Prefab and parasitic architecture: Architectural solution of the future city crisis
(With case-study design projects)

by

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This is to certify that the master’s thesis of

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has met the thesis requirements of Iowa State University

Signatures have been redacted for privacy
TABLE OF CONTENTS

ACKNOWLEDGEMENTS v

ABSTRACT vi

CHAPTER 1 1

PREFACE 2

NOMADISM- ANTHROPOLOGICAL IDEA 3

HISTORY OF PREFAB ARCHITECTURE 6

From the Ark to Shipping Containers (The history of prefab buildings) 6

Prehistory (Basic Idea from Nomadic form) 6

Before the 1900s (Gold Rush and New Material Invented) 7

1900-1909 (World War I and Henry Ford’s Conveyor System) 8

1910-1919 (Machine Aesthetic Era-The Effect of Mass Production) 9

1920-1939 (Economic Growth) 10

1940-1949 (Post War II) 12

Case Study Houses 15

1960-1969 (New Technology) 16

After the 1970s (New Phase of Prefab Architecture) 18

THE RELATIONSHIP BETWEEN CUBISM AND PREFAB ARCHITECTURE 20

The History of the Cubism Movement 20

The Relationship between Cubism and Prefab Architecture 23

Futurism 24

Characteristic of Architectural Futurism 25

The Relationship between Futurism and Prefab Architecture 26

De Stijl 27

Schoroder House and Bauhaus 29

The Relationship between De Stijl and Prefab Architecture 30

CONCLUSION 32

New Nomadism- Prefabricated Architecture 32

CHAPTER 2 34

MY ARCHITECTURE IS 35

NEW ARCHITECTUAL MECHANISM 37

Seoul Project 37
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Crisis</td>
<td>44</td>
</tr>
<tr>
<td>Analytical Approach to a Future City</td>
<td>49</td>
</tr>
<tr>
<td>Analytical Diagram</td>
<td>49</td>
</tr>
<tr>
<td>Artificial Nature Zone (A.N.Z)</td>
<td>51</td>
</tr>
<tr>
<td>City Development Scenario</td>
<td>53</td>
</tr>
<tr>
<td>PREFAB ARCHITECTURE AS MY ARCHITECTURAL LANGUAGE</td>
<td>56</td>
</tr>
<tr>
<td>Floating Housing from Laputa Island</td>
<td>56</td>
</tr>
<tr>
<td>Conceptual Design- Human Body Component and Parasitic Architecture</td>
<td>57</td>
</tr>
<tr>
<td>ARCHITECTURAL SOLUTION (STUDY CASE)</td>
<td>60</td>
</tr>
<tr>
<td>Conceptual Design- The first idea (3D Max, Study Model)</td>
<td>60</td>
</tr>
<tr>
<td>Capsule Architectural Design</td>
<td>60</td>
</tr>
<tr>
<td>Single Family Housing Design (Parasitic House No. 1)</td>
<td>67</td>
</tr>
<tr>
<td>Complex Housing Design (Parasitic House No. 2)</td>
<td>70</td>
</tr>
<tr>
<td>City Block Design (Chinatown Project in New York City- Parasitic House No.3)</td>
<td>73</td>
</tr>
<tr>
<td>Overview</td>
<td>73</td>
</tr>
<tr>
<td>Site Features and Problems (Chinatown in New York City)</td>
<td>73</td>
</tr>
<tr>
<td>Basic Architectural Concepts</td>
<td>75</td>
</tr>
<tr>
<td>Program- Dynamic Zone</td>
<td>79</td>
</tr>
<tr>
<td>City Planning- Extended Parasitic House No.3 (Expanded to City Block)</td>
<td>87</td>
</tr>
<tr>
<td>Structural Component- Human Body Structure</td>
<td>89</td>
</tr>
<tr>
<td>Structural Connection</td>
<td>92</td>
</tr>
<tr>
<td>Final Model and Drawings</td>
<td>96</td>
</tr>
<tr>
<td>CONCLUSION</td>
<td>102</td>
</tr>
<tr>
<td>EPILOGUE</td>
<td>104</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>105</td>
</tr>
<tr>
<td>BIBLIOGRAPHY OF ILLUSTRATIONS</td>
<td>108</td>
</tr>
</tbody>
</table>
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I acknowledge a special debt to mentors for finding my own architectural languages and identity, books that derive architectural and mental inspiration from brain, and You.

I approached a spectrum of my own architectural languages in an unsurpassable variety, depth and consistence because of these three facts that are mentors, books, and you.

Thanks to

(Put your name on this blank)
My thesis is basically about the concept of architecture, where humans, regarded as a living machine, will lead their lives in the future. This thesis aims to develop solutions to the problems (CO2, population, social level, sprawl phenomenon, and so on).

I pictured the image of Laputa Island in Gulliver’s travels in order to solve problems of the city. This is the definition of the Laputa.

_Laputa: Floating island in the sky, mentioned in Gulliver’s travels_

Lebbeus Woods showed imaginary architecture in the future, which mentioned “floating housing” in his works such as “Aerial Paris,” “Havana Project,” and “High House.” In short, the scale of cities will be expanded horizontally and vertically. However, people cannot only swarm about contemporary cities, due to their adjacency, movement (traffic), and limited time. The flow of many people into cities expands cities and creates many inevitable social problems, and naturally destructing cities. While deliberating on solutions to the destruction, I draw the basic hypothesis of floating housing from the works of Lebbeus Woods to bring about the re-construction of cities.

The type of floating housing represents the animals living in the existing buildings. I define such buildings as parasitic housing. Stress is laid on the adjacency of parasitic housing, which is plugged into the original architecture. I focus on the structure of parasitic housing in order to design realistic parasitic housing. All the materials of parasitic housing are pre-fabricated, so they may be easily constructed, and enormous truss structures are set up so they may support the entire load and exterior of the buildings.

Last year, when I prepared for this thesis, based on such a basic concept of architecture, I
made efforts to suggest future city problems and architectural solutions to them by applying with my own architectural color. Basically, my thesis is divided into two chapters. In each chapter, I endeavor to communicate my architectural language to my readers. The first chapter presents the basic theme of my thesis or the definition of prefab architecture, which is unfamiliar to the readers, and prefab architecture movements in each age. Research is also completed regarding the relationship between society and culture. The second chapter presents solutions to future city problems in an analytical (numerical) manner and resolves the problems through applying a case study to my work.
CHAPTER 1

This chapter presents the basic theme of my thesis or the definition of prefab architecture, which is unfamiliar to the readers, and prefab architecture movements in each age. Research is also completed regarding the relationship between society and culture.
PREFACE

One of the reasons human beings have developed throughout history is because of nomadism. During modern times, we see an ever-changing development of different nomadic types from the beginnings of nomadism. In other words, the rapid development of transportation and media has removed boundaries between countries, resulting in the creation of new forms of cultures.

I assume a future nomadic concept, based on the process of the development of nomadism and mobile architecture, and using the assumed concept, I will approach the architecture with new significance in a formative manner. Then, I will present what effect cubistic movements had on architectural movements and forms in the early 20th century, after considering the relationship between characteristics of prefab architecture and cubistic movements. In other words, I will carefully forecast the forms of architecture, which will be changed by not only a cultural effect but also social and environmental effects.
NOMADISM-ANTHROPOLOGICAL IDEA

On the assumption that the fundamental process of nomadic concepts and prefab architecture are the same, I will elucidate the initial stages of nomadism, which are the foundations of prefab architecture. That is to say, I will begin my research with the philosophical book, entitled *L’Homme Nomade* ¹ by Jacques Attali, in order to understand the fundamental concepts of the features of prefab architecture that are popular in our current generation.

Since their appearance more than 1.5 hundred million years, mammals have settled down on a wandering life in various forms as determinants of their survival. Primates came into being more than 55 million years in South Africa, which appears to be the center for their existence. These species are differentiated from monkeys, who had lived on trees to protect themselves from mammals over 30 hundred million years, and climbed trees on four feet in search of food.²

About 6 million years ago, these apes evolved into two lines for geological reasons; 1) one line is evolvement into chimpanzees and gorillas, which had limited physical and/or mental movement; and 2) the other line is evolution into a mammal called *Australopithecus* (fig.1-1)³, who could walk erect. Since they could walk on two feet, the Australopithecus had more self-defense strategies than monkeys. Also, since they stood upright for walking, they could see farther than the fierce animals, which hunted them

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as compared to other animals. On the other hand, they had less sight in the night compared to other animals. Therefore, the Australopithecus still spent time in trees to protect themselves. Like these mammals, the original primates, who came down from trees around 6 million years to the first settlers around 10,000 years, human beings have lived a wandering life under instability and uncertainty by avoiding typhoons, cold weather, and drought conditions, in addition to ferocious beasts that searched for prey and shelters. Throughout this long period, only the individuals, who best adapted themselves to unsettled lives, survived. Hunting and gathering techniques, compatible with movement improved, and only myths and religious ceremonies gave meaning to a traveler's continued existence. Thus, human beings came into existence from wandering, essential in physical and cultural aspects, and nomadism formed the body, culture, and spirit of human beings.

I will attempt to determine the basic concept of the mobile architecture from human evolution. Human beings walked erect for about 1.4 million years, and walking erect produced taking a rest while sitting. Originally, this type of resting is a simply fabricated form with natural materials such as branches from a tree and stones. Also, this is the beginning of modern furniture as formed by fabrication of mobile architecture and several pieces among mobile units.

Human evolution continuously happens in our society. Modern evolution caused by development of the Internet and means of transportation is incomparable with only the evolution of the human body. While previous human evolution shows that human beings overcame a given condition and tried to change their lives for survival over a long period of time, current human evolution is changing faster toward more convenience and practicality.

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Such convenience and practicality let men make a machine. For example, the Ford Model-T's conveyor belt as made in 1908\(^6\) played a role of reducing manpower. This replacement with machinery enabled mass production. Therefore, according to Bauhaus' universalism, mass production is more accelerated. This acceleration acts to change each meaning of house. I will attempt to newly understand the meaning of mobile unit through the history of the human race on the basis of the aforesaid nomadism of the past and present.

\(^6\) Allison Arieff, and Bryan Burkhart. *PRE FAB.* (Gibbs Smith, Salt Lake City, 2002), 13.
HISTORY OF PREFAB ARCHITECTURE

Humans have continuously moved throughout the world to obtain unknown information, such as using media in the information era. I defined this period as new nomadic era. The idea of new nomadism was made mobile by portable architectural pieces. Prefab buildings have no borders. Their material palette, design styles, and transportation methods are diverse. I will try to understand the overall view by tracing the history of prefab units and anticipating the architectural and urban forms for the future.

From the Ark to shipping containers (The history of prefabricated buildings)

Prehistory (Basic Idea from Nomadic form)

According to the Bible, 4,000 years ago, when there was God’s judgment, Noah made an Ark (fig.1-2) in God’s name and safely moved a pair of all existing animals of the time, which is deemed as the first nomadic architectural idea. And, the primitive hut that the branches of a tree are bound together with each other is a structure suggesting a prefab structural idea. Nomadic architecture moved about for various reasons in the past—locating migrant food sources, adapting to changing climatic conditions, trading goods, finding communal protection, and searching for the unknown. With these features, a flexible and durable shelter was created. These shelters include the American Indian Tipi, the Mongolian yurt (fig.1-3), the Bedouin woven goat-hair “blacktent,” and the Basque sheepherder tent/coat. These shelters and tents were structures showing the potential of mobile architecture.

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Before the 1900s (Gold Rush and New Material Invented)

Practical, prefabricated architecture started from panelized wooden houses, shipped from England to Cape Ann in 1624\(^9\). During the 19th century, the number of portable structures (housings) began to increase with the increase of new habitation sites. For instance, in 1894, as habitation sites for people who came to search gold for the Gold Rush,\(^{10}\) a shortage of materials happened. At this time, builders provided a solution by transporting materials via rail from other states. The prefab building became popular after the Crystal Palace (fig.1-4)\(^{11}\) in Great Exhibition in 1851. Crystal Palace by Joseph Paxton took 6 months to build, even though it was huge as compared to other structures in those days. The cast-iron structure (mobile building material) set a precedent for using a component system in building manufacture and site assembly, and established itself at the forefront of lightweight materials.

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\(^{10}\) Allison Arieff, and Bryan Burkhart. *PRE FAB*. (Gibbs Smith, Salt Lake City, 2002), 13.

1900-1909 (World War I and Henry Ford’s Conveyor System)

Many architects and inventors experimented with the prefab system for housing in the early 20th century. In 1908, mass production was enabled by Henry Ford’s conveyor system. (fig.1-5) Mass production in factories could be used to manufacture a high quality object as large as a car. Most factory productions had high quality and low costs compared to handcrafted products.

In 1906, the Aladdin Readi-Cut House was the first company to offer a house kit, including precut and numbered pieces. In 1908, Sears Roebuck & Co. is the most notable company to offer houses by mailing service (package). The package included housing kits with lumber, nails, windows, doors, hardware, paint, and so on. This housing had very easy construction and cheap costs. I guess that the Art and Crafts idea influenced the early movement of prefab housing. Since World War I, many countries in Europe had the task to rebuild many buildings that had been damaged during the war. Therefore, prefab buildings that could be faster and easier built, and were cost effective began to increase. Britain, France, and Germany were developing prefabricated systems of concrete and steel, instead of using wood.

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12 Allison Arieff, and Bryan Burkhart. PRE FAB. (Gibbs Smith, Salt Lake City, 2002), 13.
13 Allison Arieff, and Bryan Burkhart. PRE FAB. (Gibbs Smith, Salt Lake City, 2002), 13.
14 Allison Arieff, and Bryan Burkhart. PRE FAB. (Gibbs Smith, Salt Lake City, 2002), 13.
Le Corbusier is the most significant architect who introduced prefab architecture as the meaning of modern housing units in Europe. In 1914, he designed the *Dom-Ino house.* The Dom-Ino house is a new type of skeletal-framework construction of reinforced concrete that formed the floors, supports, and stairs of a building. The idea of the Dom-Ino house developed a number of mass production housing schemes later. Le Corbusier wrote “*Mass Production Houses*” in 1919. He mentions “*House-machine is available for everyone, incomparably healthier than the old kind.*” I found the essay gave utopian ideas on module building schemes found in international style. His idea from the essay influenced prefab building over the next several decades.

Walter Gropius suggested the view of modern building in the early 20th century with Le Corbusier. In 1910, with the mind of industrialization of housing, the main goal of Bauhaus, he developed “*Building Blocks,*” including a system of standardized flat roofed housing. This standard unit had been a very important term for mass production and it influenced internationalism. Walter Gropius developed steel house prototypes and designed a construction system for a housing estate at *Toerten-Dessau* in 1926.

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15 Allison Arieff, and Bryan Burkhart. *PRE FAB.* (Gibbs Smith, Salt Late City, 2002), 13.
16 Allison Arieff, and Bryan Burkhart. *PRE FAB.* (Gibbs Smith, Salt Late City, 2002), 15.
17 Allison Arieff, and Bryan Burkhart. *PRE FAB.* (Gibbs Smith, Salt Late City, 2002), 15.
18 Allison Arieff, and Bryan Burkhart. *PRE FAB.* (Gibbs Smith, Salt Late City, 2002), 15.
1920-1939 (Economic Growth)

The Buckminster Fuller who was visionary thinker, engineer, designer, and architect was one of the innovative architects in the history of prefab architecture. He was interested in mass-producing units while providing “efficiency in living” in 1927. Like Joseph Paxton, he focused on mass production quality, lightness of materials, and minimal weight. From his theory about mobile units, Buckminster Fuller proposed Dymaxion House (Dynamic, maximum, and tension) (fig.1-7) in 1928 and built for Chicago World’s Fair in 1933. The basic idea of the Dymaxion House was easily disassembled, transported, and reassembled, reflecting Fuller’s desire to create efficient shelters for better living. Fuller’s three favorite words—Dynamic, Maximum, and Tension—played an important role in changing the form and function of future prefab architecture.

Richard Neutra introduced his unique prefab architecture through the Lovell Health House made of lightweight steel frame in 1928. He introduced “Biorealism” through the Hollyridge Estate in 1932. Biorealism focused on man’s relationship with nature and assembled building materials with natural aesthetics. So, the Hollyridge Estate utilized and standardized the wooden-chassis construction through his architectural philosophy, “biorealism.”

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21 Allison Arieff, and Bryan Burkhardt. PRE FAB. (Gibbs Smith, Salt Lake City, 2002), 18.
22 Allison Arieff, and Bryan Burkhardt. PRE FAB. (Gibbs Smith, Salt Lake City, 2002), 18.
23 Allison Arieff, and Bryan Burkhardt. PRE FAB. (Gibbs Smith, Salt Lake City, 2002), 18.
The Museum of Modern Art in New York (MOMA)\(^{24}\) in the U.S. introduced an International style from Europe in 1932. That is, after the MOMA exhibition, the U.S. spread a new architectural form throughout the country by combining European prefab architecture style (international style) and their culture. In 1932, the U.S. car industry was on a take-off phase, owing to sharp economic growth.

*Archibald MacLeish mentioned in *Fortune* magazine in 1932. “The housing industry had followed the model of the automobile industry.”*\(^{25}\)

As he mentioned, the increase in demand for cars served as a momentum to develop the housing industry in the US. During 1932, the time was ready to predict the development of prefab architecture, as many industries were growing under consumerism with economic development in the US. This economic climate led Howard T. Fisher to develop the *General Houses Corporation*.\(^{26}\) In 1929, from the house for Fisher’s sister-in-law, he started selling customized houses for people’s taste at affordable prices (ranging between $3,000 and $4,000).\(^{27}\) At the Chicago World’s Fair, steel-prototype houses were introduced in 1933, widely publicizing prefab architecture for people. George Fred Keck’s book *“House of Tomorrow,”*\(^{28}\) also introduced the future architecture form, showing the potential of prefab architecture to people. *Frank Lloyd Wright*, who is the most famous architecture in the U.S., also took on the challenge of designing a well-designed and affordable house. In 1936, clients Herbert and Katherine Jacobs arrived at his Taliesin studio with a request to design a

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\(^{25}\) Allison Arieff, and Bryan Burkhart. *PRE FAB.* (Gibbs Smith, Salt Lake City, 2002), 15.

\(^{26}\) Allison Arieff, and Bryan Burkhart. *PRE FAB.* (Gibbs Smith, Salt Lake City, 2002), 15.

\(^{27}\) Allison Arieff, and Bryan Burkhart. *PRE FAB.* (Gibbs Smith, Salt Lake City, 2002), 15.

\(^{28}\) Allison Arieff, and Bryan Burkhart. *PRE FAB.* (Gibbs Smith, Salt Lake City, 2002), 16.
$5,000 budget house, and Frank Lloyd Wright accepted because he had wanted to design low cost housing for years. So, the *Usonian House* (*fig.1-8*) was designed and built. It used the prefab idea to solve budget limitations and the grid system that established regular and modular dimensions for wooden houses. The grid system allowed maximum design flexibility and the repetition of prefab details (standardized detail) reduced costs. So, approximately 24 more Usonian houses were built between the mid-thirties and early forties.

![Fig 1-8. Usonian House](image)

### 1940-1949 (Post World War II)

In 1942, the *General Panel Corporation* requested Walter Gropius and Konard Wachsmann to design a system of standardized panels. The General Panel Corporation contributed to popularizing prefabricated panels featured by low prices and better functions of units. *World War II* changed the view of the U.S. economy, increasing the number of prefabricated buildings. The U.S. government established *Farm Security Administration*

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29 Allison Arieff, and Bryan Burkhart. *PRE FAB*. (Gibbs Smith, Salt Lake City, 2002), 19.
(FSA)\textsuperscript{33} to improve the housing situation. In 1937, the FSA concerted an effort to inform the public about mass-produced housing that is low cost housing.

In 1939, the FSA built 50 prefab houses at a cost of $1,650 each. By this effort of the U.S. government, about 10,000 pre-fabricated houses were built between 1935 and 1940, and at the end of 1941, 18,000 prefabricated houses were under construction. Like this, a lot of prefab buildings were built under the economic situation of World War II in the U.S., which accounted for 12\% of the entire new housing units.\textsuperscript{34}

![Quonset Hut](image_url)

During the war, the engineers, Peter Dejongh and Otto Brandenberger, by the U.S. Department of Navy’s request, designed the Quonset Hut. (fig.1-9)\textsuperscript{35} Characterized as lightweight, fast fabrication, and easy transportation, it was designed as a prefabricated shelter. During the World War II, 17,000 units of Quonset huts were formed.\textsuperscript{36} The Quonset Hut transported into warehouses, stores, housing, and churches after the World War II. Buckminster Fuller reintroduced the Dymaxion\textsuperscript{37} concept during the war. He designed a structure to be built from aluminum, an alloy developed for warplane construction during the war. He was fascinated with the housing system that included compact and transportable concepts. In 1947, Fuller designed the \textit{Wichita House}\textsuperscript{38} from his Dymaxion concept. It consisted of lightweight standardized aluminum units assembled on site.

\begin{footnotes}
\item[33] Allison Arieff, and Bryan Burkhardt. \textit{PRE FAB.} (Gibbs Smith, Salt Lake City, 2002), 21.
\item[34] Allison Arieff, and Bryan Burkhardt. \textit{PRE FAB.} (Gibbs Smith, Salt Lake City, 2002), 21.
\item[35] Allison Arieff, and Bryan Burkhardt. \textit{PRE FAB.} (Gibbs Smith, Salt Lake City, 2002), 21.
\item[36] Allison Arieff, and Bryan Burkhardt. \textit{PRE FAB.} (Gibbs Smith, Salt Lake City, 2002), 21.
\end{footnotes}
The Spartan Air Craft Company (fig.1-10) began to manufacture house trailers rather than conventional homes in 1948. Trailer housing was a new facet of prefab architecture, featured by mobility and a low price of $5,000. The Housing Act was passed in continuing recognition of the national and pervasive housing crisis following World War II, inspired from Ford, who is pioneered mass-produced construction techniques. Their basic concept is that the more houses built, the lower the overall cost. In 1948, developer William Levitt made a design at the government's request in "Levittown, Pennsylvania." (fig.1-11) Levittown built 150 dwellings a week and completed a total of 6,000 dwellings. Levittown suggested a standard for future villages and had an opportunity to solve the housing crisis during the war.

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As interest in new habitation sites increased after the war, a *Case Study Houses Program* was introduced. John Entenza, who was an editor of *Art and Architecture* magazine, initiated it. His vision provided an opportunity for American and émigré architects to pursue new experimental theory in modern domestic architecture. After 20 years, 36 *case study houses* were designed and built, which had future construction on a mass scale. Architects such as Edward Killingsworth, Charles and Ray Eames, Richard Neutra, Rafael Soriano, Craig Ellwood, and Pierre Koenig (fig. 1-12) provided the building of cost-effective homes. An increase in the cost of labor and a lack of craftsmanship increased the building equipment’s economy, that enabled faster and cheaper fabrication. With this trend, buildings, that were factory built, that is using the prefab form as shown in Case Study houses, were experimentally built and became popular. However, starting in the 1950s, the meaning of prefab was changed. The purpose of prefab architecture focused on economy rather than design before 1950s. As the market for housing stabilized after 1950s, consumers demanded more freedom of choice and better quality. So, prefab architects suffered from an increase in customer’s different expectations.

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45 Allison Arieff, and Bryan Burkhart. *PRE FAB.* (Gibbs Smith, Salt Late City, 2002), 27.
1960-1969 (New Technology)

A new prefab system was introduced by the developing new technology. As new challenges faced the unit system in the sixties and seventies, architects developed new concepts that related to social, energy, ecology, and design aesthetics.

Architect Richard Rogers introduced the Zip-Up Enclosure (fig. 1-13) in 1968. The Zip-Up Enclosure using existing components is an inexpensive, low-maintenance shelter that offered a high degree of environmental control and a large range of design choices. The new formed architecture allowed maximum flexibility for partitions by lacking an internal structure, and allowed the house to be extended out or up by adding or removing panels.

Fig 1-13. Zip-Up Enclosure by Richard Rogers

Throughout the 1960s, experiments by Archigram (Architectural Telegram) introduced urban/architectural imagination in the future. Members of Archigram developed futuristic ideas, including Peter Cook’s Plug-in City, Dennis Crompton’s Computer City, and

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47 Allison Arieff, and Bryan Burkhart. PRE FAB. (Gibbs Smith, Salt Lake City, 2002), 30.
48 Allison Arieff, and Bryan Burkhart. PRE FAB. (Gibbs Smith, Salt Lake City, 2002), 30.
Ron Herron's Waling City. The basic concept of Archigram included multifunction and a reprogrammable body with detachable units. The new nomadism occurred from the theory by an Archigram member and created a new form of prefab architecture. They designed huge outdoor rock concerts like Woodstock and the Rolling Stones Show in Hyde Park from the theory of new prefab architecture (*New Nomadism*).

In 1967, the *Montreal World Expo* introduced prefab structures and architecture with future concepts. In 1967, Buckminster Fuller designed the *Expo Dome* (fig. 1-14) that is the most distinctive manifestation of the form. His dome is a geodesic three-quarter sphere with a diameter of 76 meters and height of 61 meters. Fuller’s Dome was related to nomadism by the hippie culture from a mental viewpoint, while it had flexibility and lightness, features of prefabs, from a structural viewpoint. Fuller’s dome was not the only curious prefab structure at the Montreal Expo. *Moshie Safdie’s Habitat Montreal* (fig. 1-15) was also an experimental prefab housing unit. He made an apartment house by combining 354 standard-size concrete modular units. By using such a combination of 354 mass-produced units, the habitat suggested a new line—a line of future prefab-through the project forming one apartment house.

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51 Allison Arieff, and Bryan Burkhart. *PRE FAB*. (Gibbs Smith, Salt Lake City, 2002), 33.
53 Allison Arieff, and Bryan Burkhart. *PRE FAB*. (Gibbs Smith, Salt Lake City, 2002), 33.
54 Allison Arieff, and Bryan Burkhart. *PRE FAB*. (Gibbs Smith, Salt Lake City, 2002), 33.
55 Allison Arieff, and Bryan Burkhart. *PRE FAB*. (Gibbs Smith, Salt Lake City, 2002), 33.
56 Allison Arieff, and Bryan Burkhart. *PRE FAB*. (Gibbs Smith, Salt Lake City, 2002), 33.
After the 1970s (New Phase of Prefab Architecture)

Japan became popular for innovative prefabrication in the sixties and seventies. Architect Kish Kurokawa, who had his own particular brand of prefab known as Capsule Architecture, designed the Nakagin Capsule Tower (fig.1-16) in 1970.

"By creating spaces of autonomy and individual identity, this building symbolized individual human existence in the urban landscape," Kurokawa explained.

This flexibility and openness was applied to factory-manufactured pieces, pointing the way toward a shift in prefab’s practical applications. This capsule architecture showed possibilities that were able to customize in the individual’s needs within standardized parts.

LOT/EK (fig.1-17), which is a New York based architectural studio founded by Ada Tolla and Giuseppe Lignano in 1993, has performed a range of projects by taking

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57 Allison Arieff, and Bryan Burkhart. PRE FAB. (Gibbs Smith, Salt Late City, 2002), 34.
58 Allison Arieff, and Bryan Burkhart. PRE FAB. (Gibbs Smith, Salt Late City, 2002), 34.
59 Allison Arieff, and Bryan Burkhart. PRE FAB. (Gibbs Smith, Salt Late City, 2002), 34.
advantage of mobility and economic efficiency of shipping containers from the 1990s to the present. The shipping containers, made from steel and aluminum, can be used as an inexpensive and flexible basic building block. The containers are easily transported by ship, train, or truck, and are designed to resist the forces from outside, such as earthquakes, tornadoes, and hurricanes. LOT/EK has introduced various container-based structures, including the conceptual Mobile Dwelling Unit (MDU).\textsuperscript{62} These mobile live/work spaces may be fabricated in any conditions like above a building, a downtown empty lot, etc., for use. This mobility implies that human beings live in view of nomadism from the past to the present. In other words, human beings will ceaselessly move about here and there in the future. To meet this desire, unceasingly a change in prefab architecture to a new type of prefab architectural form is needed.

THE RELATIONSHIP BETWEEN CUBISM AND PREFAB ARCHITECTURE

THE HISTORY OF THE CUBISTIC MOVEMENT

The Cubistic Movement is an art movement arising in the early 20th century, when Fauvism also took place. The Cubistic Movement or Cubism is one of the most important art movements in the 20th century that liberated European paintings from Realism that appeared after the Renaissance. This art innovating movement originated by Paul Cezanne, who insisted on the reorganization of nature, was created between 1907 and 1914 by Braque, Georges and Pablo Picasso and penetrated all corners of Europe. The aesthetics of Cubism spread from paintings to architecture, sculpture, and industrial arts. It developed into an international movement with features characterized, before everything else, by the respect for form, which seems to be a reaction against colorism started by impressionists and consummated in Fauvism and Impressionism.

In Apollinaire’s words, “Cubism is a geometrical construct of the mind; Cubists paint objects not as people see them but as people imagine them, and their art is extremely lucid and pure.” Thus, this style could be defined as an artistic expression, based on the spiritual rather than the physical truth or circumstance.

According to Apollinaire, the basic principle of cubism is to reduce various types of nature into two-dimensional geometrical types. The strict goal of cubists was to depict a solidness and voluminous feeling on a flat canvas. A canvas should not lose its two-dimensionalness or its ‘picturesque nature.’ To ensure such a nature on a canvas, cubists

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tried to express ‘a motif’ from a number of different standpoints and, at the same time, reorganize the motif on a canvas with a view to analyze planes by using geometrical methods.

Cubism became seriously prevalent in 1907, when Picasso produced *Les Demoiselles d'Avignon* (fig.1-18) that shows the organization of adventurous colors and surfaces. Cubism attempted to dismantle an object and describe the features of the object from various perspectives. Initially, it negated colors and limited the use of colors to black, green, and brown. Cubism intended to omit all the accidental properties of visible shapes and reduce various natural forms to basic geometrical ones, to establish and reorganize the existence of objects into a two-dimensional tableau. Cubism was shocking, changing existing modes and creating new modes. It provided the foundation for expressionistic approaches in Germany and Italy, paved the way for absolute abstraction in The Netherlands and Russia, and introduced new approaches to realism in the U.S. Cubism is divided into three steps (*Cezanne cubism, Analytical cubism, and Synthetic cubism*), and the characteristics of each are listed below.

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*Pierre Cabanne. Cubism (Terrail, Paris, France, 2001).*
Cezanne cubism (1907-1909)

- Deepening the theory of Cezanne by Pablo Picasso and Braque (the essential aspects of objects include "circle, cylinder, and cone").
- Summarizing and simplifying the natural forms of objects and neglecting light, brightness, distance, material quality, and painting methods.
- Nullifying the traditional expression of three-dimensional depth, space, and cubic effects.
- Mainly producing constructivist landscape or still-life paintings.

Analytical cubism (1910-1912)

- After 1910, shapes were minutely crystallized little by little and things were conspicuously dismantled.
- Motifs were developed from houses and trees to such inanimate objects as fruits, wine bottles, and cups.
- Believing that four-dimensional space and time should be recognized in paintings by all means.

Synthetic cubism (1911-1916)

- Not destroying forms, but organizing almost symbolic images in a subjective way.
- Producing individuality works, which have more deepened plane character, simplification, rich color, and material texture
- Organizing forms by way of collage.

Cubism, which has different expressions during each age, opened the gate to new imaginations in the architectural art field, affecting the forms and theories of Purism. Its basic idea to separate and dismantle objects had an impact on the architectural thinking of Le Corbusier.

Such a cubistic movement was closely related to the popularity of prefab architecture.

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THE RELATIONSHIP BETWEEN CUBISM AND PREFAB ARCHITECTURE

Cubism in the architecture field was affected by Analytical cubism (1910-1912), which notably dismantles objects. Architects began to perceive the façade of buildings as an icon, reduce the opening and front side of the façade in a geometric manner, and make them cubic. The prevalence of cubism suggested a new aspect of architecture, and dismantled geometric forms had an impact on prefab architecture, whose basic concept is the constructive structure.

Ivan Margolius defines cubism in this way: "The Style cleared the way as it succeeded to clarify the form and bring forward the importance of spatial awareness. Cubism was the point of departure for all constructive and elemental art." 74

He also defines that such cubism-affected architecture as Bauhaus by Walter Gropius (fig. 1-19) and Villa Savoye by Le Corbusier (fig. 1-20) have different aspects in their composition and space. Greater stress is put on openness, flexibility, and rationality of spaces. Cubistic composition has influenced the structure system of prefab architecture, which stresses flexibility and openness. After researching and reviewing the overall flows of cubism, I could recognize that cubism has had influence on Futurism and the De Stijl Movement. Such influences, in turn, created new concepts and forms of prefab architecture, which, faced with a new industrial philosophy of mass production, incited the prevalence of prefab architecture. Now, I will discuss what kinds of influence the theories of cubism-

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78 Alfred H. Barr, Jr. Cubism and Abstract Art (The Museum of Modern Art, New York, 1936), 140
derived Futurism and the De Stijl Movement have had on prefab architecture.

![Fig 1-19. Bauhaus](image1.png) ![Fig 1-20. Villa Savoye](image2.png)

**Futurism**

During the 19th century, each nation experienced a different level of industrialization at a different time. Industrialization made every country encounter conflicts between tradition and modernization. *The Arts and Crafts movement* appeared in opposition to the deterioration of the quality of art caused by industrialization-incited mass production and resulted in changes of economic structures. However, this movement disregarded the changing situations of the times and opposed mechanization, resulting in a conservative and sentimental drift. Meanwhile, during the 20th century when architecture was converted into purposeful modern architecture, architects groped for new ideas. Ten years before *World War 1*, there were philosophical, poetic, and mechanism tendencies in Germany and Italy. The development of the natural sciences in the 19th century brought about industrialization, which influenced every aspect of society. Increasingly, more people used buses and electric cars, and these modes of transportation rapidly changed the pattern of urban life, including life structures.
Characteristics of architectural futurism

Futurism opposes all static architectures, but encourages synchronism, speediness, and temporariness. Characteristics of futurism are listed below.

A. Severance from the past

Futurism developed in reaction to the static features and snobberies of the ruling class' elite cultures and in opposition to century-end, decadent, symbolic, and bourgeois art. Consequently, this movement promotes severance from the past, profanes classics, negates traditions, and rejects all previous norms.

B. Use of new materials

Futurism encourages architecture using new materials. Antonio sant'elia (fig.1-21)\textsuperscript{79} demonstrates the use of such industrial materials as steel and concrete in a series of his planning sketches.

C. Exclusion of decorations

Futurism advocates architecture without decorations. An architectural plan by Antonio sant'elia excludes ornaments, but develops purely geometric designs as it seemingly anticipated architectural modes in the 1930s. Such a trend had an impact on Le Corbusier and Walter Gropius in during the 1920s, in line with the positions of Ornament and Crime by Adolf Loose\textsuperscript{80}, who insist that it is undesirable to add decorations to structures.

D. Images of machines

Futurism defends such architecture inspired by machines and does not accept preconceptions. Futurism contends that each and every generation will and has to construct own cities. It prefers light and dynamic architecture, usability and speed.

\textsuperscript{80} Adolf Loose Crime and Ornament (YYZ Books, Toronto. 2002).
The relationship between Futurism and Prefab architecture

As mentioned above, Cubism-affected Futurism has greatly affected architecture as well. It also created prefab architecture that came to derive its own significance on account of Futurism, which has great meaning in the history of prefab architecture.

To begin, in 1900-1919 as stated above, mass production was possible, due to Ford T's conveyor belt system and World War I, resulting in prefab architecture surfacing on the scene along with its new construction forms. Having researched and reviewed many books on prefab architecture from the viewpoint of Futurism, I found its connections with Machine Aesthetics. The following paragraph explains the relationship between Futurism and machines.

Marinetti summed up the major principles of the Futurists, including a passionate loathing of ideas from the past, especially political and artistic traditions. He and others also espoused a love of speed, technology and violence. The car, the plane, the industrial town were all legendary for the Futurists, because they represented the technological triumph of man over nature.  

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As mentioned above, the Futuristic concept and Prefab Architecture in 1900-1919 were developed by automation and industrialization. In turn, Prefab Architecture used the characteristics of Futurism to change its own features. First, the invention of *Ford T’s Conveyor System* made mass production possible in cooperation with Futurism, which utilizes new materials such as metal and concrete. The two basic ideas of mass production stressed the realistic and economic aspects of prefab and incited the vogue of prefab. Second, Futurism’s exclusion of decorations put stress on the economic aspects of prefab architecture and developed modern-sense prefab architecture. Third, the basic theories of Futurism, which prefers light and useful architecture, agreed with and supported the inclinations of prefab architecture, which prefers architecture that can be assembled and dismantled.

**De Stijl**

*De stijl* was a comprehensive artistic movement taking place between 1917 and 1931, mainly advocated by Piet Mondrian (fig.1-22). Theo van Doesburg, and Gerrit Rietveld. It had an impact on paintings, architecture, interior decorations, designs, and home furniture. Among many modern artistic movements rising in the early 20th century, the De stijl movement is especially important in the history of art. Painters and architects cooperated with each other

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and produced their works in the same ideals and aesthetics, and they intended to incorporate the ideas of various artistic fields into architecture. The forms of architecture as an art are related to emotion and, in the process, the art is expressed in architectural languages. The two-dimensional factors of architecture are directly connected to planes. In other words, point, line, and plane form a shape on a level, while the three-dimensional factors become cubic objects, such as inner space and volume whose length and width are added with depth. The two-dimensional factors can be changed into two-dimensional characteristics through changing the characteristics of the plane. That is, one room in a building is composed of six planes, including four walls, the floor, and the ceiling. Therefore, the two-dimensional factors of a plane can be changed into three-dimensional characteristics, when the nature of the plane is changed through changing the materials of the planes of walls and the floor, and their colors. Moreover, the architects of De stijl thought the appearance of a work should not be limited to a specific point of view and used such a method so that the entire shape could be dismantled into simple shapes of volume and then re-combined together. The De stijl Group was especially interested in the process of cubism that centrifugal composition and visual exterior could be transformed through geometric changes into colors. The concept of time introduced in De stijl architecture is not stationed in an inner space by the organization of a changeable inner space, but may vary in a variety of ways in the flow of time. Therefore, such architecture is in a fluid and dynamic shape as a whole.
Schroder House and Bauhaus

The Schroder House (fig.1-23) maximizes the physical and visual movement and expansion of observers by means of exterior-oriented space development from central stairs and the fluidity and openness of a unit space with partitions and others. Moreover, the composition of rectangles is employed to organize the space, and the decomposition of them is to make the space fluid. Moving partitions highlights vertically or horizontally cuts spaces. Rietveld's chair (fig.1-24) well represents the conceptual idea of the jointing and disjointing of spaces.

Mondrian describes this chair as the “best application of De stijl” and Doesburg highly praises it and says, “it is an example for home furniture splendidly functional to be used as a sculptural piece in an indoor space.”

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By way of Bauhaus, the De Stijl Movement clearly changed the vague mysticism of Expressionists through vertical and horizontal cutting. Having such an idea, Mies van der Rohe designed a Brick country house plan. (fig.1-25) The drawing plan was influenced by Doeburg’s painting which is Russian Dance (fig.1-26) and composed of breakable pieces, where are easy to combine and dismantle. Such a composition, as in the case of Bauhaus, is rationalized into various sizes and position of spaces, and leads to functional aspects.

![Fig 1-25. Brick Country House Plan](image1)

![Fig 1-26. Russian Dance](image2)

The relationship between De Stijl and Prefab architecture

I will summarize the architectural features of De Stijl into three sections below. They show the relationship between De Stijl and prefab architecture.

A. Pursuing after universality: excluding geometric forms and decorations and, instead, using a variety of colors.

B. Characterized by clearness, simplicity, and logicality.

C. Using mechanically-produced materials such as steel (deriving the greatest strength from the minimal volume and satisfying functionalism) and panel glass (maintaining the continuity between a building and its exterior spaces)

First, De Stijl forms pursuing universality, naturally exclude geometric forms and

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decorations, put stress on economic aspects, and approach universalism ideas. Such ideas of prefab architecture lay stress on economic factors that could greatly progress in Europe in conjunction with De Stijl Movement. However, they were suffering still from economic difficulties that occurred after the World War I.

Second, De Stijl, with its rational forms, had an impact on art and architecture in the 1920s. When prefab architecture is approached from the standpoint of morphology, such rational forms have an influence on the economic aspects of the structure and program of prefab architecture. The Dymaxion House by Buckminster Fuller (1928)\(^9\) is a prefab housing with a focus on mass production quality, lightness of materials, minimal weight, and affected by the spirit of De Stijl.

Third, the theories of De Stijl, which encourages the use of mechanically-manufactured materials, facilitated the development of prefab architecture, which was developed by the emergence of mass production in the early 1900s.

Conclusion

This research part is aimed to help understand and present another viewpoint into prefab architecture, which is the basic concept of my thesis. As a result, I derived new fresh viewpoints of prefab architecture, while studying 20th century art and architecture history. I was able to grasp the connection between man's mobility and certain artistic works. Before simply researching the history of prefab architecture, I had read many books on anthropological nomadism, which is the foundation of prefab architecture. I also tried to search for the relationship between prefab architecture and cubism, which appeared almost simultaneously with prefab architecture. To remind the reader of the contents of the main body of this thesis, I want to reiterate the overall flow of prefab architecture and the relationship between cubism and prefab architecture.

New Nomadism—Prefabricated Architecture

In order to understand the basic meaning and flow of modern-sense nomadic architecture (prefab architecture), I began my research with a focus on a basic concept, such as mobile and potable architecture. Raymond Parsons coined the word, prefabricated, home in 1935. Remarkably, the prefabricated scheme was popular to many architects and designers, including Le Corbusier, Walter Gropius, Jean Prouve, Albert Frey, Buckminster Fuller, Richard Rogers, and Charles and Ray Eames. Why did many architects and designers produce products using the prefabricated idea? Its popularity stems from economic facts and social issues. So, most prefab buildings are inexpensive and functional.
In the process of searching for the relationship between prefab architecture and artistic works, I attempted to determine the relationship between cubism and prefab architecture in the early 20th century. As I mentioned above, cubism is an artistic mode whose origin can be found in Picasso. Even though Cubism has a shabby short history of less than 100 years, its characteristics have considerably influenced various fields of art and without exception—architecture. There were no direct cubism thoughts incorporated into prefab architecture, but many artistic trends derived from cubism have had an effect on prefab architecture. Furthermore, in the vortex of such architectural movements, prefab architecture could develop into modern-styled prefab architecture. In the process of researching into the relationships between cubistic ideas and prefab architecture, I could recognize many of today’s prefab architects who are following the basic spirit of cubism. I dare to conclude that Cubism emerging in the 20th century is the origin of modern-sense prefab architecture.

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CHAPTER 2

This chapter presents solutions to future city problems in an analytical (numerical) manner and resolves the problems through applying a case study to my work.
MY ARCHITECTURE IS

I have studied architecture for six years and lost and found many things about it at the same time. In the process, I started to keep a diary. The following is a part of my recent diary.

Architecture is disappearance.

It is very probable that I stick to something so much that I finally harvest just a collection of useless things. In this regard, architect, Hyo-sang Seung, says you need to learn how to throw away useless things. You should not gather together philosophical thoughts in your brain to compose such and such philosophical stories, but depict the stories most agreeable to your own concept. To reinterpret, what is important is selection. You may just take pleasure in numerous philosophical and/or architectural stories in such a way that you would enjoy coffee flavor that flies away into the air. But, you need to have your own architectural philosophy. Also, you had better not be indulged in your philosophy, but develop your own ability to reinterpret your philosophy in your own languages. I am now in an infinite tunnel. Utilizing a certain kind of light (my architectural languages). I am trying to relish this or that philosophical story.

As already mentioned in my diary, I fell into in architectural anomie in an infinite tunnel and felt my mind become paralyzed.

The Anomie: It is an anomic and chaotic state. French sociologist E. Durkheim defines, in his book, entitled “Suicide”, this word as a “chaotic state where the members of a society lack their common values and moral norms which regulate their behaviors.”

The Architectural Anomie: It is also a chaotic state where designers lack their mental values and architectural consistency that regulate their behaviors.

While researching into architectural forms and theories as part of my endeavors to grow out of the said architectural turmoil, I happened to derive an image of the machine from the architectural theories applied by Le Corbusier to Villa Savoye and from the
architectural forms applied by Richard Rogers to Lloyd’s building. After this, while developing design forms and theories related to the machine, I attempted to progress the ideas of nomadism (mobile) and parasitism by employing the basic concept of the machine. In this thesis, I will propose solutions to the problems of future cities, by applying the concept of “Nomadism + Parasitism + Mechanicism,” which has been established, while I examine architectural forms and theories in order to solve the crises and problems of future cities.
NEW ARCHITECTURAL MECHANISM

Before discussing my thesis on parasitic and prefab architecture, I will use the Seoul Project to determine the relationship between architecture and machines, since I want my readers to know about the mechanic architecture that lays the foundation for parasitic and prefab architecture. In the section of New Architectural Mechanism, I will explain why the term of mechanic architecture is used as my architectural language and introduce the module system structure that is a structure of mechanic architecture and a basic idea of prefab architecture.

SEOUL PROJECT

As we enter the millennium, we are fascinated by the changes we see happening and anticipate space travel, genetic engineering, and robotics. We have turned our eyes away from our cities and houses. They seem hardly to develop, mostly not at all. We must look around us—the negative ratio of high-quality buildings to low-quality buildings is quite shocking. The client seems like a master of the architect. In recent times, many clients order all the boring stuff up and down our street. Of course, a business aspect cannot be ignored in reality, but I believe architects should reflect their design character on their buildings. It should not be a meaningless object, but just a building, which one can feel the architect’s philosophy within it. I intend to mirror my ideas about architecture with this project. The architecture that I plan expresses Mechanic Architecture. As I have mentioned earlier, everything is changing as a new era approaches. A large number of machinery-like appearances, whether this does any good or harm, it is the reality. We are living in this
machinery world. I proposed to include mechanical ideas to the architecture in this machinery world. Thus, what does mechanical architecture mean? In a machine, bringing together all the smaller modules makes a greater module. Such modules are connected to each other through joints. The two words—“module” and “joint”—have served as a big axle for this project.

A mechanic term was utilized by me to present prefab and parasitic architecture as a solution to the problems of future cities. Mechanic architecture is not characterized by a fixed form of architecture but by a flexible form of it. A flexible architectural form will be employed as an important term to resolve, in an architectural way, the urban problems taking place after a city’s crisis. (Fig. 2-1, Fig. 2-2, Fig. 2-3, Fig. 2-4, Fig. 2-5)
Fig 2-1. Seoul Project - Site Plan Drawing
Fig 2-2. Seoul Project - Concept Model
Fig 2-3. Seoul Project - Elevation, Plan, Section Drawing
Fig 2-4. Seoul Project - Perspective Section Drawing
Fig 2-5. Seoul Project – Model
CITY CRISIS

The phases of cities are changed through such codes as society, economy, culture, and politics. These codes have the potential to make cities betray their various aspects. I define the process of urbanization as the realization of the said codes. I define the process of urbanization as consisting of four steps:

_Potentiality – Realization – Saturation - Destruction_

First, potentiality means the potential to provide the foundation for the formation of cities. For example, cities are created by such intricately entangled codes as landscapes, economics, politics, and culture. Second, the realization step means the realization of the codes. The realization decides the size of cities. Cities with harmonized codes will grow into mega cities, while those without harmonized codes remain small. Third, saturation means the limitations of mega cities. I suppose such cities include New York, Tokyo, Los Angeles, and Seoul. These cities can be shaped like a large box, surrounded by buildings. Moreover, these cities have a skyline under which the said codes are materialized in a negative manner and social evil is prevalent. I made up my mind to interpret the problems of such a society from the perspective of architecture. The problems are caused by the fact that, in such cities, the spaces for buildings are continually diminishing, while the population is increasing.

Consequently, many people are left homeless, thus making a new secluded social class. The gulf between rich and poor plays a big role in bringing the fourth step, i.e., the deconstruction of cities. It is the last or future step that contemporary cities will be faced with. In other words, the lack of architectural spaces in our modern society and the resultant disintegration of cities is the most urgent problem for us to solve.
I try to explain the process of urbanization by using the object of City Bag (Fig. 2-6, Fig. 2-7, Fig. 2-8). I will focus on the development of building a skyline and incremental city population in the city bag project. This bag is modeled after the process of the urbanization of New York and composed of four different layers. The object of a bag is used to describe the urbanization process, comprising the central potential layer and the fourth destruction layer.

In order to suggest the aspects of a future city, I will break this into four steps and analyze the problems that a city is faced with and will confront in the future as well and allow my readers to know that the features of a future city are not all positive. Then, I will present a solution derived from prefab architecture, which is the theme of this thesis.
Fig 2-6. City Bag Project - Concept Drawing, and Model
Fig 2-7. City Bag Project - Concept Drawing, and Model
Fig 2-8. City Bag Project - Concept Drawing, and Model
Above, I approached a future city from the perspective of relevant concepts and theories. I believed such a theoretical approach should be complemented by a more analytic interpretation. While searching for analytic approaches, I came into contact with a book called _Data City_ (Fig. 2-9)' authored by MVRDV, which approaches a future city from a numerical viewpoint. From it, I found materials that support my theories. I reinterpreted them in order to produce an analytical diagram as described below.

**Analytical Diagram**

This diagram (Fig. 2-10) uses the number of urban and rural populations in the present time in order to predict the number in the past. I want to use this diagram to show the expansion of a city where the inner city population is explosively increasing. Such a city is expanding through a sprawl phenomenon. However, the space on this globe, where human beings can live, accounts for no more than 11% of the entire area of the planet (Fig. 2-11). This is because about 62% of the globe is covered with water and about 37% of the remaining land comprises mountainous regions and deserts where man cannot live. Limited residential areas block the external expansion of the inner city. So, considering such a limited space of living, I assume that a city should expand vertically, not horizontally.

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92 Winy Maas. _MEGA CITY/DATA TOWN_. (Uitgeverij, Netherland, 010 Publishers, June 1999).

93 Winy Maas. _MEGA CITY/DATA TOWN_. (Uitgeverij, Netherland, 010 Publishers, June 1999).
Moreover, expansion of the inner city infringes upon ecological spaces of nature. The reduction in ecological spaces brings about such problems as global warming and substitution of CO2 for O2. As CO2 accumulates from the bottom of a city, the city will suffer from a shortage of O2. In order to solve such an urban problem, first of all, I propose to prepare an Artificial Nature Zone (A.N.Z).
Artificial Nature Zone (A.N.Z)

What is A.N.Z? I imagine A.N.Z is an artificial nature space in the inner city, which is encircled in a loop form. In Fig 2-10, the green band refers to Artificial Nature Loop (A.N.L). A.N.Z is set up on the assumption that a future city will have been filled with CO2, to which an architectural solution is applicable. An increase in the amount of CO2 in a city naturally makes people move vertically. A.N.L supplies a city with O2 and drives away CO2. However, it will take hundreds of years for A.N.Z to displace CO2 with O2 in a city. It calls for a city to have long-term temporary architecture, which will be dismantled (in the same way as the Crystal Palace was disjoined after the exhibition) after the city is purified through the circulation of CO2 and O2 (Fig. 2-12). Long-term temporary architecture shall be set up on top of the existing buildings (as a temporary structure, which will stand for a long time) because of the increase in CO2. This is what I present as future architecture for our urban villages.
Fig 2-12. CO2 and O2 Circulation Diagram
Why do we need vertical development in future city? (City development scenario)

A vertical movement is connected to the nomadism of apes mentioned in Chapter 1. Apes were inclined to stay on trees rather than on the ground. In the same manner, modern people have constructed their cities vertically high, bringing about many urban diseases. I would like to reinterpret the vertical extension, which modern cities have misunderstood, from the perspective of not a diseased vertical movement of moderners but vertical nomadism, which will cure the disease. To do this, I have set up a scenario to develop future cities by utilizing the chronological sequence described below (Fig. 2-13, Fig. 2-14). A new architectural form started to emerge in the 1800s, when potential cities suffered from a rise in the CO2 level. The vertical development of cities has been executed in a reckless and destructive manner since the 1800s and the present times. In contrast after the city crisis, a scenario for the vertical development of cities is an architectural effort to restore our cities from their unplanned and destructed structures. As I already mentioned above, what is to be built for the future vertical expansion of a city will be parasitic on the existing buildings as long-term temporary architecture (a temporary structure, which will stand for a long time). Consequently, future architecture shall be prefab and mobile, since they must be easy to construct and deconstruct.
PREFAB ARCHITECTURE AS MY ARCHITECTURAL LANGUAGE

I presume a solution to the problems of future cities is prefab architecture. But, I believe the solution must comprise not only simply prefab architecture, as mentioned in Chapter 1, but parasitic architecture as well. The characteristics of such architecture can be derived from a flexible architectural form of mechanic architecture as mentioned above. In a future city, a saturated density of population will lack space where new architecture can be erected. As an alternative to this problem, I suggest the concept of floating housing, which corresponds to prefab architecture and parasitic architecture.

Floating Housing from Laputa Island (Fig. 2-15)

Laputa: Floating Island in the sky mentioned in Gulliver’s travels

Lebbeus Woods showed imaginary future architecture that I mentioned “floating housing” in his works such as “Aerial Paris,” “Havana Project,” and “high house.” In short, the scale of cities will be expanded horizontally and vertically. However, people cannot swarm about contemporary cities, due to their adjacency, movement (traffic), and limited time. The flow of many people into cities expands cities and creates many social problems, inevitably and naturally

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destroying cities. While deliberating on solutions to the destruction, I draw the basic hypothesis of floating housing from the works of Lebbeus Woods to bring about the reconstruction of these cities.

To solve the problem of a lack of residential areas in the cities that are at the saturation point, I found an alternative to the vertical expansion of architecture. Therefore, I present realistic and detailed solutions through single housing and complex housing designs. The type of floating housing represents people living onto the existing buildings. I define such buildings as parasitic housing. Stress is laid on the adjacency of parasitic housing, which is plugged into original architecture. I focus on the structure of parasitic housing in order to design realistic parasitic housing. All the materials of parasitic housing are prefabricated so they may be easily constructed, and enormous truss structures are set up so they may support the entire loads and exterior of the buildings.

**Conceptual Design-Human Body Component and Parasitic Architecture**

I suggest prefab architecture and parasitic architecture as a solution to problems of future cities. Parasitic architecture was hinted from a picture of a dissected human body drawn by Leonardo da Vinci and from the image of a cyborg attested in the animation of Ghost in the Shell. To develop this hint into a more academic research, I referred to a book called *Coda* (Fig.2-16).²

The following is a summary of what I have learned from the book. Approaches are derived from the structure of codes in human bodies, so as to find the

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fundamental meaning of constructing and deconstructing of prefab housing.

Considering architectonics as a normative system reflecting the structure of Weltanschauung in a specific age, it is very reasonable to regard the deductive deconstructionism of Mitchel Foucault\(^3\) for bodily politics as a motive of architectural criticism. A deductive human/inhuman/mixed body may be used as an agent that will trigger what has been said on the basis of productive criticism after negotiating with the normative system of architectonics. A body is limited in that it is deconstructed in an electronic space and, at the same time, expanded to a multifaceted surface and a shared sphere. But, the imaginary concept of a mechanized body is still none other than a subject that damages the value system for the possession of the spaces of traditional architecture. A body suffers a mutation back-to-back with the conflux of organic and mechanic conditions and becomes a machine that is alive, but dying. It also changes itself into a totally heterogeneous organism like a supernatural cybernetic organism, monster, or robot, and advances into the beginning of space.

Foucault\(^4\) understands that a bodily image is a controllable tool to express the multiple coding of a body. It is evident in the paragraph where he describes a bodily image as a docile machine. Foucault’s bodily and mechanical codes are groping for what they have in common, while being opposed to one another. From such opposition, I have been attempting a new architectural viewpoint. I have been searching for the basis of future architecture from the structure of a human organ code and the construction of a mechanical code of cyborg. Utilizing the contradicting points of the two different codes, I have attempted to connect original buildings (a human organ code) with parasitic buildings (a mechanic code). (Fig.2-17)

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Fig 2-17. Human Body Component
ARCHITECTURAL SOLUTION (STUDY CASE)

Conceptual Design – The first idea – (3D Max, Study Models)

While approaching future architecture with only a vague idea about it, I happened to find an impressive image in books and movies. I began my architectural design from converting the image into forms.

The concept of prefab architecture, which can be easily constructed and deconstructed, and that of parasitism, which can easily moved to and survive in any place, led me to think of light architectural materials and to depict the skin in the form of wire frames, an organic form of a parasite, which can be easily transfigured according to situations. This conceptual design is an essential component of an experiment in order to find a practical architectural form described below. (Fig. 2-18, Fig. 2-19, Fig. 2-20)

Capsule Architecture Design

Before presenting complex and large-scale architecture, I use the afore-said conceptual design to produce a capsule, which is the smallest unit for a human dwelling. I define a capsule as a minimum unit where an adult can lay down, like for sleeping. This capsule architecture is applied with a prefab design, which a few laborers can easily construct and deconstruct, and a parasitism design, which can be erected on any site. My capsule architecture is meant to solve, in a prefab and parasitic concept, such problems of a future city with limited residential units and a CO2 crisis.

Next is an advertisement (Fig. 2-21) for selling capsule architecture. This advertisement demonstrates that the basic idea of prefab pieces and tools for capsule
architecture can be delivered to and constructed and deconstructed in any place, similar to prefab housing companies in the early 20th century *Aladdin Readi-Cut House* and *Sears Roebuck & Co*⁵.

I will plan a capsule architecture project and present its architectural possibility with a view to use my own language to experiment the practicability of prefab and parasitic architecture, discuss the problems of future cities, and resolve the problems in an architectural way. (Fig. 2-22)

⁵ Allison Arieff, and Bryan Burkhart. *PRE FAB.* (Gibbs Smith, Salt Lake City, 2002), 13.
Fig 2-18. Conceptual Design - Concept Model
Fig 2-19. Conceptual Design - Concept Model
Fig 2-20. Conceptual Model - 3D MAX Model
IT IS EASY TO ASSEMBLING
IT IS PERFECT FIT ON ANY PLACES (URBAN, NATURE AREA)
WE DELIVERY TO YOUR SPACE
THE HOUSING SET INCLUDES TRUSSES, BOLTS, NUTS, AND MANUAL.

CALL 1-800-ASK-CODE
Design by H39031

Fig 2-21. Capsule Architecture - Advertising
Fig 2-22. Capsule Architecture – Model
Single Family Housing Design (Parasitic House No. 1)

Based on the above-mentioned capsule architecture, I designed Parasitic House No. 1 (Fig. 2-23, Fig. 2-24, Fig. 2-25). First, Parasitic House No. 1 consists of a living room, bedroom, and bathroom for a family. This new architecture shall be constructed on top of existing buildings in a parasitic manner as the CO₂ level is heightened in a city.

I use the term, PLUG-IN architecture, to explain the features of the new architecture standing among preexisting buildings in a parasitic manner. PLUG-IN architecture is meant to solve the problems of the structure of parasitic architecture. The prefabricated truss structures of parasitic architecture plug in the existing buildings and support new buildings. Seven prefabricated truss structures of Parasitic House No. 1 plug into an existing building and holds up the house. To hold up a building, its skin should be made of the lightest-possible materials and its truss structure made of massive materials. This truss structure sustains the skin of a building (ceiling, floor, and 4 walls) through cables connecting with each truss.

The limitedness of a site on which new buildings are constructed on top of the existing buildings requires prefab pieces that can be assembled on the site after manufactured in a factory. I have executed the Parasitic House No. 1 project to design such
architecture. This is the result of the above-mentioned conceptual architecture, and practically solves the problems of future cities with a focus not on programs for buildings but on their structural possibilities.

Fig 2-24. Parasitic House No. 1 - Model
Fig 2-25. Parasitic House No. 1 - Plan, Elevation, and Section Drawing
Complex Housing Design (Parasitic House No. 2)

Parasitic House No. 2 (Fig. 2-26, Fig. 2-27) is a complex housing form where many housing units coexist. Study Case House No. 2 consists of eight residential units, four shared restrooms, and two commercial spaces. The entire edifice is composed of four floor levels: 1st and 2nd levels are for the residential area, 3rd floor level for the commercial area, and 4th floor level (preexisting building roof level) for the public area, where there are an Internet café and the main lobby. In other words, the preexisting building roof is connected to the main entrance on the 4th floor level and leads the circulation within Parasitic House No. 2. Like Parasitic House No. 1, Parasitic House No. 2 also uses nine plug-in truss structures. However, its entire load is larger than that of Parasitic House No. 1, so such a vertical footing as the structure system is employed. (In the model picture, the vertical footing is described by a white acrylic of a rectangular parallelepiped standing perpendicular).

Vertical footing is a perpendicularly rotated form of ground footing and connected with the massive footing on the ground. Vertical footing is at a right angle to the ground footing, adhered to the preexisting building, and supports Parasitic House No. 2. The skin is made of light, but durable, materials such as Plexiglas, steel, and carbon fiber instead of glass and concrete, for the purpose of reducing the load from Parasitic House No. 1 and other buildings. Like Parasitic House No. 1, due to the limited space of the site, Parasitic House No. 2 is made up of prefab pieces, which are easy to assemble on the construction field. The Parasitic House No. 2 project also employs such architectural concepts as parasitism and prefabrication in order to solve the problems of future cities.

In the process of implementing the last project or the China Town project in New York City, I want to show my readers such architectural concepts as parasitism and prefabrication, which are already demonstrated in parasitic houses No. 1 and No. 2; and the relationship between prefab architecture and social, political, and philosophical idea.
Fig 2-26. Parasitic House No. 2 – Model
Fig 2-27. Parasitic House No. 2 - Plan, Elevation, and Section Drawing
City Block Design (Chinatown Project in New York City - Parasitic House No. 3)

Overview

Now, I will design Study Case House No. 3 the last version of parasitic houses, based on the concepts of the Parasitic House No. 1 and Parasitic House No. 2 projects characterized by parasitism and prefabrication, which will help solve the problems of future city crises. Unlike Parasitic Houses No. 1 and No. 2 constructed upon a single preexisting building, Parasitic House No. 3 is constructed on a block in a city. And unlike Parasitic Houses No. 1 and No. 2 focusing on housing, Parasitic House No. 3 focuses on a complex program composed of housing units in commercial and public areas. That is to say, Parasitic House No. 3 is a miniature of a city in architecture and a project to demonstrate the possibility for architecture to solve the problems of future cities.

Site Features (Fig. 2-28) and Problems (Chinatown in New York City)

![Fig 2-28. Parasitic House No. 3 - Site Analysis Diagram](image-url)
While looking for a site where city block was designed, my attention is drawn to Chinatown located in Lower Manhattan. Lower Manhattan in New York City co-exists with cultures, mixed-income, and different social class levels.

Additionally, R.DOT (Rebuild Downtown Our Town) mentioned a housing crisis exists in New York City with a vacancy rate of 2.94%. Vacancy rates in Lower Manhattan neighborhoods range from 2.1% in Lower East Side/Chinatown to 4.1% in Greenwich/Financial district.\(^6\)

New buildings cannot be constructed in Lower Manhattan, which has various features of a city, due to its various contexts and whose vacancy rate is low. Furthermore, the chart listed below shows a big difference in population and median household income, depending upon districts in Lower Manhattan. Especially, Chinatown is a district where there exists the biggest difference in population and median household income between Lower Manhattan and where the vacancy rate is the lowest. So, the town is the most suitable place to experiment on Parasitic House No.3.

*R.DOT* mentioned, “Since its beginnings in the 1870s, the boundaries of Chinatown have shifted and expanded. Its historic core is eight square blocks, bordered by Baxter, Bowery, Canal, and Worth Streets. This area has substantially expanded. Two main factors determine its ethnicity—the presence of ethnic commercial businesses and a significant residential population from an origin country. Housing exists throughout all the sectors of Chinatown, mostly as apartments above retail stores, except in the manufacturing district. The predominant form of residence is the tenement, those 4-6 story walk-ups from the late 19\(^{th}\) century, many of which are deteriorating and are health hazards.”\(^7\)

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As you see in the above paragraph, Chinatown comprises both residential and the commercial areas, poor community services and amenities, a low residence ratio compared to the population, and a low vacancy ratio, all which may contribute to a city crisis. I selected as the site for Parasitic House No. 3, a block between Lafayette St. and Grand St. and Broome St., which clearly disclose the said urban problems. Unlike Parasitic Houses No. 1 and No. 2, which are intended to solve the simple urban problem of a high level of CO2, Parasite No. 3 is meant to resolve social problems in addition to the problem of CO2.

**Basic Architectural Concepts (Fig. 2-29)**

A city is a place where various contents co-exist. In particular, Chinatown in New York City has a variety of issues related to culture, economy, and ethnic groups.  

*I dare to incorporate such various contents of a city into architecture.*

Before designing Parasitic House No. 3, I analyzed the site, classified the contents surrounding the site, and, accordingly, divided the site into the commercial area mass and the residential area mass (Fig. 2-30). In Fig 2-30, the commercial area mass is blue-colored and the residential area mass is red-colored. That is to say, the combination of the two articulated masses produces architecture, which has a new form of a city constructed upon the roof of preexisting buildings (in one block).

The city block design (Parasitic House No. 3 Project) is a work designed after synthesizing the aforesaid project concepts (Fig. 2-31). I will use this project to present an architectural form, which will solve not only the problems of a high level of CO2, but also many other social problems related to program, structure, and city planning.
Fig 2-29. Parasitic House No. 3 – Mass Model Study
Fig 2-30. Parasitic House No. 3 – Mass Study
Program-Dynamic Zone

Unlike Parasitic Houses No. 1 and No. 2 that analyzes one building, Parasitic House No. 3 designs and analyzes an entire block of a city. The site for Parasitic House No. 3 is a place that comprises the commercial and residential areas, and has limited residence and poor amenities. Above everything else, because of a high level of CO2 and 2.94% of a vacancy ratio, I design architecture that is a parasite on preexisting buildings as in the case of Parasitic Houses No. 1 and No. 2. Limited residence and poor amenity call for co-existence of the residential, retail shop, and public service areas. Such co-existences are reflected in the Functional Drawing & Plan and Elevation Diagram. (Fig. 2-32, Fig. 2-33, Fig. 2-34, Fig. 2-35, Fig. 2-36) I divide Residential Area, Commercial Area and Public Service Area (Connection Area – It connects residential area and another residential area, and residential area and commercial area.) as 3 different functions. First, the residential area is divided into the Broome St. side and the Grand St. side and comprises 43 units. Capsule units, whose idea is derived from capsule hotels in Japan, are built into each of the 43 units to accommodate as many residents as possible into a limited space. Second, the commercial area located between the two residential sides connects the areas, provides easy access to the residents, and serves as retail and public service areas. Third, the public service area is mainly utilized as the connection area and the leisure activities area where people communicate with each other. The public service area is intended to produce a dynamic circulation connecting the exterior or roof of the building to the interior. These three different functions are combined to present the aspects of Parasitic House No. 3 as a city. Moreover, the division of the commercial and the residential areas helps keep a smooth flow of the circulation in the building. The commercial area situated at the center of the building
gives easy access to both the Broome St. side residential area and the Grand St. side residential area. (Fig.2-37)

Capsule Units? (Fig.2-38)

Sleeping capsule is an idea proposed to accommodate many people in a limited space. Like the aforesaid concept of capsule architecture, the sleeping capsule is a space designed to accept one adult and protect his/her privacy. Prefab pieces are assembled to produce capsule units designed to present a flexible form, depending upon their environment. That is, each of the capsule units is designed to combine or dismantle, depending upon their situations.

**CAPSULE A** - **Residential Area**
**CAPSULE B** - **Supplementary Area**
**CAPSULE C** - **Public Area**
**Layer 2 - Public**

- Capsule C - Public Area
- Capsule D, F - Retail Area
- Capsule E, G - O₂ Tank

**Layer 3 - Green Roof**

- Capsule H - Public Area
- Capsule I - Air Supplementary Area
- Capsule J - Green Area

Fig 2-34. Parasitic House No. 3 – Program Study (Plan)
Fig 2-35 Parasite House No. 3 - Program Study (Plan)
Fig 2-36. Parasitic House No. 3 – Program Study (Elevation)
Fig 2-37. Parasitic House No. 3 - Circulation, and Function Study
City Planning-Extended Parasitic House No. 3 (Expanded to city block)

The Parasitic House No. 3 project is expanded via four phases to the entire city by a city network system. In the first phase, Parasitic House No. 3 is planned and constructed on preexisting building blocks; new architecture or Parasitic House No. 3 is constructed on many blocks in a city. In the second phase, Parasitic House No. 3 is inclined to expand its scope from its surroundings, i.e., expanding over building blocks encircled by the Parasitic House No. 3. In the third phase, Parasitic House No. 3 is expanded to the entire city through a complex city network system. In the fourth phase, the expanding Parasitic House No. 3 is spreading over the entire city and forming a new city upon preexisting buildings (Fig.2-39). It is analogous to the idea of Buckminster Fuller, when he thought of a dome covering over an entire city. New architecture, constructed on old building blocks, connects the entire city with a network and solves the above-mentioned city problems. The problems of limited residential and commercial areas are resolved by new architecture, which covers the entire city and rids its districts of distinctions caused by economic and/or social status of the residents. In other words, new city basically is architecture emerging to resolve such problems as a high level of CO2, a low vacancy ratio, and other social problems. I tackle the Parasitic House No. 3 project in order to employ architecture to solve urban problems, and the possibility is demonstrated by the new architecture constructed upon each city block, which is expanding to the entire city.
Since its beginnings in the 1860s, the boundaries of Chinatown have shifted and expanded. Its historic core is eight-square blocks, bounded by Baxter, Bowery, Canal, and Worth Streets. This area has substantially expanded. Two main factors determine its dynamics: the presence of ethnic commercial businesses and a significant residential population from an origin country. Houses exists throughout all the sectors of Chinatown, mostly as apartments above retail stores, except in the manufacturing district. The predominant form of residence is the tenement, those 4-6 story walk-ups from the late 19th century, many of which are deteriorating and are health hazards.

Fig 2-39. Parasitic House No.3 - City Expansion Study

DYNAMIC CITY NETWORK>>> and oNE more THE POPULATION AND SOCIAL GAP

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CHINATOWN
POPULATION 8,464
INCOME AS CENSUS TRACT
15-01-545,115
16-02-674,521
09-810,456
---

FULTON/SEAPORT
POPULATION 2,085
INCOME AS CENSUS TRACT
15-01-545,115
16-02-674,521
09-810,456
---

EAST RIVER WATER FRONT
POPULATION 1,560
INCOME AS CENSUS TRACT
15-01-545,115
16-02-674,521
09-810,456
---

TRIBECA
INCOME AS CENSUS TRACT
21-018,384
33-011,333
39-547,083
---

FULTON/SEAPORT
POPULATION 2,085
INCOME AS CENSUS TRACT
2.01-$21,019
2.02-$22,750
08-915,002
---

LOWE R EAST SIDE
POPULATION 23,457
INCOME AS CENSUS TRACT
2.01-$21,019
2.02-$22,750
08-915,002
---

LOWER EAST SIDE
POPULATION 1,560
INCOME AS CENSUS TRACT
3-01-545,115
16-02-674,521
09-810,456
---
Structural Component-Human Body Structure (Fig. 2-40, Fig. 2-41, Fig. 2-42)

Here, I will derive a design for structures from the components of a human body, as mentioned above. First, I divide a human body into seven parts and then design structures in compliance with the articulated ratio of the parts. The articulated joint is made adjustable to any place after its structure is transformed flexibly. Such a structure can be transformed appropriately in accordance with the space size and load, transformed into the aforesaid capsule room, utilizing a limited space in the residential unit. Articulated structural pieces are a prefabricated form and can be assembled into a different form, depending upon the space size and load of a construction site. The following images refer to structure forms that may be changed as a human body is transformed.
Fig 2-41. Parasitic House No. 3 – Body (Form) Structure Study
FORM NO. 4

FORM NO. 5

Fig 2-42. Parasitic House No. 3 – Body (Form) Structure Study
Structural Connection (Fig. 2-43, Fig. 2-44)

Buildings constructed upon preexisting buildings have many structural problems. In Parasitic Houses No. 1 and No. 2, attempts are made to solve such problems of architectural structure by using the systems of PLUG-IN structure and vertical footing. However, compared to the previous two projects, in Parasitic House No. 3, the scale of buildings is larger and the architecture is constructed not on a single preexisting building but on one city block, which calls for another form of structure. Moreover, Parasitic House is long-term temporary architecture (a temporary structure, which will stand for a long time) and needs to minimize its infringement upon the existing buildings. Therefore, I set up a truss structure around the exterior of the existing buildings in such a manner that the structure may support new architecture and help minimize the damages of the existing buildings. The truss structure is an articulated truss structure form and can be easily transformed, according to the height and width of the building (Fig. 2-45). This articulated truss structure is designed in a manner suitable to the site of Parasitic House No. 3, which is constructed in the form of various buildings.

The connection between residential units

Two residential units are combined into one to produce a larger unit. The two residential units are in a reverse form reflected upon a mirror, which enables a space to be utilized in a maximum manner. The two units are combined in an organic form in the first place, but later changed into a rigid form for the sake of space utilization. Such a rigid form, along with a roof truss, supports the roof. Each of the units is assembled by applying the prefab architectural idea and in accordance with the construction site and the characteristics of new architecture. Namely, each unit is a prefab piece made of the lightest-possible materials so as not to put a load on the buildings. The two units are easily assembled using their prefab pieces (walls and ceilings and interior partitions) and bolts. (Fig. 2-46)
Fig 2-43. Parasitic House No.3 - Constructing Step (Drawing)
Fig 2-44. Parasitic House No. 3 – Constructing Step (Model)
Fig 2-45. Parasitic House No. 3 – Connection between preexisted architecture and new architecture by Truss Structures

Fig 2-46. Parasitic House No. 3 – Connection between residential units
Final Model and Drawings (Fig. 2-47, Fig. 2-48, Fig. 2-49, Fig. 2-50, Fig. 2-51, Fig. 2-52)

Fig 2-47. Parasitic House No. 3 – Final Site Model
Fig 2-48. Parasitic House No. 3 – Final Model
Fig 2-49. Parasitic House No. 3 – Final Model
Fig 2-50. Parasitic House No. 3 – Final Model
Fig 2-51. Parasitic House No. 3 – Final Plan Drawing
Fig 2.52. Parasitic House No. 3 - Final Section Drawing
CONCLUSION

A city is changing according to the process of *Potentiality – Realization – Saturation – Destruction*. Many problems are arising in modern cities, which are at the saturation point. Many urban problems will lead to the destruction of a city. This thesis of mine is intended to employ architecture to solve urban problems, with a focus on the conditions of a city after its destruction.

On the assumption that the destruction of a city is caused primarily by a high level of CO2, future cities require a new form of city free of the CO2 problem. I present PREFAB and parasitic architecture to my readers as a solution to such problems of future cities, after deriving basic ideas for prefab and parasitic architecture from *Data City* by MVRDV, who approaches the features of a future city in a numerical perspective and from a book entitled *CODA*.

*I aim to solve the problems of future cities by employing architectural language.*

I planned and designed the Parasitic House project in order to look for such architectural language to help solve problems of future cities. The Parasitic House project suggests a new form of architecture, depending upon the level of CO2. The new architecture is constructed on top of preexisting buildings and has Artificial Nature Zone (A.N.Z) in a loop outside the inner city to purify CO2 and supply O2. However, it will take hundreds of years for A.N.Z to provide O2 to purify a city filled with CO2. It calls for long-term temporary architecture to be constructed in a city to purify the city through the substitution of O2 for CO2 and to be dismantled after the purification. Such long-term, but temporary, architecture has an effect on the form and structure of the parasitic house project. These characteristics require prefab
and parasitic pieces made of light materials, which are easy to assemble and dismantle. In particular, Parasitic House No. 3 is a project designed to construct architecture on an entire city block, based upon the architectural concepts acquired from Parasitic Houses No. 1 and No. 2. Expanding such concepts will create a new city. That is, I intend to cure the diseases of future cities by applying Parasitic House No. 3.
EPILOGUE

I am interested in future city problems and have searched for such architectural terms as prefab and parasitic architecture in order to solve the problems. To do this, I have developed many projects and examined the feasibility of the projects. Such architectural proposals of mine are no more than a presumed solution and may remain as a form of paper architecture. Nevertheless, in this thesis, I may find my architectural color and detect the problems of a future city, which I have tried to solve through the architecture applied with my color. Herewith, I will conclude my first thesis, believing that my future architectural world will be more strengthened by the results of this thesis, including the suggestions and analysis of the problems derived from many phenomena and the expression of the problems in my own architectural language. I appreciate the assistance and support provided to me over the past year by those who have encouraged me to be interested in new architecture and successfully seek my own architectural color.
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