"RESULTS FROM JUNK"

TEACHING CONSTRUCTION IN CHINA, 1926-1937

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Introduction

Seventy years ago Chinese students of construction were producing "results from junk" in Beijing.[1] This paper not only explains how this happened but suggests why we in the late 1990s should pay attention to these students' results. While they were designing and building in China, contemporary students at the Bauhaus were being inspired to produce results from other kinds of building materials. Especially since the establishment of the Bauhaus in 1919, and even more emphatically in the last quarter-century, many architectural educators have been intrigued with how to integrate the hands-on craftsmanship of building construction with the hands-steady draftsmanship of building design. Many scholars have written about how Itten, Moholy-Nagy and other Bauhaus instructors devised ways for students to use building materials to unleash creative genius. After World War II theorist-practitioners such as Buckminster Fuller similarly advocated that architects capitalize on the connection between a tactile familiarity with materials and an abstracted representation of building spaces and volumes through drawings or models.

More recently scholars such as Strike, Frampton and Peters have investigated the dynamic relationship between construction and design.[2] As was clear at last year's ACSA European Conference, "tectonics" has become a fashionable word in contemporary architectural education, indicating a renewed professional and pedagogical interest in the connection between the building site and the studio. In the past generation, changes in architectural practice have likewise reflected a more intense dialogue between studio-based design and site-based construction, hence the popularity, for example, of design/build practices. Given these trends, it is perhaps not surprising that many architectural programs now incorporate into their curricula design projects that sometimes result in students becoming engaged in construction projects that transfer ideas about architectural design into structures, or pieces of structures, that reflect those ideas. Other architectural programs devise exercises that compel students to become intimately familiar with the tectonic qualities of already erected buildings.[3] These endeavors appear to be increasingly popular, responding to students' desires (as discussed in the 1996 Boyer Report) to be assigned more hands-on projects.[4] And yet, perhaps because they are too busy actually implementing these ideas into their curricula, architectural educators are sometimes unaware of all the historical precedents that demonstrate not only a *western* tradition associated with these ideas, but also a *cross-cultural* component of this tradition in architectural education.

This paper focuses on two of those precedents, bringing to light the work of a pair of unknown, trail-blazing educators in China during the 1920s and 1930s who sought to use students' familiarity with indigenous building practices as a conceptual foundation upon which to teach western, architectural and engineering construction techniques. After providing thumbnail sketch biographies of these two individuals, I will discuss the key lessons they learned, outline some of the many questions that remain unanswered about their work, and finally underscore how their approaches apply to design pedagogy today, especially in those geographic contexts where western architectural methods overlap with indigenous traditions that are not always easily integrated into architectural curricula. When placed in the context of some of today's debates about design instruction and the utility of integrating design with construction, these two individuals appropriately rise out of the footnotes.

Getting started in China: Sam Dean and Alfred Emms

Who were these two educators? One was Sam Dean, an American missionary engineer, and the other was Alfred Emms, initially a British carpenter. Seventy-five years ago in a small, apprentice-based, architectural program in Beijing, Dean taught Chinese students how to design, build and manage a construction site along western lines. Emms, who taught in Shanghai and who appears to have been unaware of Dean's existence, researched lower Yangzi Valley carpentry practices and then attempted to apply what he learned in his teaching. Independently they learned three significant lessons by teaching construction in China: (1) to teach by observing, respecting and understanding indigenous construction practices; (2) to encourage students to learn about construction by working with them at a real building site; and (3) to utilize the experience of building with indigenous methods as a way to teach universal architectural principles.

Fig. 1. Sam Dean in 1935, when he was the President of the Association of Chinese and American Engineers, in Beijing. From the Journal of Association of Chinese and American Engineers *16 (May-June 1935): 122.*

Fig. 2. A prototypical Chinese building site, as depicted by an unnamed artist working for the Andersen & Meyer Company, in Charles J. Ferguson, ed., Andersen, Meyer & Company of China *(Shanghai: Kelly and Walsh, 1931), p. 73.*

Sam Dean's Experience

Samuel M. Dean worked in the anthracite coal mines of Pennsylvania before graduating as a mechanical engineer from Pennsylvania State College in 1912, just as the Qing Dynasty was being overthrown in China.

Dean then worked in the railway shops of the Chicago Northwestern Railway, but reentered Penn State to study for an advanced degree in heating and ventilation systems. Although it remains unclear how he became interested in China, in 1915 he was hired by the National Normal University in Beijing to be the supervisor of industrial education, a post he held for five years. He became fascinated with how to train leaders for China's rural and small decentralized industries. By the early 1920s Dean began to merge his background in construction with an interest in Presbyterian missionary work. This was a period of burgeoning missionary activity in republican China and Dean's building and managerial skills were put to use effectively.[5] Furthermore, increasingly by the early 1920s American and Chinese engineers and architects began to collaborate professionally.[6] In 1923-24 he was placed in charge of designing and then building Beijing's College of Chinese Studies, and subsequently he directed first the North China Architects Bureau (a coordinating office of architectural affairs for eleven missions) and then the Trade School Department of the Presbyterian Mission in Beijing.

In the politically tumultuous 1920s Sam Dean merged his missionary and engineering interests in north China, where he said bluntly that "wars get mixed up with plumbing and guilds with concrete." Dean believed that "building is building, and workmen workmen the world over," and he therefore used his small technical school to train Chinese workers to build as if they were anywhere. Although the school's enrollment data have not survived, it is likely that Dean and his teachers trained no more than twenty students at a time, with each of the two year's classes being about the size of a current architectural program's studio section.[7] One observer noted that Dean's students sat on sawhorses in unheated rooms, that the shop was "a pile of junk made largely by [the students]" and that those students looked like "a bunch of half-clad coolies."[8] However, Dean recruited men (and *only* men) who were "willing to work hard and efficiently" and he trained them in architectural design work, building erection and a multitude of installation jobs related to heating, plumbing and electrical wiring.[9] Dean utilized a myriad of missionary building sites as places where he could teach by doing.[10] Although frequently confounded by what he called the "interlacings and tangled rules" of the traditional guilds, he marveled at the tenacity and skill of Chinese workmen. Nonetheless, he affirmed that "a life of building in our western methods with Chinese workmen [was] never a calm, predictable or routine performance."[11]

Dean summarized his three most important pedagogical principles as: (1) working for results, and not for "face;" (2) only using teachers who "spend most of their time earning a living by the means of hard work in practical life;" and (3) forcing the student to become "a real apprentice . . . [who] gets down to hard work." Dean had little patience for bookish theoreticians; he called them "as useless as a pair of tennis shoes in a snowstorm."[12] Dean organized his curriculum around the exigencies of his building sites. For two years his students worked (and were paid at market wages) for ten hours a day and six days a week, but from December to February (because of the harsh Beijing winter) they were instructed in English

Fig. 3. Alfred Emms as he appeared in the China Reconstruction & Engineering Review *13 (February 1937): 45.*

to learn elementary technical subjects. Reminiscent of what we in the 1990s might call problem-based learning, Dean expected his students to use mathematics and western scientific principles to solve practical, building-related problems that they'd face in the drafting room, office, shop or building site. He claimed that in winter classes his students learned twice as fast as ordinary students because in their formal courses his students found answers to problems they'd already been encountering for several months at their building sites; "everything [a student] learns is illustrated by something he has seen in practical life."[13] After two years Dean placed his students in engineering or architectural offices for nine months of what might be called year-out training in the 1990s. This served the double purpose of enabling Dean to train a larger number of students while simultaneously confirming that his men were being trained for what he called "definite opportunities."

Dean also stressed to his students the importance of learning not only how to handle effectively, but also how to treat humanely the people with whom they were working. Without being able "to get men to work together," Dean asserted, his students couldn't get results and, without results, he deemed his students were without merit. He wanted his students to be "those who love to construct China with their hands rather than their tongues."[14] Dean's students consistently earned his respect, even when he was astounded by their behavior, such as when they took naps on precarious overhangs, or when they disregarded what he considered to be basic safety measures at dangerous construction sites. Similarly, Dean was impressed by what he saw as the "rule-of-thumb methods" by which Chinese vernacular architecture had evolved,[15] and although he taught western construction management and design, inevitably he utilized indigenous examples as significant object lessons for his students.

Many unanswered questions remain about Dean and his architectural training program. Who, precisely, were his students and what particular impact did they have on the evolving nature of contemporary Chinese architectural practices? What happened to Dean and his school during and after the Japanese occupation of China in the late-1930s? Was Dean's program utilized as a model in any way for other architectural programs in China, such as the one organized by Chinese at Tung Pei University in Shenyang in 1928?[16] Was Dean familiar with other, foreign architectural educators in China?

Alfred Emms's Experience

One of those educators was Alfred Emms, whose career took him from a carpentry job in Bradford, England during the early 1920s to a teaching post at Shanghai's Lester Institute of Technical Education from 1934 to 1937. Emms, like Dean, believed that students who wanted to practice architecture needed to be well-versed in the actions and skills found at the building site. Emms himself had apprenticed for seven years before turning to teaching carpentry and joinery at the London Institute's Technical College in the early 1930s.

At this time many architects believed there was a desperate need for a training course in architecture to be established in Shanghai, at the hub of architectural practice in coastal China.[17] The catalyst came from Henry Lester (ca. 1857-1927), a British architect and engineer who willed a portion of his financial legacy to create the Lester Institute of Technical Education, which was inaugurated in 1934.[18] Emms was hired as part of the Institute's staff. Just prior to shipping out to China, Emms had developed three "schemes of work" that were being implemented in selected British technical schools: Domestic Handicraft, Handwork through the Senior School, and Geometry through Handwork. In Shanghai, Emms implemented the schemes that he had begun in the U.K. At the same time Emms became fascinated with joinery and carpentry practices in the lower Yangzi valley, and he used his research results about these practices as bases for student instruction.

If Dean excelled as a program director, Emms distinguished himself by melding his field research with his teaching.[19] As he probed the knowledge of Chinese carpenters, he was struck by how rapidly "the old order [was] being superseded" by how pervasively imported tools, methods and materials were responsible for replacing indigenous craftsmanship. Emms was at the pivot of these changes, on the one hand teaching building trades in the Lester Institute by using a British-based system of technical education, and on the other hand becoming ever more aware of how differently Chinese carpentry guilds prepared students for a career in building. Within two years of arriving in Shanghai, Emms was using his knowledge about indigenous joinery and craftsmanship to enrich his teaching about western methods in the context of his courses at the Institute.

Emms was distressed by how the western concern for speedier, cheaper construction was overriding the

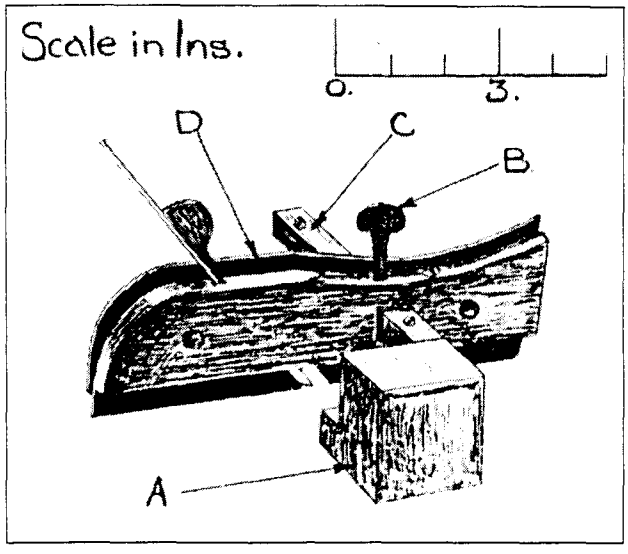

Fig. 4. Chinese moulding plane, as drawn by Alfred Emms and his wife, D.M. Emms, for publication in the Chinese Reconstruction & Engineering Review *13 (February 1937): 50.*

Chinese craftsman's concern for quality work, leading to what Emms called "bastardized craftsmanship." He advocated another approach, which he put into practice in his courses: to introduce "modern, scientifically designed tools" while simultaneously demonstrating the "scientific" way to use them; and to teach academic subjects (such as mathematics) by using "a more *practical* bias." Emms asserted that if craftsmen could be educated more pervasively in modern technical colleges, then they could retain the "true craftsmanship" that they had already learned, and supplement that with the "scientific" building knowledge being exported by Westerners and promoted in places such as the Lester Institute.[20]

As with Dean, many questions remain about Emms's work in a China that, during the late 1930s, was increasingly being politically, economically and socially torn asunder. Just as he was integrating his approach at the Lester Institute, Shanghai was bombed by the Japanese, most construction activity was halted and Emms vanished from the documentary sources that might indicate what he did, if anything, with the lessons he had learned from watching Chinese carpenters.

The Upshot of Emms and Dean's Teaching Methods

Two of the main implications derived from Emms and Dean's methods that apply to today's realities are: (1) that transplanting western models of design education is neither straightforward nor always desirable; and (2) that using hands-on building methods as a basis for teaching and/or learning about architectural space, form, material and function yields results that contrast with those derived from teaching design strictly in the studio.

Dean and Emms were both personally inspired by the vernacular traditions they experienced firsthand, and professionally moved to integrate that experience in their teaching of non-western students.[21] Therefore, even though they were employed and committed to teach non-Westerners how to master western building concepts or practices, they did so increasingly with a healthy scepticism that the grafting of western methods onto Chinese practices would take hold easily. They therefore modified their assumptions about what they could accomplish and rooted themselves increasingly at their sites. In Dean's case, that meant spending time with his students at a multitude of building sites not only so he could observe firsthand the "results from junk" they were achieving, but also so he could illustrate at the site how a western professional approached the problem at hand. In Emm's case, the site in question seems to have been one where he could observe native builders practicing their craft without necessarily having been given instruction by Emms himself. He was a carpenter-anthropologist of sorts, culling material for use back at the Institute where he demonstrated western tools and methods as counterpoints to what he had observed in the field.

For Dean and Emms the process and activity of building was integral to the elaboration of an architectural design. Their work in a non-western context confirms what James Strike has argued about the influence that construction has had upon western design in the past 300 years, and it reinforces what Tom Peters has written about the dynamic relationship between western engineering and architecture.[22] However, the largely unknown experiences of Dean and Emms in a non-western building culture also suggest the need for architectural educators and researchers to better understand the cultural dynamics at work, both historically and in architectural education today, when western architectural assumptions are brought to bear upon non-western students, architects, engineers and builders of any description. The experiences of Dean and Emms in China were enriched by their being perceptive about the logic of building construction, a logic they sought to complement with western building methods. Their experiences might well serve as examples to many architectural educators today.

NOTES

[1] See Sam Dean, "Results from Junk," *Journal of the Association of Chinese and American Engineers* [hereafter *JACAE*] 16, no. 6 (August 1926), pp. 5-10.

[2] For the Bauhaus, see Gillian Naylor, *The Bauhaus Reassessed: Sources and Design Theory* (N.Y.: E.P. Dutton, 1985) and Eckhard Neumann, ed., *Bauhaus and Bauhaus People* (N.Y.: Van Nostrand Reinhold, 1993). For Fuller, see P.H. Wagschal and R.D. Kahn, eds., *R. Buckminster Fuller on Education* (Amherst: University of Massachusetts Press, 1979. Also, James Strike, *Construction Into Design: The Influence of New Methods of Construction on Architectural Design, 1690-1990* (Oxford: Butterworth-Heinemann, 1991); Kenneth Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth-Century Architecture* (Cambridge, Mass.: MIT Press, 1995); and Tom F. Peters, *Building the Nineteenth Century* (Cambridge, Mass.: MIT Press, 1996).

[3] At the 1996 ACSA European Conference in Copenhagen, for example, Prof. Robert Greenstreet discussed how students at the University of Wisconsin-Milwaukee are required first to study

and then to model portions of local historic buildings. Many architectural programs worldwide are seeking ways to integrate construction practices with design studios; my personal familiarity with this ideal comes from experiences at the Chinese University of Hong Kong, where students are required to engage in construction-related projects.

[4] Ernest L. Boyer and Lee D. Mitgang, *Building Community: A New Future for Architecture Education and Practice* (Princeton, N.J.: Carnegie Foundation, 1996), p. 68.

[5] See, e.g., Jeffrey W. Cody, Striking a Harmonious Chord: Foreign Missionaries and Chinese-style Buildings, 1911-1949, *Architronic: The Electronic Journal of Architecture* 5, no. 3 (December 1996), located on the World Wide Web through the URL: http://www.saed.kent.edu/Architronic/.¡

[6] For example, the Association of Chinese and American Engineers was founded in Beijing on November 22, 1919, with a mission to "[advance] engineering knowledge and practice; [maintain] high professional standards; and [foster] a spirit of cooperation and fellowship among engineers."*Journal of the Association of Chinese and American Engineers* [hereafter *JACAE* 1, no. 1 (September 1920), p. 2.

[7] In 1930 Dean's school had ten in the first year and six in the second. Sam Dean, "North China School of Engineering Practice," *JACAE* 11, no. 3 (March 1930), p. 13.

[8] Sam Dean, "Results from Junk," p. 5.

[9] Women as well as men were sometimes involved in contemporary Asian construction practices, but this is an insufficiently documented topic that certainly merits further research. For one example, concerning Japanese women pile drivers, see Jeffrey W. Cody, "'Erecting Monuments to the God of Business and Trade': the Fuller Construction Company of the Orient, 1919-1926,"*Construction History* 12 (1996), pp. 67-82.

[10] By 1934 Dean's students had worked on a hostel and club for the Peiping Kincheng Bank; a dormitory for the National Normal University; a 63-bed hospital in Jilin and a 100-bed hospital in Changchun; a nurses' hostel in Hsuchow Fu; a hospital and synod building in Canton; and several houses, educational buildings and chapels in Nanjing, Kuling and Jinan. "News Notes," *JACAE* 15, no. 3 (May 1934), p. 63.

[11] Sam Dean, "China, the Land Where Builders Get Insomnia," *JACAE* 16, no. 4 (June 1926), p. 3.

[12] Sam Dean, "North China School of Engineering Practice," pp. 11-20.

[13] Sam Dean, "Results from Junk," p. 7.

[14] Ibid., p. 10.

[15] For issues of safety, see Sam Dean, "China, the Land Where Builders Get Insomnia," p. 6. For "rules of thumb," S.M. Dean, "Peiping Gray Tile Roof Construction," *JACAE* 16, no. 5 (September-October 1935), pp. 247-52.

[16] Wilma Fairbank, *Liang and Lin: Partners in Exploring China's Architectural Past* (Philadelphia: University of Pennsylvania Press, 1994), pp. 41-43.

[17] C.A. Middleton-Smith, "Changes in China: a strong plea for the establishment of a school for architecture," *North China Daily News*, 28 January 1934, p. 7; and "Engineering Development in China: The Need for International Cooperation and Technical Education," *JACAE* 18, no. 4 (July-August 1937), pp. 256-276.

[18] Lester practiced architecture in Shanghai as early as 1880. In addition to Lester's bequest for an Institute in his name to promote architectural education, he initiated the complementary Henry Lester Institute for western-style medical education, in association with a hospital. *British Medical Journal* 1 (1929), p. 313.

[19] Alfred Emms, "The Practice of Joinery and Carpentry Amongst the Chinese of the Yangtsze Valley," *China Reconstruction and Engineering Review* 13, no. 2 (February 1937), pp. 45-55; no. 3 (March 1937), pp. 96-101; and 14, no. 1 (April 1937), pp. 25-32.

[20] Emms, "The Practice of Joinery and Carpentry," pp. 31-2. To better understand the fuller implications of the relationship between scientific thinking, technological innovation and design, see Tom F. Peters, *Building the Nineteenth Century*, especially pp. 347-8.

[21] Emms and Dean were not the only contemporary western engineers working in China who respected indigenous construction methods. See, e.g., C.J. Carroll, "Chinese Construction Methods," *JACAE* 6, no. 2 (February 1925): 1; "Bamboo for Reinforced Concrete," *JACAE* 7, no. 6 (August 1926) pp.18-21; and Paul Wiant, "Experiments with Acoustical Plasters Using Native Materials," *JACAE* 13, no. 2 (March 1932) pp. 6-9.

[22] See James Strike, *Construction into Design*, 2, and Tom F. Peters, *Building the Nineteenth Century*, pp. 347-51.