

Cheap (conceivably) and Temporary: In Praise of Mobility

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PRECEDENTS AND PARAMETERS

Portable building solutions in a fluctuating world are a response to a society which expands, contracts and shifts depending on its needs. The inspiration of mobile and portable architecture is the premise for a paper which explores building inexpensively, flexibly and creatively in the next millennium. Portable structures are not only impermanent but are also unaffected by burdensome emotional ties to the environment and communal responsibilities. Relocatable and demountable constructions address the issue of the affordable transient dwelling.

According to the Bible, over 4000 years ago Noah was called by God to build an ark which would be capable of transporting the natural world and its creatures to safety when the apocalypse struck. This may have been the first portable and relocatable structure whose purpose was self-sufficient housing. And, later, another sort of ark also proved mobile. I recently visited Capernaum near the Sea of Galilee in Israel, thought to be the site of the first, and possibly only, mobile ark on wheels (where the Torah scrolls are stored). Built during the 1st century the synagogue is designed with an internal rectangular colonnade and surrounded by a generous stone bench which provides seating and close proximity to the center for observers and worshippers. Carved on the stone entablature is the image of the Synagogue's facade with large wheels underneath, evidence of mobile support. It is said that this is a depiction of the ark which was placed at the center of the space and moved about for purposes of discussion, debate and accessibility.

In mediaeval Europe mystery plays were performed as populist parables that related to Biblical stories. The plays were staged in demountable theaters called "mansiones," which were platforms or booths set up in the town market place, or sometimes in an existing building. Additionally, "from the Basque sheepherder tent/coat and Bedouin woven goat-hair 'blacktent' to Mongolian yurts and American Indian tipis, human ingenuity has created an astonishing array of portable dwellings."

Historic examples such as these describe a preindustrial world which was not bound to place but possessed an ideology of itinerant and nomadic responses to permanence.

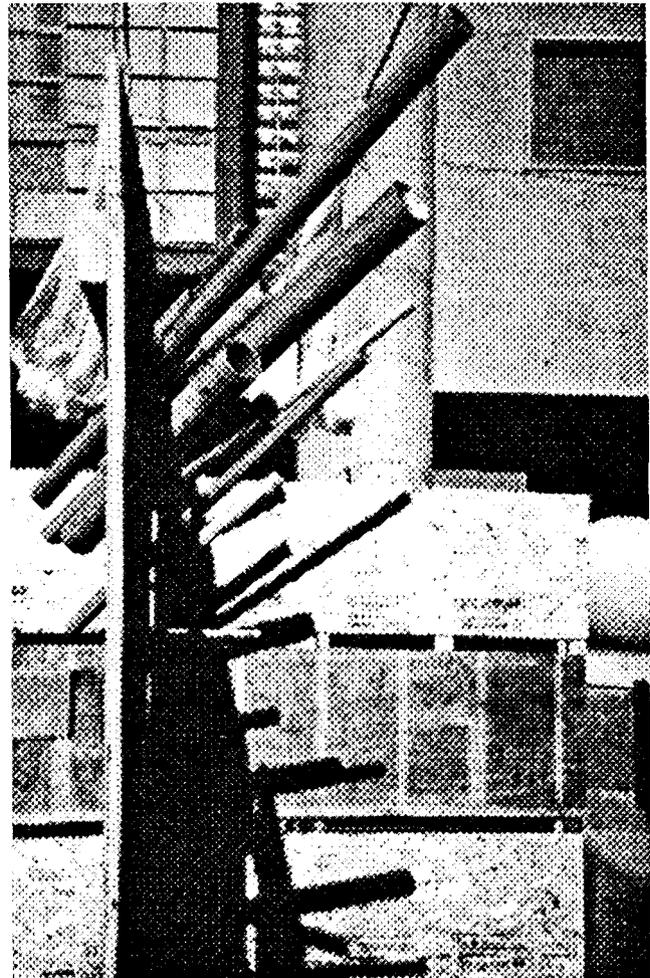


Fig. 1. Viewing wall. From the book entitled *Mobile Laboratory: Limitations + Invention*. A Design/Build project I completed with students at Arizona State University.

EVOLUTION OF MOBILE TYPOLOGY

Only in the Old World, with its dream of permanence, does the deserted house or the deserted field invariably speak of human tragedy.'

History has shown that exhibitions have been used as architectural petri dishes for cultivating new design ideas. It is here that the wildest of dreams may be legitimized as genuine contributions to advancing building technology. In an effort to be on the cutting edge of technology, entire countries will display (and financially support) the unimaginable and give shape to the metropolis of the future.

With the Great Exhibition of 1851, Great Britain provided an international forum for display of manufacturing and industry, much like the present day World Exposition. It was here that the way was forged for a new type of mobile building material. Joseph Paxton's Crystal Palace, built in six months between 1850-51, exemplified the use of cast-iron, which was designed specifically for demounting and reassembly. The structure set a precedent for using a component system in building manufacture and site assembly which established itself on the forefront of lightweight, movable building systems. Unlike its predecessors, "every item of the building's construction was meticulously planned for reuse in the new structure, even the temporary timber fencing was reused as floorboards inside." The system was successful in its innate logic and economy which allowed for rapid assembly and reassembly, and could be erected in locations remote from its manufacture.

Some years later, with similar concerns, Buckminster Fuller was working on the development of methods for producing high-quality, affordable housing. Like Paxton, his primary concerns for portable structures were focused on the implementation of mass production, lightness of materials, and determining the minimal weight. Fuller's proposal, the Dymaxion House (dynamic/maximum/ions: Dymaxion), was patented in 1928 and was to be built for the 1933 World's Fair. The design was influenced by technology borrowed from boat building and fishing work and the house was light enough to be deployed by aircraft. If the house had been put into production in 1933 it was estimated to have cost \$1,500, when the average cost for a new home in the US was \$8000.

In 1940 Fuller designed the "Mechanical Wing," which first appeared in *Architectural Forum's* special issue "The Design Decade." The first prototype for "plug-in" self-sufficient mobile housing, the trailer contained a compact kitchen, bathroom and generator, and was towed behind an individual automobile. Coupled with the Butler Bins, a circular steel container used for storing grain, the DDU (Dymaxion Deployment Unit) was the first cheap and portable dwelling, originally intended to be used for military and factory worker housing.

The advantages of the prefabricated system were becoming increasingly popular; their promise offered greater economy, speed of erection, reduction in need for skilled labor on the site, and a higher quality product due to factory manufacture.

Other designers and pioneers were investigating similar concepts. Walter Gropius and Hirsch Kupfer were engaged in the evolution of "knockdown buildings that can be easily assembled"⁴ developing and later building the Copper House.

The Berlin Growing House exhibition of 1932 exemplifies Gropius's design for a factory-made, flexible system, which combined standardization with variability.

A fascination with an automated-machine-based process was already of interest to Ray and Charles Eames in 1948 when they designed their Case Study house for John Entenza's (editor) *Arts and Architecture* magazine. The use of prefabricated, commercially available products made up the component pieces which were used as a palette from which "good design" could be composed and efficiently constructed.

Unique responses to various conditions because of convenience or necessity have employed the need for pre-manufactured buildings. When there is a sudden unforeseen demand and no local resources or materials, such as during natural disasters, they are transported to a site for assembly. In 1787, Samuel Wyatt built 12 movable hospitals which could be dismantled and re-erected within an hour without using tools. More recently, in Vietnam and the Gulf Wars, portable and demountable units known as MUST (Medical Unit, Self-contained, Transportable) have been developed by and for the military and are used around the world where speed of deployment and immediate proximity to areas of conflict are necessary.⁵

ECONOMY OF MOVEMENT: FORM FOLLOWS NECESSITY

Mobile home/ trailer "park"

Le Corbusier states in *L'Esprit Nouveau* that it was "impossible to wait on the slow collaborations of the successive efforts of excavation, mason, carpenter, joiner, tiler, plumber...houses must go up all of a piece, made by machine tools in a factory, assembled as Ford assembles cars, on conveyer belts."⁶

The mobile home is a factory-built building ranging in size from 2.5 meters by 10 meters to 7.5 meters by 25 meters. On average, it takes 100 hours and a single working day to build a single mobile home unit. It is generally transported to its site on its own chassis and wheels, though some of the larger units, called 'double-wides' are transported in sections and assembled by specialists. Nearly half of all homes are placed in mobile home parks of which there are 24,000 in the USA the average size is 150 to 175 spaces.¹

A notable image and historical precedent for the mobile dwelling was the covered wagon or Conestoga Wagon, used by the American settlers heading West during the nineteenth-century. Initially mass-produced for moving goods to the new frontier, the Prairie Schooner was quickly converted and accessorized to become a dwelling for the mobile pioneer family.

During the 1920's, when the automobile was relatively affordable, a new type of domestic traveler began to emerge, and the pleasure of short term travel and overnight excursions was popularized. Images such as the Aerocar Land Yacht,

designed and made by Glenn Curtis, combined the streamlined images of the train and aeroplane, making a convincing argument for the independent and freedom-bound traveler. In 1935, The Airstream Company was founded by Wally Byman, fostering a new dreamscape for America. With its aerodynamic appearance, the Airstream's sleek silver body was designed to move through the air like a bullet; it still remains a timeless icon for mobility.

As the Great Depression began to affect job opportunities in the large cities, and the country entered into World War II, people moved where they could to find work, and the demand for instant or emergency housing was required. During these years, over 200,000 trailers were mass-produced, with more than 60 percent of them located in defense-production areas. Colleges and universities also responded to the need to accommodate the many soldiers returning from the war, and the corresponding increase of married students, by introducing the trailer to campuses.

Concurrently, early itinerant and migratory factory and farm workers were providing new examples of self-fabricated housecars and wagontrain caravans. These structures, based on an economy of movement, where form followed necessity, were responding to the immediate environment, which needed to be adaptable and flexible. The cinema later evoked these images, from the traveling evangelist/miracle curer to the circus/entertainer, as depicted in such films as Arthur Penn's 1970 *Little Big Man* and Federico Fellini's 1954 *La Strada*. These films take on a nostalgic yet realistic portrait of the nomad who lives in places for brief moments of time, constructing the novelty of the spectacle before rolling on.

In 1991, the now defunct *Progressive Architecture* sponsored a competition to increase the quality of affordable housing, and turned to the industrialized housing sector. The task was to design and build a nuclear family home for under \$65,000. The winning scheme, by Abacus Architects in Boston, developed the assembly line prototype by using a combination of the module, built on its chassis, and the flat-pack, designed to sit on top with a collapsible roof which would lie flat when being transported and unfold to form a conventional pitched roof. Built in less than a month, the modules were erected in one day. With an emphasis on contextuality, the shotgun-style house slips unassumingly into a preexisting neighborhood.

Referred to in the building industry as Manufactured Housing, 97 percent of these dwellings will move only once, from the factory to a new trailer 'park', and remain permanently sited. Typically the building material is a lightweight wooden superstructure which is built on its own chassis with a permanently fixed set of wheels, making the mobile process simple.

While marveling at the remarkable efficiency of the mobile dwelling, it would be unrealistic not to mention the critical position that many people take toward these structures. There are certain social stigmas associated with living in a trailer park, where class distinction and unfavorable

preconceptions determine aesthetic judgments. As stated by J. B. Jackson, "the trailer has no real attachment to place."⁸ Its anonymity, disregard for regional contextualism, and inability to work with the contours of the natural landscape force the mobile dwelling to remain on the periphery of blue-color society, making the argument for acceptance arduous.

Flat-pack

pre-joined hinged strategy in which most of the components are arranged in simple surfaces such as walls, floor and roof, which, when opened in a predetermined manner, fold into place and, after simple fixing, into a rigid volume.⁹

The end of World War II brought with it a housing shortage and a need to develop a flexible approach to industrialized building. The Acorn House was designed by Carl Koch (with Huson Jack and John Callender) in 1945. Designed specifically with truck transportation in mind, this narrow unit made from 37 factory-made and assembled component parts, had folding panels that opened to form living space and folded back in on itself for transport. Delivered to a site in a collapsed form, their condensed size makes them advantageous for long distance delivery and efficient when size, weight and volume are restricted.

Modules

The most familiar manufactured building form, the module units are delivered to a site in their completed state relying on an external source for movement. These independent building units are ready for use, most commonly built from wood and steel or a composite skin panel of metal and plastic based insulation, and sometimes made of GRP or vacuum formed plastic.

Truck culture

In the late 1930's, the truck had become an accepted form of commercial transportation. As a mobile enterprise, the workplace expanded to include 'delivering, collecting, hauling, distributing, as well as making repairs'.¹⁰ With the introduction of the transit shed and soon after the highway, the loading dock became an integral part of building design, and the trailer-tractor truck evolved. Replacing small immobile businesses, the truck enticed the mobile entrepreneur, giving rise to a "new industrialized landscape."

Social interaction had moved on to the streets, incorporating the drive-in (franchise restaurants, banks, liquor stores, package stores, car washes, dry cleaners, libraries) into a mobile culture. The mobile specialist or business sector, had become a fixture in society.

MATERIALITY

Perhaps we really enjoy wood's temporary quality; that is what makes it seem alive and responsive."

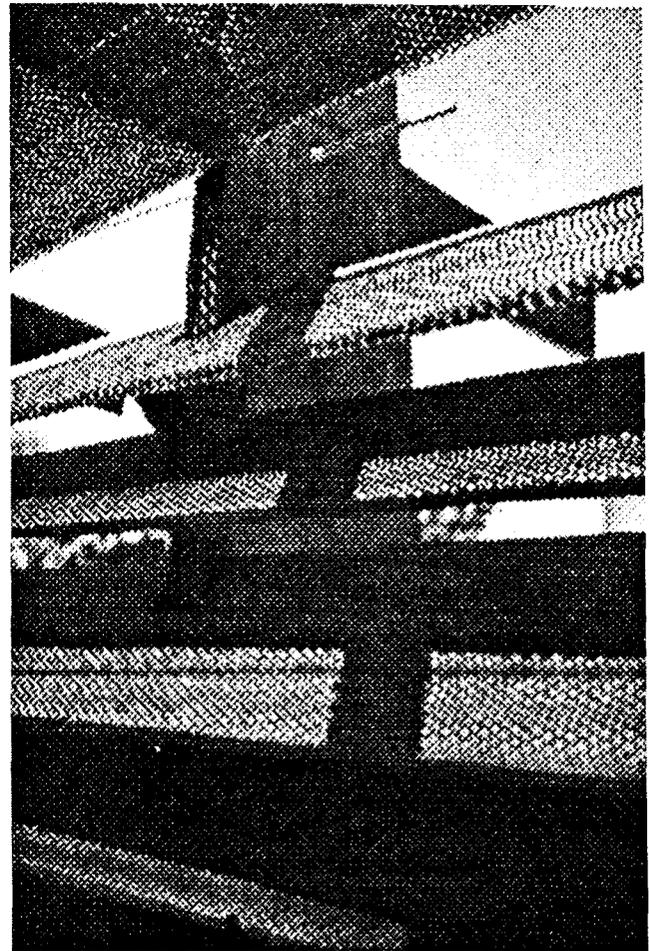
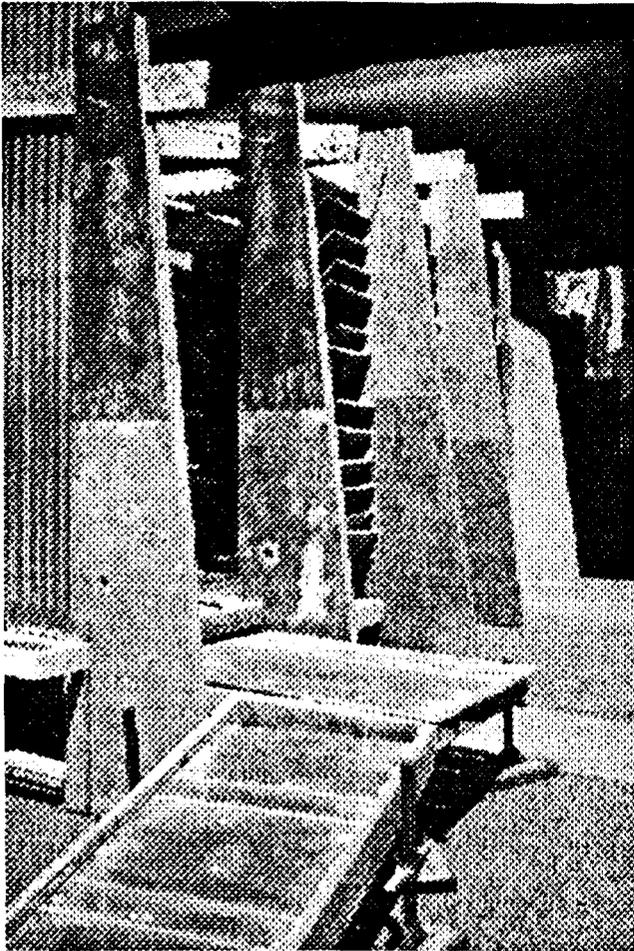


Fig. 2.-3. Threshold and detail of telescopic passageway. From the book entitled *Mobile Laboratory: Limitations + Invention*. A Design/Build project I completed with students at Arizona State University.

The specificity of the material palette is essential to the body of work represented. Historically, people moved whole villages and hamlets when soil was exhausted or there was threat of an enemy attack. As J. B. Jackson points out in *The Movable Dwelling and How It Came to America*, "For all their squalor medieval peasant dwellings had a remarkable flexibility and mobility – not only in that they could be taken down and reassembled elsewhere, but in that they could easily change function and change tenants....the temporary nature of the dwelling, its negligible material value, meant that it could be lightheartedly abandoned when crops failed, when war threatened, or when the local lord proved to demanding."¹²

Materials spoke of what was considered to be mobile and immobile, where the flimsiness of the construction protected the family from dangers of staying put. The use of wood was a language of impermanence, while the use of stone was a symbol of solidity or immovability. Wood, a modest and abundant material could be separated from the operation of the farm or detached and rapidly reassembled elsewhere. This was preferred over stone which had lasting endurance but not suitable for transport.

The American pioneers had a readily and seemingly unlimited material palette at their disposal. Wood was abundant

and could be easily manipulated to provide material for simple structures which could be erected with minimal labor and in a short time. Sears and Roebuck offered enticing visual images creating a market for the ready-cut or mail-order house. Concurrently, the development of the box house emerged, constructed from single planks of wood nailed together vertically with no internal framing. The proliferation of these buildings was evident. Used as slave quarters on plantations and in mobile lumber towns and camps, they were inexpensive and easily relocatable by railroad and later automobile.

"The real novelty was that these dwellings were built, occupied, and eventually disposed of as *commodities*, merchandise designed and produced to satisfy a definite market."

MASS-PRODUCTION AND THE AD HOC

Mass-production started with John Manning, a London carpenter and builder who in 1830 designed the "Manning Portable COLONIAL cottage." Designed to break down into component pieces which were then small enough to be stowed for shipping, "the Manning dwelling can be seen as the

beginning of the prefabrication industry which produced products that utilized standardized interchangeable components and dimensional coordination to form easily erected flexible structures."¹⁴ Although the Manning cottage created new possibilities for the mobile building industry, the monotony by which mass-production evolved incited such responses as Edgar Kaufmann Jr.: "Within the great impersonality of the world of mass-production and new disposability there becomes clear for the first time the possibility of an intense personalism as a proper balance and as a proper enrichment of life. The future of design lies in situation design and not in product design; products merely implement the situations."¹⁵

Such a situation is exemplified in my (co-authored with Todd Erlandson) recent article which documents the collage of pre-fabricated parts in a Mexican village. "In Northern Baja California, traveling south on Route 1; mile marker #73 indicates Campo Rivera, where an unschooled, fanciful ad hoc trailer park is located. Similar to the conventional trailer park, each compound stakes out an individual plot, here in arid desert terrain. The Airstream trailer is the keystone for these land plots, the central element, and this wagon gives rise to a train of disparate parts, synthesized through an ingenious and adaptive use/reuse of materials. The given programmatic modules are those of the trailer, the addition, the outhouse and the water tank...This is the primary datum of each construction. Inventiveness comes through the manipulation of the modules, while maintaining individual identity using a limited palette of components and materials."¹⁶

TEMPORARY WORKS

All construction projects make use of a palette of temporary of materials. New freeways, bridges and buildings using poured-in-place concrete rely uniformly on plywood formwork which is used until the material fails or is no longer valued in its present scarred and unsightly state. Increasingly, scaffolding is the most common form of temporary works used in the construction industry, whose modular system makes it first easy to expand and demount. The use of scaffolding as a simple assembly procedure was used most notably by Tadao Ando who designed the Karaza theater, built in 15 days in 1987. Renown for his permanent buildings constructed with the use of pure concrete slabs, Ando designed the theater to be portable, with a vast majority of its structural elements made from locally sourced standard components. Additionally, one of the most well-known portable buildings is the Teatro del Mondo designed by Aldo Rossi for the Venice Biennale in 1979. Based on sixteenth-century floating pavilions, this temporary structure was built from steel scaffolding supported underneath by a large steel barge.

MOBILE LABORATORY

In the Spring of 1996 I had the opportunity to develop a third-year undergraduate design and build architectural studio at Arizona State University. The premise was to explore design

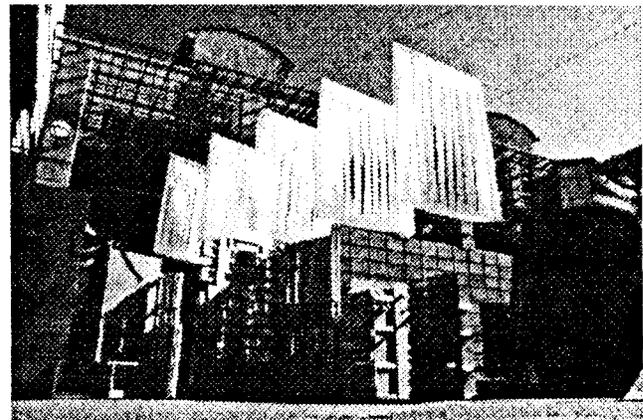
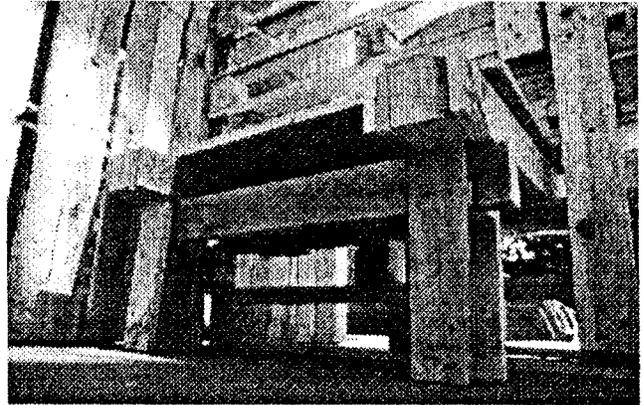


Fig. 4-5. Bench for waiting and personal contemplation. Celebrating arrival. From the book entitled *Mobile Laboratory: Limitations + Invention*. A Design/Build project I completed with students at Arizona State University.

and construction in a studio/laboratory which could develop with regard to issues of portability. As stated by Sant'Elia in his "Futurist manifesto" catalogue for the *Citta Nuova* exhibition: "We no longer believe in the monumental, the heavy and static, and have enriched our sensibilities with a taste for lightness, transience and practicality...We must invent and rebuild ex novo our modern city like an immense and tumultuous shipyard, active, mobile, and everywhere dynamic, and the modern building like a giant machine."¹⁷ The incorporation of a defined material palette (specifically that of donated cast-off plywood formwork from a new Antoine Predock Science museum under construction) fostered experimentation and invention.

The program offered was initially posed as a theoretical question. Students were asked to propose through typical design methodology (writing, drawing, modeling) a critical programmatic response to the public area between the old and new architecture buildings, connected by a spacious yet uninhabited pedestrian plaza/corridor. Initial individual solutions were evaluated and expanded through an accumulative procedure. Students then broke into smaller groups and explored various solutions with similar portable agendas. In

the later weeks of the semester the studio evolved into full-scale construction.

As a laboratory, they were given a workyard adjacent to the studied area, and directed in the use of skillsaws and screwguns, rather than more meticulous hand carpentry methods. This type of construction would enable the students to do more with their limited knowledge of conventional construction and limited abilities and provide the opportunity for review and re-construction. The workyard, shared with the drama department, was truly used as a working laboratory. Pieces were developed, standardized, mass-produced and tested on site.

Programmatic issues as described by students were:¹⁸

- We used modes of transportation as metaphors for arrival and departure. Our project redefines the passageway between the two architecture buildings as a telescopic hallway that leads individuals past points of temporary waiting to their ultimate destinations beyond the site.
 - Our project, a gallery, has been defined within a physical framework of temporal instability, of flux and change both in methodology and formal manifestation. The design is composed of component parts which were made to be (re)assembled in various forms.
 - Our project suggested a parallel relationship between the pedestrian corridor and the transition of the student through the university/educational system. Both are about movement and time, in which a journey is experienced. By creating moments to sit and fixing specific views of the site, we heightened the experience of time by providing places for personal contemplation.
 - We created an object that uncovers multiple views and understandings of a site. The object was a tool for site analysis, in the sense that it records aspects of an area and interactions between human, site, and object. The object was not site specific and could be placed anywhere. Due to its scale, mobility, and weight it became a probe that was compatible with any surface.
- The adopted studio language conveyed a fresh, pro-active design process that responded to the challenge of building for mobility. The final constructs, responsive to Sant'Ellias' 'Futurist manifesto' and the pioneer mobile *Citta Nuova*, were built as lightweight temporary structures: economic, experimental, and flexible. The work from the studio was documented and reproduced in the concurrent book *Mobile Laboratory: Limitation + Invention*.

CONCLUSION

The Generic City is always founded by people on the move, poised to move on. This explains the insubstantiality of their foundations. Like the flakes that are suddenly formed in a clear liquid by joining two chemical substances, eventually to accumulate in an uncertain heap on the bottom, the collision or confluence of two migrations - Cuban émigrés going north and Jewish retirees going south, for instance, both ultimately on

their way someplace else - establishes, out of the blue, a settlement.¹⁹

Our current culture produces a wide variety of portable, relocatable, and demountable building types ranging from health care to educational and commercial facilities. The portable culture has roving access to blood donor stations, medical check-ups, libraries, banking and portable sanitary facilities. Through mobile deployment of these facilities the infrastructure is expanded.

Presently, the pre-fabricated mobile home, the metal Air-stream trailer and the deployable Dymaxion House share the essential traits of the early American box house dwellings: the portability, the frailty, the lightness of construction, the temporary quality, the loneliness, and the absence of a solid foundation. These dwellings offer an alternative and possibly a solution for the inhabitants of the next millennium's new "generic" landscape.

ACKNOWLEDGMENTS

I would like to thank and acknowledge the students from Arizona State University who participated in the Design/Build studio in which this paper is based.

Shawping Abeyta, Scott Allen, Geoff Brown, Jill Chapman, Fernando Cornejo, Ron von Feldon, Leilani Gnall, Rodger Hammond, Brent Harris, Mike Hennessey, Andy Howerzyl, Matius Mandolang, Eric McNeal, John Pruden, Michael Rumpeltn, Rachel Settecase, Charlie Williams.

NOTES

- ¹ Ema Aljasmets, *Garden of Eden On Wheels* (Los Angeles: The Museum of Jurassic Technology, 1996), Intro.
- ² John Brinckerhoff Jackson, *Discovering the Vernacular Landscape* (New Haven, Yale University Press, 1984), p. 97.
- ³ Robert Kronenburg, *Houses In Motion The Genesis, History and Development of the Portable Building* (London, Academy Editions, 1995), p. 41.
- ⁴ Gilbert Herbert, *The Dream of the Factory-Made House* (Cambridge: The MIT Press, 1984), p. 106.
- ⁵ Robert Kronenburg, *Houses In Motion The Genesis, History and Development of the Portable Building*, p. 60.
- ⁶ Robert Kronenburg, *Houses In Motion The Genesis, History and Development of the Portable Building*, p. 63.
- ⁷ Robert Kronenburg, *Houses In Motion The Genesis, History and Development of the Portable Building*, p. 92.
- ⁸ John Brinckerhoff Jackson, *A Sense of Place, a Sense of Time* (New Haven: Yale University Press, 1994), p. 60.
- ⁹ Robert Kronenburg, *Houses In Motion The Genesis, History and Development of the Portable Building*, p. 71.
- ¹⁰ John Brinckerhoff Jackson, *A Sense of Place, a Sense of Time*, p. 184.
- ¹¹ John Brinckerhoff Jackson, *Discovering the Vernacular Landscape*, p. 93.
- ¹² John Brinckerhoff Jackson, *Discovering the Vernacular Landscape*, p. 95.
- ¹³ John Brinckerhoff Jackson, *Discovering the Vernacular Landscape*, p. 96.
- ¹⁴ Robert Kronenburg, *Houses In Motion The Genesis, History and Development of the Portable Building*, p. 38.
- ¹⁵ Robert Kronenburg, *Houses In Motion The Genesis, History and Development of the Portable Building*, p. 67.

- ¹⁶ Jennifer Ruth Siegal and Todd A. Erlandson, "The Alchemy of The Ad Hoc," The Los Angeles Forum for Architecture and Urban Design (May 1995), p. 2.
- ¹⁷ Robert Kronenburg, *Houses In Motion The Genesis, History and Development of the Portable Building*, p. 43.
- ¹⁸ Jennifer Ruth Siegal, *Mobile Laboratory: Limitations + Invention* (Tempe: Arizona State University, 1997).
- ¹⁹ Rem Koolhaas, "Generic City," Sikkens Foundation, Sassenheim (November 1995), p. 11.

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