initially, in the Maoist period of high socialism when practice was seen as leading theory, craft knowledge was treated sometimes as backward and an impediment to national progress, sometimes as a valuable resource for developing the forces of industrial production.⁴⁰ Since the Reforms of 1979, which repudiated Maoism in favour of technocratic development, crafts and craft knowledge have been viewed as a springboard for alternative forms of economic development in rural or minority areas unsuited to industry.⁴¹ Consumerism and the digital revolution in marketing, design and distribution have brought new opportunities for small-scale producers, shifted the emphasis in vocational schools from manual skill to design, and raised new concerns about the sustainability of expanding the production of ostensibly “simple” and “natural” commodities.⁴² Today's equation of crafts with skill, beauty and authenticity rather than utility or necessity, enhanced by the recent explosion of the national and global cultural heritage industry, has added cachet and value to selected artifacts and craft skills,

³⁸ Moll-Murata, *State and Crafts*, 44. Moll-Murata also provides a helpful list of those productive domains that were industrialised (the military sector, some mining, iron and steel, some transport and communications, much of the printing industry, cotton textiles) and those which continued largely untouched (including salt production, milling, much mining, sericulture and silk weaving, a large part of the paper and printing industry). Although industrial cotton milling became a key sector under the Republic and the People's Republic of China (PRC), as Eyferth shows, domestic handloom weaving by rural women continued to clothe much of China under the official radar; Jacob Eyferth, “Women's Work and the Politics of Homespun in Socialist China, 1949–1980,” *International Review of Social History* 57, no. 3 (2012): 365–91, doi: 10.1017/S0020859012000521.

³⁹ Lili Jiang, “Crafts in China,” in *A Cultural Economic Analysis of Craft*, ed. Anna Mignosa and Priyatej Kotipalli (Cham: Springer International Publishing, 2019), 61–73, doi: 10.1007/978-3-030-02164-1_6; Xiaofang Zhan and Stuart Walker, “Value Direction: Moving Crafts toward Sustainability in the Yangtze River Delta, China,” *Sustainability* 10, no. 4 (2018): 1252, doi: 10.3390/su10041252.

⁴⁰ Contrast the policy to suppress handloom weaving in order to consolidate industrial textile production, analysed by Eyferth, ‘Women's Work,’ with the Great Leap Forward campaign to mobilise local skills to set up iron foundries in every rural community; Donald B. Wagner, “Some Traditional Chinese Iron Production Techniques Practiced in the Twentieth Century,” *Historical Metallurgy* 18 (1984): 95–104; Donald B. Wagner, *The Traditional Chinese Iron Industry and Its Modern Fate* (Richmond, Surrey: Curzon, 1997).

⁴¹ Jiang, “Crafts in China,” provides a useful historical survey of definitions, government bureaus and policies, educational institutions and training formats, and certification and recognition.

⁴² Zhan and Walker, “Value Direction.”

but has also reinforced the conceptual division between craft and industry, minor commodity and economic mainstay—and has directed attention away from the way certain unobtrusive but essential crafts such as carpentry, with its combination of material and cosmological skills, remain embedded in everyday life.⁴³ More broadly, while researchers have copiously investigated the impact of industry on handicrafts, there has been little attention to how craft or craft-like practices and skills remain embedded within even the most modern industry, in China or elsewhere.

Craft and the building site

As much as any act of production, building has always been closely associated with the skilled practices variously called the arts, mechanic arts, practical arts, trades, crafts, and handicrafts. The variety of these terms and their differing histories and shades of meaning reveal the speed of change brought about by industrialization from the eighteenth century onward, and the precarious condition of people who made their living and formed identities within these roles. Yet as more and more trades moved inside factories, some disappearing in the process, the building trades were relatively charmed in retaining their basic shape and character, including many of their tools, customs, and procedures. This increased their claim to continuity—to craft—in a world characterized by rupture. The United Brotherhood of Carpenters and Joiners (UBCJ), for example, is still in the early twenty first century one of the largest and most powerful unions in the US and Canada, with half a million members, and continues to use the words craft and craftsman liberally in self-description. Even those members of the UBCJ who now drive piles for skyscrapers and create the molds for poured concrete, describe themselves as exercising a craft. As Clancey's and Ren's articles (this issue) demonstrate, the presence, power, and historical self-identity of carpenters has likewise survived in Japan, and in even more traditionalist form than for their American counterparts.

Yet paradoxically, building craftspeople have been orphans in most of the contemporary literature about craft, which focus more on ceramic makers, weavers, and other producers of smaller and more vendable objects, and who often form the type of geographically-bounded communities which anthropologists are most drawn to studying. *Design*, for example, is often taken as a defining element of craft, yet building craftsmen may or may not be involved in conceptualizing the object—the building—they are using their craft to help make. *Bodily presence* from the beginning to the end of a process is also taken to define the craft process in many accounts (self-consciously reversing Adam Smith's division of labor, and hence the industrial revolution) but the building crafts normally work at a site sequentially, contributing

⁴³ E.g., Congcong Ren, Ruchen Bian and Simiao Li, "On Technology and Ritual of Chuandou House Construction in Southwest China: The Case of Dong Minority Area," *Built Heritage* 2, no. 1 (2018): 39–48.

their skill and labor as successive acts in a multi-stage production. Only on the smallest projects do they see through a process of creation in the manner of a potter at a wheel or a weaver making a run of fabric. Neither are building craftspeople a particularly endangered group in need of protection or conservation, a condition implicit in much scholarship about craft. They have always been, and remain today, essential actors in urban and national economies, and are for that reason liberally spread across maps, like the act of building. We also expect craft to carry *aesthetic* and *cultural* value, and while this is often part of the performance of building crafts, other times the bulk of their work is masked from view, inside walls, crawlspaces, attics, or cellars. In Nègre's account of building a dome in eighteenth century Paris (this issue), even the erection and dismantling of the scaffolding was a complex display of craft, but one that left no trace behind.

The use of hand tools and the eschewing of machinery are another value we instinctively associate with craft as a concept. Virtually all building craftspeople wear tool-belts and carry hand-tools, even today. But the building trades have not been averse to using machinery when it suits them. The eighteenth century artisans in Nègre's account were instrumental in building wooden machinery necessary to the completion of the work, and carpenters around the world in the twentieth century have accepted the electrification of hand-tools for the sake of efficiency.⁴⁴ But Clancey calls the acceptance of new technologies and work organisations by Japanese carpenters *conservative innovation*, in that its intention is to preserve what the craft community believes to be its core elements, often in response to (or against the backdrop of) perceived existential threats. Thus, some practices or objects which may be traditional, but are perceived to be peripheral to the identity of the craft, are adjusted, simplified, or even surrendered over time so that practices and objects deemed essential be preserved. This likely occurs in all craft communities, of any scale, when they are pressured by forces outside themselves. But as Ren's account also illustrates, a mature craft community can also "innovate" through re-applying past practices or even re-discovering lost tools. This is more easily done in niche areas like temple restoration, however, where historical precedent carries such discursive weight, or among amateurs or hobbyists, whose search for authenticity and historicity need not be hampered by market competition.

Another fundamental difference between building and other ways of making things lies in their sites of production. Buildings are not made in the same place twice, except at long intervals. In the building process, the place of production is thus also the very object that is being produced. With the exception of modern tract housing or other very large-scale real estate developments, the production of a city or even a neighborhood is a gradual as well as a mobile process.

⁴⁴ Shu's study illustrates the reverse flow of knowledge and materials, from the building site to the industrial laboratory, showcasing modern engineers learning from craft knowledge and attempting to build it into new engineering practices.

Everyone involved in it is nomadic, and faces different circumstances with each new location and design program. There may be permanent shops offsite to make or finish components, and temporary shops set up onsite to house building-related activities. But the very temporary, even fleeting, existence of the building site, which is ironically replaced by an object so very definite, grounded, and (most often) long-lived, places the building process outside normative discussions of manufacturing in economics, business studies, labor studies, etc. which take factory or plant production as their norm. Located everywhere and nowhere, the *building process* is elusive and difficult to generalize. In all these senses it is closer to the production of a film than of other more concrete objects.

Unlike in films, however, where almost everyone is included in the credits, building tradesmen have generally remained anonymous, and their work-processes unheralded. The building site has traditionally been outside the concern of art and architecture, even if it is essential to their enactment. The director, in this case the architect, need not even be on-site. Building has generally been viewed by architects as an unfortunately long and necessary interval between the finalization of their designs, and the eventual rendering of the finished building as photographs (or before the mid-nineteenth century, engravings) contributory to an architect's portfolio and reputation. This movement from image to image most defines the "art" aspect of architecture, and accounts for why the words *building* and *architecture* evoke such different feelings, and even seem to describe entirely different worlds, despite their entanglement.

There is also the matter of gender. Building sites have traditionally been (and still are) overwhelmingly male spaces, and have often purposely excluded female participation. This has left building craftsmen outside the rich feminist literature on craftspeople, though every contributor to the present volume, save one, is a female scholar. The craftsman is a generally admired figure in the contemporary world, but exclusionary behaviors, prejudices, and all manner of restrictive practices have been common to craft communities the world over, and in the building trades particularly. In the history of organized labor, craft unionism has been the *bête noire* to industrial unionism, whose grand and progressive idea was to organize all workers in an industry or sector regardless of skill, gender, race, or seniority. "Unskilled" workers represented a threat to the craft unionist, however, if only because theirs was the fate industrialization seemed to have in store for all working people. But in the building trades, women, foreigners, members of racial minorities, or political radicals could equally be perceived as threatening to the craftsman's self-identity. Thus have craft unions generally been perceived by the left as conservative and self-serving, a "labor aristocracy" impeding the political organization of the broad working class. From the perspective of many craft unionists, however, capitalism and socialism were potentially equal threats in their mutual embrace of mechanization, and in devaluing embodied skill as an historical relic.

Four case studies

The four articles in this issue discuss the practice of building trades or crafts across very different spaces and time periods: eighteenth century France, twentieth century China, and twentieth to twenty first century Japan. Yet certain themes recur. For one thing, they portray craft as a knowledge realm which has been variously challenged, neglected, or co-opted by other professionals within the building process, particularly architects and engineers. The building site is cooperative, but also hierarchal for all its ephemerality. The skills and even technologies that gather there have often been hidden from the historical record. And as essential as craftspeople have been to the process, they have not, with rare exceptions, written their own histories.

Valerie Nègre's paper gives us a rare window into a late eighteenth century Parisian building site, using the diary of the one of the two architects in charge. While official accounts of most buildings record only their architect-designers (and even this is not always certain), Nègre extracts from the diary the larger world of artisans and workers on-site, and, rarer still, some of the specific innovations or forgotten practices they contributed to overcome problems of design and execution. Every building site presents unique challenges, but raising a dome over Paris's grain market was an unprecedented project requiring novel methods and even equipment. This made the building site, as Nègre puts it, "a place of continual invention," and also performance. Knowledge needed to be exchanged among different actors, but generally in one direction, from the artisan to the architects. This reveals the truism that the architect, while having a vision or conception of the finished edifice, has often been an amateur to the process of building. The architect was the 'gentleman on site,' however, entrusted with seeing it through by others of his class. The artisans were in turn imagined to be his assistants, "abstract men . . . associated with embodied skill rather than knowledge" and thus not fully-recognized partners in innovation. While a project of scale of the *Halle au Blé* opened a space "of great freedom to invent," as Nègre puts it, the innovations of the craftsmen involved would have disappeared in the mists of time if not for the stray survival of the architect's diary.

Architects in the modern period were actually keen to distance themselves from artisans, particularly as architecture came to be perceived in the eighteenth and early nineteenth centuries as an art defined by drawing, and thus closer to painting than brick-laying. But from Ruskin onward, they did not necessarily distance themselves from craft as an ideal. This was reinforced in the role of the architect-historian, which gave architects a privileged if often superficial insight into craft by tracing and documenting its evolution through historic buildings. As Congcong Ren's paper points out, professional, school-trained architects appeared quite late in both China and Japan, and initially with little or no knowledge of the carpenter-dominated building world they were stepping into, yet with the mission of eventually transforming it. One door into craft knowledge for the architectural profession, and which did not require engagement with carpenters or masons, was through above-ground archeology. What had

begun in Europe with Ruskin, Pugin, Viollet-le-Duc and others, was taken up by Ito Chutah in late nineteenth century Japan, and in early twentieth century China by Liang Sicheng and Lin Huiyin. In the Chinese case described by Ren, historic buildings were studied morphologically rather than ethnographically, and with little reference to craft culture or practice. Yet architect-historians discursively captured the corpus of past craftsmanship first by declaring such buildings “architecture,” and then by raising key design elements—in the Chinese case the bracketed cornice—to the status of cultural symbols. Ren considers that architectural curation of carpentry went farther in China than in Japan, where some temple and shrine carpenters were powerful enough to push back with their own expertise against that of architect-historians involved with restoration projects.

Gregory Clancey’s article shows that the survival of Japanese carpenters and their skills has extended beyond the temple-building craftsmen discussed by Ren, to include those who build regular houses. Despite the high-tech image of Japanese construction, the majority of Japanese houses to this day are built by carpenters operating in very small firms, using traditional framing techniques, and owning uniquely Japanese tools. Facing competition from more “modern” house building systems (prefabrication and 2x4 construction) they have survived as a craft community through what he calls *conservative innovation*. The number of historically-used joints has been reduced, much cutting is now done by computer-controlled machinery, and heavy framing members are now lifted into place by cranes, to take three examples. But these and other changes are meant to preserve the unique and still-complex post and beam frame, which has always been the locus of carpentry skill and practice, and remains peculiar to Japan. As the only non-engineered building system to survive in the otherwise high-tech Japanese building world, the carpenter-made Japanese house-frame has long been a source of frustration to economic planners, but efforts to supplant it by engineers and architects have had only limited success.

Chang-Xue Shu’s paper does not deal with craft or craftsmen per se, but with engineers attempting to create a new hybrid technology combining the modern Western system of reinforced concrete with a material endemic to Chinese craft practices: bamboo. For the actors in her account, the identification of bamboo with a long history of practical use in China for bridges, houses, water-wheels and furniture suggested the material might also play a role in twentieth century civil engineering, substituting for more expensive steel reinforcing bars. Bamboo had been previously adopted in Western aeronautical engineering, which emboldened Chinese students at MIT to suggest expanding its use to other engineered domains. Using lab reports, theses, engineering journals, and the files of engineering organisations, Shu traces this idea from Massachusetts to China, and across various experiments and proposals, some boldly realized. Yet in the end bamboo-reinforced concrete did not become a commonly-accepted technology, in part because the culture of engineering had difficulty accepting wood

as a material, particularly within the increasingly mathematized and industrialized system of reinforced-concrete design and research.

This volume will hopefully spur further scholarship into the neglected worlds of building artisans or craftspersons, a group that literally makes city and town-scapes all over the world, yet has remained subaltern in urban history, architectural history, labor history, the history of technology, and even the history of craft. Understanding how the premodern building trades or crafts have transitioned into modern roles adds, at the very least, significant caveats to the standard picture of how industrialization has affected work. What is at stake is precisely that the performance of such knowledge—embodied, material, and social—remain invisible, so that the myth of a universal industrialization and modernist ideals may be assured. What our cases make visible is that these bodies do exist, and that building knowledge is crafted on-site. With enough accumulated case studies, it may offer a basis for critiquing industrialization more fundamentally. Likewise, the increasing appeal of craft as an imagined alternative if not transformative space of practice within the modern production regime requires a more critical, empirically-based history to give it perspective and meaning, which the papers in this issue help provide.

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