INTEGRATION AND INTERACTION:  
Redesign the Campus of Wuhan University, China

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ABSTRACT
This thesis examines the principles that a Chinese campus should have in order to support a world-class academic performance. As China aims to promote the academic reputation of its higher education, it is necessary to upgrade its campuses according to world standards, especially the U.S. examples that greatly influenced the Chinese campuses at their inception. This thesis conducts the research process on the campus of Wuhan University (WHU) as the case study project. First, through quantitative comparison and analysis, the thesis establishes the goals for campus growth. Second, a long range plan of the Wuhan University campus is proposed to guide future developments. Third, this thesis provides a design proposal on an immediately available site named Science Quadrangle in search of an interactive academic environment.

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## CONTENTS

*Integration and Interaction*

*Redesign the Campus of Wuhan University, China*

Abstract 3
Acknowledgements 5
Introduction 11

1. The Foundations of the Campus in Terms of Academic Performance 13
   1.1 Background 15
      1.1.1 Principles of Good Campus Design 15
      1.1.2 Chinese Campus: A Brief History 18
      1.1.3 Influences of U.S. campuses on Chinese campuses 27
   1.2 Assessment of Wuhan University Campus 29
      1.2.1 Brief history and Basic Facts of Wuhan University 30
      1.2.2 Campus Evolution and Development 38
      1.2.3 Historical Plans Review: F.H. Kales plan and the 2006 plan 45
   1.3 Strategies for W.H.U. Campus growth 65
      1.3.1 Comparison: Quantitative Study of World Universities 65
      1.3.2 Steps of Growth: Minimal, Medium, and Ideal Targets 76
      1.3.3 Strategies and Available Sites for New Developments 79

Mapping of W.H.U. Campus 84
Relation with the city / Surrounding / Satellite map / Campus existing plan / Figure-ground / Open space system / Terrain / Streets and Trees / Circulation: car, pedestrian, service & parking / Color and material / Building Typology / Images

2. From Multi-centered Campus to Integrated Campus 111
   2.1 University Vision and Campus Plan 113
      2.1.1 Vision and Plan 113
      2.1.2 Redifining Land Use on Campus 113
   2.2 Localized Centers 116
2.2.1 Science Division: Existing and Future Expansion 116
2.2.2 Engineering Division: Existing and Future Expansion 116
2.2.3 Information Division: Existing and Future Expansion 118
2.3 Campus Plan Concept 118
   2.3.1 Four Pairs of Relationships 118
   2.3.2 Connection and Integration 120
   2.3.3 Vehicular Underpass on Bayi Road 125
2.4 Vision and Long Range Plan 125
   2.4.1 Long Range Plan 126
   2.4.2 Phases of Plan 144

3. Interactive Learning & Research Environment: Science Quadrangle 155
   3.1 Spatial Distribution of Disciplines 157
      3.1.1 Disciplinary Distribution 157
      3.1.2 Disciplinary Distribution of Wuhan University 157
   3.2 Cross Disciplinary Interaction 159
      3.2.1 Cross-disciplinary Interaction 159
      3.2.2 The Science Quadrangle of Wuhan University 159
   3.3 From Library to Learning Center: An Interactive Learning Environment 192

4. Conclusion: the Chinese Campus 193

Appendices 195
Appendix 1: Morphological Study: main open space of world campuses 196
Appendix 2: National Heritage Architecture on Wuhan University Campus 200
Appendix 3: Comparison with TAMU, Harvard and MIT 204

List of Figures and Illustration Credits 210
Bibliography 215
"There are few earthly things more beautiful than a university a place where those who hate ignorance may strive to know, where those who perceive truth may strive to make others see."

John Masefield
Introduction

The university is the most important invention in the second millennium of human history.¹ In the era of globalization, the status of a country is highly related to the status of its higher educational system. The U.S. exemplifies this relation. Since the 1990s, China has undergone several projects to promote the status of its higher education, such as Project 211 and 985.² Recently, some elite universities have shown an ambition to build world-renowned universities within decades.

Meanwhile, the importance of the physical environment to the university’s overall performance has not yet been fully realized by the university leadership. Although a good campus is not the determining factor of a prestigious university, physical environment is highly related to its academic performance and often serves as the precondition of a distinguished academic reputation.

With the short history of Chinese architectural design industry, the campus design realm is still at the inception. Around 2000, dozens of brand new campuses were built nationwide, and this construction movement was a climax in Chinese campus history. As these campuses were built so quickly, many problems emerged. For example, the functional zoning principle was often treated as dogma in campus layout while open space was not well defined. These new campuses are unlikely to contribute to building world-renowned academic reputation. Meanwhile, there are a number of old campuses with historical buildings presenting different scenarios. Situated within this background, the goal of this thesis is to find a good campus which fulfills the requirements of desired academic reputation.

The history of U.S. campuses provides useful lessons for Chinese campuses. On one hand, Chinese campuses were greatly influenced by the U.S. campuses at their inception; on the other hand, the U.S. campuses support numerous prestigious universities in the world. The comparison between the U.S. campuses and Chinese campuses helps the latter to determine meaningful targets of campus growth.

Wuhan University, one of the earliest national universities, is the case study project of this thesis. The evolution of Wuhan University campus is a snapshot of the campus development history in China. Originally designed in the late 1920s by American architect F. H. Kales, currently the campus can not support a distinguished academic performance due to the inadequate development in recent decades. The design proposal of this thesis aims to ensure adequate space for academic activity and more importantly make the campus more integrated by redesigning the

2. Project 211 means 100 universities in 21 century, and Poject 985 is related to President Jiang Zemin’s speech in May, 1998.
open space system.

This thesis is divided into three sections in search for a good Chinese campus. Chapter one examines the properties that a good campus should have. The analysis of the brief history of Chinese campuses reveals that these campuses have been influenced by several dynamic factors: traditional architecture, the American campus, the Soviet Union campus, and modern architecture. Based on the quantitative study of selected prestigious Chinese and U.S. universities, several growth goals are established for Chinese campuses. Moreover, the mapping-analysis of Wuhan University campus situates the ensuing design proposal of the thesis.

Chapter two proposes a long range campus plan of Wuhan University campus. This plan has three functions. The first function is to make sure there is enough space for future development on a step-by-step basis. The second function is to strengthen the entirety of the campus through the redesign of open space system. The third function is guide the future development in terms of buildings and circulation.

Chapter three zooms into a part of the campus, namely the Science Quadrangle, and investigates the strategies that promote community interaction, especially cross-disciplinary communication. Several linkages are proposed to embed the Science Quadrangle in the whole campus context. In doing so, this new area can be easily accessed and is well connected to the rest of the university. Since the spatial layout aims to encourage cross-disciplinary interaction, the introduction of a new campus building typology- learning center- is intended as an architectural focal point of the Science Quadrangle.

Consequently, the issue of a good Chinese campus is examined in three aspects: the current status within global context, an integrative campus through systematic plan, and finally a detailed design proposal that is entitled to the Science Quadrangle. As the social-economic environment in China is changing rapidly, the campus is also experiencing dynamic developments. From a historical perspective learned from the western context, the Chinese campus is still in its early phase of evolution; thus, the search for a good Chinese campus requires more intensive studies.
1. THE FOUNDATIONS OF CAMPUS IN TERMS OF ACADEMIC PERFORMANCE
1.1 Background: Chinese University and Campus

The initial idea of this thesis was enticed by the observation that there is a relation between the university and the developing status of a nation. In other words, the reputation of the higher educational system is related to a country’s overall developing status. For example, according to the *Times Higher Education* World University Rankings for 2010-11, the U.S. universities occupy seven of the top ten positions and 72 of the top 200 positions.\(^3\) In contrast, mainland China has only six universities listed in the top 200 positions, and this phenomenon is related to the developing status of China. Obviously China has a long way to go in the realm of higher education, although it has intended to build several world-class universities for several years.

1.1.1 Campus Definition and Principles of Good Campus Design

The Definition of Campus

According to Paul Turner, the word *campus* was first used to describe the grounds on which the early buildings were located at Princeton University in the early eighteenth century.\(^4\) According to Merriam-Webster online dictionary, a campus refers to the grounds and buildings of a university or a college.\(^5\)

In general, a campus consists of three systems: buildings, landscape and open space, and circulation. The basic function of a campus is to provide protected indoor space for learning and research activities of the university community. Besides, a campus should also promote a sense of dynamic community and facilitate social and institutional change. In other words, a good campus should minimally provide adequate building floor area as needed by the university, and its spatial configuration should promote academic reputation. Moreover, there is no specific relation between a beautiful campus and a good campus. A good campus often provides excellent environmental experience, while some beautiful campuses fail to support the university effectively and efficiently.

Principles of Good Campus Design

According to D. Kenney, R. Dumont and G. Kenney, the foundations of a campus are: first, “linking the university’s mission and its place”; second, “enhancing student learning and

---

\(^3\) [http://www.timeshighereducation.co.uk/world-university-rankings/2010-2011/analysis-usa-top-universities.html](http://www.timeshighereducation.co.uk/world-university-rankings/2010-2011/analysis-usa-top-universities.html)


participation”; third, “strengthening community interaction and improving the relation between the university and its neighbors”. In their book *Mission and Place*, the authors conclude that good campus design should address following issues: creating meaningful places, expressing a big idea, and enhancing interaction through density. Besides, mixed-use, sustainability, and new technology, a vital neighborhood also plays significant role in good campus design. According to *University Planning and Architecture*, the campus plan consists of the design of three systems: landscape, architecture, and circulation.

**The function of a campus plan:**

According to *University Planning and Architecture*:

*A campus plan is a comprehensive plan for physical growth, predicated upon a needs assessment responsive to the university’s vision, academic strategy, history and culture. The plan outlines and explains the function, scale, siting, and cost of new development and the improvement of existing facilities to produce an academic setting that is both functional and special.*

Consequently, the plan has three major functions: the first is to manifest the university’s values and missions, the second is to create meaningful spaces, and the third is to promote community interaction.

**Landscape:**

The campus landscape should be viewed in terms of a sequence of encouraged experiences, a visual progression of connected landscape met with on the journey through the campus. Frequently, little heed has been given to ensure that this experiential sequence is one of the fluidity and lucidity and the role of landscape within the campus whole is diminished.

*A well-ordered landscape shapes and strengthens the campus plan, reinforces circulation routes, roots the university to its locality, and expresses its individual character and values. The landscape should also respond to its location by reflecting the natural environment of the region and its climate.*

---

7. Ibid., p.3-9.
8. Ibid., p. 3-9.
10. Ibid., p.235.
11. Ibid., p.237.
Buildings:

Open spaces and the buildings that frame them work in tandem to determine the identity and quality of a campus. [When planning new structures, one should keep in mind the dictum that] every campus is the sum of its parts. All buildings must function collectively on campus to create a lucid, connected whole. The task lies in designing buildings that strengthen the master plan, perform their individual functions, [and] respond to their context and accord to the overarching campus image.

Each university environment should aim towards establishing an individual character, and this can be realized through architecture in terms of material, style, scale and so forth. Guidelines for a homogenous and harmonious architecture can be a key factor in creating a sense of place upon campus. Of greater importance is achieving a masterly synthesis of scale, material, colors, textures and landscapes. Each building on campus should assert its individuality within the entity, but simultaneously, when looked at in context, should be seen as contributing to the identity of the university as a whole.

Some campus buildings from their outset have been intended as landmarks. These buildings are often located in a conspicuous location or intended to fulfill a conspicuous function. Commanding locations, such as the termination or intersection of axes, may invite the construction of a unique building. A location at the entryway of campus also often justifies a landmark, which can symbolize the public face of the university. Landmark buildings may carry risks in terms of campus harmony, longevity, and cost.

Certainly, universities should continue to push the boundaries of architectural innovation in pursuit of design excellence but this experimentation should always take place within the framework of the overall master plan and complement the identity of the institution as a whole.

Building plan should consider following factors:

Produce an index of basic characteristics within core campus buildings; systematize these characteristics into design guidelines outlining general terms such as scale, materials, colors, textures and so forth; use these guidelines as criteria for assessing building proposals; consider the landscape when designing buildings. 12

Circulation:

The term circulation encompasses all the elements involved in the movement of people, goods and services across campus, and the movement and storage of cars. Campus circulation consists of three systems: service vehicles, car movement and parking, and pedestrians. The well-planned environment should give precedence to the pedestrian through the provision of spacious footpaths linking lecture theatres, libraries and recreational facilities, and consigning vehicular roads to peripheral campus areas. Prioritizing pedestrian movement does have the effect of restricting the size of the campus, but vibrant pedestrian activity is what lends a sense of life and community to an institution. Circulation ways should connect campus destinations hierarchically, so that the largest volumes of pedestrian activity are routed along chief desire lines, heightening potential for social interaction and the perceived sense of security through mass pedestrian activity. The ideal master plan should provide a carefully conceived circulation and parking system in combination with mixed-use planning to moderate the demand for car parking.\(^\text{13}\)

1.1.2 A Trilogy: a Brief History of Higher Education in China

Higher Education in China

Before China opened to the rest of the world in the mid-nineteenth century, the legalist and Confucian ideals had shaped the overall Chinese mindset for more than 2500 years.\(^\text{14}\) After the First Opium War of 1840, western advances in science and technology were introduced to China. From then on, higher education in China began its inception under the influence of the West. The modern university was introduced to China in the end of the nineteenth century.\(^\text{15}\) During the 100-year development, Chinese universities experienced booming periods and also suffered from social-political disasters. The history of universities in China can be roughly separated into three phases.\(^\text{16}\)

The first phase is from the 1840s to 1949. This period witnessed a tripartite situation: the universities founded by western Christian organizations, national universities, and private universities.\(^\text{17}\) The British and American Christian organizations founded more than ten universities by the 1920s, and these universities directly brought higher education to China and served as examples that some national and private universities followed.\(^\text{18}\)

\(^{13}\) Ibid., p.239.


\(^{15}\) The first university in China was Shanghai Saint John's University which was founded by US Episcopal Church in 1879. Higher Education in China, Wikipedia," http://en.wikipedia.org/wiki/Higher_education_in_China#mw-head#mw-head


\(^{17}\) In the 1920s, there were 13 universities founded by Protestantism organizations: Yenching University, St. John's university, Cheeloo University, University of Shanghai, University of Nanking, Soochow University, Fukien Christian University, Lingnan
founded by the Chinese government, were the most significant component and most of them were the predecessors of current elite universities.

The second phase is from 1949 to the 1970s. During this time, the universities were brought under government leadership under the influence of Soviet Union. Former Christian universities and private universities were either closed or merged with national universities. In 1952, the higher educational system underwent a reshuffle movement that transformed comprehensive universities into specialized universities. Meanwhile, a number of specialized institutes were founded. From 1966 to 1976, most of the universities were devastated during the Cultural Revolution.

The third phase is from the late 1970s till today. Since the resuming of National Higher Education Entrance Examination in 1977, higher education has undergone a series of reforms that have brought improvements. With the rapid economic growth, enrollment has grown dramatically since the late 1990s. Around 2000, a number of universities underwent a merging movement. In this period, some universities began to shift the overspecialization status back to the comprehensive models.

A Brief History of Chinese Campuses

Like mirrors reflecting the changes in the nature of the university, the physical environment of the universities in China also underwent three major phases (Figure 1.1). In the first phase (1840-1949), the campus layout was deeply influenced by the American campus, especially the Beaux-Arts tradition. The campus configuration emphasized the ideas such as functional zoning, series of quadrangles, and the use of axes. Open space, enclosed by surrounding buildings, was given top priority. The campus layout was also influenced by traditional Chinese architecture and the buildings often employed a compromise style named Chinese Renaissance. For instance, most Christian university campuses used traditional large roofs in order to attract Chinese people. The academic buildings often adopted a quadrangle layout, creating a peaceful atmosphere.

During this time, American architect Henry K. Murphy designed a number of campuses in China, including Yale in China, Yenching University, Tsinghua University, Lingnan University, Ginling College, and Xiamen University. In the 1914 plan of Tsinghua University, the buildings were...
Figure 1.1
Timeline of Chinese Campus Plans

976 BC
Hunan Yuelu Shuyuan (ancient college)
Henan Yingtian Shuyuan
Jiangxi Bailudong Shuyuan
Hengyang Shigu Shuyuan

1830
1840
1850
1860
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010

pre-university era

1840-1949: western influenced inception and a tripartite situation: Christian universities, national universities, private universities

1949-1970s: under Soviet influence

1980s-: back to normal - reforms & developments

fast development
reform and recovery
devastated: Cultural Revolution
Influence by Soviet system
Sino-Japanese War
recovery
Golden period
national universities
Christian universities
inception
1879
Shanghai
Saint John’s University
pre-university era 1840-1949: western influenced inception and a tripartite situation: Christian universities, national universities, private universities

1879 Shanghai Saint John’s University

1898 Imperial University of Peking (Jingshi Daxuetang)

1910 Fudan Gongxue

1913 Yale in China (by Henry Murphy)

1915-1926 University of Nanking (by PEHA)

1918 Imperial University of Peking (Jingshi Daxuetang)

1918 Fukien Christian University (by H. Murphy)

1918 Peking Union Medical College (by Harry Hussey)

1921 Ginling College (by H. Murphy)

1928 Western China Union University

1914 Tsinghua School and University (by H. Murphy)

1920-1926 Yenching University (by H. Murphy)

1929 Northeast Univ. (by Tingbao Yang)

1917 Qilu University (by PEHA)

1929 Wuhan University (by F. H. Kales)

1930 Tsinghua University (by Tingbao Yang)

1935 Central University (by Yu Ping-lie) unbuilt

1954 Tsinghua University

1980-: back to normal - reforms & developments

fast development

reform and recovery
devastated: Cultural Revolution Influence by Soviet system
Sino-Japanese War | recovery

Golden period

national universities

Christian universities
1921 Ginling College (by H. Murphy)

1914
Tsinghua School and University (by H. Murphy)

1917
Qilu University (by PEHA)

1920-1926
Yenching University (by H. Murphy)

1929
Northeast Univ. (by Tingbao Yang)

1917
Qilu University (by PEHA)

1929
Wuhan University (by F. H. Kales)

1930
Tsinghua University (by Tingbao Yang)

1935
Central University (by Yu Ping-lie)
unbuilt

1954 Tsinghua University

Eight Institutes in Beijing

Huazhong Institute of Technology (Huazhong University of Science and Technology)

University of Science and Technology of China

Shenzhen University

2000
Zhejiang University (by He Jingtang)

District 5 of Guangzhou Higher Education Mega Center

2003
Guangzhou Higher Education Mega Center (by He Jingtang)

2007
Nanjing University new campus (by Zhang Lei)

2010
South University of Science and Technology of China competition

University of Science and Technology of China

1840-1949: western influenced inception and a tripartite situation: Christian universities, national universities, private universities

1949-1970s: under Soviet influence

1980s-: back to normal - reforms & developments

Sino-Japanese War | recovery

Golden period

pre-university era

fast development reformation and recovery devastated: Cultural Revolution Influence by Soviet system Sino-Japanese War | recovery

national universities

Christian universities

inception
pre-university era
1840-1949: western influenced inception and a tripartite situation: Christian universities, national universities, private universities

1949-1970s: under Soviet influence

1954 Tsinghua University

1954 University of Science and Technology of China

1954 Huazhong Institute of Technology (Huazhong University of Science and Technology)

1954 Eight Institutes in Beijing

1954 University of Science and Technology of China

1954 University of Science and Technology of China

1954 University of Science and Technology of China

1954 University of Science and Technology of China
1840-1949: western influenced inception and a tripartite situation: Christian universities, national universities, private universities

1949-1970s: under Soviet influence

1980s-: back to normal - reforms & developments

1980

1990

2000

2010
organized around a central lawn, similar to the campus of University of Virginia (Figure 1.4 and 1.5). Meanwhile, the layout of Yenching, a Christian university, consisted of a series of quadrangles which were enclosed by traditional style buildings. Yang Tingbao, graduated from University of Pennsylvania, also designed a number of campuses including the 1929 plan of Northeast University, the 1930 plan of Tsinghua University. Some of the campuses built in this period currently serve as the core part of respective universities.

In the second phase (from the 1950s to the 1970s), the campus was greatly influenced by Soviet Union campus. For example, the east campus of Tsinghua University was a mini version of the Moscow State University with a high-rise main building as a focal point (Figure 1.2 and 1.3). Most new campuses built in the 1950s-1960s also followed the layout of Soviet campus. This monumental campus layout corresponded to the propaganda of patriotism in that time. During Cultural Revolution, most campuses built a statue of Mao Zedong as a focal point.

Since the 1990s, the Chinese campus has experienced a fast expansion period. Around 2000, dozens of brand new campuses were built within one or two years. There are several characteristics of these recently built campuses. First, the new campuses are often huge and thus are mainly located in the suburban area of the city. Second, several campuses often are adjacent to each other which created a “university-city”. Third, there are all kinds of campus layouts but few of them emphasize open space.

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25. Ibid., p.56.
27. Ibid., p.6-p.7.
1.1.3 Influences of the U.S. Campuses on Chinese Campuses

As aforementioned, the U.S. universities deeply influenced the Chinese counterparts in the first half of 20th century. Consequently, the U.S. campuses also had a significant impact on early Chinese campuses as they were either designed by American architects or Chinese architects who received professional training in U.S.  

First, the campus layout emphasized open space. The façades of adjacent buildings cooperated to enclose open space such as quadrangles and squares. Second, the open space and buildings often had human scale. Unlike their descendants, the old buildings were usually three or four stories high and their facades were decorated with artistic details. Third, buildings were organized by axes or quadrangles, in respond to the configuration of open space. The pattern of open space system was clear and hierarchical (Figure 1.4 and 1.5).

---

1.2 Assessment of Wuhan University Campus

“The establishment of Wuhan University was an impressive achievement and is important to our story because its campus became the wartime seat of government in 1938. Carefully planned at the national level by a blue-ribbon commission and constructed by a team of Chinese architects led by the American F. H. Kales, the resulting complex combined Chinese and Western architectural and landscaping styles. Completed in 1932, the university’s gardenlike campus layout and imposing “Chinese renaissance” structures sat on a hilly suburban site overlooking Wuchang to the west and Donghu Lake to the north. The new university’s president, Wuhan native Wang Shijie, had been a leading academic at Beijing University in the 1920s and had served as Chiang Kaishék’s foreign minister in the early 1930s. To fill key posts in the university, as much as possible Wang conducted nationwide searches to recruit senior faculty with wide visibility and pro-Guomindang political credentials. Thus the university’s creation had a clear political purpose: as a flagship institution under firm central-government leadership, it was to set a national example of how to control and rechannel student activism.”

Wuhan, 1938: war, refugees, and the making of modern China
Chapter one, p. 15
1.2.1 Brief history and basic facts of Wuhan University

A Brief History: 1893-2011

Regarded as one of the top ten universities in China, Wuhan University (WHU, colloquially: Wūdà) is located in Wuhan, a city along Yangtze River, which is also known as “the nine provinces’ leading thoroughfare”. This university originated from Ziqiang Institute, a foreign language school founded in 1893 by the provincial governor Zhang Zhidong. Through evolvements under different names, it was finally designated as National Wuhan University in July 1928 and became one of the oldest national universities in China. Originally located in a downtown area, it moved to its current site where a brand new campus was under construction near Luojia Mountain. As Wuhan was lost in 1938 during the Sino-Japanese War, the university relocated to Leshan, Sichuan Province until the war ended. From the 1930s to the 1940s, this university experienced a rapid development and reached its highest academic reputation in its history. In 1946, it became a comprehensive university including six colleges: Literature, Law, Sciences, Engineering, Agriculture and Medical schools (Figure 1.6).

In June 1949, Wuhan University was taken over by Chinese Communist Party. In 1952, it was transformed into a liberal arts university during the national higher educational reshuffle movement. The engineering, agriculture and medical disciplines were incorporated into other institutes. From 1966 to 1976, the university was devastated during the Cultural Revolution.

In 2000, new Wuhan University was established as a combination with other three universities: former Wuhan University of Hydraulic and Electrical Engineering (WUHEE), former Wuhan Technical University of Surveying and Mapping (WTUSM), and former Hubei Medical University (HBMU). Unlike other university-mergers, the merger of Wuhan University has an advantage in that the participating campuses are adjacent to each other, which benefits future campus integration.

30. Early national universities: National Peking University, National Peiyang University, National Shanxi University, National Southeast University, National Tsinghua University, and National Zhejiang University. http://bbs.txiao.com/showtopic.aspx?forumid=8&topicid=24284&go=next
31. From 1937, National Wuhan University along with National Peking University, National Tsinghua University, National Central University and National Zhejiang University cooperated to hold national admission examinations. These five universities were called “the five prestigious universities” of Republic of China.
33. Ibid.
34. The medical campus is approximately one kilometer to the northwest of the main campus across the East Lake.
Facts of Wuhan University (October, 2010)\(^{35}\)

National university ranking 2010 = 7\(^{\text{th}}\) (mainland China)

Campus scenery ranking = 1\(^{\text{st}}\) (China)

Topography = 11 hills, 2 inner lakes, and 1 city lake

Vegetation = Spermatophyte: 120 families, 558 genera, and 800 species

National heritage sites = 26 buildings

Annual Tourists during Cherry Blossom = over 1,000,000 people

Total enrollment of 2010 = 55,386 including 32,640 undergraduate

Faculty = 3,639 teachers including both faculty and instructors

Campus area = 3,444,887 square meters

Building footage = 2,654,069 square meters

Value of fixed asset = 4,099,588,000RMB

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\(^{35}\) http://www.whu.edu.cn/xxgk/default.html and http://baike.baidu.com/view/1264.htm#sub1264

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Figure 1.6
Timeline of Wuhan University
Figure 1.7
Top: Panorama of Wuhan University Campus Core
Bottom: Panorama of Wuhan University from Southwest
Academic Structure:

As a comprehensive university, Wuhan Universityv has six discipline groups each consists of various numbers of schools and departments:

**Humanities:** School of Chinese Linguistics and Literature, History School, School of Philosophy, School of Foreign Languages and Literature, School of Journalism and Communication, Department of Art

**Social sciences:** School of Information Management, School of Economics and Management, Law School, School of Political Science and Public Management, College of Education, WTO Studies School, Department of Sociology

**Sciences:** School of Mathematics and Statistics, School of Physics and Technology,
College of Chemistry and Molecular Sciences, College of Life Sciences, School of Resource and Environmental Science

Engineering: School of Water Resource and Hydropower, School of Electrical Engineering, College of Power and Mechanical Engineering, School of Urban Design, School of Civil Engineering

Information sciences: School of Computer Science, School of Remote Sensing Information Engineering, School of Electronic Information, International School of Software, School of Geodesy and Geomatics, Department of Printing and Packaging

Medical school: School of Medicine, College of Basic Medicine, School of Nursing, School of Stomatology, School of Public Health, College of Pharmacy.
Figure 1.10
University Development 2000-2010
1.2.2 Campus Evolution

Figure 1.11
Campus Evolution 1893-2011
1.2.3 Historical plans review: F.H. Kales plan and 2006 Campus plan

“In the afternoon we drove out with the Ambassador, Lady Kerr, and a professor named Kuo, to visit the Wuhan University. It is on the south side of the river, near Wuchang. The university buildings are quite new: they were started in 1931. Their neo-Chinese style of architecture brilliantly combines the old horned roofs with the massive brutality of blank concrete. From the distance the huge central block, with its rows of little windows, standing magnificently in a wild hilly park beside a big lake, reminds you of pictures of Lhasa. Actually this effect of size is achieved by a clever architectural fake – what appear to be the tops of great square towers are, in reality, comparatively small buildings set upon the crest of the hill, so that they rise above the lower façade. The interior is disappointing, chiefly, no doubt, because the war has cut short the work of decoration.”

W.H. Auden and Christopher Isherwood
Journey to a War, p.149
Figure 1.12
F.H. Kales Plan 1929 (early version)
Part 1: 1929 F.H. Kales Plan (Francis Henry Kales)

Background of the Kales Plan

From 1913 to 1928, the predecessor of Wuhan University was located Dongchangkou, a place within the walled city of Wuchang. The current campus was built in 1928, when Kuomintang government restructured Wuchang Zhongshan University into National Wuhan University. In the same year, National Wuhan University Construction and Installation Committee (NWUCIC) was created to oversee the planning and construction of the new campus. Li Siguang, a preeminent geologist, was appointed as the chairman of the Committee, which consisted of renowned scholars from different disciplines. Li Siguang and agriculturalist Ye Yage along with other committee members conducted field survey and chose a site nearby East Lake in suburban of Wuchang. The first phase of construction began from March 1929 till January 1932. The rest of the early campus was finished in 1936.

The Committee commissioned American architect Frank Henry Kales as the principle planner and architect of the original campus. Frank Henry Kales (class of 1907) received his architectural training at MIT from 1903 to 1907 as a special student course. Kales was working at Shanghai in 1920s. He won the entry prize for his proposal in the national competition of Sun Yat-sen Memorial Mausoleum in September 1925. A. Levenspiel and Richard Sachse served as structural engineers. Miao En-chao, who studied civil engineering at MIT from 1914 to 1918, oversaw the construction process.

The initial campus plan proposed following buildings: 1) Literature School, Law School, Science School, Engineering School, Agriculture School, and Medical school; Grand Hall, Library, Gymnasium, and Dining hall; 2) six male student dormitories, one female dormitory; 3) dozens of faculty villas; 4) electric plant, factory, water plant, landscape facilities and several miles of roadway (Figure 1.12).

Site Selection

The core campus is widely admired by both university community and people who have visited there. The campus design by F.H. Kales is considered as a masterpiece of modern architecture history in China. The selection of current site, which is to the southwest of East Lake with a

38. Ibid., p.10.
39. 1907 Massachusetts Institute of Technology Yearbook (Cambridge, Mass.: Massachusetts Institute of Technology, 1907).
41. MIT Archive, Chinese Student Alumni 1930.
coastal line of more than two kilometers, was the foundation of this master piece.

As described by Chinese poet Guo Moruo in the 1930s:

“The campus of Wuhan University outside of Wuchang city, should qualify as the Utopia of the tri-city of Wuhan. The magnificent buildings on Luojia Mountain are all concrete structures with western style. Flourish woods grow on the hill and leafy flora is everywhere; the immense East Lake is on the foot of the mountain. The lake is deep and clear, the air of the mountain is cozy, and there is even a swimming area at the coast of the lake...It is often said that, the quality of Chinese is far backward than foreign people, but if you have ever been here, you are expected to change your view. In my life I traveled extensively, but only this place is the most ideal...During peaceful time, people who studying and especially teaching here should feel most fortunate.”

Hong Bo Qu

Guo Moruo (Kuo Mo-jo; November 16, 1892 - June 12, 1978)

The site is very hilly, and it houses Luojia Mountain, Lion Hill, Half-side Hill, Slanting-boat Hill, Firestone Hill and other hills. The lowest point is 20.5 meters in altitude, while the peak of Luojia Mountain is 118 meters high. The site is about 200 hectares. With a gorgeous landscape, the site has extraordinary views towards the vast lake and remote mountains (Figure 1.12).

**Execution of the Kales Plan**

F. H. Kales made several versions of plan. Figure 1.12 and figure 1.13 are two of the campus overall plans which are still preserved in Wuhan University archive. They were proposed in 1929. Figure 1.14 shows the campus layout in a 1935 map. Figure 1.16 shows detailed central campus plan which was redrew according to the executed plan.42

The main ideas were already well represented in figure 1.12, and figure 1.13 was a refinement of the former plan. As shown in figure 1.12, the buildings in the center were relatively dense and they enclosed a large open space which contained an athletic field and several gardens. The other buildings were scattered around the core campus. The Medical School was located to the north of the core campus. The Agriculture School was located far away to the northwest of core campus as the school might require vast area for field study. The factories were arranged in the east along the bank of East Lake; the faculty residence was placed in the south slope of Luojia Mountain to ensure adequate sun exposure as well as tranquility.

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From the comparison of this plan (figure 1.13) and the 1935 campus map (figure 1.14), we can see that the core campus and the faculty residence were well executed while the rest of the plan was not executed or was changed. One significant difference between the overall campus plan (figure 1.13) and the detailed plan of campus core (figure 1.16) is that the Gymnasium was relocated westward, and the east-west axis between Gymnasium and Grand Hall was expanded accordingly. In doing this, the open space in between was better defined and it housed several gardens, a pond, some tennis courts and an athletic filed surrounded by amphitheatre. On the slope of Lion Hill, six interconnected dormitories were reduced to four dormitories, and three future dormitories were placed separately at the west side of Lion Hill.

The executed plan (figure 1.16) is very close to the current condition despite three minor modifications. First, the Library on hill top was moved southward, so that its volume can be observed from the middle arch-gate of the dormitories (figure 1.19 and 1.20). Second, the east-west axis was not executed, which might be attributed to the direction of the slope and circulation which conflicted with the east-west axis. Third, the Grand Hall was not executed due to financial reasons; instead, the Humanity building was built in its location around 1990, 60 years after the Grand Hall was proposed.

**Landscape Concept: The Sense of Grand Garden**

The campus also provides a sense of Chinese garden in its spatial configuration. Compared with the traditional small scale gardens in Suzhou, the campus that Kales designed could be considered as a grand garden. Within the campus, it is like a giant three-sided garden which was enclosed by both hills and buildings. This garden opens to the west in response to the direction of the valley, and is a wonderful place for a promenade: every step of moving will bring exciting sceneries. In terms of the relation with environment, the campus organization might be influenced by a traditional garden design technique named “borrowed scenery”, which means to incorporate background landscape into its own composition. In the case of Wuhan University, the background landscape is East Lake, the gorgeous scenery of which can be easily experienced within the boundary of the campus.

**The Balance between Wholeness and Diversity**

The campus design emphasized the wholeness while simultaneously maintained diversity in the three buildings groups: Lion Hill building group, Science School group, and Engineering School
Figure 1.13
F.H. Kales Plan 1929 (developed)

Figure 1.14 (facing page)
Campus Map of 1935

Key
1 Dining Hall
2 Liberal arts school
3 Library
4 Liberal arts school
5 Dormitories
6 Science school
7 Gymnasium
8 Engineering School
9 Law school
10 Grand Hall
11 Biology school
12 Office building
13 Medical School
14 Agriculture School
15 Boat factory
16 Motor factory
17 Female dormitory
18 Faculty villas
19 construction committee office
20 Athletic field
group. As shown in figure 1.17, the Lion Hill group consists of four interconnected dormitories, Old Library, Law and Literature schools. Ascending along the slope of Lion Hill, the four dormitories are connected by three arch-gates on the fourth floor. In order to make the arch-gates more visible, a single-storey structure was added on top of each gate and its traditional roof made these dormitories architecturally coherent with the surrounding buildings. All the buildings on Lion Hill used green-blue tiled roofs, so as to obtain a harmonious relation with nature. With its large volume and central location, the Library dominated this cluster of buildings and was the highest point on campus.

The Science School cluster is about 80 meters to the east of the Lion Hill. In order to avoid monotony and distinguish itself from the Lion Hill cluster, Kales designed a Byzantium-dome structure as the main volume of the Science cluster. The attached buildings to sides of the dome
Figure 1.15
The 1929 Plan Overlapping with Google Earth image of 2011

Figure 1.16 (facing page)
Detailed Plan of Campus Core (F. H. Kales)
used traditional roofs so that to provide a sense of consistency with the Lion Hill cluster.

The composition of the Engineering cluster consists of a main building in the center and four secondary structures in the surrounding. The main building is square in plan and has a central lobby running from basement to the roof. The glass of the steel-trussed roof allows light into the lobby and also distinguishes itself from Lion Hill and Science buildings. Similar to the secondary buildings of Science cluster, the surrounding structures also have traditional roofs.

These three building clusters each has a dominant structure but their layouts vary. Kales emphasized the collectiveness rather than individual manifestation, and this approach echoes the spirit of traditional Chinese architecture which emphasizes the relation of individual buildings.

**Open Space**

As aforementioned, the buildings of the core campus enclosed a vast open space which measures 550 meters east-west and 250 meters north-south. This open space consists of several smaller spaces: an athletic filed which is 150-by-200 meters surrounded by an amphitheater, a garden
Figure 1.17
Aerial View of Campus Core
on the slope of Lion hill, a street with Cherry Blossom, a pond which reflects the image of the Library and the dormitories, a forest full of camphor trees, a smaller amphitheater, and several basketball courts. Located in the valley between Lion Hill and Luojia Mountain, this group of spaces accommodates various activities.

The climax of the open space is the square on top of Lion hill, which is enclosed by the Library, Law school and Literature school and further expanding to the roof of the dormitories (figure 1.18).

**Significant Architecture**

*The old dormitories:* As shown in figure 1.18, the dormitories are unique in spatial configuration. They employed an architectural trick named “even roof, uneven ground”, which refers to building massing ascending upon the slope until the hilltop. At the foot of hill the façade can be fully observed; once reaching on the top, there is no building massing but the roof and remote vistas can be perceived. Five outdoor stairs ascending from the foot to the top of the hill not only function as outdoor pathway but circulation for the dormitories. This is an intelligent technique as it saves space within the dormitories to provide more living area; as the stairs are directly constructed on the slope of the hill, the tectonic is rather simple and construction cost is much cheaper than regular indoor stairs. Moreover, the roof top of the dormitories is conveniently accessible and it has become a popular open space (Figure 1.17 and 1.18).

43. Ibid., p.71.
The individual room of the dormitories measures 3.3x4.5meters, and basic furniture such as closet was included in its design. Each room now accommodates two bunk beds within an area of thirteen square meters. The four dormitories provide more than three hundred rooms and each dormitory has four gates opened directly to the stair along the hill slope.44

Old Library: The Library consists of three spaces: a grand reading/lecture hall, stack area, and service area. The circulation desk is placed between the stack area and the reading hall, and the circulation of readers, staff and books is well organized according to modern library functionality. The reading hall also functions as public lecture hall, and it is approximately ten meters in height. The stack area is only 2.4 meters high and a certain amount of natural light is allowed inside as the windows are set between stacks. The five-storey stack area can accommodate 500,000 volumes.45 The architectural style is traditional Chinese while the structure is a combination of

44. Ibid., p.72.
45. Ibid., p.72.
reinforced concrete frame and composite truss. The application of new construction technology and material created a grand space. This 6,000 square-meter building was finished in about one year, which was an excellent feat in that era. The structure is still sound and the appearance still keeps the original tone after 70 years.

*Science School:* The domed structure is mainly dedicated to classrooms: in its lower level are located two 300-seat lecture halls and the rest are small classrooms. The secondary buildings adjacent to the dome are dedicated to physics and chemistry, accommodating laboratories and offices. These buildings are connected through several corridors (Figure 1.22).

*Engineering school:* The four surrounding buildings used to be offices for Department of Civil Engineering, Mechanical Engineering, Electrical Engineering, Mining and related laboratories. The main structure is dedicated to teaching, in the center of which is a five storey high atrium; around the four sides of the atrium is single loaded corridor connecting the peripheral classrooms. The corridors provide a social space between classes. The basement is a gallery for science and technology exhibition which can be accessed directly from the outside road. The transparent glass roof allows daylight into this space creating a dynamic academic environment (Figure 1.23).
The Relations between Building and Topography

“Building a university in such a beautiful place had been my expectation long ago, so I have to think again and again. Building a university on the hill needs to level some hills so as to provide adequate land for the university buildings. There’ll be a lot of earth leveled from the hills. It’s troublesome to find a place to store it, and it costs a lot to bring earth away. But it is easy and economical to put earth leveled from the hills into the valley nearby. In this way, earth piled in the valley can be paved into a sports-ground, around which are the beautiful university buildings. In front of you is a beautiful, magnificent, and majestic university.”

Francis Henry Kales

The most significant architectural achievement of the Kales Plan is the harmonious relations between buildings and topography. The plan (figure 1.16) took full advantage of the topography in several ways. First, Kales placed campus core in a lower valley area which was enclosed by

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Figure 1.24
Exploded Axonometric (orange lines show circulation, green area shows open space of hilltop)
several hills: Lion Hill in the north, Little Turtle Hill in the east and Firestone Hill in the south. The valley opened towards the west and housed a pond. This core area is about 500 meters from north to south and about 700 from east to west. Kales organized the buildings on the hills, while used the lower ground as open space such as athletic fields and gardens. In doing so, the buildings achieved certain relationships with each other and increased the spectrum of spatial experiences.

Second, the former Engineering School was located between the valley area and Luojia Mountain. Seen from the valley area, the buildings look more magnificent and the mountain becomes the background. This group of buildings can be seen clearly both from the old dormitories and the Science School to the north. The Engineering School and Science School formed a 400-meter long axis, which runs from south to north. The former Science School was arranged at the north end of this axis. An athletic field was placed in the lower ground between the two schools, with an amphitheater surrounding its edge.

Third, the Old Dormitories were built on the south slope of Lion Hill to guarantee adequate sun exposure. The depth of each floor plan varies and the roof was designed on the same level with the top of Lion Hill so that the tight hill top was expanded. Building on the hill slope also makes the dormitories look more magnificent than they actually are.

Fourth, on the large scale, the campus has a harmonious relation with its environment. The campus was designed in such a way that the vast East Lake and remote Moshan Mountain could be seen on campus from the north and east on top of Lion Hill. As Lion Hill can also be seen from lake area and the site is an important component of the larger landscape, the layout of the campus required considering its visual impact upon the whole lake area especially its silhouette along the lake. Kales arranged the Library (now the Old Library) in the center on the top of Lion Hill and the Law School and Literature School were placed to the southeast and southwest to the Library symmetrically. The Library used a neo-Chinese style roof which dominated the skyline of the Lion Hill. The roof of Law and Literature schools were flat and shorter. Seen far away in the north from the lake area, the skyline appears very harmonious with the landscape.

Fifth, on the close scale, the buildings were organized artistically with the terrain that housed them. For example, the old dormitory buildings are located on the south slope of Lion hill, and the roof of the dormitory is on the same level with the hill so that the area of the hilltop almost doubled which gradually became a popular place for people to enjoy the beautiful scenery of the rest of the campus. Meanwhile, the Library, Law School, and Literature School are placed on hilltop, which makes them appear larger and more magnificent. Thus, the top of Lion Hill became the spatial climax of the whole campus. This group of buildings has taken full advantage
of the terrain of Lion Hill. Their relation with the terrain makes the buildings more exciting. It is obvious that Kales had become extremely familiar with the topography of the site and he fully understood the order of the terrain; thus, he was able to integrate the building group with the Lion Hill seamlessly and created a series of space at the same time. This site is often compared to Potala Palace of Lhasa as they employed the same architectural trick on the usage of terrain (Figure 1.24).

According to Li Chuanyi, within the nearly 30,000 square-meter building group, there is no single piece of earth-retaining wall which not only means the harmonious relation between buildings and terrain but also the ecological consideration of the design.47

**The Pedagogical Ideas of the Kales Plan**

From the layout of the Kales plan (Figure 1.13), we can observe some pedagogical ideas which the architect and the committee might intend to manifest through the campus. First, the athletic fields were in center location and functioned as a spatial organization factor, which emphasized the importance of physical education in the university curriculum. Second, the dormitories were placed near the center which reflected the importance of students in the university agenda. Third, the relation between the campus and its environment, such as “borrowed scenery”, illustrated the mutual-beneficial relationships between the university and the city and the nature.

**The Lessons from Kales plan**

First, it introduced western spatial configuration to Chinese architectural history as traditional Chinese architectural configuration often could not fully support modern functions.

Second, it illustrates the importance of emphasis on building relationships, the idea of borrowed scenery, the relation between building and terrain. The design also set up examples in terms of the mastery of architectural decoration and the innovation of building technology and material.

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The 2006 Campus Master Plan of Wuhan University

Figure 1.25 shows the campus master plan of Wuhan University which was proposed in 2006, and it was provided by the university’s Basic Construction Office. This plan has become outdated for two reasons. First, the campus itself has changed greatly in recent years and several major developments did not follow the plan. For example, the Computer Science building was built on the location which was originally intended for the student center and the athletic complex according to the 2006 plan. This change might be induced by financial considerations, as the Computer Science complex is more urgently in demand than that of the student center complex. Second, the neighboring area has also changed significantly. Several high-rise buildings and an
elevated expressway have been erected to the west boundary of the campus.

The 2006 plan has major shortcomings. The plan lacks the consideration of adequate space for future growth of the university in the long run. The building coverage of new development is too low and there is too much open land. Also, the relation between the buildings is obscure. Some new buildings have no respect for the context and others do not define proper open space. Meanwhile, the plan proposed a link between the Information Division and the main campus across Bayi Road. This proposal is a good concept, however, the design should be further developed.
1.3 Strategies for Campus Growth

1.3.1 Comparison: Quantitative Studies of World Universities

The fundamental function of the campus is to provide adequate floor area to accommodate teaching, learning, and research activities. At Wuhan University, there is a shortage of space according to the feedback from students; this finding incurred the quantitative study of other universities in order to get more accurate facts. Due to the scope of the thesis, the author selected five U.S. universities and six Chinese universities for comparison. The data is collected directly from the up-to-date reports from the respective institutes. Based on the data from the “Comparing Campus Study” conducted by Ayers Saint Gross Architects, this thesis further studied 40 campuses worldwide.

Table 1.1 shows the quantitative comparison between five U.S. and six Chinese universities. As the medical discipline has a different spatial requirement, the figures in this table do not include the medical part of respective campus. The most significant factor is the average academic floor area per student. Most U.S. campuses provide approximately 60 square meters academic floor area per student; while the Chinese campuses provide only 22.4 square meters on average. The latter is about one third of the former. Meanwhile, the difference of the general building floor area per student is smaller. This might be attributed to the phenomenon that Chinese campuses provide a large amount of employee housing while U.S. campuses do not. In Chinese media, there is often news regarding the shortness of resources. For example, a university has to adopt a lottery to allocate the seats in its library as there are too many students. As there suggests an association between the academic performance and the campus floor area, it is highly recommended that Chinese universities gradually increase academic floor area according to the U.S. standard.

Table 1.2 shows an expanded comparison of 40 world universities-mostly U.S. ones. Most of these campuses are located in an urban context. The mean value of Floor Area Ratio is 0.83; the FAR of most campuses is around 1.0 which provides a reference for new campus growth. Considering the situation in China, it is suggested that the FAR should be greater than 1.0 in order to save land and provide a sense of urbanity. The mean value of building floor area per student is 53.7 square meters. It is worth noticing that the most prestigious research universities such as Johns Hopkins University, MIT, Princeton University, University of Chicago, and Yale University all have a number greater than 100 square meters; while less renowned universities such as George Washington University, Louisiana State University and Old Dominion University

<table>
<thead>
<tr>
<th>University</th>
<th>Campus area (h.a.)</th>
<th>Gross building floor area (s.m. in 000's)</th>
<th>Enrollment [undergrad+grad]</th>
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<td><strong>Wuhan University</strong></td>
<td>328.5</td>
<td>2,117</td>
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<td>MIT</td>
<td>129.0</td>
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<td>39,593</td>
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<td>1,285.7</td>
<td>3,112</td>
<td>41,924</td>
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Table 1.1
Comparison of Wuhan University with 5 U.S. and 5 Chinese Universities
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<th>Building floor area</th>
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<tr>
<td></td>
<td>99</td>
<td>61</td>
<td>18.00</td>
</tr>
</tbody>
</table>
Massachusetts Institute of Technology

Motto: Mens et Manus [Mind and Hand]
Founded: 1861
Number of employees: 10,700
Number of students: 10,253
Percentage of foreign students: 27%
Ratio male/female students: 64%/36%
Number of departments: 32
Largest department: Engineering
Number of Nobel Prizes: 62
Annual budget: 1,602m EUR [2006]

Figure 1.26
Massachusetts Institute of Technology
Tsinghua University

Motto: Self-discipline and Social Commitment
Founded: 1911
Number of employees: 7,186
Number of students: 36,305
Percentage of foreign students: 5%
Ratio male/female students: 67%/33%
Number of departments: 55
Largest department: Electronic Engineering
Number of Nobel Prizes: 1

Academic Building
Floor area per student [square meters]

World University Ranking 2010
Times Higher Education

22
58th

Tsinghua University

Figure 1.27
Tsinghua University
Harvard University

Motto: Veritas [truth]
Founded: 1636
Number of employees: 14,866 [w/o Hospital]
Number of students: 20,042
Percentage of foreign students: 20%
Ratio male/female students: 52%/48%
Number of faculties: 10 [w/o College]
Largest department: Arts and Sciences
Number of Nobel Prizes: 43
Annual budget: 1,200m EUR [2006]
Nanjing University

Motto: Sincerity with Aspiration, Perseverance with Integrity
Founded: 1902
Number of academic staff: 3,000
Number of students: 25,166
Percentage of foreign students: -
Ratio male/female students: -
Number of departments: 75
Number of Nobel Prizes: 0
University of Michigan

Motto: Arts, Knowledge, Truth
Founded: 1817
Number of academic staff: 6,238
Number of students: 41,674
Percentage of foreign students: 6%
Ratio male/female students: 50%/50%
Number of departments:-
Largest department:-
Number of Nobel Prizes:-
Huazhong University of Science and Technology

Motto: Morality, knowledge, truth and innovation
Founded: 1953
Number of academic staff: 3,448
Number of students: 56,040
Percentage of foreign students: -
Ratio male/female students: -
Number of departments: -
Largest department: -
Number of Nobel Prizes: 0

ACADEMIC BUILDING FLOOR AREA PER STUDENT [SQUARE METERS]
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<th>Enrollment</th>
<th>Land properties</th>
<th>Campus area</th>
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<td>**Yale University ***</td>
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<td>350</td>
<td>1,416,000</td>
</tr>
<tr>
<td>Stanford University *</td>
<td>14,144</td>
<td>8,100</td>
<td>1,951,000</td>
</tr>
<tr>
<td>Brown University</td>
<td>7,333</td>
<td>143</td>
<td>579,000</td>
</tr>
<tr>
<td>Union College</td>
<td>2,175</td>
<td>115</td>
<td>465,000</td>
</tr>
<tr>
<td>University of Notre Dame *</td>
<td>11,311</td>
<td>1,200</td>
<td>2,323,000</td>
</tr>
<tr>
<td>Georgia Institute of Technology</td>
<td>14,075</td>
<td>360</td>
<td>1,457,000</td>
</tr>
<tr>
<td>University of Michigan *</td>
<td>37,197</td>
<td>3,114</td>
<td>2,230,000</td>
</tr>
<tr>
<td>University of Virginia *</td>
<td>18,463</td>
<td>1,809</td>
<td>1,813,000</td>
</tr>
<tr>
<td>Northwestern University</td>
<td>17,089</td>
<td>263</td>
<td>1,064,000</td>
</tr>
<tr>
<td>University of Pennsylvania</td>
<td>22,469</td>
<td>262</td>
<td>1,060,000</td>
</tr>
<tr>
<td>Carnegie Mellon University</td>
<td>7,557</td>
<td>103</td>
<td>417,000</td>
</tr>
<tr>
<td>IIT</td>
<td>4,730</td>
<td>120</td>
<td>486,000</td>
</tr>
<tr>
<td><strong>UIUC</strong></td>
<td>36,738</td>
<td>782</td>
<td>3,165,000</td>
</tr>
<tr>
<td><em><strong>UCLA</strong></em></td>
<td>35,000</td>
<td>419</td>
<td>1,696,000</td>
</tr>
<tr>
<td>University of Pittsburgh</td>
<td>23,538</td>
<td>132</td>
<td>534,000</td>
</tr>
<tr>
<td>Univ. of Wisconsin at Madison</td>
<td>40,109</td>
<td>933</td>
<td>3,776,000</td>
</tr>
<tr>
<td>Boston University</td>
<td>22,202</td>
<td>132</td>
<td>534,000</td>
</tr>
<tr>
<td>Iowa State University *</td>
<td>27,823</td>
<td>2,000</td>
<td>1,068,000</td>
</tr>
<tr>
<td>Boston College</td>
<td>11,481</td>
<td>116</td>
<td>469,000</td>
</tr>
<tr>
<td>**Ohio State University ***</td>
<td>48,511</td>
<td>1,715</td>
<td>1,858,000</td>
</tr>
<tr>
<td>University of Florida *</td>
<td>46,107</td>
<td>2,000</td>
<td>4,367,000</td>
</tr>
<tr>
<td>Washington Univ. in St. Louis</td>
<td>16,049</td>
<td>182</td>
<td>737,000</td>
</tr>
<tr>
<td>Tulane University</td>
<td>9,722</td>
<td>125</td>
<td>506,000</td>
</tr>
<tr>
<td>Duke University *</td>
<td>10,630</td>
<td>1,812</td>
<td>3,800,000</td>
</tr>
<tr>
<td>McGill University</td>
<td>20,909</td>
<td>80</td>
<td>324,000</td>
</tr>
<tr>
<td>UC Berkeley *</td>
<td>30,011</td>
<td>1,232</td>
<td>882,000</td>
</tr>
<tr>
<td>University of Oregon</td>
<td>15,696</td>
<td>280</td>
<td>1,133,000</td>
</tr>
<tr>
<td>Texas A&amp;M University *</td>
<td>44,026</td>
<td>5,200</td>
<td>4,180,000</td>
</tr>
<tr>
<td>University of British Columbia</td>
<td>44,161</td>
<td>944</td>
<td>3,820,000</td>
</tr>
<tr>
<td>George Washington University</td>
<td>19,481</td>
<td>43</td>
<td>174,000</td>
</tr>
<tr>
<td>Louisiana State University</td>
<td>29,881</td>
<td>585</td>
<td>2,367,000</td>
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<tr>
<td>University of Hong Kong</td>
<td>12,870</td>
<td>40</td>
<td>162,000</td>
</tr>
<tr>
<td>Old Dominion University</td>
<td>18,556</td>
<td>200</td>
<td>809,000</td>
</tr>
<tr>
<td><strong>Wuhan University</strong></td>
<td>55,386</td>
<td>851</td>
<td>3,445,000</td>
</tr>
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</table>

Table 1.2
Comparison of 40 World Universities
<table>
<thead>
<tr>
<th>Building area (square meters)</th>
<th>F.A.R.</th>
<th>Location</th>
<th>Building floor area per student (s.m.)</th>
<th>Ranking*</th>
</tr>
</thead>
<tbody>
<tr>
<td>767,000</td>
<td>0.8</td>
<td>Suburban</td>
<td>120.8</td>
<td>5</td>
</tr>
<tr>
<td>1,145,000</td>
<td>1.4</td>
<td>Urban</td>
<td>113.4</td>
<td>12</td>
</tr>
<tr>
<td>538,000</td>
<td>0.9</td>
<td>Urban</td>
<td>104.9</td>
<td>13</td>
</tr>
<tr>
<td>1,124,000</td>
<td>0.8</td>
<td>Urban</td>
<td>104.0</td>
<td>10</td>
</tr>
<tr>
<td>538,000</td>
<td>0.5</td>
<td>Rural</td>
<td>97.8</td>
<td>99</td>
</tr>
<tr>
<td>910,000</td>
<td>1.5</td>
<td>Urban</td>
<td>91.3</td>
<td>3</td>
</tr>
<tr>
<td>1,605,000</td>
<td>0.5</td>
<td>Small city</td>
<td>88.5</td>
<td>14</td>
</tr>
<tr>
<td>188,000</td>
<td>0.1</td>
<td>Rural</td>
<td>80.9</td>
<td></td>
</tr>
<tr>
<td>1,087,000</td>
<td>0.6</td>
<td>Suburban</td>
<td>76.8</td>
<td>4</td>
</tr>
<tr>
<td>557,000</td>
<td>1</td>
<td>Urban</td>
<td>76.0</td>
<td>55</td>
</tr>
<tr>
<td>139,000</td>
<td>0.3</td>
<td>Urban</td>
<td>64.1</td>
<td></td>
</tr>
<tr>
<td>711,000</td>
<td>0.3</td>
<td>Suburban</td>
<td>62.8</td>
<td>63</td>
</tr>
<tr>
<td>815,000</td>
<td>0.6</td>
<td>Urban</td>
<td>57.9</td>
<td>27</td>
</tr>
<tr>
<td>2,151,000</td>
<td>1</td>
<td>Urban</td>
<td>57.8</td>
<td>15</td>
</tr>
<tr>
<td>1,061,000</td>
<td>0.6</td>
<td>Urban</td>
<td>57.5</td>
<td>72</td>
</tr>
<tr>
<td>975,000</td>
<td>0.9</td>
<td>Suburban</td>
<td>57.1</td>
<td>25</td>
</tr>
<tr>
<td>1,175,000</td>
<td>1.1</td>
<td>Urban</td>
<td>52.3</td>
<td>19</td>
</tr>
<tr>
<td>383,000</td>
<td>0.9</td>
<td>Urban</td>
<td>50.7</td>
<td>20</td>
</tr>
<tr>
<td>224,000</td>
<td>0.5</td>
<td>Urban</td>
<td>47.3</td>
<td>&gt;200</td>
</tr>
<tr>
<td>1,671,000</td>
<td>0.5</td>
<td>Micro-urban</td>
<td>45.5</td>
<td>33</td>
</tr>
<tr>
<td>1,579,000</td>
<td>0.9</td>
<td>Urban</td>
<td>45.1</td>
<td>11</td>
</tr>
<tr>
<td>1,054,000</td>
<td>2</td>
<td>Urban</td>
<td>44.8</td>
<td>64</td>
</tr>
<tr>
<td>1,705,000</td>
<td>0.5</td>
<td>Urban</td>
<td>42.5</td>
<td>43</td>
</tr>
<tr>
<td>933,000</td>
<td>1.7</td>
<td>Urban</td>
<td>42.0</td>
<td>59</td>
</tr>
<tr>
<td>1,115,000</td>
<td>1</td>
<td>Urban</td>
<td>40.1</td>
<td>156</td>
</tr>
<tr>
<td>459,000</td>
<td>1</td>
<td>Suburban</td>
<td>40.0</td>
<td>161</td>
</tr>
<tr>
<td>1,904,000</td>
<td>1</td>
<td>Urban</td>
<td>39.3</td>
<td>66</td>
</tr>
<tr>
<td>1,691,000</td>
<td>0.4</td>
<td>Urban</td>
<td>36.7</td>
<td>&gt;200</td>
</tr>
<tr>
<td>369,000</td>
<td>0.5</td>
<td>Urban</td>
<td>34.6</td>
<td>38</td>
</tr>
<tr>
<td>334,000</td>
<td>0.7</td>
<td>Urban</td>
<td>34.4</td>
<td>&gt;200</td>
</tr>
<tr>
<td>325,000</td>
<td>0.1</td>
<td>Urban</td>
<td>30.6</td>
<td>24</td>
</tr>
<tr>
<td>600,000</td>
<td>1.9</td>
<td>Urban</td>
<td>28.7</td>
<td>35</td>
</tr>
<tr>
<td>798,000</td>
<td>0.9</td>
<td>Urban</td>
<td>26.6</td>
<td></td>
</tr>
<tr>
<td>414,000</td>
<td>0.4</td>
<td>Urban</td>
<td>26.4</td>
<td>&gt;200</td>
</tr>
<tr>
<td>1,129,000</td>
<td>0.3</td>
<td>Urban</td>
<td>25.6</td>
<td>&gt;200</td>
</tr>
<tr>
<td>1,115,000</td>
<td>0.3</td>
<td>Urban</td>
<td>25.2</td>
<td>30</td>
</tr>
<tr>
<td>459,000</td>
<td>2.6</td>
<td>Urban</td>
<td>23.5</td>
<td>95</td>
</tr>
<tr>
<td>687,000</td>
<td>0.3</td>
<td>Urban</td>
<td>23.0</td>
<td>&gt;200</td>
</tr>
<tr>
<td>245,000</td>
<td>1.5</td>
<td>Urban</td>
<td>19.1</td>
<td>21</td>
</tr>
<tr>
<td>250,000</td>
<td>0.3</td>
<td>Urban</td>
<td>13.5</td>
<td>&gt;200</td>
</tr>
<tr>
<td>2,654,000</td>
<td>0.77</td>
<td>Urban</td>
<td>13.4</td>
<td>&gt;200</td>
</tr>
</tbody>
</table>

Mean 0.83
Mean 53.7
have a number less than 25 square meters. This comparison further illustrates the point that Chinese universities should strategically build more if they intend to advance towards world-class research universities.

### 1.3.2 Steps of Growth: Minimal, Medium, and Ideal Growth Targets

The previous study provides references for the campus growth of Wuhan University. Based on the comparison with top U.S. research universities, an ideal growth target is set up for Wuhan University campus. The comparison with Chinese counterparts serves to set up the minimal growth target for this campus. The medium target is the mean value of the ideal target and the minimal target.

#### Comparison

From table 1.1, the main campus (medical part excluded) occupies an area of 328 hectares, provides building floor area of 2,117,000 square meters, has a faculty of 2,362 and accommodates 45,524 students; meanwhile, the campus of Harvard (medical part excluded) occupies an area...
of 230 hectares, provides building floor area of 2,111,000 square meters, has a faculty of 2,410 and accommodates 18,634 students. The first three factors are close; however, the enrollment of Harvard is only 40 percent of Wuhan University, which means the resources per capita of Harvard is 2.5 times of the later. In terms of academic floor area per student, Harvard is 55.5 square meters, while Wuhan University is only 13.3 square meters, which equals only 24% of the former.

Based on the comparison with its Chinese counterparts, the building growth of Wuhan University seems really urgent as the factors are below average level of these universities.

**Academic Building Floor Area per Student**

The above analysis helps to determine three goals that Wuhan University should fulfill in the long range, as illustrated in figure 1.32.

First, the minimal growth target is to increase the academic building floor area per student to at least match the average value of Tsinghua, NJU and HUST of 22.4 square meters. Assuming the enrollment keeps at 45,524, then the university should build \((22.4 - 13.3) \times 45,524 = 408,000\)
square meters. Assuming the construction speed of 2011-2020 doubles from 220,000 square meters during 2000-2010, thus this growth target can be achieved around the year 2020.

Second, the medium growth target is to obtain 40.3 square meters academic building floor area per student. Assuming the construction speed is around 400,000 square meters per decade, than this target can be achieved around its sesquicentennial the year 2043.

Third, the ideal growth target is 60 square meters, which is the same level with world-renowned universities such as Harvard and MIT. Assuming the construction speed is still 400,000 square meters per decade, this target can be achieved around 2066.
1.3.3 Strategies and available sites for new development

Three Types of New Development

Generally, there are three types of new development on existing campus. The first type is “infill” growth. Usually a new building is built in the blank area between existing buildings. The second type is “metabolism” where an old building is demolished and replaced by a larger building. The third type is “cluster development” which means a new group of buildings are built simultaneously. This often requires a large available land area.

Proper FAR for Future Developments on W.H.U. campus

Proportional growth

This part of the thesis is to set up growth goals for the four disciplinary divisions proportionally. The four divisions are Engineering, Humanities and social sciences, Sciences, and Information Division.

Current enrollment of four divisions are 9 500, 16 500, 9 900, 10 000 respectively.

<table>
<thead>
<tr>
<th>Division</th>
<th>Enrollment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>9 500</td>
<td>20%</td>
</tr>
<tr>
<td>Humanities and social science</td>
<td>16 500</td>
<td>36%</td>
</tr>
<tr>
<td>Science</td>
<td>9 900</td>
<td>22%</td>
</tr>
<tr>
<td>Information</td>
<td>10 000</td>
<td>22%</td>
</tr>
</tbody>
</table>

Academic floor area of four divisions (square meters):

<table>
<thead>
<tr>
<th>Division</th>
<th>Area</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>169 069</td>
<td>28%</td>
</tr>
<tr>
<td>HASS</td>
<td>139 539</td>
<td>23%</td>
</tr>
<tr>
<td>Science</td>
<td>193 094</td>
<td>32%</td>
</tr>
<tr>
<td>Information</td>
<td>102 507</td>
<td>17%</td>
</tr>
</tbody>
</table>

As 750 000 square meters of 220,000 total construction during 2000-2010 was provided for Humanities and social sciences and the fundamental role of science disciplines, the suggested growth proportion is:

<table>
<thead>
<tr>
<th>Division</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>30%</td>
</tr>
<tr>
<td>HASS</td>
<td>16%</td>
</tr>
<tr>
<td>Science</td>
<td>36%</td>
</tr>
<tr>
<td>Information</td>
<td>18%</td>
</tr>
</tbody>
</table>
Figure 1.33
Growth Area Overlapping with Campus Map FAR=1

Figure 1.34
Growth Area Overlapping with Campus Map FAR=1.46
Current Average floor area per student (square meters) is:

- Engineering: 17.8
- HASS: 8.5
- Science: 19.2
- Information: 10.0

For Minimal growth of 408,000 square meters multiply by suggested proportion:

- Engineering: 122,000
- HASS: 65,000
- Science: 147,000
- Information: 73,000

For Medium growth of 1,228,000 square meters multiply by suggested proportion:

- Engineering: 368,000
- HASS: 196,000
- Science: 442,000
- Information: 221,000

For Ideal growth of 2,048,000 square meters multiply by suggested proportion:

- Engineering: 614 000
- HASS: 328 000
- Science: 737 000
- Information: 369 000

FAR determination

Considering approximately one third of the campus is hilly area and the campus core is national heritage site, it is suggested that the new development should have a higher FAR.

The current FAR of Engineering quadrangle is 1.46 (Figure 1.35). Figure 1.33 and figure 1.34 shows the required areas overlapping with the campus plan with FAR of 1.0 and 1.46 respectively. From the comparison of the two figures, it is obvious that FAR 1.46 is more practical than FAR 1.0.

Thus, the future development should have a FAR around 1.46.
Three Types of Sites for Future Development

Figure 1.36 shows the available, potential, and ideal sites for future growth. The orange area refers to the National Heritage site where new development is highly limited. The dark green areas, currently non-campus properties, are strategic purchase targets which can link the main campus with the medical campus. Meanwhile, these sites can be categorized into three types (Figure 1.37): immediately available sites, future available sites, and long range sites.
Figure 1.36
Available Sites for Campus Growth

Figure 1.37
Sites Capacity
Figure 1.38
The Top 100 World Universities (The Times Higher Education)
Wuhan University is not here
Top 20 Universities in mainland China

Wuhan University 2011 Ranking 7 (www.cuaa.net)

Figure 1.39
Top 20 Universities in mainland China
Figure 1.41: Google Earth Map

- East Lake
- MEDICAL SCHOOL
- INFORMATION ENGINEERING
- LUOJIA MOUNTAIN
- LION HILL
- SCIENCES
- SOCIAL SCIENCES
- HUMANITIES
- INFORMATION
Figure 1.42
Existing Campus Plan
Figure 1.44
Campus Boundary
Figure 1.45
Existing Open Space
Figure 1.49
Building Evaluation

- Heritage Buildings
- Good I
- Good II
- Medium I
- Medium II
- Uncontributing
Figure 1.50
Academic Building Condition
Figure 1.51
Building Age
Figure 1.52
Circulation Evaluation
Figure 1.53
Contour Lines
Figure 1.54
Building and Terrain
Figure 1.55
Building Use
Engineering
School of Civil Engineering
School of Electrical Engineering
School of Power and Mechanical Engineering
College of Water Resources and Hydro-electrical Engineering
School of Urban Design

School of Physics and Technology
College of Life Sciences
College of Chemistry and Molecular Sciences
School of Mathematics and Statistics

Information and CS
International Software School
School of Electronic Information
School of Computer Science
School of Geodesy and Geomatics
School of Remote Sensing and Information Engineering

Social sciences
Economics and Management School
School of Law
School of Political Science and Public Administration
College of Education Science
Department of sociology
College of WTO

School of Information Management
Performance Arts Department
College of Chinese Language and Literature
School of Foreign Languages and Literature
School of Philosophy
School of Journalism and Communication

Social sciences
Humanities

Figure 1.56
Discipline Distribution
Figure 1.57
Districts and Links

- **Primary districts**
- **Secondary districts: academic use**
- **Secondary districts: other use**
- **Linkages**
Figure 1.58
Color Map
<table>
<thead>
<tr>
<th>Mega-structure:</th>
<th>Symmetric:</th>
<th>Asymmetric:</th>
<th>Cluster:</th>
<th>Multi-courtyard building</th>
</tr>
</thead>
<tbody>
<tr>
<td>enclosing open space</td>
<td>“I” shape, part of</td>
<td>L, U, part of quadrangle</td>
<td>main, secondary buildings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>quadrangle</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Diagram of building types](image1)

<table>
<thead>
<tr>
<th>Rectangular</th>
<th>Slab:</th>
<th>U shape:</th>
<th>L shape:</th>
<th>Serpentine:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>parallel to others</td>
<td>enclosing open space</td>
<td>enclosing open space</td>
<td>enclosing open space</td>
</tr>
</tbody>
</table>

![Diagram of building types](image2)

**Figure 1.59**
Building Typology Study
<table>
<thead>
<tr>
<th>Multi-skylight building</th>
<th>Central courtyard building</th>
<th>Independent building: significant location</th>
<th>Irregular shape</th>
<th>High-rise building</th>
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</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mixed: courtyard + connecting</th>
<th>Serpentine: respond to terrain</th>
<th>Independent building</th>
<th>Mat-shape: occupying large lot</th>
<th>Irregular shape</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image6.png" alt="Image" /></td>
<td><img src="image7.png" alt="Image" /></td>
<td><img src="image8.png" alt="Image" /></td>
<td><img src="image9.png" alt="Image" /></td>
<td><img src="image10.png" alt="Image" /></td>
</tr>
</tbody>
</table>

107
Figure 1.60
Images
2. FROM MULTI-CENTERED CAMPUS TOWARD AN INTEGRATED CAMPUS
...There is not an easy answer to producing a high quality campus environment. Minimally, three things are required:
1. A vision
2. A plan
3. A process.
Michael Dennis
On Campus Design and Planning

The mission and values of higher education shared by most colleges and universities bind them to society and to each other. An institution’s mission, expressed in its mission statement, is the foundation to which that institution’s every decision and action should be held accountable. Upon this bedrock of institutional values, the entire edifice of educational and co-curricular programs, student life, faculty interaction, and community relations is built. The campus plan, architecture and landscape architecture facilitate the realization of fundamental values in all these areas.
Daniel R. Kenney Richard Dumont Ginger Kenney
Mission and Place
2.1 University Vision and Campus Plan

2.1.1 Vision and Plan

The motto of Wuhan University is: Improve Oneself, Promote Perseverance, Seek Truth and Make Innovations. The detailed institutional mission statement is not available, which is common among Chinese universities. As the university aims to build a world-class university, it is apparent that the university needs translate its mission statement into the physical environment through a good plan.

In the context of Wuhan University, there are two major functions that should be addressed in the campus plan. As aforementioned, the first function is to make sure the campus can provide adequate space for future development. In the third part of the first chapter, the thesis proposes three major steps that can facilitate the university to achieve this growth capacity.

This part of the thesis focuses on the other major function of the campus plan which is to connect the university’s mission to its physical manifestation. As mentioned in the evolution of the campus, four universities merged into the new Wuhan University in 2000. Through ten years of development, parts of former campus boundaries disappeared while there are still a number of barriers between different districts. In other words, the current campus is not well integrated spatially.

On a case by case basis, the thesis examines the DNA of the three divisions and proposes different concepts respectively. These concepts aim to facilitate the existing opportunities and enhance the local centers of the three divisions. At the overall campus scale, the thesis proposes several strategies to promote the entirety of the campus by integrating the open space system.

2.1.2 Redefining Land Use on Campus

Currently, one third of the land use on campus is dedicated to faculty residence. This is different from the situation on the U.S. campuses where few faculty members live on campus. Due to the scarcity of land resources on the Wuhan University campus, one way to provide more academic floor area is to transform faculty residences into academic use. It is worth noticing that most faculty apartments are in bad condition and a great number of faculty members already moved to off-campus apartments. Thus, it is reasonable and possible to gradually relocate faculty to off-campus residences.
Academic Dominant Area
Student Housing and Services
Sports and Athletic Fields
Non-university Property
For Academic Expansion
For Faculty Housing
On Campus Faculty Housing
Available Area for Academic Use

Current Land Use Designation

- Academic Dominant Area: 700,000 sm
- Student Housing and Services: 360,000 sm
- Sports and Athletic Fields: 260,000 sm
- Non-university Property: –
- On Campus Faculty Housing: 600,000 sm
- Available Area for Academic Use: 300,000 sm

Figure 2.1
Current Land Use
Academic Dominant Area
Student Housing and Services
Sports and Athletic Fields
Strategic Land Purchase
For Academic Expansion
For Faculty Housing
On Campus Faculty Housing

Proposed Land Use Designation

- Academic Dominant Area: 1,600,000 sm
- Student Housing and Services: 500,000 sm
- Sports and Athletic Fields: 260,000 sm
- Strategic Land Purchase: 360,000 sm
- On Campus Faculty Housing: 100,000 sm

Figure 2.2
Proposed Land Use
Figure 2.1 and figure 2.2 shows the current and proposed land use pattern respectively. The zone for student dormitories is more evenly distributed and closer to academic areas. The former student dormitory located on the east is changed into faculty residence as it is too far from accessing the rest of campus.

2.2 Localized Centers

2.2.1 Science Division

The Science Division has a significant location on campus. It is immediately adjacent to the main entrance thus presenting the first impression of the whole campus. It is located to the west of the old campus, which is a national heritage site that currently houses the humanities and social sciences departments. The west boundary marks the threshold between the campus and the city.

The Campus Street in the middle divides the Science Division into two parts. On the east part, several modern buildings are scattered randomly around Luojia Square. On the west part, the Computer Science complex and the Chemistry School are located in the zone with mostly barren land. As the CS complex is located on the north end and presents a dominant symmetrical façade, a new quadrangle is proposed to unify this part of the campus. The Science Quadrangle is enclosed by a group of new buildings. Meanwhile, four linkages provide pedestrian paths to its surrounding areas (Figure 2.3 and 2.4).

2.2.2 Engineering Division

The Engineering Division is located on the northern section of the campus. During the period of National Wuhan University, it was the site for the agriculture school. During the 1950s, former Wuhan College of Hydraulic and Electrical Engineering was founded here until it was merged with the new Wuhan University. To the north of the Engineering Division is the East Lake. The Lion Hill, where a group of national heritage buildings is located, defines the southern boundary of the division. The Institute of Hydrobiology, Chinese Academy of Science is located to the northwest of this division.

There are several established axes and a series of quadrangles in the current spatial configuration. The main open space is the Engineering Quadrangle which is enclosed by eight buildings. Another major open space is the Century Square, in front of the former agriculture school.
Figure 2.3
Science Division Existing Axes

Figure 2.4
Science Division Expansion Diagram
The concept of this proposal is to extend the axes and quadrangle system toward the west. As the east part of this division is well established, the future growth should take place on the west side where currently occupied by the faculty residence. Gradually, the faculty residences will be replaced by academic buildings except some red brick houses will be renovated into small offices. The Century Square is further enclosed by the introduction of new buildings. Several smaller scale quadrangles will grow in the east-west orientation. Two quadrangles are placed along the boundary of the Institute of Hydrobiology to enhance the interaction between the two institutes (Figure 2.5 and 2.6).

2.2.3 Information Division

The Information Division is located on the south side of the campus. It is the former campus of the Wuhan Technical University of Surveying and Mapping before year 2000. Bayi Road separates this division from the rest of the campus. A dynamic commercial street specializing in digital products marks the southern boundary of the division. Huazhong Normal University is located on the other side of the street.

A north-south axis dominates the spatial layout of this division; while the rest of the division is less related to this axis. The texture of the west part of the division is random, thus less legible. Currently, only a diagonal roadway links the Information Division to the main campus through the main entrance.

In order to strengthen the relationship with the main campus and enhance its spatial legibility, two ideas are introduced. The first idea is to extend the north-south axis northward in order to connect with the rest of the campus. The second idea is the introduction of a loop of green belt which functions as a ‘transportation corridor’ and provides linkage to other local spaces (Figure 2.7 and 2.8).

2.3 Campus plan concept

2.3.1 Four Pairs of Relationships

There are four pairs of relationships that are related to campus design and planning process (Figure 2.9). The first is the relationship between the campus and the city. Ideally there should be no barrier between the campus and the city; the circulation and the fabric of the campus should relate to its neighborhood. In this case, the campus has a long historical presence within
Figure 2.5
Engineering Division Existing DNA

Figure 2.6
Engineering Division Expansion Diagram
its surroundings. However, the surrounding is changing rapidly and some of the neighboring
development lacks quality. An elevated freeway was just built on the west side of the campus;
and high-rise buildings are emerging along the campus boundary. In other words, the
surroundings become less associated with the campus. Thus, the strategy for WHU campus is
to be more introspective and to act as role model by creating an influential presence through its
architectural quality within the neighborhood.

The second is the relationship between the different divisions. On the main campus, there
are four divisions: Humanities and Social sciences, Sciences, Engineering and Information
related sciences (Geo-sciences). According to the curriculum of the university, it is required
that students take courses in other divisions. Thus, the campus layout should emphasize the
relationship and connection of the divisions. Each division should have its own character while
being well connected.

The third one is the relationship between different disciplines. The layout of each division should
promote cross-disciplinary interaction. As said in Mission and Place:

A university’s new science quadrangle with its arcaded walkways that units the biology
and chemistry buildings may be an exciting space that speaks to the university’s vision of
the importance of the sciences in its curriculum. It may also spark more interdisciplinary
communication between these two departments, leading to more creative research and new,
leading-edge course offerings.\footnote{50}

The last one is the relationship between the human assets – the faculties, the students, and the
student communities. This requires a well-designed network of open spaces on campus as well
as abundant shared spaces in individual buildings.

\subsection*{2.3.2 Connection and Integration}

In this part, the thesis examines the strategies that can connect the aforementioned divisions. The
first strategy is to use open space as a medium to link different areas. As open spaces function
as gathering spaces, they can naturally invite people from one area to the adjacent area. For
example, a new open space is proposed between Information Division and Science Division in
order to link the Information campus to the rest of the main campus.

The second strategy is to use signature buildings to link two adjacent areas. These iconic

\footnote{50. Daniel R. Kenney, Ricardo Dumont and Ginger Kenney, \emph{Mission and Place: Strengthening Learning and Community through
Campus Design} (Westport,CT: Praeger Publishers, 2005), p.4.}
Figure 2.7
Information Division Existing Axis

Figure 2.8
Information Division Expansion Diagram
PAIRS OF RELATIONSHIPS

Figure 2.9
Four pairs of relationships
Figure 2.10
Connection and Integration Strategies

- primary linkage
- local / secondary linkage
- existing major open space
- proposed major open space
Figure 2.11
Underpass of Harvard University

Figure 2.12
Underpass Proposal for Wuhan University
buildings are usually located at significant locations. For example, a new student center with iconic appearance is proposed between the Engineering Division and the Science Division. It provides a variety of programs such as fitness center, dining hall, swimming pool, study room, and café. This complex will attract people from surrounding area, and thus function as a gigantic indoor socializing space (Figure 2.10).

2.3.3 Vehicular Underpass on Bayi Road

Bayi Road separates the Information Division from the rest of the campus. This case is highly similar to a Harvard campus situation. Cambridge Street used to go through the area between Harvard Yard and North Yard, which brought a number of problems in terms of safety and aesthetic. In 1966-1968, a 120-meter long vehicular underpass was built and a new green space was created on the ground above the underpass. This construction greatly improved safety and contributed the integration of the Harvard campus. Meanwhile, the later Science Center also responded to the open space above the underpass as its building mass steps from single-storey in the south to six stories in the north. The building mass is formed specifically to avoid the creation of an unpleasant six-story-high wall adjacent to the open space (Figure 2.11).

From this precedent at Harvard, it is apparent that a similar strategy of constructing a vehicular underpass along Bayi Road will benefit Wuhan University greatly. In addition, two lessons should be noted from the precedent; one being the dedication to open space on the ground above the underpass, while the other being the enclosure of the surrounding buildings to create a precinct. Since the scale and the site differ from that of the Harvard precedent, it is suggested that the underpass should be two hundred meters long, so as to provide more generous space to link the Information Division and the rest of the campus (Figure 2.12).

2.4 Vision and Long Range Plan
KEY
1 Engineering Division Expansion
2 Engineering Division
3 Student Center
4 Science Division Expansion (Science Quadrangle)
5 Humanities
6 Social Sciences
7 Sciences Division
8 Visitor Center/ Museum
9 Main Entrance
10 Square above underpass
11 Future Academic Expansion
12 Student Dormitories
13 Information Division Expansion
14 Research Park
15 Information Division
16 Student Dormitories

Figure 2.14: Long Range Plan
Figure 2.17
North-south Linkage
Figure 2.19
Building Massing and Terrain
Figure 2.20
Aerial view from southwest
Figure 2.24
Axes and Linkages
Figure 2.25
Pedestrian Circulation
Figure 2.26  
Vehicular Circulation
Figure 2.27
Campus Shuttle and Student Centers
Figure 2.30
Buildings to be demolished for Phase 2
Figure 2.32
Buildings to be demolished for Phase 3
Figure 2.34
Buildings to be demolished for Phase 4
Figure 2.36
Buildings to be demolished for Phase 5.
3. INTERACTIVE LEARNING COMMUNITY: SCIENCE QUADRANGLE DESIGN PROPOSAL
3 INTERACTIVE LEARNING & RESEARCH ENVIRONMENT : SCIENCE QUADRANGLE

3.1 Spatial Distribution of Disciplines

3.1.1 Disciplinary Distribution

Overall disciplinary distribution is usually the result of the evolution of campus history. Due to enrollment growth and campus expansion, the disciplinary distribution always changes. Some outdated disciplines disappear, while novel disciplines emerge. Oftentimes, similar disciplines will become closer to each other like a group of magnets.

Disciplinary distribution is related to the mission and culture of the university. The disciplines with higher reputation often occupy the core location of the campus; the expansion and development of certain disciplines demonstrates the new academic direction that the university attempts to promote.

Disciplinary distribution varies from campus to campus. At Yale University, there is a clear distribution pattern that is arranged on the basis of schools. In the north side of the campus, there are: Divinity School, School of Forestry & Environmental Studies, School of Management, School of Engineering & Applied Science; near the old campus, there are: Law School, School of Music, School of Drama, School of Architecture and School of Art; in the south campus, there are School of Public Health, School of Medicine and School of Nursing. This pattern of distribution is convenient for certain disciplines. For example, the engineering buildings and applied science buildings are close enough to encourage cross disciplinary interaction; School of Architecture and School of Art are immediately adjacent to one another which both schools can benefit from this proximity.

However, the campus of MIT presents a unique case especially compared with Yale, as all the buildings in MIT are interconnected. Ever since William Bosworth’s campus plan in 1916, the campus layout has adopted an indoor circulation system named Infinite Corridor, which consists of numerous enclosed corridors and bridges. There is no absolute boundary between departments and most departments are accessible through the system of the Infinite Corridor. For instance, although the architecture discipline is located around the west end of Infinite Corridor, people from civil engineering and urban planning disciplines have a great opportunity to see
what is going on there, because they have to walk through that area in order to access their own departments.

The campus of Tsinghua University further illustrates the observation that disciplinary distribution is a result of development over time. Originally a comprehensive university, Tsinghua was transformed to an engineering university to educate socialist engineers after People’s Republic of China was founded. Recently, the university is trying to recover its science and humanity disciplines for they are necessary components of a world-class university. The engineering related disciplines occupy both the core location with western classical style architectures and the main building area with Soviet-style architecture. At the end of the 1990s, a group of buildings dedicated to social sciences were erected in front of the main building. Meanwhile, several red brick buildings dedicated to science school are built to the northwest part of the core campus.

3.1.2 Disciplinary Distribution of Wuhan University

On the north side of the artistic gate of the campus, are written six Chinese characters which refer to six disciplines: literature, law, science, engineering, agriculture and medicine. Wuhan University was designated as a comprehensive university at its inception; later on it was transformed into a liberal arts university; recently, it has returned to the comprehensive status.

In the Kales plan of Wuhan University in 1929, there were already six disciplines. The liberal arts and law school were organized on top of Lion Hill to the west; the science and engineering schools were placed at the ends of the central athletic field; the medical school was located to the north of the science school, while the agriculture school was located to the northwest of the medical school. The medical school was not built and agriculture school was relocated closer to the north of Lion Hill. This disciplinary distribution was clear and performed well as the enrollment was fewer than 1,000 in the 1930s.

In recent decades, the university erected several buildings, such as the Chemistry, Physics and Biology schools in the west part, which has less hilly topography. These recent buildings are randomly scattered in the landscape and are remote from one another. This spatial layout fails to facilitate the cross-disciplinary communication.

Merging with the adjacent universities in year 2000, Wuhan University returned to the comprehensive university status. Meanwhile, the number of departments and enrollment both increased dramatically. In 2010, there are 36 departments in six divisions, and the total
enrollment is over 50,000. The problem of the current spatial distribution between disciplines is that the physical separation and the remoteness between one another—which cannot facilitate cross-disciplinary interaction. The solution is to introduce new development in the middle area between the divisions and create a more dynamic science division.

### 3.2 Cross Disciplinary Interaction: Sciences Quadrangle

#### 3.2.1 Cross-disciplinary Interaction

According to a 1988 report conducted by Sigma Xi– Scientific Research Society, cross-disciplinary research includes both interdisciplinary and multidisciplinary activity: “the former involves a team effort of experts from two or more allied fields working closely together on a project; the latter involves individual contributions from experts in separate disciplines.” The report also discussed that scientists have different views on the value of cross disciplinary interaction, such as whether new scientific progress takes place in the shared grounds of different disciplines or in the center of certain disciplines.

Apparently, cross-disciplinary interaction is an indispensible part of contemporary university culture and is gaining more and more momentum in recent years. Without cross-disciplinary interaction, the university will be only a collection of unrelated departments with individual agendas linked into respective professional networks. There are numerous activities that illustrate ongoing cross-disciplinary interaction worldwide. For examples, MIT recently dedicated a new building to its Koch Institute of Integrative Cancer Research, bringing engineers and biology scientists together to stimulate cutting edge research. Equal number of engineers and scientists participate in this institute, including people from following disciplines: biology, chemical engineering, materials science and engineering. By “bringing in individuals trained in very different disciplines, who essentially speak different languages”, this institute is able to promote an intriguing research culture because the engineers’ academic background is a complement to traditionally trained biologists.

#### 3.2.2 The Science Quadrangle of Wuhan University

*Site History*
The proposed Science Quadrangle is located in Yangjiawan area. Yangjiawan used to be a bay area in history. In the 1930s, when Wuhan University just moved to its current location, Yangjiawan was the closest neighboring community. This community existed before the university moved in, and most of the households were urban vagrants, vendors and craftsman. Restaurants, bathrooms, barbershops and even a bawdyhouse were concentrated along the street crossing. Before the 1950s, it was a vibrant area where students and professors often visited. This area also housed Young Men’s Christian Association and the student’s association. After the People’s Republic of China was founded, this area also underwent political transformation that was highly influenced by socialism. Most commercial activities disappeared and a new police office and local government official office was created. In the 1990s, Yangjiawan experienced a golden period as the increasing student body brought a great amount of commercial opportunity. Around year 2000, Yangjiawan neighborhood was relocated away from campus as a result of a cooperative effort between the university and the government. Currently, most of the land is vacant except the Chemistry building in the east and the brand new computer complex in the north.

**Location analysis**

The Yangjiawan site has a significant location. It is located immediately north to main entrance. To its east is the original campus, and to the west is the city. To the further north is the Engineering Division, and to the further south is the Information Division. From an urbanistic perspective, it is a connecting area which represents the potential to bring surrounding areas together.

**Critique of the historical plan of Yangjiawan**

The University organized a competition in 2002 for Yangjiawan area. The proposal of figure 3.1 won the first place. In the following years, this area remained unchanged and this proposal never materialized. Although this proposal was chosen as the first place winner, it had several short-comings and it has become outdated. First, the proposal overlooked its context and failed to integrate Yangjiawan area with the rest of campus. Second, the open space in this proposal is unclear and ambiguous; there is no center and no clear boundary. Third, the proposal has a wrong representation of the terrain. As the Computer Science Complex has been built in the north side of Yangjiawan area, the existing condition of this proposal did not exist anymore. Thus new design proposal should be made.
Design Proposal for the Science Quadrangle

Situated within the academic structure, this area is mainly dedicated to science disciplines. The buildings adjacent to Computer Science and the Chemistry complex are dedicated to interdisciplinary activities. These buildings, together with the two existing buildings enclose an open space, which is named the Science Quadrangle. Several paths are arranged in order to link the Quadrangle to the surrounding area. Since the Computer Science complex lacks architectural magnificence, a learning center is placed to the other end of the quadrangle. This Learning Center is intended as signature building, providing a variety of functions. The buildings in the south are dedicated to mixed use programs so as to be shared between the university and the city. Office buildings, campus visitor center, university museum and a theater will be housed in this part.
Figure 3.2
Location on Campus
Figure 3.3
Satellite Map
Figure 3.4
Site Plan for Science Quadrangle
Figure 3.5
Landscape Plan
Figure 3.6
Ground Floor Plan (colonnade)
Figure 3.9
Parking
Figure 3.11
Exploded Axon
Figure 3.12
Flexibility Research
Figure 3.13
Sections
East-west Section Facing South

North-south Section Facing East
The Colonnade
The Colonnade is intended to provide a place for students and professors to communicate formally or informally. The atmosphere of the Colonnade is dynamic, similar to the Infinite Corridor at MIT.
Figure 3.16
Perspective
The Lawn
(Towards C.S. Building)

The Lawn is intended to connect the surrounding buildings and provide a public space for the academic community.
The Lawn and the Learning Center

The proposed Learning Center provides a backdrop to the Lawn, with a façade like a giant billboard reflecting various academic activities inside.
The Amphitheater
The outdoor Amphitheater provides spaces for people to communicate with each other formally or informally.
The Colonnade
The Colonnade is a spatial device to unify the interior space and the open space.
Figure 3.16
Perspective
Linkage towards Campus Core
This open space corridor links the proposed Science Quadrangle to the core campus via a popular athletic field in the middle ground. The old Gymnasium is located in the center, a national heritage architecture functioning as a focal point.
Figure 3.16
Perspective
The Amphitheater

The outdoor Amphitheater takes the advantages of the topography, unifying the Chemistry Building on the left and the proposed Learning Center on the right. The stairs, ramps, trees, and other landscape elements create an extraordinary place for students and professors to communicate with one another.
3.3 From Library to Learning Center: An Interactive Learning Environment

Arguably, the library is the most important building typology on campus. Indeed, the university libraries are essential buildings that linking the academic communities together. According to Brian Edwards and Biddy Fisher, new technologies do not destroy the library, instead they liberate libraries into a public place, providing new public services and attracting new audience. They further argued that one significant aspect of the library is its social dimension, which serves as “a center of community interaction and a place to celebrate learning.” They also demonstrated that ‘learning recourse center’ is the future form of library:

The library has become a ‘learning recourse centre’. This new title helps signal the new emphasis upon all resources- electronic and book, upon learning (not just reading) and upon the concept of ‘center’ as against building.

In the case of Wuhan University, the Old Library locates on the hilltop, is widely regarded as the most important and beautiful building on campus. The university seal is a simplified version of its south elevation. Meanwhile, the new library that was constructed in the 1980s just underwent an expansion this year. Currently, the university has four libraries. These libraries received little influence by the new technology in terms of spatial layout. In other words, they lack spaces that can promote communal interaction and dynamic atmosphere.

The Science Quadrangle provides an opportunity to experiment with the idea of the Learning Center. The purpose of this building is to provide a focal point for the Quadrangle that will facilitate a dynamic learning environment, and a place that provides a variety of programs, including meeting room, group study space, reading room, computer cluster, café, fitness room, lounge, etc. More importantly, it has a magnificent atrium in the center which is a modern version of the big hall in the Old Library. This atrium not only functions as the gateway to Science Quadrangle, but also acts gathering space for all kinds of events, similar to the multifunctional Lobby Seven in the MIT campus.
4. CONCLUSION: THE CHINESE CAMPUS
Conclusion

The current enthusiasm to upgrade the academic reputation of Chinese universities has sponsored numerous on-campus developments. However, the impact of the campus environment on academic performance has not yet been fully realized by the leading universities in China. The leading universities are often unaware and unmindful of the importance of good campus planning and its association and contribution to academic performance.

The analysis of the Chinese campus history illustrates that it has been influenced by many factors. Chinese campus planning received a direct influence by the U.S. campus at its inception, and later on by the Soviet Union campus. Meanwhile, compared with its western counterparts, the Chinese campus is still in an early phase of evolution. On one hand, the Chinese campus lacks academic space required by current academic activities. On the other hand, open space and landscape is often neglected in current campus practice.

The campus of Wuhan University provides a promising case study because its evolution is a direct reflection of Chinese campus history. Through a systematic campus planning, the thesis provides guidance for the future growth of the university. Moreover, the proposed open space network improves the open space system and strengthens the integration of the whole campus.

The design proposal of Science Quadrangle creates an interactive academic environment for the scientific disciplines of Wuhan University. The colonnade, the lawn, the amphitheater, and the outdoor decks form a platform that will house a variety of social activities. These open spaces in combination with flexible indoor spaces create an interactive learning and research environment.

Due to the scope of this thesis, future research is needed to further reveal the relationship between the physical environment campus and academic performance. Moreover, the Chinese campus faces a rapidly-changing environment, which presents both opportunities and challenges. As the American campus gained its own character based on the fundamental belief of its political ideology and evolved from the models originated from Europe, it is reasonable to argue that the campus practice in China should also incubate its own identity by incorporating Chinese culture.
Appendix I

Columbia 100×160M

Cornell 300×120M

Columbia 60×200M

UCLA 100×200M

Harvard North Yard 90×130M

UCLA 200×130M

Harvard Old Yard 200×70M / 100×100M

Princeton 90×90M

MIT Kllian Court 100×160M

Brown 70×140M
Appendix I

Main Open Space of World Campuses
Appendix I

Yale 250×100M

Cambridge 80×80M

Michigan 110×170M

Cambridge 90×130M

Tsinghua 150×220M

Cambridge 70×170 M

Tsinghua 70×170 M

Oxford 60×110M

Peking 70×80M

Oxford 60×110M

Peking 160×60M
Appendix I

Main Open Space of World Campuses

WHU: Engineering 70×110M / 80×160M

WHU: Core 130×200M

WHU: Core 160×270M

WHU: Geo 140×160M
<table>
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<th>Historical Photography</th>
<th>Current Image</th>
<th>Plan</th>
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<td>The Students’ Dormitories</td>
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<td>The Students’ Dining Hall and Club</td>
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<td>The Gymnasium</td>
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<td>The June 1st Memorial Kiosk</td>
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<td>Li Da’s Former Residence</td>
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<td>No. of Buildings</td>
<td>Floorage S.M.</td>
<td>Original Use</td>
<td>Current Function</td>
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<td>2727</td>
<td>Dining/Club</td>
<td>Dining/Theatre</td>
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<td>Gymnasium</td>
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<td>58</td>
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<td>Young Faculty Dormitory</td>
<td>Administration</td>
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<td>1952</td>
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<td>168</td>
<td>President's Residence</td>
<td>Administration/Museum</td>
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</tbody>
</table>
Appendix III

Wuhan University (Existing)
Plan of TAMU
(Michael Dennis & Associates)
LIST OF FIGURES AND ILLUSTRATION CREDITS

CHAPTER 1


Figure 1.2 Moscow State University campus core. Redrawn by Kui Xue. Original plan: Kerstin Hoeger and Kees Christiannase, eds., Campus and the City- Urban Design for the Knowledge Society (Zurich:gta Verlag, 2007) p. 213

Figure 1.3 Eastern campus of Tsinghua University. Drawn by Kui Xue.

Figure 1.4 The Lawn of UVA. http://www.nedgallagher.com/journal/archives/001806.html

Figure 1.5 Old campus of Tsinghua University. Google Earth Image.

Figure 1.6 Timeline of Wuhan University. Drawn by Kui Xue.

Figure 1.7 Panorama of Wuhan University from Southwest. Top image: http://sub.whu.edu.cn/xcb/wdjg/index.html. Bottom image: Google Earth Image.

Figure 1.8 Campus Statistics. Drawn by Kui Xue.

Figure 1.9 Campus Districts. Drawn by Kui Xue.

Figure 1.10 University Development 2000-2010. Drawn by Kui Xue, data from: http://office.whu.edu.cn/news/otype.asp?owen1=统计信息&owen2=学校基本数据

Figure 1.11 Campus Evolution 1893-2011. Drawn by Kui Xue.

Figure 1.12 F.H. Kales Plan 1929 (early version). Li Xiaohong and Chen Xieqiang, The Early Architecture of Wuhan University; (Wuhan: Hubei Fine Arts Press, 2006), p.104.

Figure 1.13 F.H. Kales Plan 1929 (developed). Wuhan University Archive.

Figure 1.14 Campus Map of 1935. Wuhan University Archive.

Figure 1.15 The 1929 Plan Overlapping with Google Earth image of 2011. Drawn by Kui Xue.

Figure 1.16 Detailed Plan of Campus Core (F. H. Kales). Li Chuanyi, "The Plan and Architecture of Early Wuhan University Campus," Huazhong Architecture, CSADI: Wuhan, Vol. 1987(2), p70.

Figure 1.17 Aerial view of campus core. Drawn by Kui Xue.

Figure 1.18 Aerial View of Lion Hill Buildings (front: dormitories, left: Law School, center: Library, right: Literature School). http://sub.whu.edu.cn/xcb/wdjg/index.html

Figure 1.19 Section of Lion Hill (Library and dormitory).

**Figure 1.20 View of Library through the middle Arch Gate.** Google Earth Image.

**Figure 1.21 Buildings with Terrain.** Drawn by Kui Xue

**Figure 1.22 Science School group (looking from Engineering School).** Google Earth Image.

**Figure 1.23 Engineering School (looking from the athletic field).** Google Earth Image.

**Figure 1.24 Exploded Axonometric (orange lines show circulation, green area shows open space of hilltop).** Drawn by Kui Xue

**Figure 1.25 The 2006 Campus Plan.** From Fundamental construction office of Wuhan University.

**Table 1.1 Comparison of Wuhan University with 5 U.S. and 5 Chinese universities.** Drawn by Kui Xue. Data collected from respective university websites.

**Figure 1.26 Massachusetts Institute of Technology.** Adapted and redrawn by Kui Xue. Photography: http://en.wikipedia.org/wiki/Massachusetts_Institute_of_Technology

**Figure 1.27 Tsinghua University.** Adapted and redrawn by Kui Xue. http://en.wikipedia.org/wiki/Tsinghua_University

**Figure 1.28 Harvard University.** Adapted and redrawn by Kui Xue.

**Figure 1.29 Nanjing University.** Adapted and redrawn by Kui Xue. http://en.wikipedia.org/wiki/Nanjing_University

**Figure 1.30 University of Michigan at Ann Arbor.** Adapted and redrawn by Kui Xue.

**Figure 1.31 Huazhong University of Science and Technology.** Adapted and redrawn by Kui Xue.

**Table 1.2 Comparison of 40 world universities.** Drawn by Kui Xue.
Data from: http://www.asg-architects.com/2007/07/08/comparing-campuses/

**Figure 1.32 Timeline of Campus Growth of Wuhan University.** Drawn by Kui Xue

**Figure 1.33 Growth Area Overlapping with Campus Map FAR=1.** Drawn by Kui Xue

**Figure 1.34 Growth Area Overlapping with Campus Map FAR=1.46.** Drawn by Kui Xue

**Figure 1.35 Core Part of Engineering Division of Wuhan University.** Drawn by Kui Xue

**Figure 1.36 Available Sites for Campus Growth.** Drawn by Kui Xue

**Figure 1.37 Sites Capacity.** Drawn by Kui Xue

**Figure 1.38 Top 100 World Universities.** Drawn by Kui Xue.
Data from http://www.timeshighereducation.co.uk/world-university-rankings/2010-2011/reputation-rankings.html

**Figure 1.39 Top 20 Universities in mainland China.** Drawn by Kui Xue. Data: www.cuaa.net

**Figure 1.40 Wuhan City and Wuhan University.** Drawn by Kui Xue

**Figure 1.41 Google Earth Map.** Adapted from Google Earth Image.
Figure 1.42 Existing Campus Plan. Drawn by Kui Xue
Figure 1.43 Campus Surrounding. Drawn by Kui Xue
Figure 1.44 Campus Boundary. Drawn by Kui Xue
Figure 1.45 Existing Open Space. Drawn by Kui Xue
Figure 1.46 Existing Open Space. Drawn by Kui Xue
Figure 1.47 Landscape Evaluation. Drawn by Kui Xue
Figure 1.48 Figure-ground. Drawn by Kui Xue
Figure 1.49 Building Evaluation. Drawn by Kui Xue
Figure 1.50 Academic Building Condition. Drawn by Kui Xue
Figure 1.51 Building Age. Drawn by Kui Xue
Figure 1.52 Circulation Evaluation. Drawn by Kui Xue
Figure 1.53 Contour Lines. Drawn by Kui Xue
Figure 1.54 Building and Terrain. Drawn by Kui Xue
Figure 1.55 Building Use. Drawn by Kui Xue
Figure 1.56 Discipline Distribution. Drawn by Kui Xue
Figure 1.57 Districts and Links. Drawn by Kui Xue
Figure 1.58 Color Map. Drawn by Kui Xue
Figure 1.59 Building typology study. Drawn by Kui Xue
Figure 1.60 Images. Photos taken by Kui Xue

CHAPTER 2

Figure 2.1 Current Land Use. Drawn by Kui Xue
Figure 2.2 Proposed Land Use. Drawn by Kui Xue
Figure 2.3 Science Division Existing Axes. Drawn by Kui Xue
Figure 2.4 Science Division Expansion Diagram. Drawn by Kui Xue
Figure 2.5 Engineering Division Existing DNA. Drawn by Kui Xue
Figure 2.6 Engineering Division Expansion Diagram. Drawn by Kui Xue
Figure 2.7 Information Division Existing Axis. Drawn by Kui Xue
Figure 2.8 Information Division Expansion Diagram. Drawn by Kui Xue
Figure 2.9 Four pairs of relations. Drawn by Kui Xue
Figure 2.10 Connection and Integration Strategies. Drawn by Kui Xue
Figure 2.11 Harvard University. Adapted and redrawn by Kui Xue
Figure 2.12 Underpass Proposal for Wuhan University. Drawn by Kui Xue
Figure 2.13 Existing Condition. Drawn by Kui Xue
Figure 2.14 Long Range Plan. Drawn by Kui Xue
Figure 2.15 Major Open Space. Drawn by Kui Xue
Figure 2.16 Landscape Plan. Drawn by Kui Xue
Figure 2.17 North-south Linkage. Drawn by Kui Xue
Figure 2.18 East-west Linkage. Drawn by Kui Xue
Figure 2.19 Building Massing and Terrain. Drawn by Kui Xue
Figure 2.20 Aerial view from southwest. Drawn by Kui Xue
Figure 2.21 Exploded Axon. Drawn by Kui Xue
Figure 2.22 Open Space. Drawn by Kui Xue
Figure 2.23 Figure-ground. Drawn by Kui Xue
Figure 2.24 Axes and Linkages. Drawn by Kui Xue
Figure 2.25 Pedestrian Circulation. Drawn by Kui Xue
Figure 2.26 Vehicular Circulation. Drawn by Kui Xue
Figure 2.27 Campus Shuttle and Student Centers. Drawn by Kui Xue
Figure 2.28 Buildings to be demolished for Phase 1. Drawn by Kui Xue
Figure 2.29 Phase 1. Drawn by Kui Xue
Figure 2.30 Buildings to be demolished for Phase 2. Drawn by Kui Xue
Figure 2.31 Phase 2. Drawn by Kui Xue
Figure 2.32 Buildings to be demolished for Phase 3. Drawn by Kui Xue
Figure 2.33 Phase 3. Drawn by Kui Xue
Figure 2.34 Buildings to be demolished for Phase 4. Drawn by Kui Xue
Figure 2.35 Phase 4. Drawn by Kui Xue
Figure 2.36 Buildings to be demolished for Phase 5. Drawn by Kui Xue
Figure 2.37 Phase 5. Drawn by Kui Xue

CHAPTER 3


Figure 3.2 Location on Campus. Adapted by Kui Xue. Google Earth Image.

Figure 3.3 Satellite Map. Google Earth Image.

Figure 3.4 Site Plan for Science Quadrangle. Drawn by Kui Xue

Figure 3.5 Landscape Plan. Drawn by Kui Xue

Figure 3.6 Ground Floor Plan (colonnade). Drawn by Kui Xue

Figure 3.7 Axes and Linkages. Drawn by Kui Xue

Figure 3.8 Disciplinary Distribution. Drawn by Kui Xue

Figure 3.9 Parking. Drawn by Kui Xue
Appendices

Appendix I: Adapted and drawn by Kui Xue. Images from Google Earth.


BIBLIOGRAPHY

Campus World-wide:


Hoeger, Kerstin, and Kees Christiannase, eds.. *Campus and the City- Urban Design for the Knowledge Society.* Zurich:gta Verlag, 2007.


American Campus:


Chinese Campus:

Cody, Jeffrey W. *Building in China: Henry K. Murphy's “adaptive architecture,”*


**University and Education:**


**University Library:**


**Others:**


**Campus Guide:**

Press, 1999


**Journals and Archives**


MIT. *1907 Massachusetts Institute of Technology Yearbook*. Cambridge, Mass.: Massachusetts Institute of Technology, 1907.

MIT Archive. *Chinese Student Alumni 1930*.


**Websites:**

http://en.wikipedia.org/wiki/

http://en.wikipedia.org/wiki/Higher_education_in_China#mw-head#mw-head


http://sub.whu.edu.cn/xcb/wdjg/index.html


http://www.douban.com/group/topic/8490222/

http://www.jllib.cn/njmgjz.cn/lymy/b163

http://www.merriam-webster.com/dictionary/campus


http://www.timeshighereducation.co.uk/world-university-rankings/2010-2011/reputation-rankings.html

http://www.timeshighereducation.co.uk/world-university-rankings/2010-2011/analysis-usa-top-universities.html

http://www.whu.edu.cn/xlwz/yxsz.php

http://www.whu.edu.cn/xxgk/blxs.html