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Dongas and Demountables: Four Observations Concerning Prefabricated Housing

Prefabricated housing in Australia has a long and illustrious history. From the time of European colonisation, prefabricated 'kit' houses were exported from Britain to facilitate early nineteenth century settlement. The mid-nineteenth century gold rushes further exacerbated the demand for housing, and engendered an Australian construction industry, which provided a range of buildings to local and international markets. Although the technique of transporting pre-cut timber houses for assembly in the tropical north and arid west had been practiced in Queensland since the mid-nineteenth century, it was not until the first decades of the twentieth century that this construction technique reached its fullest uptake with the emergence of the so-called "Queenslander". Like most industrialized countries, Australia's post-war housing scene was dominated by materials shortages and the push towards the fuller industrialization of housing construction, begun during WWII. The 1950s saw wide ranging attempts at mass housing using prefabricated building techniques, and from the 1960s onward, the conditions of prefabrication in housing have remained relatively constant. On the one hand they are defined by an ever-expanding suburbanization around Australia's coastal capitals, and on the other hand by the boom-bust cycle associated with remote mining operations. In both situations, prefabrication has become a mainstream construction technique, whose attractiveness has risen sharply over the past decade within the context of Australia's national housing and skills shortages and the housing affordability crisis. These Australian examples, however, are mostly at odds with the bulk of architect-led prefabricated housing projects, both in Australia and internationally.

Despite a persistent fascination within architecture culture for the idea of prefabrication, this paper attempts to describe the complications that have plagued its translation in real terms. Observations on prefabricated housing include: its definition; its cyclical nature; the effects of digital fabrication techniques; and the divide between designer and 'spec' built examples.

Terminology

Prefabrication, as a term, has itself become a topic for closer scrutiny in recent times. Partly, this is a result of the term's negative associations. Rightly or wrongly, it is the “dongas” and “demountables” that have come to characterize “prefab” housing and building in Australia. With few notable exceptions, prefabrication is often associated with temporary, poor quality and unsightly building. This is a result of the history of prefabrication and the nature of utilitarian buildings for which prefabrication has been deployed, such as schools, hospitals, the military, mining accommodation and remote state operated detention centres. The increased scrutiny around the term also arises because of its commonplace status and ubiquity in twentieth century architecture culture. In a recent article, Chris Knapp provocatively called for an end of prefabrication, largely because he felt “there is not another word in the current lexicon of architecture that more erroneously asserts positive change”¹ Knapp is not alone in thinking that the problems that have coalesced around the area of prefabrication have done so because of problems of definition and the hubris associated with architect-led attempts. In a follow-up to Knapp's article, Tedd Benson joined Charlotte Bundgaard in advocating the adoption of the Scandinavian housing industry inspired “Montage”.² Alison Arieff's *Prefab* (2002) carries a warning to the reader regarding “our definition of PREFAB”, and that “[m]any of the houses presented ... are not prefabricated in the strictest sense of the word”.³ A decade later, in an article in the *New York Times*, describing New York's latest architectural movement towards stackable prefabricated housing units, Arieff's attitude towards the term is more ambivalent still. Although the *Times* article is titled “Prefab Lives!”, Arieff avoids describing the projects as prefabricated, instead referring to the construction techniques as “modular building”.⁴ Arieff describes her change of heart thus:

“Just over a decade ago when I published my book *Prefab*, the potential for factory fabrication to improve housing was tenable (and explains why so many architects have been obsessed with taking on the challenge). But after I evangelized for years after about prefab's transformative potential [...] one thing became clear to me: Prefab is best utilized in the design and construction not of single-family homes but multifamily housing.”⁵

Where it is - or once was - common to refer to buildings assembled off-site as prefabricated, this definition does not take into account that in contemporary building, with very few exceptions, the overwhelming majority of building components are fabricated off-site and merely assembled *in*

1 Chris Knapp, “The End of Prefabrication,” *Australian Design Review*, 18 October 2013, accessed 2 November 2013, <http://www.australiandesignreview.com/features/35295-the-end-of-prefabrication>.

2 Tedd Benson, “Give Up On Prefab?,” *The New House Rules*, 18 December 2013, accessed 4 June 2014, <http://teddbenson.com/2013/12/18/give-up-on-prefab/>; Charlotte Bundgaard, *Montage Revisited: Rethinking Industrialised Architecture* (Aarhus: Arkitektens Forlag, 2013).

3 Allison Arieff and Bryan Burkhart, *Prefab* (Salt Lake City: Gibbs Smith, 2002), 4.

4 Alison Arieff, “Prefab Lives!” *The New York Times*, 23 May 2013, accessed 2 November 2013, http://opinionator.blogs.nytimes.com/2013/05/23/prefab-lives/?_r=0.

5 Arieff, “Prefab Lives!”

situ. This problem has a longer history, indeed there is a strong argument that, as Martin Bignell has pointed out, a large portion of Australian housing construction has been an industry of assembly, and not an artisan, craft-based industry of bespoke, climatically and regionally adapted building which is a common tenet of vernacular housing.⁶ A fitting historical example of this phenomenon is the “Queenslander”, which was developed as a kit of parts by the coastal sawmills, sold by catalogue order, and transported around the state by ship or rail and used indiscriminately in arid, tropical, sub-tropical and temperate climates.⁷ Viewed in this context, from nineteenth century colonial expansion to post-WWII suburbanization, a large portion of housing has been prefabricated, varying only by the degree. And, in this same manner, the Australian contemporary project home industry could equally be regarded as an industry heavily reliant on prefabrication.

A variety of terms have emerged over the past century to explain these differences and the confusion around prefabrication. Modular, systems, kit or packaged homes, tend to point towards the flexible nature of prefabrication. Off-site or indoor construction refers to how and where the components are made. Pre-made and pre-built are simple synonyms for prefabrication. Portable, mobile, and transportable housing highlight the moveable nature of these building. And finally, manufactured, factory-built and mass-produced are all references to scale and level of industrialization involved. While these terms may be of use as descriptors, they are perhaps less useful in understanding the nature of the problems, and the historical barriers faced by architect-designed prefabricated housing.

In reviewing the ever-growing list of terms and concepts in the area of prefabrication, one could conclude there is less a problem of definition than of meaning. In essence, these terms and their associated technical approaches have largely the same intentions: they all strive to deliver the core advantages of prefabrication, which have, in fact, changed very little over the past two centuries. These are geared around achieving benefits in cost, time, and quality, and offering particular solutions for remote or problematic sites where materials or skills are in short supply. From the 1960s onward, the economic conditions of prefabricated housing in Australia have remained relatively constant. On the one hand they are defined by an ever-expanding suburbanization around Australia’s coastal capitals, and on the other hand by an episodic boom-bust cycle associated with remote mining and resource operations. The simple benefits offered by prefabrication explain the early interest in prefabricated housing solutions in the colonial period, equally for mining accommodation both in the nineteenth and twenty-first centuries. As Colin Davies has pointed out in his book, *The Prefabricated Home* (2005), in the hands of architects the fundamental conditions, which have made prefabrication of interest, are often overlooked, and debates around terminology

6 Martin Bignell, “Some Assembly Required: Component and Ensemble in Prefabricated Australian Domestic Construction,” paper presented at the 31st Annual Conference of the Society of Architectural Historians, Australia and New Zealand. Auckland, 2-5 July 2014.

7 Peter Bell, *Timber and Iron: Houses in North Queensland Mining Settlements, 1861-1920* (St Lucia: University of Queensland Press, 1984). For an example of local industry, see “Redicut” by James Campbell and Sons in Brisbane. “James Campbell and Sons, Ltd.,” *Queensland Times* 15 August 1916, 5.

have perhaps served as a distraction.⁸ In this context, the problems around the definition and meaning of prefabrications are more symptomatic of the lack of historical awareness surrounding prefabrication, than they are prescient of inherent problems with the field or its terminology.

Prefabricated Housing and Architecture: The Promised Land

“The reason for the malaise [in housing] is the fact that the public is always at a disadvantage, whether it builds with an entrepreneur or with an architect. Many justly avoid the entrepreneur, because he unscrupulously hurries projects through in order to save costs, and because he does damage to his client by saving materials and wages in order to increase his own profit. The architect on the other hand who provides designs only is interested in raising the cost of a job, since final cost determines his fee. In both cases the client is the sufferer. His ideal is the artist architect who sacrifices all to aesthetic aims and thereby does economic damage to himself.”⁹

Since Walter Gropius wrote those words in 1909, architects have been repeatedly enticed by the promise of prefabricated housing solutions. In many ways, it would be difficult to find a more revealing description of the underlying professional and financial conditions which have motivated not only architects such as Gropius, but the entire housing industry. Indeed the story of this text, and the influence it has exerted over successive generations of like-minded attempts at prefabrication, has only served to underscore its importance. Gropius made these observations in a pitch delivered in March 1910 to Emil Rathenau, the then president of the German industrial giant AEG, as part of a proposal for a new version of industrialized housing that was based on the mass production of flexible, though standardized, housing. Of the company Gropius wrote: “The new Company intends to offer its clients not only inexpensive, well-built and practical houses and in addition a guarantee of good taste, but also take into consideration individual wishes without sacrificing to them the principle of industrial consistency.”¹⁰

This text was initially known through a solitary reference in Nikolaus Pevsner’s 1936 *Pioneers of the Modern Movement*.¹¹ Later, excerpts were published in condensed form in Sigfried Gideon’s *Walter Gropius, Work and Teamwork* (1954),¹² and finally, in its entirety, in the *Architectural Review* in 1961.¹³ Gideon’s reference is the most likely source for the generation of post-war architects, including the

8 Colin Davies, *The Prefabricated Home* (London: Reaktion Books, 2005).

9 Walter Gropius, “Gropius at Twenty-Six [Reprint of “Programme for the Establishment of Company for the Provision of Housing on Aesthetically Consistent Principles],” *The Architectural Review* 130, no. 773 (July 1961): 49.

10 Gropius, “Gropius at Twenty-Six,” 50.

11 Pevsner wrote: “In 1909, Gropius worked out a memorandum on standardisation and mass-production of small houses, and on advisable ways of financing such building schemes.” In the attached footnote, Pevsner stated: “This was never published. Letter of W. Gropius to the author, 16 January 1936.” From, Nikolaus Pevsner, *Pioneers of the Modern Movement: From William Morris to Walter Gropius*, (London: Faber and Faber, 1936), 42; 215. See also, Gilbert Herbert, *The Dream of the Factory-Made House: Walter Gropius and Konrad Wachsmann* (Cambridge, Mass.: MIT Press, 1984), 32-35, 337 n. 20.

12 Sigfried Gideon, *Walter Gropius, Work and Teamwork* (London: The Architectural Press, 1954), 74-78.

13 Gropius, “Gropius at Twenty-Six,” 49-51.

Australian architect and writer Robin Boyd.¹⁴ Australia, like most other industrialized countries, adopted a large-scale mass-housing programme in the post-war period, and found in Robin Boyd a leading advocate of the promise of prefabrication. With explicit reference to Gropius's foundational study, in his most famous book *The Australian Ugliness* (1960), Boyd wrote:

"If the housing industry were to embrace modern factory methods with even half the enthusiasm of the car industry, in no time it would be producing standardized components or space-enclosures of some kind which could be assembled in various ways to suit the needs of each buyer. Gradually the family itself would become the designer of its own pattern of standardized units, as suggested by Walter Gropius as early as 1909, changing them about if necessary as the pattern of the family life developed".¹⁵

As the passing of time has shown, the enthusiasm of Gropius and Boyd for an architect-designed mass housing concept was never fully realized. In Australia, despite large programmes for "prefab" building in the 1950s, today's mass housing market is dominated by project home companies, who, to the casual observer, appear to have little regard for architect-designed houses or highly industrialized processes.¹⁶ As Davies has described in great detail, the lack of success of Gropius and other well known twentieth century architects, including Frank Lloyd-Wright, Richard Buckminster Fuller, the engineer Jean Prouvé, up to the polemic of Archigram in the 1960s, has in no way acted to deter other architects and designers from similar attempts at prefabricated housing.¹⁷ The ubiquity associated with the term "prefabrication" in twentieth century architectural culture is also marked by strong cyclical interest.

Gropius is significant in this debate, not only because of his early and insightful views on the potential for the mass production of houses, but because of his continued efforts in the field. Among them: Törten Housing in Dessau; the Weissenhof Housing in Stuttgart in 1920s Germany; his copper-plated prefabricated housing for the German industrialist Hirsch Copper and Brass Works in the early 1930s; and finally, and most spectacularly, his work on the General Panel Company with fellow German émigré architect, Konrad Wachsmann in the USA in the 1940s. Of these forays into prefabricated building, "The Packaged House" had the best preconditions of all Gropius' previous attempts to actually deliver a truly industrialized building. It boasted a highly talented and influential team, large amounts of private and public funding, and the post-war housing boom that favoured mass prefabricated housing as it did in Australia. Yet this project ultimately resulted in commercial failure, which perhaps explains why the most in-depth treatment of the Packaged Home

14 Boyd must have had it from Giedion, because Gropius's full text was first published in 1961.

15 Robin Boyd, *The Australian Ugliness* (Melbourne: Cheshire, 1960), 111.

16 For an example of research on the prefabricated housing program in Brisbane, see, Alfons Vernooy, *The Dutch Houses of Coopers Plains: A Postwar Housing Debacle at Brisbane* (Kelvin Grove: Brisbane History Group, 2004).

17 Davies points out that in some cases the reaction to failure has been quite the opposite, such as the case of Buckminster Fuller where failure in commercial terms has been used to highlight creative and artistic integrity. See Chapter One "An Architectural History", in, Colin Davies, *The Prefabricated Home* (London: Reaktion Books, 2005), 11-43.

project - Gilbert Herbert's 1984 excellent examination of mid-century prefabrication - is titled *The Dream of the Factory-Made House*.¹⁸

If architect-designed prefabricated housing has mostly remained a dream set to recur every ten to twenty years, then historical understanding of prefabricated housing and the challenges it has faced evidences as kind of amnesia. Despite a handful of excellent studies stretching back to the 1950s there remains a distinct lack of historical awareness around the subject of prefabrication in architectural culture, which sees each new generation of architects holding on the dream, but reinventing it from scratch.¹⁹ In great part, this dynamic is continued by the large-format high-volume picture books such as Taschen's *Prefab Houses* (2010) and FKG's *Prefab Architecture* (2012), which continue to cement the role of prefabricated housing - if not in the minds of the public and industry, then at least on their coffee tables.

Issues within architecture culture which have limited the potential uptake of prefabrication at the scale and modes suggested by architects themselves include: the commodification of "prefab" architecture, which frames such buildings as "designer" objects for consumption, underscoring their potential as a medium for social and cultural distinction based on taste, exclusivity, and price much in the manner of the luxury car market; predispositions towards a particular material, visual or formal styles of building not widely accepted by the market; and finally, the lack of historical awareness for previous attempts mentioned above. But there are also more structural issues at play in the cyclical interest in prefabricated housing. In his paper, "Some Assembly Required," Bignell has pointed to some of the underlying causes for Australia's staccato attempts at prefabrication.²⁰ Historically, interest in prefabrication in Australia was almost universally tied to external needs, such as housing and materials supply shortages, remote working settlements, or episodes of housing demand which were bounded by physical and/or temporal conditions, such as those presented by the Australian mining industry.²¹ Not surprisingly, this interest has tended to coincide with the boom-bust logic of these industries or the particular conditions that engendered them, ensuring no continuity of technique, technology or building experience between the discrete episodes.

18 Gilbert Herbert, *The Dream of the Factory-Made House: Walter Gropius and Konrad Wachsmann* (Cambridge, Mass.: MIT Press, 1984).

19 A selected bibliography of these works includes: Burnham Kelly, *The Prefabrication of Houses* (Cambridge, Mass.: MIT Press, 1951); Arthur Bernhardt, *Building Tomorrow: The Mobile/Manufactured Housing Industry* (Cambridge, Mass.: MIT Press, 1980); Herbert, *The Dream of the Factory-Made House*; Allison Arieff, *Prefab* (Salt Lake City: Gibbs Smith, 2002); Davies, *The Prefabricated Home*; and Barry Bergdoll, Peter Christensen, Ron Broadhurst, and Museum of Modern Art, *Home Delivery: Fabricating the Modern Dwelling* (New York: Museum of Modern Art, 2008).

20 Martin Bignell, "Some Assembly Required."

21 On the issue of contemporary mining accommodation in Australia, see Mathew Aitchison, "The Experience of Australian Mining: Building, Planning, and Urbanization," in *The Architecture of Industry: Changing Paradigms in Industrial Building and Planning*, ed. Mathew Aitchison (Farnham: Ashgate, 2014 [Forthcoming]).

Digital and Automated Fabrication

Over the past decade, architectural culture has become increasingly occupied with the promise of new digital and automated fabrication technologies. With specific regard to the field of prefabrication and industrialized building, many commentators see in these technologies the arrival of a long-sought-after potential to transform prefabricated housing from a generic to a highly tailored building product. Where mass production previously implied the repetition of identical objects to achieve cost benefits, recent digital and automated production techniques promise individuality with similar cost benefits of mass production. The catchword of this potential is “mass customization,” its associated production technique: “file to fabrication” or “file to factory”. Stephen Kieran and James Timberlake’s book *Refabricating Architecture: How Manufacturing Methodologies are Poised to Transform Building Construction* (2004) has played a leading role in both explaining and proselytising this potential.²² Architecture culture, on the most part, is sympathetic to this movement, because there is a sense that these technologies will change the rules of industry itself, and give architects back an agency in building that they have progressively lost.

Despite the considerable enthusiasm for digital and automated fabrication over the past decade, it has yet to be incorporated into the historical narrative of architecture. The current generation of architects and scholars – as typified by Kieran and Timberlake – are now steeped in the techniques and technologies of digital fabrication and enthusiastic about the potential it holds for the discipline. But as with prefabrication there appears to be a certain amnesia regarding the long history of previous attempts to harness the forces of industrialization within the architectural project. Take, for example a later iteration of Gropius’s call for a flexible housing system based on advanced manufacturing in 1923:

“Human housing is a matter of mass demand. Just as it no longer occurs to 90 percent of the population to have shoes made to measure but rather buy ready-made products that satisfy most individual requirements thanks to refined manufacturing methods, in the future the individual will be able to order from the warehouse the housing that is right for him. It is possible that present-day technology would already be capable of this, but the present-day building industry is still almost completely dependent on traditional, craftsmanly construction methods.”²³

As noted above, practices like prefabrication, modular construction, and standardization have long offered the possibility of a fundamental transformation of architecture’s relationship to industrialization and mass production – the same transformation that Gropius invoked which turned tailoring into ready-made fashion. Both Gropius and Boyd shared the idea that the industrialization of the design and production of housing would not only lead to improvements in housing, but also

22 Stephen Kieran and James Timberlake, *Refabricating Architecture: How Manufacturing Methodologies Are Poised to Transform Building Construction* (New York: McGraw-Hill, 2004).

23 Walter Gropius, “Wohnhaus-Industrie,” in Adolf Meyer, *Ein Versuchshaus des Bauhauses* (Munich: Langen, 1924), 5-14; quoted in Hartmut Probst and Christian Schädlich, *Walter Gropius* (Berlin: Verlag für Bauwesen, 1985), Vol. 3, 97.

be flexible and adaptable. This is the same claim reiterated by Kieran and Timberlake, who, however, feel that modern technology has the potential to finally realise the architectural dream:

“We have always customised architecture to recognize differences. Customization ran at cross-purpose to the twentieth-century model of mass production. Mass customization is a hybrid. It proposes new process to build using automated production, but with the ability to differentiate each artefact from those fabricated before and after. The ability to differentiate, to distinguish architecture based upon site, use, and desire, is a prerequisite to success that has eluded our predecessors. With the information control tools we now have we are able to visualize and manage off-site fabrication of mass customized architecture.”²⁴

As the history of twentieth century architect-led prefabrication housing projects illustrates, architecture has tended to resist industrialization more than most design disciplines. But according to Kieran and Timberlake, digital fabrication and automated construction are changing our concept of industrialization itself, as ideas of mass customization, free-fabrication, rapid prototyping, small batch, and decentralized productions are testimony. These ideas promise a deep departure from the mass production of identical objects, revealing an emergent paradigm with which architectural culture seems to have many sympathies. Today, technologies like three-dimensional (3D) printing and Computer Numerical Control (CNC) milling offer a mode of industrialized fabrication that promises to bypass the mass production that architecture has often sought in theory, but long resisted in practice. So far, however, it appears the excitement over formal possibilities has eclipsed the urge for practical application of these technologies, which echoes the promise of so many mostly failed attempts at industrialization in the past.

“Mass customization” and “file to fabrication” carry with them a sense that new technologies will help architects painlessly bypass the mass-production of Gropius and Wachsmann’s Packaged House, or Boyd’s automobile-industry-inspired call to arms. The repeated invocations for building to imitate the mass production of cars, aeroplanes, and shipbuilding - invocations repeated by Kieran and Timberlake - not only continues a line of enquiry common in architecture since Le Corbusier’s comparison of a modern car with the Parthenon, but also tends to neglect the various (and often painful) changes the auto industry itself has experienced as it developed from a craft based industry towards an automated lean production system.²⁵ Here, a historical irony is becoming apparent in Australia, with the recent hope that the emergent industry of manufactured housing can take up the place of the now departed car manufacturing.²⁶

24 Kieran and Timberlake, *Refabricating Architecture*, xiii.

25 For an engaging history of the changes in car production across the twentieth century see, James Womack, Daniel T. Jones, and Daniel Roos, *The Machine That Changed the World: The Story of Lean Production - Toyota’s Secret Weapon in the Global Car Wars That Is Revolutionizing World Industry* (New York: Free Press, 2007).

26 Jemma Green and Peter Newman, “Building a Housing Industry from the Relics of a Car Industry,” *The Conversation*, 14 February 2014, accessed 19 May 2014, <http://theconversation.com/building-a-housing-industry-from-the-relics-of-a-car-industry-23195>.

Bifurcation of the Prefabricated Housing Industry

As Barry Bergdoll pointed out in the catalogue of MOMA's 2008 exhibition *Home Delivery: Fabricating the Modern Dwelling*, several of the observations introduced above have led to a fundamental bifurcation in the prefabricated housing industry: between architect-designed exemplars and the mass-produced volume housing industry. On the one hand architect-designed prefabricated housing customarily foregrounds the "designerly" quality of the housing, usually privileging the expression of the materials, techniques and technology used to construct it, and making distinctive aesthetic and formal choices. Such examples are numerous, ranging from the polite modernism of Gropius and Wachsmann's work on the General Panel Corporation (1947-52), to Matti Suuronen's futuristic bubble pod "Futuro" (1968-78) and on to Shigeru Ban's neo-modern "Furniture House" (1995). Architect-designed examples have continued into the twenty-first century using new materials and techniques such as automated and digital fabrication technologies introduced above, which have resulted in a range of solutions, from high-end containerized systems to branded designs by well-known architects, such as Richard Rogers and Renzo Piano internationally, and Donovan Hill and Fender Katsalidis Architects in Australia.

Where architects have often tended to foreground technique, technology, and its expression, the mass housing developers, on the other hand, have consistently submerged such techniques and technologies within the range of accepted (and often) historicist housing styles. Mass housing manufacturers, who produce housing in any "style" broadly accepted by the market, have enjoyed enormous proliferation and commercial success around the world. Many such houses are indistinguishable from their site-built neighbours. From Sears and Roebuck mail order kit-houses from the early twentieth century, to post-war mass-produced housing such as Levittown, on to the mass production of housing in Japan by companies like Sekisui House and Misawa House. As Bergdoll points out, manufactured housing in the United States captures a third of the detached housing market, and appears to be "all but impervious to, design culture".²⁷ In Australia, such prefabricated housing has a long and illustrious history. From Manning's kit-buildings of the 1830s, early twentieth century "Redicut" homes by Brisbane builders James Campbell and Sons, to post-war aviation-assembly-inspired Beaufort Homes, Queensland's prefab housing projects, which deployed imported kit-houses from France, Sweden and Holland in the early 1950s. Although these Australian examples were not as commercially successful as many of the international examples, these houses show a key differentiation to architect-led projects. They demonstrate that technological and commercial innovation need not always have an outward appearance of innovation or invention.

Among those scholars who have set out to examine the bifurcation within the prefabricated housing industry, Colin Davies's work is exemplary. Davies argues that the disciplinary frameworks, which circumscribe the field of architecture and construction, lie at the heart of this issue. Where the

²⁷ Barry Bergdoll, *Home Delivery: Fabricating the Modern Dwelling*, ed. Barry Bergdoll and Peter Christensen (New York: Museum of Modern Art, 2008), 13.

architecture field has been resistant to industrialization, the construction industry has been quick to implement broad and sweeping changes to traditional and customary approaches to building. Davies's point in case is the mobile home industry. He describes in great detail how such exemplars are not only scorned by architects and indeed by the wider public, by labels like "trailer trash," but Davies also praises the leading role of this industry - more recently renamed "manufactured homes" - for providing low-cost housing for emerging design requirements, for its advances in construction techniques and efficiency, and for the changes it has successfully brought about in the regulatory environment which has historically provided a barrier to many architect-led prefabrication attempts.²⁸ The architecture field, however, has consistently shunned the field of construction and chooses instead to frame its disciplinary boundaries such that the prosaic questions of building and construction are firmly located exterior to the struggles and vicissitudes of high design.

Conclusion

As many of the books on prefabricated architecture introduced above illustrate, twentieth century architect-led designs of prefabrication have placed a high value on inventiveness, often at the expense of innovation, uptake and application. Debates around the terminology of prefabrication have arguably tended to distract, rather than focus, interest towards the real uptake of industrialized building solutions and purported benefits that industrialisation has promised for at least a century. The most obvious argument to disarm the increasing bluster around "prefab" and the other nuanced terms in the area is the fact that other non-English speaking countries, many of whom have a long tradition of prefabricated housing and industrialised building, have continued to operate successfully using completely different terms: the German *Fertighaus* or "Finished House" and the Swedish *Montagehus* (Assembled or Montaged House) being just two examples with little or no resemblance to the English-language corollaries.

Many of the examples previewed in the "prefab" picture books introduced above convey a sense of luxury and expense. As Knapp has pointed out, this is clearly part of a broader media apparatus, whose ultimate aim is to "support the commodification of Modernism",²⁹ but it is also a symptom of a lack of historical understanding in architectural culture around previous attempts at prefabrication and at the conditions that make prefabrication of interest to the market in the first place. In attempting to design new versions of prefabricated housing, architects have tended to place an inordinate amount of effort on implementing technology systems - often derived from analogous construction industries in car, ship and aerospace - and been caught up in a race with a questionable version of progress and an over-determined use of technology. This illusory chase for the holy grail of architecture Herbert termed "The Henry Ford syndrome," a twentieth century phenomenon whose symptoms are described thus: "Why can't we mass-produce houses -

²⁸ Davies, *The Prefabricated Home*, 69-87.

²⁹ Knapp, "The End of Prefabrication."

standard, well-designed, at low cost - in the same way Ford mass-produces cars?"³⁰ Apart from the observations pertaining specifically to the history and future of industrialized building made in this paper, and in line with Davies's thesis, prefabricated housing also tells us much about the discipline of architecture and the challenges it faces. Architectural concepts and techniques such as tectonics, space, authorship or architecture's relation to specific cultures and places, have been the bedrock of the discipline, foundations which prefabrication and industrialization, if realized, would promise to change irrevocably.

30 Herbert, *The Dream of the Factory-Made House*, 3.