

Inheritance and Development of Architectural Heritage: A Case Study of China's First Architectural History and Theory Ph.D

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Abstract: *Every field of study needs an academic flag and benchmark that enables future academics to build upon and progress in the field. This paper is a case study of Dr. Wu Qingzhou, a Chinese scholar who obtained the first Ph.D. in architectural history and theory field in his home country rather than in the Western world. The study aims to investigate the contribution, significance, and legacy of Wu's Ph.D. in the field of architectural history and theory, elucidate the influence of his formative years in architectural education, the evolution of mentorship between Wu and his supervisors, and his development and advancement of mentor's ideals. The research follows a qualitative method and utilizes approaches including literature review, case study, interview, content analysis, and historical approach. The conclusion reveals the significance of cross-disciplinary disciplines as a crucial source of scientific innovation. It enlightens the necessity for each academic period to be interconnected in order to maintain coherence in scientific research and integrate the extensive hands-on actions and past generations.*

Keywords: Wu Qingzhou, Long Qingzhong, Architectural heritage, Inheritance and Development

1. Introduction

1.1 Background

In accordance with the United Nations' Sustainable Development Goals 2, 6, 11, 12, 14, 15, and 16, we should make cities, human settlements, water and sanitation systems, infrastructure, agriculture production, terrestrial ecosystems, and inclusive societies sustainable. The continuity between the past and future should be integrated into management systems and ensure that the evolution of the local value of the place is not impaired (UNESCO, 2003; United Nations, 2017). In the process of the swift urbanization of Chinese society, city construction activities surge. Traditional architectural cultural values have been greatly damaged due to the decision-makers' lack of professional knowledge and disregard for these values, as well as their uncritical admiration for Western architectural culture. Several historically and culturally significant cities, originally capable of applying for world cultural heritage status, have missed out on this exceptional chance due to extensive demolition and construction activities in their city centers (Wu, 2003). Therefore, it is imperative that we identify solutions to address these issues. The World Heritage Committee has officially proclaimed heritage as a means to achieve sustainable development for all societies. (UNESCO, 2002). Since the 20th century, Itō Chūta,

a Japanese architectural historian; Ernst Boerschmann, a German architect; Osvald Sirén, a Swedish art historian; and Le Jiazao, a Chinese scholar, undertook studies on the history of architecture in China earlier (Boerschmann, 1911; Itō, 1901; Le, 1933; Sirén, 1924). Over time, an increasing number of Chinese architectural historians have become engaged in research in this topic. Among the most renowned of these historians are Liang Sicheng (Liang), Liu Dunzhen (Liu), Long Qingzhong (Long), Wu Qingzhou (Wu) (Fairbank, 1994; Liang, 1945, 2005; Zhang, 2010).

1.2 Research objectives

The topic of Wu is a fascinating subject for meticulous historical investigation and scholarly inquiry. Wu's case is highly exceptional and warrants thorough investigation. As early as 1915, the Government of the Republic of China already issued "Outline of Special Education", which mandated the inclusion of a doctoral degree as one of the three primary types of degrees to be awarded (Lin, 2014). However, the real establishment of PhD programs was delayed until the conclusion of the Cultural Revolution, as a result of the Anti-Japanese War, the Anti-Rightist Movement, and the Cultural Revolution itself. The initial doctoral degree awarded in China across all fields was obtained by physicist Ma Zhongqi, who completed his PhD in 1982 (Lv, 2020). While in the field of architectural history and theory, Wu' is the first Ph.D. Ma and Wu, who were both 38 years old at the time of their enrollment, serve as a common characteristic of the initial Chinese Ph.D. recipients, which was their old age. In 1983, during his initial year of enrollment, Wu attended the National Architecture Academic Conference in Yangzhou. Surprisingly, he was the youngest delegate to the conference. In the meeting, Wu's conference paper was recognized as one of the two outstanding papers of the meeting. The other one was authored by Wu Liangyong, the vice President of the International Union of Architects (Wu, 2001). Wu, as the first doctoral student in the field of Chinese architectural history and theory to be trained in China, received the best teacher resource from the government, namely Long, who was 80. During that period, Long was the sole qualified doctoral supervisor for the field of architectural history and theory in the whole of China. As a result of the impact of the Cultural Revolution, Wu's academic pursuits were forcibly halted for a period exceeding ten years. However, he ultimately triumphed over this difficult experience and attained remarkable intellectual accomplishments. Thus, Wu serves as the flag and benchmark for the upgrading stage in the realm of Chinese architectural history, and the study of his scholarly accomplishments and experiences holds three significant significances. First, comprehensively examine Wu's current scholarly accomplishments in the realm of architectural history, to accurately comprehend, preserve, and advance his research in the architectural history domain. Second, to study Wu's academic experience and the origin and development of his research paradigm in order to provide samples and ideas for young scholars in the field of architectural history and related fields, as well as to provide a way out for scholars who have encountered difficulties in their academic careers (Figure 1) .



Figure 1: Wu in front of Statue of Laozi at Laojun Rock, Qingyuan Mountain in 2022
 Source: Wu

Therefore, the research aim of this study is: to investigate the contribution, significance, and legacy of Wu's pioneering Ph.D. in the field of architectural history. Additionally, we aim to elucidate his development and advancement of his mentor's ideals and evaluate the impact he had on the architectural history sector. To enable achievement, the aim is broken down into the following three research objectives:

- i. To examine Wu's pioneering contribution as the inaugural self-developed Ph.D. in the discipline
- ii. To articulate the influence of Wu's formative years in his architectural education and the evolution of mentorship between him and his supervisors.
- iii. To analyze Wu's specific development and advancement of mentor's scholastic theories.

2. Research Method

2.1 Methods and Materials

The truthfulness or reality that exists in the world can be subjectively measured, and the selection of a research methodology should be aligned with RO (Abdulai & Owusu-Ansah, 2014). This study can only be understood in context-specific settings. Thus, qualitative methodology is employed, including case studies, literature research, interviews, and content analysis, historical methods. Correspondingly, the research materials in this study consist of cameras, voice recording pens, books and pens, computers, projectors, drawing tools, tape and leather measures, tape and leather measures, and a range of original archival materials, as well as software including Auto CAD, Photoshop, NVivo, Endnote as well as Endnote, and varieties of original archival materials as below (Table 1):

Table 1: Research Materials

Author	Materials types: content description
Sun Yat-sen	Records of speech and conversation: Highlight the significance of university
	Orders: Establish the National Guangdong University, Appointed the director of the Preparatory Committee, later reappointed the chancellor
	School Motto: National Guangdong University school motto
	Documents: Establish the University Ordinance
	Orders and Letters: Negotiated with the foreign powers to partly return boxer Indemnities, ordered military personnel to donate money, requested them to give up their houses for school dormitories, informed KMT party, the Govt, and military stuff to provide corresponding support, set up a variety of taxes to funding the university
	Records of speech and conversation: Reasons for selecting Shipai as the new campus, study skills, strategy to save China
	Letters, records of speech and conversation: Emphasize education is the key to establishing and developing country in variety of letters including a petition to Qing Government and many speeches in all kinds of situations
	Ordinance: Order the minister of education to establish normal schools to cultivate teachers swiftly
	Articles, books: The strategy to establish and develop China internationally, etc. domestic and international policy, etc
	Probates: Establish and reunite country strategy and international relationships, etc
KMT government	Official Letters and Decisions: renaming the National Guangdong University as the Shipai National Sun Yat-sen University (SpNSYSU), Approving the English Name of Sun Yat-sen University, changing the name of National Sun Yat-sen University to First Sun Yat-sen University, Restoration of the Name of National Sun Yat-sen University by the First National Sun Yat-sen University, Approving the English Name of Sun Yat-sen University
Zou Lu	Articles, books: Records on the siting and construction of the SP NSYSU campus, etc
SpNSYSU	Yearbook, archive compilation, charts, primitive photos, and other canonical materials: Record documents on SpNSYSU campus construction
SYSU, GDASS, CASS	Books: All Sun Yat-sen's works, e.g., letters, orders, speeches, articles, documents, etc. Include those written by Sun or credible records by others. Note: contributors: Research Institute of Sun Yat-sen, Sun Yat-sen University; Research Institute of History, Guangdong Academy of Social Sciences (GDASS); Research Institute of History of the Republic of China, Chinese Academy of Social Sciences (CASS)
Recognized expert in Sun Yat-sen studies	Books, articles: Eg., Harold Zvi-Schifferin, Marie-Claire Bergère, Yi Hanwen (curator of Sun Yat-sen University archive), Xia Jian Zhi Shu (Pinyin, President of the Sun Yat-sen Study Association of Japan)
SYSU LingnanU TwNSYSU	Books, archive compilations, charts, primitive photos, articles, and other canonical materials: <u>Their respective university names evolution process, other related university records, etc.</u> Authority historical documents, yearbooks, archive compilation, charts, primitive photos, acts, ancient books, articles: A systematic review of the decrees and regulations governing the gradual evolution of school names from the late Qing Dynasty to the present day, from Shuyuan, Xuetang, Xuexiao to universities. Eg., the Charter of the Jing Shi Da Xuetang (predecessors of Beijing University)

2.2 Data Collection

This study integrates data obtained from both desktop research and empirical data. It is derived from both secondary sources and primary sources.

i. Case study

This study adopted the qualitative approach suggested by Yin (2014), employing the case study as a method of inquiry. As previously stated, this study picked Wu as the subject of investigation in recognition of his uniqueness.

ii. Literature research

The literature review follows the unique “Literature Review Synthesis Process” (Ibrahim & Mustafa, 2018) in (Masiran et al., 2020). The syntheses systematically identify where research findings are clear and where they aren't, and establishing the conclusions science supports (Rousseau et al., 2008; Templier & Paré, 2015; Xiao & Watson, 2019). For the literature inclusion criterion, we only considered papers written in English and Chinese. Additionally, we only chose studies that were highly relevant to the theme "Wu Qingzhou" for reporting. We deemed both English and Chinese journal articles and books published by reputable publishers, written by noted scholars, or well-cited as high-quality research for our review. Given the study case being in China, publications sourced from journals indexed by the official Chinese science database CNKI are utilized. However, only publications that have been indexed by reputable Chinese databases CSSCI (Chinese Social Sciences Citation Index) and PKU Core (Peking University “A Guide to the Core Journals of China”) are chosen among the papers available on CNKI. For English articles, we exclusively chose that were indexed by WOS Core Collection and Scopus. We searched WOS, Scopus, and CNKI by using the keywords “Wu Qingzhou”, “Long Qingzhong” “architectural heritage”, and “Inheritance and Development”. Additionally, we replaced these keywords with their respective synonyms in order to broaden our study scope. The preliminary relevancy of each article was judged based on its title. After title searches, filtering out and identified related research papers. The abstracts were reviewed and assigned according to the best relevant smaller sub-themes. The distribution into the smaller sub-themes was based on their existential importance since the study notes that new, but critical, emerging theme may have lesser literature articles.

iii. Historical methods

As the study highly relates to history and culture, all the reliable sources of information of Long and the great picture of Chinese architectural history need to be fully understood. Thus, one of the authors gathered first-hand documents regarding ancient Chinese architectural history and related to Wu, Long, and Liang from the School of Architecture, SCUT archives and libraries, Guangdong Provincial Sun Yat-sen Library. A plethora of primary source materials, such as manuscripts, sketches, records, letters, articles, books, and more.

iv. In-depth Interview

Kvale (1996) identified seven distinct stages in the in-depth interview process. The first three stages involve data gathering, namely thematizing, designing, and interviewing. The last four stages are dedicated to analysis and drawing conclusions. The study followed a semi-structured interview approach, with the interview topics aligning with the three aforementioned ROs. Over one and half years, starting from June 2022, one of the authors conducted individual semi-structured interviews with Wu to examine their perspectives on the aforementioned topics 2 times in his residence. During the initial interview, Wu's wife was present and participated to assist Wu in recollecting his experiences during his formative years in architectural education and the development of mentorship between Wu and Long. Prior to the interviews, Wu was furnished with the interview questions, duly apprised, and explicitly agreed that their viewpoints would be made public. Wu responded to the questions based on his best knowledge and experience. Each interview had a duration of around 1 hour, contingent upon Wu's completion of answering all questions to the best of his comprehension.

2.3 Data Analysis and Processing

The data analysis method used in this study was the thematic analysis method suggested by Braun and Clarke (2006). Through this approach, the investigators have understood and

mastered the data collected, created codes, found, and developed themes, and finally led to writing a report of the research findings.

i. Case study.

The analysis of Wu's case study surrounds three perspectives: his scholarly achievement and impact to the sector, the progression of his mentorship with Long, and the inheritance and upgrading of the mentor's academic philosophy.

ii. Literature research.

As mentioned above, the abstracts of the searched articles were reviewed. The top reviews that can potentially solve the main study's problem were selected for the literature synthesis review process. The analysis and processing of literature is that a synthesized summary for each main theme is produced, looking into cross-analysis, integration of possibilities, and prioritization of the synthesized summaries of highly probable solutions for the ROs. The analytical method can also be described as a process of screening, integrating, de-emphasizing, combining, and simplifying the obtained data in order to create a literature tree that aligns with the study objectives and finally fulfills the research aim.

iii. Historical methods

We conducted an examination of the flood prevention characteristics of historic Chinese capitals from different dynasties in China by analyzing their respective mappings and local chronicles, with a particular focus on the Forbidden City of the Qing Dynasty. We specifically analyzed the design features that make it highly effective in managing and preventing floods. Furthermore, we conducted an inquiry into the profiles and scholastic accomplishments of renowned researchers both domestically and internationally architecture historian who have focused on the study of Chinese architectural history since 19 century. Specifically, we have conducted a comprehensive examination of the articles, books, and scholarly contributions authored by Long and Liang.

iv. In-depth Interview

Carefully analyze the content of the interviews, honestly and accurately annotate the necessary texts to the interviewee's simplified and incomplete expressions by Wu's real meanings. Add brackets to the annotated text to distinguish it from the original text. Delete unsure viewpoints, remove duplicate content, integrate and refine core content, and sort out Wu's viewpoints point by point. The sorted information was further integrated into three main themes according to ROs, and divided themes into subthemes if need to further clarity.

v. Qualitative content analysis.

As above, the data sources are mainly non-digitized materials such as text, maps, and photos, sound records. Thus, qualitative content analysis approaches are adopted. The data analysis procedure comprises four stages:

- a) Data preparation: organizing documents and data, transcribing text.
- b) Data exploration: reading the data, writing memos, developing a qualitative codebook.
- c) Analyzing the information: coding the data, assessing labels for coding, grouping the codes into themes, abstracting into a smaller set of themes.
- d) Data presentation: presenting the findings in discussions of themes, presenting the tables and figures, providing results in table form.

3. Finding and Discussions

3.1 Fundamental Contribution of Wu as the First Self-cultivated Ph.D. in the field

Wu argues that China's ancient cities were threatened by two major types of calamities during their development. The first category is man-made calamities such as wars, and the second category is natural disasters such as floods. Wu's doctoral dissertation focuses on the study of flood control in ancient Chinese cities, which fills a gap in the history of Chinese science and technology, i.e., it opens up a new field of research in the history of architectural flood control technology as well as in the history of urban development, which is the fundamental academic contribution of his doctoral research. The author summarizes the main points of his research as follows:

3.1.1 Research Question and Arguments of Wu's PhD

The research question at hand Wu's doctoral dissertation describes how ancient Chinese cities were flood-proofed. In order to elucidate this complex inquiry, he deconstructed it into three subordinate inquiries to bolster his thesis. First, how did flood control develop and evolve in ancient Chinese cities? Based on the progression of flood management in ancient Chinese cities, Wu argued that Chinese ancient cities are classified into four distinct developmental stages depending on their level of development status: 1) The late Neolithic era to the Xia and Shang dynasties (approximately 25 to 11 centuries BC); 2) Western Zhou dynasty to the Spring and Autumn period and the Warring States period (11 centuries BC to 221 BC); 3) Qin and Han dynasties to the Five Dynasties (221 BC to 960 AD); 4) Song, Yuan, Ming, and Qing dynasties (960 AD to 1840 AD). Secondly, what are the precise tactics and measures employed for flood prevention? In accordance with Wu's thesis, the author provides a concise overview of flood management measures, which include blocking, channeling, saving, elevating the ground, fortifying buildings, shifting the river, moving the city, and temporarily relocating people and property. For the aforementioned tactics, specific measures are sorted out, which include land consolidation, urban planning, architectural design, wall flood control technology and management, flood control facilities, rescue and relief, and post-disaster management measures. Thirdly, what are the many categories of urban landforms in China, and how can the aforementioned strategies and specialized measures be implemented based on the different urban landforms? He classified Chinese cities into five distinct categories based on their geomorphological characteristics: plains, water towns, lakes, coastal estuaries, and mountainous riverside cities. Wu asserts that the strategies and measures mentioned above can only be effective if they are adapted to the local conditions. As to how to adapt to local conditions, it is necessary to apply the aforementioned strategies and specific measures according to the characteristics of different urban landscapes. He conducted a comparative study and argumentation on the flood control design of the capital cities, which represent the highest level of planning and design of each dynasty, and the case study cities are five typical ancient cities in the pre-Qin era and eight capital cities in each dynasty from Qin, Han to Ming and Qing. For example, the elevating the ground and fortifying buildings measures are especially suitable for dealing with flood control in low-lying cities along the rivers in mountainous areas (Wu, 1986).

Furthermore, Wu also argues for the importance of flood control research, and the author concisely outlines his points as follows: (1) No previous research has been done in this field. (2) Anthropogenic catastrophes result in calamities as the Chinese populace fails to recognize the significance of flood protection infrastructure established by their ancestors and haphazardly dismantles and demolishes them, resulting in substantial loss of life and property during flood events. (3) The water system of the ancient city is quite intricate and requires

thorough investigation. (4) The integration of modern scientific and technological advancements with past historical experience can better address the issue of urban flood management. Additionally, he asserted that ancient China had pioneered the most sophisticated science and technology in the world for mitigating disasters during that era. He cited the painful consequences experienced in Ankang, Shaanxi Province in 1958 as a result of arbitrary demolition of flood control facilities constructed built by the ancients, as well as the painful lessons learned from the blockage of the traditional river channels in the ancient water cities of Jiangsu and Zhejiang, which led to flooding.

3.1.2 Research Findings, Significance and Legacy of Wu’s PhD

Wu discovered that the flood control system of ancient Chinese cities was distinguished by its integration of military defense and flood control initiatives. Furthermore, the water system of the ancient city serves multiple purposes, encompassing water supply, agricultural production, transportation, irrigation, breeding, military operations, drainage and flood discharge, deployment and savings flood, disaster prevention, fire prevention, protection against wind and waves, gardening, greening, water recreation, and regulation of the city's microclimate, etc. For instance, the ancient city of Suzhou, which is the first water city in China, and the water system in Chinese water towns are extremely complex and have many functions (Wu, 1995b). Wu argued from the Tang and Song dynasties to the Yuan, Ming, and Qing dynasties, the planning and design of urban drainage facilities have evolved and become more scientifically complete gradually. The Forbidden City of the Ming and Qing Dynasties represents the highest level of flood prevention in China's ancient cities and has never been flooded for more than 600 years (Figure 2). Correctly comprehending and learning from historical experience and summarizing the cycle and pattern of floods in history can predict the occurrence of flood disasters, thus avoiding or reducing floods in Chinese cities. Disregarding historical knowledge and demolishing the flood control infrastructure of the ancient city will result in or intensify flooding.

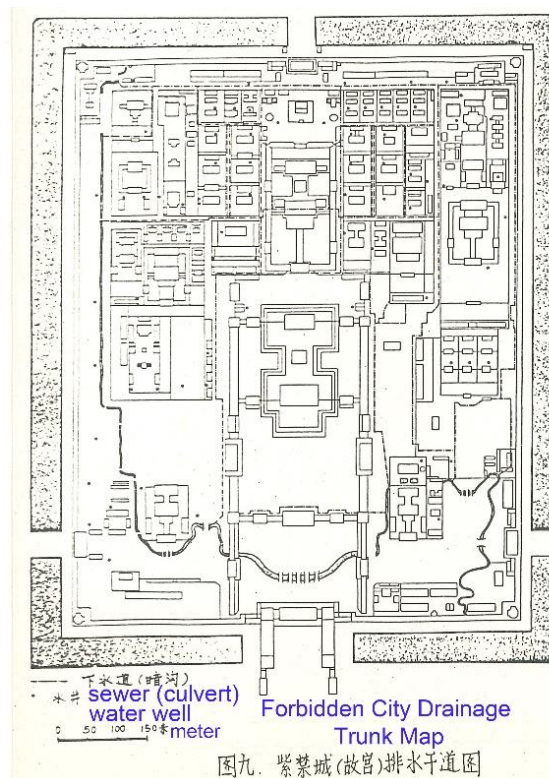


Figure 2: Forbidden City Drainage Trunk Map. Source: (Wu, 1986), translated by author

The significance and legacy of Wu's doctoral study lies in, i. It has significant academic value. The research is quite innovative in the field of architecture and does not belong to the main field of traditional architectural historians' research. Traditional architectural historians, such as Liang and Liu, generally study the classical techniques of ancient architecture, such as the dou gong (system of brackets) and greater carpentry in the Yingzao Fashi (Treatise on Architectural Methods). While Wu conducted the first study of flood control in ancient Chinese cities, and from the perspective of flood control, he opened up a new way to study urban planning and history of urban development, created a new discipline of multidisciplinary cross-study, and pioneered the study of urban disaster prevention. Furthermore, it possesses significant practical significance. Given China's susceptibility to frequent flooding, the knowledge and techniques employed in flood control in ancient cities play a significant role on contemporary urban flood control initiatives and mitigating the consequences of severe rainfall, hence minimizing casualties and property damage. Furthermore, Wu achieved the distinction of being the inaugural recipient of a Ph.D. in architectural history and theory from within China, marking a significant advancement in architectural disciplines within the country, and signifying that the architectural history education at SCUT is at the forefront of the nation.

3.1.3 Wu's footprint on the work of subsequent scholars

As the first Ph. D. in the architectural history field, Wu had a great influence on later scholars who studied Chinese architectural culture at large. Wu is dedicated to resolving the practical application problems of urban flood control and advocates multidisciplinary cross-research. This research paradigm, which focuses on problem-solving, has greatly inspired and influenced later scholars. The wider social and academic circle he created is also quite influential for many related sectors. Following the publication of Wu's PhD research, many scholars in the fields of architecture, planning, landscape architecture, and water resources pay attention to the issue of urban flood control and continued to deepen their research in the field of flood control that Wu had opened up. Wu's study has also changed Chinese scholars' perceptions of urban flooding in ancient China and leave valuable lessons for the present. As modern China lagged behind the West, the notion of total rejection of ancient Chinese urban governance experience prevailed in Chinese academia. Wu's research led subsequent researchers to correctly acknowledge the experience and accomplishments of flood control in ancient Chinese cities, prompting a reassessment of the significance of China's ancient city flood control experience and technology in the global history of science and technology.

Dr. Wu's study possesses several constraints. Initially, Dr. Wu examined an excessive number of case cities, preventing a thorough investigation of each individual city. Furthermore, China's extensive land area results in significant variations in the geographical environment and natural climate across different cities. The number of case cities studied by Dr. Wu is limited, and the generalizability of his findings needs to be improved. More Chinese cities should be studied to supplement this information, which will promote more complete, systematic and convincing research in this field.

3.2 Influence of Formative Years in Architectural Education and Evolution of Mentorship.

Wu's academic experience as the pioneering Ph.D. in the field is also noteworthy, alongside the importance of his dissertation study. His unique identity positioned him as a representative figure in the transformation and upgrading stage of China's architectural history education. Consequently, he played a leading role in the academic development of subsequent scholars in architecture and related disciplines. A man's scholarship cannot be stripped from his

experiences. Only by understanding his academic experiences can we really comprehend Wu's academic achievements and understand the value of Wu's research.

3.2.1 Influence of Wu's formative years in architectural education

Wu was born in 1945 in a small Hakka village located in Xingning County, Guangdong Province, which has a very good tradition that highly emphasizes education (Hsieh, 1929; Leong et al., 1997; Tao et al., 2017). Wu has had a profound passion for studying since childhood and was admitted to Xingning No. 1 Middle School, where his physical education teacher recommended that he pursue a major in architecture as Liang in Tsinghua University (THU). Wu gained admission to THU in 1963, during Liang's tenure as the head of the Department of Architecture. Wu was taught from Liang and numerous other distinguished architectural academics at THU. Liang's selfless dedication to the study of ancient Chinese architecture served as a motivation for Wu's drive to pursue the study of ancient architecture. He diligently pursued the study of Liang's writings, transcribed the complete text of Liang's book "History of Chinese Architecture", conducted field trips to the buildings mentioned in Liang's works, and subsequently produced scholarly studies on ancient architecture (Wu, 2021). Therefore, the author believes that the person who exerted Wu the most when he entered into the portal of architectural history field was Liang.

3.2.2 Evolution of Mentorship Between Long and Wu

The evolution of mentorship between Long and Wu is reflected specifically in both architectural history and academic management terms. Regarding architectural history, after graduating from THU, Wu began working for two state-owned construction companies successively as per government duties. During this period, Wu attempted the examination for the postgraduate program in computer translation at the Chinese Academy of Sciences but did not succeed. Subsequently, a coworker of Wu within the company informed him that Long was a professor of equal renown as Liang. He successfully took the examination to apply for Long's postgraduate degree. Upon Wu's enrollment in school, Long nurtured Wu wholeheartedly by offering courses in architectural history and assisting Wu in gaining a deep understanding of Chinese ancient architecture (Wu, 2001) (Figure 3) .



Figure 3: Prof. Long Qingzhong supervising master's student Wu Qingzhou in 1981
 Source : Wu

Long also took Wu outside to investigate ancient architecture. Instructed Wu to surveying and mapping Zhaoqing Mei'an (Buddhist nunnery), Deqing Xuegong (Confucian Temple) Dacheng Dian (main hall of the palace), Yuecheng Longmu Imperial Ancestral Temple (Dragon Mother Temple) and write scientific papers. Nearly 20 year later, these three ancient monuments are identified as China's National Cultural Relics Protection Units based on above drawings and articles (Wu, 2021). Wu's master research topic is "An Investigation and Study of Flood Avoidance in Buildings in Guangdong and Guangxi Areas." Following the completion of his master's degree, he stayed on as a faculty member, concurrently pursuing a PhD under the guidance of Long. Long bestowed upon his doctoral dissertation the title "Study of Ancient Chinese Urban Flood Control." With the mentorship of his supervisor, Wu published dozens of papers on flood control, culminating in the book "Research on Flood Control in Ancient Cities of China" (Wu, 2009). Dr. Wu's dissertation defense included esteemed individuals Wu Liangyong, ancient architecture experts Zheng Xiaoxie, architectural historian Professor Guo Husheng, and water historian Professor Feng Zhang. They were invited by Long to form the defense committee. After Dr. Wu's graduation, Long recommended him to visit the United Kingdom for further studies (Wu, 1989; Wu, 2021) (Table 1).

Table 1: Milestone of Formative Years in Architectural Education and Evolution of Mentorship

Year	Academic events
1963-1967	Undergraduate program of Architecture, THU
1968	Staff of Publicity and Education Section, China 18th Metallurgical Construction Group, Chongqing
1976	Construction quality inspector, China 15th Metallurgical Construction Group, Wuhan
1979-1982	Master program of Architectural history and theory, SCUT
1983-1987	Ph.D. program of Architectural history and theory, SCUT
1987-1989	Visiting fellows on disaster prevention and mitigation, University of Oxford Polytechnic, UK

In addition, the evolution of mentorship also reflected on the academic management aspect. When Wu became a PhD student, Long requested Wu deliver lectures for students in classroom on his behalf. As Long's advanced age and physical frailty grow day by day, but still he positioned himself behind the podium to oversee the sessions.

The author posits that the establishment of the master-disciple relationship between Wu and Long can be attributed to both fortuitous and corollary reasons. The fortuitous cause firstly stems from the fact that Wu's colleague informed him about Long. Secondly, Liang, the head of the department of architecture at THU, and Liu, the head of the department of architecture at Nanjing University of Technology (current Southeast University), both died during the Cultural Revolution. The fall of these masters left Wu with no other options, as evidenced by the fact that in 1983, Long, who was 80 years old at the time, became the sole qualified PhD supervisor for architectural history and theory field in the country (Wu, 2001). The corollary reason manifested itself in the fact that Wu was good enough in his studies to pass the master's entrance exam required by Long. When queried by the author, Wu explained that the year he applied for Long's master's degree, Long imposed rigorous standards for the math exam. Consequently, all other candidates were unsuccessful in passing Long's math examination, as exams was a prerequisite for admission to Chinese master's degree programs at that time. The authors believes that Long's requirement of rigorous math exams is related to his emphasis on solving real-world problems that characterize his research, and that his later designation of Wu to work on flood control research, which requires a great deal of mathematical calculations, suggests that Long very likely considered his students' areas of study prior to their enrollment.

Oxford Polytechnic, which Long subsequently recommended Wu study at as a visiting scholar, is renowned for its ability to solve real-world problems with practical applications. It also fit for Long’s research feature. Furthermore, corollary reasons also embody that Guangdong is Wu’s hometown. According to Wu’s statement, he decided to return to his hometown, where SCUT is located, because he personally witnessed THU’s chaos in the “Cultural Revolution”.

3.3 Specific Development and Advancement of Mentor’s Ideas

3.3.1 Development and Advancement Mentor’s Ideas

As aforesaid, the research feature of Long’s academic ideas center on solving real problems. Long’s main contribution is recognized as creating the fields of architecture and urban disaster prevention. He has the expertise to employ traditional Chinese culture and technology to achieve research goals. Namely, figuring out the concepts and design rationale of ancient construction activities and applying that knowledge in practice (Chang, 1996; Chen, 1989; Wu, 2004a). Long believes that disaster prevention is a prerequisite for heritage conservation and urban, architectural, and landscape design and categorizes it into five types: flood prevention, earthquake prevention, fire prevention, wind prevention, and lightning prevention. Wu studies the flood prevention type. Long’s research paradigm is utilizing local chronicles for disaster prevention research, which was inherited by Wu. Wu’s doctoral research mainly employs historical approach, utilizing a substantial amount of local chronicles. Furthermore, Wu founded the SCUT Architecture Culture Research Center, which also continues Long’s research paradigm of using local chronicles (Cui, 2022; Feng, 2007). Long’s ideas served as the foundation for Wu’s subsequent accomplishments in the field of flood control research. When Wu selecting the subject for his PhD, he would supposed to study the history of architectural art. Long proposed that he engage in urban flood management. Long emphasized that flood control encompasses various areas of expertise and that research should be carried out with an open visionary. Under the influence of Long, Wu started advocating for the concept of interdisciplinary cross-fertilization. Furthermore, Wu further developed Long’s research area of heritage conservation, and he was awarded the UNESCO Heritage Conservation Award three times (Table 2). The findings of Wu, the heritage of Yaozhouyuan Garden in the Nanhan Dynasty, have also been restudied many times by subsequent researchers (Guo & Li, 2018; Lin & Lu, 2019; Wu, 1995). Due to Wu’s contributions to architecture education career, he won the highest award for architectural educators in China in 2010. In addition, Wu has also pioneered a number of research areas in urban culture, e.g., He developed urban layout theory in ancient China as Xiang Tian Fa Di, Qiwu Fangsheng (Wu, 1996; Wu, 2004b), and traditional cities and building were constructed according to by Wuxing theory (the Five Elements-metal, wood, water, fire, soil) (Wu, 2015).

Table 2: Wu’s UNESCO heritage awards

Authorized organization	Award Types	Year	Award Level	Projects (Location)
UNESCO	Asia-Pacific Heritage Awards (for Culture Heritage Conservation)	2005	Honorable Mention prize	Zhaoxiang Huang Ancestral Hall Restoration Project (Foshan City)
		2011	Award of Excellence	Baojiatun Watermill Restoration Project (Anshun City)
		2018	Award of Merit	Aijing Zhuang residential complex in Yangwei Village Restoration Project (Yongtai County)

3.3.2 Wu’s students further developed his approaches and put it in good use in real world

Wu has trained a number of doctoral students who have broadened and enhanced the scope of Wu’s research area (Appendices I and II). The research areas of these PhD students cover urban disaster prevention, urban defense, urban culture, urban form, urban transformation, urban

design, regional architectural history, architectural art, regional gardens, etc. Compared Wu's doctoral research primarily examined ancient Chinese cities, the scope of these doctoral students' urban studies encompasses both ancient and modern periods, with a particular emphasis on Chinese province capitals and cities of historical and cultural significance (Appendix II). Unlike Wu's doctoral dissertation, which simultaneously examined many case cities, their research was more focused and deeper, with each PhD student investigating only one individual city. The author asserts that studying through case studies of particular cities makes it easy to develop in-depth research, which complements the limitations of Wu's doctoral dissertation. For example, one of Wu's doctoral students, Xie Xuan, studies the Chinese city of Chongqing, a mountainous city with a unique topography that is exceptionally well-suited for military defense, which has altered China's fate on two times in history (Xie, 2011). Wu has integrated the doctoral researches completed by his PhD students into a series book collections that specifically examine the history of urban construction in China (Su et al., 2010; Wu et al., 2014).

4. Conclusion

4.1 Sources of Scientific Innovation and the Limitations of Division of Disciplines

Wu's doctoral research enlightens us that cross-disciplinarity is an important source for generating scientific innovations. It reveals that the current practice of dividing research into particular specializations has clear limitations and frequently falls short of addressing the problems faced in scientific investigations. The essence of scientific study consists in addressing unresolved problems that have eluded past generations and hence cannot be confined to a particular discipline. While urban flood prevention was initially suggested within the realm of architecture, addressing this issue requires expertise not only in architecture but also in history, hydrology, geography, and language (since local chronicles are recorded in the old Chinese literary language). Hence, in order to enhance the flood resilience of structures and urban areas, it is imperative to draw on the knowledge from the aforementioned disciplines. Divisions of specialization is man-made, and both nature and human society are not divided into specialties. Therefore, there is no assurance that if a problem is posed in a particular field, the answer to that problem, or the idea, method, or key technology, would necessarily lie inside that same field but rather could be found in an entirely different sector. In order to resolve solve a scientific problem, there are often, in reality, many multiple interconnected disciplines involved, all of which must be addressed. The problem cannot be resolved solely from the perspective of a single discipline.

4.2 Connecting each academic experience, ensuring coherence and consistency in scientific study.

From above Wu's experience formative years in architectural education and evolution of mentorship. We conclude that Wu is good at making the choices of academic careers coherent, which eventually accumulate to form great academic achievements. Wu's academic experience has many important milestones, such as when he heeded his teacher's guidance at Xingning No. 1 Middle School and pursued a major in architecture at Tsinghua University, heeded the advice of his colleagues at the construction company, and enrolled in Long's master's program. Furthermore, he followed Long's suggestion to choose the flood control of the ancient city as his research topic. Finally, he consolidated the urban research of his Ph.D. students and published a series of books on urban history. Scientific research is a very accumulative and step-by-step endeavor, and Wu's academic experience has inspired us to ensure the consistency and coherence of academic decisions so that we are possible to push original scientific boundaries ahead.

4.3 Shoulders of Giants Combined with Extensive Hand-on Action

Long's vision greatly facilitated Wu's scientific career. The aforementioned studies on urban flood prevention, Zhaoqing Mei'an, Deqing Xuegong, and Longmu Imperial Ancestral Temple, conducted under Long's guidance by Wu, have demonstrated Long's exceptional acumen for scientific study. However, possessing Long's vision alone is insufficient; Wu must also exert diligent effort and take action to make it work. Furthermore, Wu has dedicated his entire life to the study of flood control. Regarding the three significant cultural relics, Wu also dedicated almost two decades to transforming them into Chinese National Cultural Relics Preservation Units. However, without Long's guidance, Wu would have had to retrace the exact scientific research path taken by Long in order to reach the same level of academic success he enjoys today. Wu's case demonstrates the necessity for scientific research to build upon the achievements of previous generations, while also indicated the need for substantial and enduring efforts in order to attain academic success.

5. Contribution and Future Work

This study demonstrates the characteristics of the upgrading phase in the field of Chinese architectural history education by analyzing the academic journey of a representative individual. This paper holds great value for scholars in architectural history and related fields and serves as an important benchmark for guiding the academic growth and development of young scholars in these areas. Future research should enlarge the scope of this research and investigate the instances of the first Ph.D. in architectural history in different nations, situating Wu's case in broader context for comparative analysis, thus making it possible to draw more valuable insights.

Authors Contributions

Xubo He: conducted data collection, interviews, data analysis and wrote the manuscript.

Sumarni Ismail: examined the article and made suggestions for revision.

Nor Atiah Ismail, Noor Fazamimah Mohd Ariffin, Shanyu Chen: helped perform the analysis with important constructive discussions.

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