



中國
古橋



The Ancient
Chinese
Bridges

華藝出版社



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主編：孫 波
副主編：杜建業 林 鐸 劉俊仁
撰文：羅哲文
英譯：王月英
責任編輯：林 鐸 黑薇薇
裝幀整體設計：鄭在勇

Chief editor: Sunbo
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Writer: Luo Zhe -Wen
Translator: Wang Yue -Ying
Responsible editor: Lin Duo Hei Wei -Wei
Designer: Zheng Zai -Yong

攝影：(按姓氏筆畫)

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因爲人

們貶的是人而

不是橋。《詩經》中有

“親迎於渭，造舟爲梁”的描寫。據說公元前一千年，周文王爲了娶親，在渭水上架了一座很大的浮橋，以顯示氣派。使用這橋是表示尊貴的一種制度，只有奴隸主的首領——天子才能使用，用后就拆除。“過河拆橋”一說，不一定出之於此，也可能是人們在長期的社會實踐中，有感於人際關係的復雜，爲了托物譏人，創造了這個比喻。

啊，橋！人們離不開橋，不僅要愛護橋，保養橋，歌頌橋，還應學習橋，用它自我犧牲的精神，“長虹飲澗”般的氣勢，“彩練行空”般的風姿，

好好修檢自己。

啊，橋！

……

啊，橋！

（代序）

孫波

橋，是堅毅的。它同人民一起

飽經滄桑，歷盡劫難。它經受過多少驟起

狂飆、澎湃怒濤的洗禮？見識過多少推潮挾浪、摧屋拔樹、壓倒一切的風雲人物？迎送過多少志憤氣壯、爲國紓禍、萬里馳風的民族英豪？當然，它的軀體也留下了無數強暴踐踏的蹄印和累累彈痕。它是和人民一同流淚滴血的啊！

橋，是精神寄托的象徵。一提到橋，人們每每會想到“鵲橋會”那則故事。牛郎與織女不能相會，使喜鵲爲之感動。它們就組織起來搭成一座橋，每年七月七日之夜，讓兩位情人相晤。由此，古人曾有：“相聚鵲橋短，對望銀河長”的感嘆。每提到海峽兩岸的

“三通”和交往，人們也常想到橋，希望在兩岸人民的心靈上築起一座橋，排除障礙，加快祖國統一的步伐。可見橋在人們心目中佔有着重要位置，有了難處常常會想到了橋，借橋相助。

橋，有時被人們用於貶人，貶斥有些人忘恩負義，“過河拆橋”。不過，這並無損於橋的品格，

爲

出版大型

畫冊——中國古橋，

我有幸翻閱了幾百張絢麗多姿的彩色圖片，不禁爲之悠悠意遠，思緒時而深沉、凝重，時而輕柔飄渺，時而飛向懸崖百仞、澎湃的江河，時而飛向林木蔥籠、爭嬌競艷的園林，時而飛向歷歷如畫、風烟俱淨的山村水閣，時而飛向北京城縱橫交錯的空中立交橋……橋，作爲民族燦爛文化華木的一枝，無疑是值得人們引以自豪的！

橋，作爲山川、河流的交通樞紐，它是我國人民世代創造着輝煌業績的歷史見證！

橋是偉大的。它不僅像彩虹一般裝點了中華大地的錦綉河山，而且甘居人下，忍辱負重，默默奉獻。千百年來有多少人踏着它堅固、坦平的身軀跨高溝，越深澗，過大江，渡大河？有多少人經過它的身軀，穿枝扶葉，曲徑通幽，探奇攬勝？橋又是含情藏趣的地方，玩月觀魚、馳目遠眺。談情說愛的人們，往往偎依在它的身傍，坐騎在它的身上。據《莊子·盜跖篇》記載，公元前四世紀一個叫尾（或微）生的男子與一女子相約，在一座橋下幽會，可到了約定時間那女子沒來，不料江水暴漲，尾生爲了不失約，抱着橋柱而死。類似的故事還有很多，都是說橋與人生密不可分。有的寫得像尾生約而不遇一樣悲感；也有的寫得很美滿，美得像一首詩。

When the large-size photo pamphlet of the ancient Chinese bridges has been being prepared to publish, I had a chance to look through hundreds of beautiful colored illustrations in separate sheets. My view couldn't help being attracted to remote places. The train of my thought was heavy now, then it was light. Now it was travelling to steep cliffs and turbulent rivers, now it was travelling to dense trees and beautiful gardens. Now it was travelling to clean and pure villages and pavilions by water that look like paintings, now it was travelling to the crisscross solid-crossing bridges in Beijing city...Bridges are worth people's pride for its being a branch of the splendid culture tree.

Bridges are the hubs of communications of mountains and rivers and they are the historical testimonies of brilliant achievements created by our people for generations.

Bridges are great. They not only decorate the beautiful lands in the Chinese Land, but also they rest content with being under human beings, endure humiliation in order to carry out the important mission and are unknown to devote themselves. For thousands of years, innumerable men have passed by on bridges.

They have gone through the severe tests of abrupt hurricanes and turbulent waves. They have known many brave men of the hour who were filled with rebellious spirit. They welcomed and speeded the parting of many national heroes with soaring aspirations who removed disasters for their own countries and were known far and wide for their military prowess. However, innumerable hoof marks and shot marks were treaded by ferocious adversaries on bridges' bodies. Bridges have been weeping and shedding blood with people.

Bridges are firm and persistent. They have also seen many of the changes and gone through all kinds of hardships and difficulties of human beings with people.

They have gone through the severe tests of abrupt hurricanes and turbulent waves.

They have known many brave men of the hour who were filled with rebellious spirit. They welcomed and speeded the parting of many national heroes with soaring aspirations who removed disasters for their own countries and were known far and wide for their military prowess. However, innumerable hoof marks and shot marks were treaded by ferocious adversaries on bridges' bodies. Bridges have been weeping and shedding blood with people.

Bridges are the symbol of spiritual sustenance.

When people speak of bridges, they will always remember the story called The Meeting on the Magpie Bridge. Niulang and Zhinu loved each other so devotedly that magpies were moved by them. Magpies organized voluntarily to form a bridge in July every year so that the two lovers can meet on it. Therefore, the ancients had the sigh with feeling that "The time to meet is so short while the time to look face to face is so long". When people speak of the Three Communications and Acquaintance between the both banks of the Taiwan Strait, they often remember bridges. It means that people hope to erect a bridge between the souls of the both banks to remove difficulties so that the step of nation unification is speeded.

From those above, we can know that bridges cover important position in people's hearts. When people encountered difficulties, they often remember bridges and draw support from it.

Sometimes bridges are used to denounce ungrateful men. To destroy the bridge after one has crossed the river (to discard a person after one has outlasted his usefulness) is a sentence that functions such a function. However, it doesn't do harm to the bridge's characters and morals because people don't denounce bridges but some ones. The Book of Songs recorded that "Men used boats as a bridge to welcome marriage troops across the Wei River". It was said that Zhou Wen King built a great floating bridge over the Wei River to display his authority in 1000 B.C.. The bridge was the symbol of riches. Only slave owner could use it and it was taken apart afterwards. The idiom, to destroy the bridge after one has crossed the river, which did not come from the story, was probably a sigh with feel that relations between people were complex shouted out by people during the long social practice to ridicule some ones.

Oh, bridges! Human beings can't exist without bridges. We should not only cherish bridges, maintain bridges and sing the praise of bridges, but also learn from bridges. We should cultivate ourselves by learning bridges' spirits of self-sacrifice, the momentum of "A long rainbow is drinking from a gully" and the charm of "A coloured chain is walking in air".

Oh, bridges!

Oh, Bridges!

(Deputing Preface)

Sunbo

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啊,橋!(代序) Oh,Bridges! (Deputing Preface)

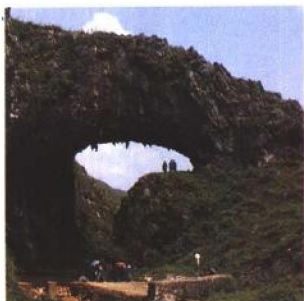
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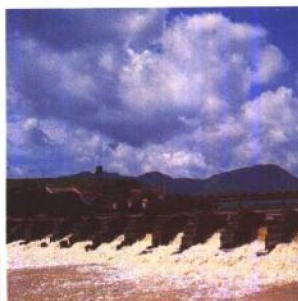
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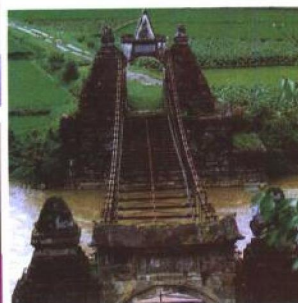
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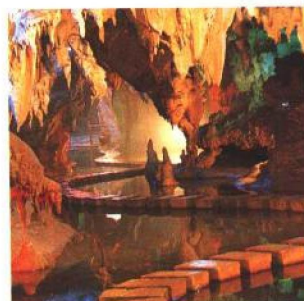
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中國古橋

The Ancient Chinese Bridges

當我們漫步中華大地的時候，不管是在高山峽谷、溪澗湖池、大江大河甚至波濤洶湧的大海之濱，以及在幽靜的園林庭院之中，隨處都可以看到有各式各樣的橋梁飛跨其間。許許多多造型優美的古橋，不僅以它們堅固坦平的軀體千百年來為人們跨越高溝深澗、大江大河服務，而且以它們雄偉而又優美的身影點綴着中華大地的錦綉河山，引得了許許多多著名的文學家、畫家為之謳歌，繪影。他們常常以“長虹飲澗”、“彩練行空”等等詞語來描繪古橋的風采。的確，這許許多多的古橋好像是一道道人間彩虹在神州大地翩翩飛舞，使大地添彩，河山增色。

一、悠久的歷史

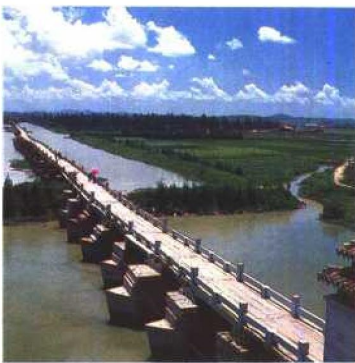
我國造橋的歷史悠久，在原始社會早期我們的祖先在利用自然的山洞岩穴和構木為巢的時候，就已經懂得從自然倒下的樹木枝幹加以搬運作為跨越的工具了。在原始社會的后期，出現了原始聚居的村落，在村落周圍出現了人工挖掘的防禦性的深溝大壕，以防止野獸和外部落的攻擊。與此同時也就必然產生了村落內部必須經常出入跨越大壕溝的問題，也就是要架設安全方便的過溝建築物——橋的問題。根據經過考古發掘的距今五千多年前西安半坡村原始村落遺址的復原圖來看，在半坡遺址的周圍，有一條寬約五、六米，深約五、六米的大壕溝。這條大壕溝每天都要有很多人進出，是必然要有橋的。根據建築材料和施工能力推斷，這裏的橋應當是木梁橋，是用幾根長七、八米的樹木拼成的。在古代文獻中也有這樣的記載，如《說文解字》上說：“梁之字，用木跨水，則今之橋也”，“凡獨木者曰杠，駢木者曰橋”。《廣志》上說：“獨木之橋，曰榦，亦曰杓（音灼 zhuó）。獨木橋，應當很早就出現了，因其更為簡單，便於搭設，人們從小河、狹谷岸邊把樹木推倒搭向對岸就成了。

還有一種歷史最早的橋之一叫踏梁或石磴，稱作踏步橋，堤梁橋等。在原始社會里，我們的祖先在遇到了溪澗、小河水漲水阻的時候，為了渡水，便采取了在水中拋置石塊當橋的做法。這種形式的橋很簡單，也便於架設，在人類能夠用手搬物的時候就可能有了。它與獨木橋可能同一時期就出現了，在早期歷史文獻中對這一類的橋也有了不少的記述。如像我國最早的一部編年史書《竹書紀年》和後來的《考工典拾遺記》以及其他文獻史料中都記載了大約在公元前 2100 年時“舜命禹疏川奠嶽，濟巨海，鼃（音元 yuàn）鼃（音陀 tuó）以為梁”和“周穆王三十七年（前 965 年）伐楚，大起九師，東至九江，駕鼃鼃以為梁的故事。鼃鼃本是一種特大的烏龜，人們把它們用來形容在溪澗小河中露出水面的石磴、石塊築成的踏步橋，倒也是非常生動的。在古文辭解釋的專書《爾雅·釋宮》中把這種橋稱之為石杠并作了解釋：“石杠謂之倚（音寄 jì），倚者，步橋也，按即聚石水中，以備步涉者”。現代人還有把這種橋稱之為“汀步橋”、“過水梁”等等的。

此外還有一種藤橋和繩索橋，也是很早就可能出現的



上清浮橋



安平橋

橋。原始人類曾經攀緣於高山密林之間，往往借垂索懸藤飛蕩跨越，當他們學會用手的時候，自然也會把藤條垂索的另一端加固就可緣着它們渡到對岸去了。但由於這種原始藤索橋難以保存，已無法找到早期的遺物了。後來，發展成為竹索、鐵索橋，在古橋類型中佔有重要的地位。

自從我們的祖先在很久很久以前利用和簡單加工自然的樹木、藤條、石塊等材料，創造了這種解決阻斷交通問題的橋梁建築之後，隨着社會的不斷發展和科學技術的進步，我國古代橋梁修建的數量越來越多，橋梁建築的工程技術水平越來越高，橋梁建築的藝術也越來越豐富，越來越精美。現在保存下來的古代橋梁早期實物雖然已經不多，但從豐富的歷史文獻記載和考古發掘的資料上還可以看出它們的情況來。如像在春秋戰國時期各諸侯競相爭雄，修城、開渠、築路工程的大力發展，城有城壕，渠有水道，路有溝谷，都需要建大量的橋才能使交通通暢。公元前五世紀西門豹在鄴城（今河北臨漳）治水開渠十二條，因與馳道相交，所修築的十二座跨渠水橋，一直延用到了漢朝。據《華陽國志》上記載，公元前三世紀秦代蜀守李冰在益州（今四川成都）城西面與南面的郫江與錦江上造了七座橋。西門外的叫沖治橋；西南石牛門外的叫市橋，市橋下還放了潛水石犀，以鎮水妖；城南的叫江橋；錦江上的叫夷里橋，又名竿橋和萬里橋；沖治橋西北的叫長昇橋，郫江上北面的叫永平橋。這七座橋又名為七星橋，它們在成都這座歷史文化名城的發展史上，曾經起過積極的作用。公元前四至三世紀，秦昭王在渭水北岸的咸陽宮與南岸的興樂宮之間，造了著名的渭水橋，把兩座宮殿區聯成一氣。這橋長380步（1步5尺），為我國建橋史上早期傑出的結構。

在近代的考古發掘中，考古工作人員，在山東臨淄春秋戰國時期齊國都城的城門外城壕（護城河）的兩岸地下，發現了修築橋臺的石塊與夯土，護城河寬約七、八米，橋的跨度至少也在七、八米以上。在陝西西安、咸陽渭河老河床下也發現了渭水橋（可能是中渭橋）的木樁基礎，證明了古老的著名的渭水橋確是存在，規模甚是巨大。

早期的古橋中，還有一種橋型叫做“舟梁”，也就是後來的浮橋。因為它當時是臨時性的，用過就拆，所以難以保存，也無遺址可考，只能從歷史文獻記載上去了解。在《詩經》中有“親迎於渭，造舟為梁”的描寫，傳說在公元前1000年的時候，周文王為了娶親，在渭水上架了一座大浮橋以顯示其氣派。《史記·秦本記》上記載：公元前541年，秦公子鍼去投奔晉國，為便於大批車馬行人通過，在臨晉關附近的黃河上建一大浮橋，通過的隊伍有“車重千乘”之多。

自秦始皇統一天下之後，由於國家的統一，農業、手工業和各項社會事業的發展，城池的興建，交通空前發達以及政治、經濟、軍事、文化的不斷發展，對橋梁的要求更為迫切，同時也為修建橋梁提供了物質基礎和科學技術的條件。於是，橋梁修建的數目越來越多，規模越來越大，類型越來越豐富，建橋技術越來越先進，橋梁藝術越來越精美。許多古橋至今仍然保存着，成了中華民族歷史文化遺

產重要的組成部分，有些古橋如河北趙縣隋代趙州橋（安濟橋）和北京盧溝橋等久已揚名世界，成了世界人類科技文化的重要遺產。

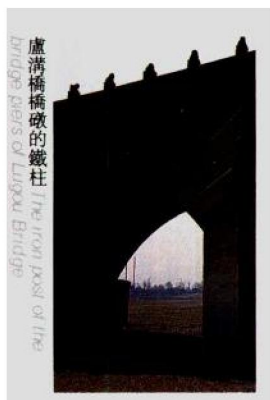
二、雄偉的工程 精湛的技術

在福建晉江南安之間有一座跨越晉江出口處安海港的古橋，橋亭上一副對聯的下聯寫道：“天下無橋長此橋”。這橋就是距今八百年前的宋代古橋——安平橋。橋長八百一十丈，三百六十二孔，超過了五里，所以又名五里橋。像這樣的長橋不僅在中國就是在世界古橋中也是首屈一指的，它跨越在波濤洶湧的江波海濤之上，其工程之艱巨可想而知。像安平橋這樣的跨海長橋在古代泉州灣還有很多，如盤光橋，長四百餘丈，一百六十孔；無尾橋長五百餘丈；東洋橋長五百四十七丈，二百四十二孔。還有一些比安平橋工程更為巨大的橋，如泉州南門外的玉瀾橋，長一千餘丈，較之安平橋還長二百多丈。惠安大海中的鯤廬橋有七百七十孔，超過了安平橋孔的一倍。可惜這些古橋隨着泉州港灣的興衰和海岸地形的滄桑變化，都已先後無存，但這些雄偉的橋梁工程已經載入古橋史冊，為豐富的古橋歷史增添了光輝的一頁。

除了橋的長度之外，橋梁構件之雄偉巨大也是世所罕見的。在福建漳州有一座江東橋（也稱虎渡橋），其石梁之巨大，實屬罕見。其中最大的一根石梁長達24米，高2米多，寬1.8米，重達200多噸，像這樣巨大的石構件在任何古代建築物上都是沒有的，被稱作巨石的埃及金字塔石件一塊才有2.5噸重，較之江東橋石梁相差了將近100倍。

像安平橋、江東橋這樣工程宏偉的古橋，在中華大地的大江大河、深溪高谷之間者何止千萬。如像河北趙州橋、泉州洛陽橋、蘇州寶帶橋、北京盧溝橋等等不勝其數。

然而雄偉工程的建成，還必須有賴於精湛的建橋技術。一千多年來人們不斷以“結構奇特，人不知其所以為”，“奇巧固護，甲于天下”，“自古神丁役此工”等辭句來稱頌趙州橋的建橋技術。就以今天的科學來分析，趙州橋的結構奇特、奇巧固護確係事實，但並非不知其所為，也並非神丁所役，它正是反映了我國古代科學技術和建橋技術的高度水平。我國古代建築雖以木結構為主，所以在秦漢以前的古橋主要是梁式橋。但是建築工匠們並不局限於木構技術，而在磚石發券技術上也進行了大膽的嘗試，攻克了許多難關，才取得了像趙州橋這樣世界古橋第一的成果。從歷史文獻記載上看，晉朝太康三年（282年）在洛陽七里澗上所建的旅人橋是最早記載的石拱橋，但實際上磚石拱橋遠在這以前就有了。如在河南洛陽等地的地下古墓中就發現了兩千多年前的磚拱墓室，人們既然能用它來建造墓室，當然也可以建造橋了。此外從漢代畫像石、畫像磚上也有許多拱橋的圖像。由此可以推斷，磚石拱橋至少在兩千多年前就已經產生了。



拱橋的出現，在我國造橋史上是一個極大的飛躍，因為發券結構發揮了磚石建築材料之所長，磚石材料在防腐承重各方面又是最能適用於橋梁建築之需要。自磚石拱橋在兩千多年前出現之後，與早已出現的梁式橋一起不斷改進發展，建橋工匠們發揮了他們的聰明才智，不斷創造出了建橋技術的奇迹。茲舉數例如下：

(1) 世界首屈一指的“敞肩拱”或稱“空撞券”(open spandrel)式的趙州安濟橋。此種形式的拱橋的特點就是在大拱之上的兩端各開小拱，它比歐洲出現這種形式的橋早了近千年的時間。造橋的技術達到了當時世界領先的水平。它的優點第一是大大減輕了橋身的重量。第二是遇到洪水時大大增加了排洪的能力，使河水暢通無阻。第三是減輕了洪水對橋身的沖擊力，增大了橋梁的安全係數。第四是使得橋身更加玲瓏美觀。

像這種空腔拱式的石橋，在趙州橋以後，歷唐、宋、遼、金、元各代不斷繼承興建，為中國古橋中的一種重要形式。

(2) 聯拱長橋盧溝橋。自隋代(605年)出現了單孔大券空腔式拱橋以後，磚石拱橋又向着聯拱長橋發展。現存的北京盧溝橋就是其中的一例。盧溝橋位於北京西南10餘公里的桑乾河上，創建於金大定二十八年(公元1188年)，距今已有八百多年的歷史。全橋十一孔，長266.5米，為我國北方年代最早而又長的聯拱石橋。盧溝橋由於在元代做官之意大利人馬可波羅對此橋作了高度評價並把它稱之為鮮有之美麗石橋記入他的游記之中，在七百年前就已名傳海外了。盧溝橋八百多年來仍巍巍屹立，其故何在？這主要就在於建橋技術之高超完善，橋的設計十分科學。為了迎擊洪水特別是上游浮下的巨大冰塊，把橋墩修得非常的巨大堅實，並在迎冰一面的分水尖上安設了十根巨大的三角鐵柱以破冰分水。最近又發現古橋橋孔之下有七層大石板均密密地用大鐵柱穿透打入河床之內，牢牢固住了橋墩和整個基礎。石與石之間用了大量的腰鐵固護，真可算是做到了萬無一失的地步。

(3) 首創筏形基礎的泉州洛陽橋。泉州洛陽橋位於古時洛陽江入海的江口之上，是我國一座著名的古橋。過去曾經把它的修建工程之奇妙編成了戲劇《蔡狀元修造洛陽橋》來歌頌修造工程的艱巨和造橋人們的智慧。這一名橋建於北宋皇祐五年(1053年)，到嘉祐四年(1059年)完成，一共經過了七年的時間。戲劇傳說中的故事大體是說，北宋時期泉州的一位地方官主持修建洛陽江口的這座大橋，但苦於海濤洶湧，無法施工。這位官員親自寫了一封信給海神，說明了他為人民謀福的心願，要求海神予以幫助，並招聘到一勇士，持書下海去見海神。海神果然應允幫助並立即回了一信，拆開一看只有一個“醋”字。經過推敲得知是這月的廿一日酉時可以施工。于是一切準備停當，到時果然海潮退落，抓緊施工，順利完成了橋的基礎工程。這位地方官就是有名的曾任泉州太守的北宋文學家、大書法家蔡襄。這個戲劇所反映的修橋困難的確不假，因為這裏的地質條件極差，江口是多少年來的沖積泥沙軟層，在當時

的條件下，既無法開挖也挖不到底。聰明的建橋工匠們便創造出了筏形基礎的方法。即是將大量的石塊拋入江中，形成一個大石筏，好像一道石堤然后在石堤上建橋墩。這在近代世界橋梁史上所稱的“筏形基礎”，在中國一千年前就已經發明了。還有一個創造發明，即是為了固結橋基橋墩的石塊，工匠們利用海中生物牡蠣的膠結作用，在石塊種植大量牡蠣使橋更加堅固，真可算是巧奪天工了。

(4) 利用水的漲落架巨梁。梁式橋的石梁都是非常的長大，有的十幾噸、幾十噸甚至上百噸的。在古代既無大的起重機也無其它特大的提升機具，要把這樣重大的石梁架到水深浪急的橋墩上去，的確是一個難題。但聰明的古代建橋工匠們，創造出了利用水的浮力和水的漲落，巧妙的把巨大石梁架設到水深浪急的江心橋墩上去了。特別是利用海潮的漲落更為方便。

以上所舉只是我國古代建橋工程技術中的幾個實例和方法，還有許多的能工巧匠，特殊技藝，不能一一例舉了。

三、豐富的内容 精美的藝術

中國是一個馳名世界的文明古國，歷史悠久，文化燦爛。精美的藝術不僅表現在一些專為欣賞的純藝術品上，而且表現在大量實用藝術上。橋梁即是其中重要的一個方面。中國古橋本身既是一項工程技術的成果，而它同時也是一件藝術的作品，因而它們也是中華民族優秀的歷史文化遺產中重要的組成部分。古橋的藝術內容非常豐富，主要的表現在以下三個方面：

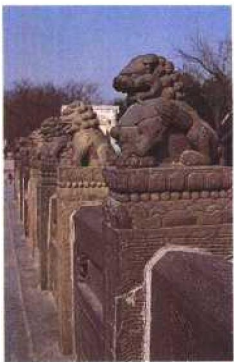
1、古橋本身的藝術造型 由於橋梁本身是一項科學技術工程，它的主要功能是在為解決過往行人車馬等交通問題的，所以它的形狀首先決定於工程結構的需要。但是古代建橋工匠們并不僅僅滿足於解決功能結構，而是在解決實用問題的同時又解決了橋本身的美學問題的，使橋又實用又美觀。

趙州橋是一個實用與美觀結合得非常好的例子。它那圓弧形大拱，矢跨比(即拱高和拱徑比)，比五分之一還小，在結構功能上有良好的效果，它既能使排水量更大，而又使橋面更為平坦。同時在造型上又更加美觀，因而得到了宛如“初月出雲，長虹飲澗”之贊譽。大拱兩肩上各開兩個小孔，是為了更多的排洪，所謂“蓋以殺怒水之蕩突”，而且能減輕橋身之自重，但是又使整個橋身顯得玲瓏輕巧。

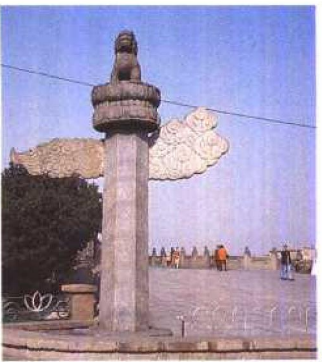
蘇州寶帶橋當中的幾孔做得較高，它既有利於下面船隻的通行而又使整座長橋有起伏變化。頤和園中的兩座高拱橋玉帶橋和綉漪橋以潔白的橋身高聳湖上，看上去特別美觀超群，原來它一個是入水口，一個是出水口，下面都要進出船隻的。盧溝橋的橋孔從中心孔向兩旁依次遞減，使整座橋的外形美觀，而實際上是為了橋下主河道泄水和航運的需要而設計的。

廣西三江的程陽橋和許多被稱作風雨橋的廊屋橋，在橋上建橋廊和亭子，它們原來的功能是讓過往行人在橋上

盧溝橋石獅



盧溝橋華表



盧溝橋石象



遮風避雨之用的，但是它們又使橋梁更加美觀了。程陽橋上的五座亭子，修建工匠們特別把亭子的形式和大小都有所變化，使橋的造型更加美麗。福建泉州五里橋由於過長，特在橋上修了好幾座亭子以供過往行人休息，避風雨，但又使平淡的長橋頻添了風采。揚州瘦西湖的五亭橋更是以優美的藝術造型取勝，橋的下面由十二個橋墩、十五個橋孔構成一個大橋座，上面五個亭子分列其上，中間一個大亭，四角各建一小亭，飛檐翹角，如翼斯飛，與橋下的橋孔結合得十分的融洽和諧。倒映湖中，波光雲影，相互增輝。在江南園林中，為了增加人們在園林里漫步的行程和逸趣，特地把小橋造成曲折迂迴的形式，有三曲橋、五曲橋……九曲橋以及跨水飛虹等凌空複道等等，在橋的藝術造型上更達到了高度的水平。

2、古橋的裝飾藝術 古橋除了橋身本體在適應功能和結構上加以美化之外，它們根據橋的位置、重要性和工程大小不同也給予了不同程度的裝飾。有許多重要古橋的裝飾藝術十分驚人，成了我國美術史上重要的一頁。

由於我國古橋大多數是石或磚修造的，所以它們的藝術裝飾大多是石或磚的雕刻，其中尤以石雕藝術最為突出，主要表現在以下幾個部分：

(1) 橋欄杆裝飾 橋的欄杆，本來也是具有很大適用價值的構件，它主要的功能是防止過往行人跌入水中的阻攔物，也可供人們憑欄眺望江河湖海景色之用。人們過橋大多是依傍着欄杆行走，從橋旁或水上、地上觀望橋梁，橋欄杆也是最為奪目之處。因此，橋欄杆便成了雕刻藝術家們發揮所能的重要部位。一千多年前唐朝文學家在描寫趙州橋的欄杆時，就以“盤繞擎踞、若飛若動”的詞句來形容隋代趙州橋欄杆雕龍的生動姿態。“盧溝橋的石獅子——數不清”，這是從前在北京人中流行的一句“歇後語”。為什麼會數不清呢？其原因是雕刻家們的雕刻技法太高明了，在橋欄杆望柱頭上所雕刻的石獅子除了一個大獅子之外，它們的身上、腳下、懷里、頂間，甚至耳朵邊都或許隱藏有小獅子，欄杆望柱又如此之多，所以一般過往行人實在很難數清的。有些橋的欄杆上，還雕刻了各種圖案花紋、奇花異草、珍禽異獸以至戲劇故事等等內容。

除了石橋欄杆之外，許多木橋欄杆也有不同程度的裝飾，它們雖不如石欄杆那雕刻豐富，但是它們以各種縱橫交錯的木棧組成各種漏空的圖案，顯得玲瓏剔透，甚至只用橫棧豎棧也有其獨到的藝術效果。

(2) 華表 華表是我國古代建築中用來標示入口、裝飾大門和其他重要建築物的凌空立柱。它常常用在宮殿、陵墓的前面和街衢大道之上。橋頭也常用華表來標示入口。橋頭的華表，有木製的也有石製的。北京盧溝橋的兩頭都有一對非常精美的石製華表，它的頂上刻有東西相背的石獅，有一石獅舉起前腳揮舞彩帶，像在迎送過往的行人。

(3) 牌樓 牌樓也稱作牌坊，它本是古代城市里坊制度時期里門、坊門所留下的傳統形式。後來又把它用於大街之上、公共場所、公用建築的入口。橋頭上的牌樓也不

少，現在北海公園內團城與瓊島之間的橋兩頭的牌樓還保存着，南面的叫堆雲，北面的叫積翠，這橋也叫堆雲積翠橋，可見橋頭的牌坊不僅標示橋梁的入口，而且也表明橋的名稱。當然也有一些橋頭牌坊的橫闌寫了一些雅詞之類。現在全國各地還保存了不少橋頭的石牌坊或木牌坊。許多橋頭的牌坊不僅本身是橋頭裝飾，而且在它的身上也有藝術性很强的雕刻和書法藝術。

(4) 石獅、石象 獅子是公元前二世紀西漢時期才從西域傳入中國的。傳入之後，中國人就對這獸中之王加以馴服了，並把它們的形像雕成石刻或畫在圖上來看守大門以壯威風，看去不是凶而是那樣的可愛，民間還把它的形像用來玩耍。象是現存最大的地上動物之一，它力大無窮，但它很善良，很多的宮殿、寺廟都把它形像雕刻出來守護大門或壯觀庭院。在許多古橋的橋頭，也利用了這兩種獸中之王和獸中之最來守護橋梁，壯觀橋路。在盧溝橋的兩頭入口處分別雕刻了一對獅子和象，它們都那樣的溫馴，用它們巨大有勁的身軀頂住石欄杆，使石欄杆穩如泰山，好像什麼力量也推不倒似的。

(5) 地伏石和仰天石 地伏石和仰天石是橋面外緣顯露的部分，也是引人注目的地方，建橋藝術家們便利用這塊地方進行加工裝飾的藝術活動。我們在趙州橋可以看到在地伏石和仰天石上一行行落地蓮花和乳丁雕飾，好像在橋的兩邊鑲上了一道花邊。在盧溝橋的地伏石邊上刻的是密排的雲頭。有的橋雖未作花紋雕飾，但也把這個部分刻成盆唇或冰盤托檐等形式，以增加橋的藝術效果。

(6) 龍頭、券臉裝飾 在橋的拱頂正中一塊龍門石，這是拱橋結構上最為重要的部位，當拱砌到頂了用它來起合攏的作用，把它比作鑰匙，也是橋的側立面最顯要的部位。因此，凡是較大或較為重要的拱橋都要在這裏進行加工裝飾。一般是雕作突出的龍頭、螭首或其他獸面，俗稱之為吸水獸，希望它能將洪水吸去以保橋的安全。在拱券外側的券臉石，是拱券的門面，因而是必須加工的。裝飾藝術的繁簡，根據具體情況有所不同。一般總是以一道，兩道，三、五道不等的突起綫條隨拱雕製，并用不同的粗細鑲紋以為裝飾。也有用打磨光平的“素平”手法的。有些石拱橋在券臉石上雕刻出非常富麗的圖案，如河南臨潁的小商橋在大小拱券的券臉石上雕刻出了行龍、奔馬、飛羊、流雲以及牡丹、蓮荷等動植物花紋，好像給拱券鑲了一條花邊。有些橋在拱頂、拱腳旁及相宜部位雕出人物或動植物花紋。

(7) 碑刻與碑亭 修建一座橋，是一件便利交通行旅之事，過去稱之為“善舉”、“義舉”，官方修橋稱之為德政。像這樣的好事是應該加以記載表揚的。因此，往往要立碑刻石以垂永久。碑上記載了修橋的年月，花費的金錢財物，主持修建的官員、工匠以及贊助錢財的施主姓名等等，是研究此橋重要的歷史文獻資料。有的修橋碑也進行了富麗的裝飾。重要的碑還修建了保護的碑亭，如北京盧溝橋的“盧溝曉月”碑和碑亭不僅增加了橋的藝術內容，它本身也是一件很有價值的藝術品。



3、與環境的融洽協調 我國古橋除了它本身的造型和裝飾藝術之外，與環境的融洽協調也是一門重要的藝術。在高山峽谷江河之上、大海之濱修什麼樣的橋型，用什麼樣的結構，是在籌建設計之時就要考慮的。除了滿足其功能之外，也要考慮它的形式、裝飾藝術與環境的協調。“小橋流水人家”成了古代詩人描寫優美田野風光的佳句。這樣融洽的環境給人們產生了美的韻律。唐代詩人杜甫的詩中有“市橋官柳細，江路野梅香”之句，白居易的詩中有“晴虹橋影出，秋雁櫓聲來”之句，形象的刻畫出古橋與自然環境、山川景色交融的意境。

橋梁與環境的融洽協調，在園林中表現得尤為突出。因為橋梁本身就是園林藝術不可分割的一部分。唐代詩人杜牧在他的《阿房宮賦》中寫道“長橋臥波，未云何龍，復道行空，不霽何虹”，說明了橋作為宮苑中的不可缺少的建築，也是按照阿房宮這一宮苑的需要而布置的。現在頤和園中的十七孔橋，正是造園匠師們所精心規劃的長橋臥波的雄偉場面。蘇州拙政園中的“小飛虹”，是一座從湖邊涼亭渡過湖水到湖中小山去的凌空貼水小橋，它伏壓水面，與周圍的建築非常協調。

橋梁的選址實際上也是環境的科學，所稱的“天造地設”，即是這裏的山河道、地形地質給修橋創造了條件，而橋梁也給自然的山川形勢增添了風采。人工與自然相得益彰、相互增色。

四、多樣的橋型 不同的風采

我國自古是一個地大物博、歷史悠久的多民族國家，各族人民在漫長的歷史歲月中，根據他們所在的不同地區的自然環境、地理地質、氣候陽光以及風俗習尚等等不同的情況，創造了各式各樣的橋梁建築。許許多多的古橋，它們既是解決人們交通行旅需要不可缺少的工具，又是各民族建築藝術重要的組成部分。古橋形式之多，難以勝計，可以說幾乎每一座橋都不是完全一樣的，都有它們的特點。但是我們按它們的用材、結構和形式等加以分析大約可歸為以下幾個主要類型：

一、天然橋

二、梁式橋：又分為石梁橋、木梁橋、伸臂橋、廊屋橋、亭閣橋等等。

三、拱橋：又分為石拱橋、磚拱橋、木拱橋、廊屋橋、亭閣橋等。

四、繩索橋：又分為竹索橋、鐵索橋、溜索橋、藤網橋等。

五、其它橋：有浮橋、步墩橋（踏步橋、堤梁橋、步橋、過水梁）、冰橋、鹽橋等等。

You can see all styles of bridges across mountains, gorges, streams, lakes, pools and rivers, even on the shores of turbulent seas and around gardens and court-yards when you stroll the Chinese Land. A lot of ingenious bridges have been not only solid and flat enough to help human beings cross big ditches and deep gullies for thousand of years, but also have been grand and graceful enough to ornament the beautiful lands in the Chinese Land. Many eminent writers and painters eulogized the bridges' elegant demeanor by the poetic line that "A long rainbow is drinking from a gully" or by the poetic line that "A coloured chain is walking in the air". Indeed, these ancient bridges have seemed to be flying as many earthly rainbows in the Divine Land so that the land has gotten more beautiful.

1. The long history

The history of the chinese bridges is so long that the chinese ancestors could use the branches of naturally-falling trees as surmounting tools when they lived in natur stone caves and wood huts in early primitive society. In later primitive society, primitive social villages occurred. There were deep man-made defending ditches around the villages to prevent wild beasts and other tribes from attacking them. In the meanwhile, a problem that the ditches hindered the men of the same tribe from going out and in was brought. In order to settle the problem, safe and convenient crossing-ditch buildings (bridges) had to be erected. According to the recovered pictures of the relics of the five-thousand-year-old primitive villages in Banpo of xian, there was a ditch with five-to-six-meter width and five-to-six-meter depth around each ruin. It was necessary to build bridges because the men of the villages needed to cross the ditches everyday. From the materials and the construction ability, we can confirm that the bridges were beam wood bridges and each of them was formed by putting seven-to-eight-meter trees together. There were many records about the style of bridges in old documents. ShuwenJieZi (a book analysing articles and words) recorded that "A beam (called a bridge later) is formed by woods across a river" and that "A single-plank is called a lever while a plural-plank is called a bridge". GuangZhi (records about various incidents) recorded that "A single-plank bridge is called Zhou". The single-plank bridges should have existed ages ago because the single-plank bridges have simple structure and they can be erected easily. In order to erect such a bridge, men sometimes pushed down a tree near a

潭渡踏石橋



The Anlan Rope Bridge 安瀾索橋



stream or a gully toward the opposite bank or edge.

One of the earliest ancient bridges were called stepping-buttresses, including stone mounds, stepping bridges and dyke-beam bridges. When the Chinese ancestors encountered a stream or when a small river was at the flood, they threw stones in the stream to form a bridge so that they could cross the stream. Because the style of bridges have simple structure and can be built easily, they and the single-plank bridges probably occurred at the same time when human beings could remove things by hand. There were a large number of narratives about this style of bridges in early historical documents. ZhuShuJiNian (a bamboo book recording incidents according to calendar) and KaoGongDian ShiYiJi, the earliest Chinese chronicle, recorded that "Emperor Shun ordered Yu to dredge rivers, to change high mountains into plains, to fill big seas and to use Yuans and Tuoes as bridges in about 2100 B.C." and that "Zhoumo King moved all troops to attack Chu Country by using Yuans and Tuoes as bridges on the way to Jiujiang city in the east in 956 B.C." Yuan and Tuo were actually a kind of big soft-shelled turtle. Men compared them vividly into the stones outcropping over streams. These style of bridges were called stone levers in a book called ErYa. ShiGong. A monograph explaining old articles and words. The book recorded that "The stone levers named Ji were step bridges and they were formed by throwing stones in water so that men crossed water". Now, some people still call this style of bridges "step-in-water bridges" or "crossing-water bridges".

In addition to the styles of bridges above there were rattan bridges and cable bridges ages ago. Primitive men ever clambered high hills and dense forests by dropping ropes and hanging rattan. When they learned to use their hands, they naturally learned to reinforce another end of a rattan so that they could cross a river on it. But this style of primitive rattan bridges were difficult to remain, we impossibly find the things left behind. Later, this style of primitive rattan bridges were developed into bamboo cable bridges and iron cable bridges. These bridges were greatly significant in bridge family.

With the social development, scientific and technological progress, the number of the ancient Chinese bridges had increased in great number, the engineering technology of bridge construction had been greatly improved and the art of bridge construction had gotten richer and delicater since Chinese ancestors created to overcome transportation problems by using or simply

processing such materials as natural trees, rattan and stone. Although the material objects of few early ancient bridges have been remain, we can know how they were from many documents and archaeological data. In the Period of the Spring and Autumn and the Warring States, Princes contented each other and many walls, canals and roads were constructed. Because of trenches around walls, waterways on canals and ditches on roads, a large number of bridges had to be erected to make roads unobstructed. In the fifth century B.C., Ximen Bao built twelve bridges across canals which could be used until the Han Dynasty because the canals which were being digged and roads intersected in Han city (Lin Zhang in Hebei province now). According to Hua Yang Guo Zhi (History of Hua Yang Country), Libing, a governor of Sichuan province in the Qin Dynasty, built seven bridges over the western Pijiang River and over the southern Jianjiang River in Yi Zhou (Chengdu city in Sichuan province now) in the third century B.C.. The bridge outside the west doorway was called the Chongzhi Bridge. The bridge outside the south-west stone-ox doorway was called the Shi Bridge with a diving stone rhinoceros located under the Shi Bridge to suppress water goblins. The bridge in the south of the city was named the Jiang Bridge with the Yili Bridge (the Zhuo Bridge or the Wanli Bridge) over the Jianjiang River, the Changsheng Bridge in the north-west of the Chongzhi Bridge and the Yongping Bridge over the north end of the Pijiang River. The seven bridges were also called the seven-star bridge. They ever took a significant role in the development history of Chengdu city which was ever a famous culture city in history. Zhao King of the Qin Dynasty built the famous Weishui Bridge between the XianYang Place on the north of the Weishui River and the Xinle Palace on the south so that the two palaces were connected together. The length of the bridge was three hundreds and eighty steps (five chi each step). It was a early masterpiece in the Chinese bridge history.

Today, archaeologist discovered the stones and tampered earth which were used to built bridge steps under both banks of the city moat of Qi country's capital in Linzi city of Shandong province in the Spring and Autumn Period and the Warring States Period. The city moat's length was seven-to-eight meters and the bridge spanned at least seven-to-eighty-meters. The excavated wooden stakes of the Weishui Bridge under the old beds of the Weishui River in Xianyang of Shaanxi province proved that the famous Weishui Bridge was ever there and its scale was great.

The Jiangdong River bridge 江東橋



Another style of early ancient bridges were called "boat beams" which were named floating bridges later. Because they were temporary and were taken apart soon afterwards, they were very difficult to remain and there were not their relics for textual research. We can know them only from historical documents. The Book of Songs recorded that "Men used boats as a bridge to welcome marriage troop across the Weishui River". It was said that Zhou Wen King built a floating bridge over the Weishui River to welcome marriage and displayed his authority in 1000 B.C.. According to the Shi Ji • Qin Bei Ji (the historical records about the Qin Dynasty in the Historical Records), Zhen, a prince of the Qin Dynasty, built a big floating bridge over the Yellow River near the Linjin Pass to help the army with thousands of carriages to cross the river when he went to Jin Country for shelter in 541 B.C..

Since Qin Shi Huang (the first king of the Qin Dynasty) unified the world, bridges had been more urgent to be built and the materials and technology for bridge construction had been prepared because of the development of agriculture, handicraft industry, city transportation, economy, military and culture and the construction of city walls and moats. Then, bridges increased in great number with greater scale, more styles, newer technique and more delicate art. Many ancient bridges still exist now as a significant part of the China Nation's culture inheritance. Some ancient bridges such as the Zhaozhou Bridge (the Anji Bridge) of the Sui Dynasty in Zhao County of Hebei Province and the Lugou Bridge in Beijing have been famous in the world and have become the significant inheritance of human beings' science, technology and culture.

2. The great engineering and the exquisite technique

There is a bridge across the Anhai Port at the exit of the Jinjiang River between the Jinjiang county and Nan'an county. The second line of an antithetical couplet on the bridge pavilion says that "No bridge is longer than this bridge in the world". The bridge is the Anpin Bridge, built in the Song Dynasty (before 800 years). Because its length is eight hundreds and ten Zhang (more than five Li) with three hundreds and sixty-two openings, it was also named the Wuli (Five Li) Bridge. Such a long bridge is second to none of the ancient Chinese bridges, even of the ancient world's bridges. The bridge crosses the tempestuous waves so that the difficulty of the engineering can't be imagined. There

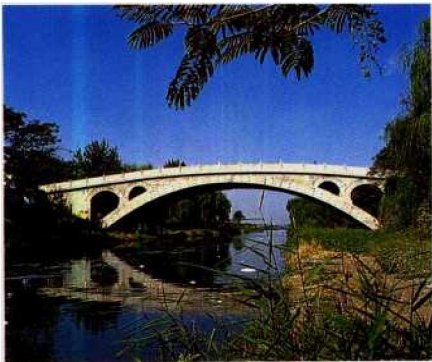
were many such long crossing-sea bridges as the Anpin Bridge in the ancient Quanzhou Bay. The Panguang Bridge was more than five hundreds Zhang long with one hundred and sixty openings; the Dongyang Bridge spanned five hundreds and forty-seven Zhang with two hundreds and forty-two openings; the Wuwei Bridges' length was over five hundreds Zhang. The scale of some bridges were greater than the Anpin Bridge. The Yulan Bridge in the south of Quanzhou city was one thousand Zhang long, two hundreds Zhang over the Anpin Bridge. The Taku Bridge had seven hundreds and seventy openings, more than twice as the Anpin Bridge. Unfortunately, these ancient bridges disappeared early or later with the rise and fall of the Quanzhou Bay and the change of the sea bank terrain. But these significant bridge engineering have gone down in history and become a brilliant page in the rich ancient bridge history.

In addition to bridges' length, the significance of the components of the ancient Chinese bridges was seldom seen. There was a Jiangdong Bridge (the Hudu Bridge) in Zhangzhou city of Fujian province with rarely big stone beams, the biggest of which was twenty-four meters long with more-than-two-meter-height, one-point-eight-meter width and more-than-two-hundred-ton weight. The biggest was so huge that other ancient architectures had not the same and that its weight was over one hundred times as a two-point-five-ton huge stone of Egypt's pyramids.

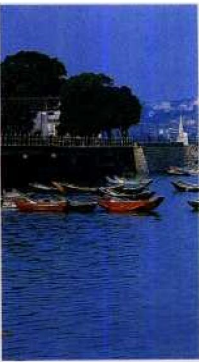
More than millions upon millions of such significant ancient bridges as the Anpin Bridge and the Jiangdong Bridge were erected over the rivers, between deep streams or between high gullies. For examples, the Zhaozhou Bridge in Hebei province, the Luoyang Bridge in Quanzhou city, the Baodao Bridge in Suzhou city, the Lugou Bridge in Beijing and so on.

In the meanwhile, the construction of significant engineering must depend on consummate bridge technique. For more than one thousand of years, the construction technique of the Zhaozhou Bridge has been sung by the lines that "Its structure is so peculiar that no one know how it has been built", "The exquisite consolidation is the first in the world", and "Ancient gods built it". According to modern scientific study, the description of the peculiar structure and exquisite consolidation was reasonable, but how to built it is known and it wasn't built by gods. The description revealed the mastery of the ancient Chinese science, technology and bridge technique. Although the ancient Chinese architectures used wood as the major parts so that the bridges before the Qin Dynasty and the Han

The Zhaozhou Bridge 趙州橋



The Luoyang Bridge 洛陽橋



Dynasty belonged primarily to beam bridges. building workers didn't confined to wood componet technique and had made a brave attempt on the stone-arch technique. Many hard problems were resolved so that the Zhaozhou Bridge became the first of the ancient world's bridges. According to the records in history, the Liren Bridge, built over the Qilijian Rive in Luoyang city in the third year of the Taikang Period of the Jin Dynasty (282 A.D.), was the earliest recorded stone-arch bridge, but the brick-arch bridge had actually existed earlier. The brick-arch coffin chambers, which have been there for more than two thousands years, have been discovered in the ancient underground tombs in Luoyang city of Henan province and other places. Because coffin chambers could be built with the sonte, arches bridges could certainly be constructed with them. We can reckon that the stone-arch bridges had existed before at least two thousands years from the pictures of the stone-arch bridges on the drawing bricks and drawing stones of the Han Dynasty.

The occurrence of the stone-arch bridges was a great step in the chinese bridge history. Because arch structure made full use of the advantages of the construction material (brick) whose anticorrosive performance and supporting ability are sutable to erect bridges, soon afterwards, building workers played their wisdom fully to imporve the stone-arch bridges (occurring two thousands years ago) and beam bridges (occurring earlier than arch bridges) and continued to create the miracles of bridge technique.

1. The Anji Bridge in Zhaozhou city with a spacious shoulder arch (open spandrel) which is second to none in the world. It was a characteristic of the sytle of arch bridges that many small openings were opened at both ends of the big opeing. the style of bridges occurred nearly one thousand years earlier than in Europe. The technique of the bridge construction was in the lead of the world. The following is the advantages of the sytle:

- (1) Lighten bridges' weight largely.
- (2) Enhance the ability to drain flood so that flood can go through bridges smoothly.
- (3) Reduce the impulsive force of flood and increase the safety coefficient of bridges.
- (4) Make bridges more exquisite and more pleasing to eyes.

Following the Zhaozhou Bridge, a style of vacant cavity stone-arch bridges continued to be erected in the Tang Dynasty, the Song Dynasty and the Jin Dynasty, so the style became an important part of the ancient chinese bridges.

2. The long jointing-arch Lugou Bridge. Since the vacant cavity style of bridges with a single opening (a big arch) occurred in the Sui Dynasty in 505 A.D., brick and stone bridges were developed into long jointing-arch bridges. The existing Lugou Bridge is one of the style of bridges across the Sangganhe River which is ten kilometers far from the south-west of Beijing. the Lugou Bridge two hundreds and sixty-six point five metre long with more-than-eight-hundred-year history, eleven openings, built in the twenty-eight year of the Dading Period of the Jin Dynasty (1188 A.D.) was the earliest and longest jointing-arch stone bridge in the north of China. The Lugou Bridge has been famous overseas since Macopolo, who ever was an official of the Yuan Dynasty, praised the bridge highly and recorded it in his travel notes as a rare, beautiful stone bridge. The reason why the Lugou Bridge has stood for more than eight hundreds years is that the bridge technique is superbly perfect and that the bridge's design is extremely scientific. In order to prevent flood and huge ice blocks from the upper reaches of the river threatening the bridge, the watershed was installed with ten huge triangle iron pillars towards ice so that the bridge piers got particularly strong. Recently, under the opeings of the ancient bridge scientists discovered seven layers of big slabstones which were puched by big iron pillars under the river bed so that the bridge pillars and its whole base were fixed. Any stone is connected solidly with any other by a lot of waist irons so that the structure was safe absolutely.

3. The Luoyang Bridge in Quanzhou city which was the first raft-shape-base bridge. The Luoyang Bridge across the sea port of the ancient Luoyangjiang River was the famous ancient bridge of China. The construction of the Luoyang Bridge was ever written in a play (Number One Scholar Cai Building The Luoyang Bridge) to sing the engineering's hardships and the building workers' wisdom. The construction took seven years, with the bridge built initially in the fifth year of the Huangyou Period in the North Song Dynasty (1053 A.D.) and completed in the fourth year of the Jiayou Period (1059 A.D.) There was a tale in the play. A local official managed to build the Luoyang Bridge at the exit of the Luoyangjiang River. Because the wave was so tempestuous that the bridge couldn't be erected. The official wrote a letter to a sea god in order to express his will to work for the walfare of the people and hoped the sea god to help him. The sea god met the demand and wrote back when a engaged warrior went to meet the sea god with the letter. From the only given word 'vinegar', the official reckoned that the suitable time was the

You time (the period of the day from 5 pm to 7 pm) of the twenty-first of the month. The sea tide really ebbed on time when all were prepared well. Workers took action urgently and completed the construction of the bridge's base smoothly. The local official was Caixiang who was a famous literary and calligrapher in the North Song Dynasty. The description of the construction's difficulty in the play was real. Workers were unable to dig the mud and it was also impossible to dig up the mud completely because of the extremely bad geological condition of soft mud and sand alluviation which had been there for years at the exit of the river. The wise building workers adopted the measure with the raft-shape base. A large amount of stone was thrown into the river to form a big stone raft as a stone dike on which the workers built bridge pillars. The measure, called " The raft-shape base " in the world's bridge history, was created in China one thousands years ago. At the same time, another measure was created. In order to connect the stone blocks of bridge pillars and base solidly, building workers planted a lot of oysters (a kind of sea life) between stone blocks to make the bridge more solid considering the oysters' cementing ability. The measure was really wonderful workmanship excelling nature.

4. Erecting big beams with the help of water's rise and fall. The stone beams of beam bridges were very long and big. Some weighted more than ten tons, or several tens tons, even more than one hundred tons. It was really difficult to erect so heavy stone beams on pillars in deep, rapid water without huge cranes and lifting machines. But the wise ancient building workers made use of water's buoyancy, rise and fall originally to erect ingeniously huge stone beams on bridge pillars in the center of deep, rapid rivers. It was particularly convenient to make use of the rise and fall of sea tide.

These are only some samples and measures about the engineering technique of the ancient Chinese bridge construction with more skilled Craftmen and special artistries unexampled.

3. The abundant contents and the ingenious arts

China is a world-famous civilized ancient country with a long history and splendid culture. The art was ingenious not only because of its value for appreciation, but also because of its practical value. Bridges were part of the ingenious arts. The ancient Chinese bridges were not only the



The Chongyang Bridge 崇陽橋

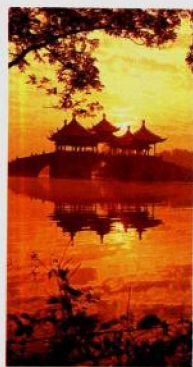
achievements of engineering technique, but also pieces of works of art. So bridges were significant part of excellent historical culture inheritance of the Chinese Nation. The content of the ancient bridges' art was very rich, but the three respects below were major:

1. The artistic modelling of the ancient bridges. Bridges were scientific, technological engineering themselves. Bridges' shape depended primarily on the need of their engineering structures because of their main function to resolve transportation problem for walkers, carriages and horses. But the ancient building workers weren't satisfied only by the achievement of the function structure, but also they resolve the aesthetics problems of the bridges to make the bridges more pleasing to eyes when they succeeded in practical problems.

It is typical for the Zhaozhou Bridge to combine practice and beauty well. The structure function of the arch with the less-than-zero-point-two ratio to vector and span (the ratio to arch height and arch width) is so good that it made bridges' discharge capacity more and made bridges' surface more smooth. The bridges were praised by the poetic lines "The new moon is piercing through clouds" and "A long rainbow is drinking from a stream" because of more ingenious modelling. Two openings designed on two shoulders of the big arch can not only drain more flood and probably prevent the sudden attack of flood, but also they can lighten the bridge and made the whole bridge exquisite and simple.

Some openings of the Baodai Bridge in Suzhou are high so that boats can go through the bridge smoothly and the whole long bridge looks undulated. The two white high-arch bridges across the lake in the Summer Palace, the Yudai Bridge and the Xiuyi Bridge look specially pleasing to eyes and prominent. The former is the entrance of a water and the later is the exit. Boats can go through under them. The diameters of the bridge's openings decrease by the order from the center to both sides so that the appearance of the whole bridge becomes more beautiful. The openings were designed actually to meet the need of the flood discharge of the main way and transportation.

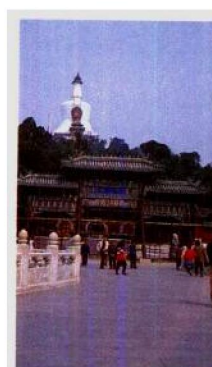
A lot of bridge verandaes and pavilions were built on the Chongyang Bridge over the Sanjiang River in Guangxi province and on many veranda bridges called wind-rain bridges originally to provide the shelters from wind and rain for pedestrians, but actually to make bridges more pleasing to eyes too. The shape and size of the five pavilions of the Chongyang Bridge varied largely to make bridges



五亭橋



The Jiuqu Nine Turning Bridge 九曲橋



The Ornamental gateway of Duiyun Bridge 堆雲積翠橋牌樓

more beautiful. A lot of pavilions were built on the long Wuli Bridge in Quanzhou city of Fujian province to provide the resting places and the shelters from wind and rain for pedestrians so that much elegant demeanour were added to the insipid bridge. The Wuting (Five Pavilion) Bridge over the Shouxi Lake in Yangzhou city won the victory by its delicate artistic modelling with twelve pillars under it, fifteen openings, a big pavilion on its middle, four small pavilions on its four corners. These pavilions with upturned eaves and warped horns looked flying and coordinated very harmoniously with the openings. The inverted images of the pavilions were reflected in the lake. The splendour of the wave and the image of the cloud were set off by contrast each other. In order to extend the walking way and to add the comfort and interesting the small bridge was built tortuously and circuitously. The high artistic standard of the modellings was devoted to three-to-nine-turning bridges and the duplicate ways like flying rainbows across water in the air.

The ancient bridges' decoration arts. Addition to the decoration of bridge bodies to be suitable for their functions and structures, the various styles of decoration were done depending on bridges' position, importance and engineering's scale. The frightening decoration arts of many ancient bridges become an important part of the Chinese art history.

Because the majority of the ancient Chinese bridges were stone or brick bridges, the majority of the art decorations were the stone-carving and the brick-carving, particularly the stone-carving. The following are some parts of the decoration arts:

(1) *Bridge banisters' decoration* Bridge banisters were components with great practical value because they could prevent walkers from dropping down and pedestrians could look into the scenes of rivers and seas by the banisters. The majority of walkers walked by the banisters. Our eyes are attracted primarily by the banisters when we see a bridge near it from the surface of a water or from the ground. So, bridge banisters become the important positions which carving artists devoted their ability to. The literaries in the Tang Dynasty ever described vividly the banisters of the Zhaozhou Bridge (built in the Sui Dynasty) by the poetic line "The bridge twines and stands above as if it is flying or walking". The sentence "The stone lions of the Lugou Bridge were uncountable" was a two-part allegorical said in Beijing. Why were the stone lions uncountable? The reason was in the fact that the carving skill of carving artists was particularly brilliant. You can see a bigger stone lion with many smaller lions on its bodies, under its feet, in its arms, around its necks, even near its

ears when you look up at the stone lion at the top of a pillar. Because of so many pillars, walkers can not count them. The banisters of some bridges were decorated by various kinds of patterns, exotic flowers, rare trees, rare birds and animals, even play stories.

The banisters of many wood bridges were decorated besides those of stone bridges. Although their carving arts were less abundant than those of the stone banisters, they appeared to be exquisite with all kinds of patterns up in the air, composed of criss-cross wood twigs. The original artistic effect was also revealed only by horizontal arrises and perpendicular arrise.

(2) *the ornamental columns (often erected in front of bridges)* Ornamental columns were used to label entrances, or to decorate the gate and the soaring pillars of other important architectures of the ancient Chinese architectures. They were often seen in front of palaces, tombs, and on streets. Either end of a bridge was often decorated by a ornamental column to label the entrance. The ornamental column at either end of a bridge was made of wood or made of stone. There are a couple of very delicate stone ornamental columns at both ends of the Lugou Bridge in Beijing with the eastern stone lion back the western stone lion on the top of ornamental columns. One of the two lions lifts its front feet to wave coloured ribbons as if it is welcoming walkers.

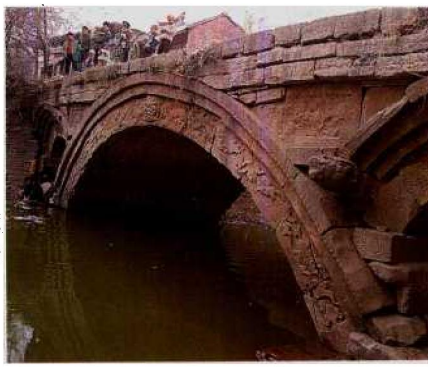
(3) *Pailous* Pailous, also called memorial archways, were the traditional forms of alley gates and lane gates of the ancient cities' alleys and lanes system. Afterwards, pailous could be seen on streets, at republic architectures' entrances and even at either end of a bridge. The pailous are remain at both ends of the bridge between Tuan City and Qong Island in the North Sea Park. The southern pailou was called Duiyun, while the northern one was named Jicui. So, the bridge was called the Duiyun Jicui Bridge. It is evident that the pailou at either end of a bridge not only labels the entrance of the bridge, but also indicates the bridge's name. But the pailous at the ends of some bridges were decorated only by graceful words. A lot of stone pailous or wood pailous are remain all over the country now. many pailous are not only ornaments of the ends of bridges, but also are carving and calligraphy arts with high artistic quality.

(4) *Stone lions and stone elephants* Lions were propagated to China from the West Land in the West Han Dynasty (the second century B. C.). Afterwards, Chinese tamed the king of beasts. The carved stones and pictures with lions' images were

The Stone lions of Lugou Bridge



The Xiaoshang Bridge 小商桥



set by the gates to be majestic-looking. The images looked so lovely that they were played by folks. Elephants are the biggest animals on the land now. Although they are extremely strong, they are kind hearted. Their images were carved in many palaces and temples to guard the gates, or to make the courtyards grander. At the ends of many ancient bridges, the king of beasts and the biggest of beasts were set to guard the bridges and made the bridgeways grander. A couple of tame lions and a couple of tame elephants were set separately at the entrances of both ends of the Lugou Bridge. They used their strong bodies to withstand the stone banisters so that the stone banisters are steadily as the Mountain Tai and no strength can push them down.

(5) *Facing-the-ground stones and facing-the-sky stones* Facing-the-ground stones and facing-the-sky stones are the visible parts of the outer edges of the surfaces of bridges where our eyes often focus. The bridge artists made full use of the places to decorate the bridges. We can see lines of the carving decoration of falling lotuses and small milky white cubes as if lines of decoration borders were mounted in both sides of bridges. Crowded cloud heads were carved on the sides of the facing-the-ground stones of the Lugou Bridge. Some bridges weren't decorated by patterns, but the same positions were carved into basin lips and the images of ice blocks holding the eaves to achieve better artistic effects.

(6) *The decoration with dragonss' heads and arch-shape faces* The Long men Stone at the central top of the arch is the most important part of arch structure. It can join the two sections of a bridge when the arch is built completely. It is compared into a key and is the powerful part of the sides of a bridge. So, bigger or more important arch bridges were all decorated at the positions. The outstanding heads of dragons, chis' heads and other beasts' faces were often carved. They were called drawing-water beasts in the hope that the flood could be drawn away to guarantee bridges safe. Because the arch-shape facial stone on the outer sides of a arch is the facade of the arch, it must be decorated. The complexity or simplicity of decoration arts depends on the practical conditions. One, two, three, or more lines of protruding strips were often carved on a arch with various decorative drilled lines. some decorations adopted the general grinding technique to be bright and flat. Sumptuous patterns were carved in the arch-shape facial stones of some stone-arch bridges. The decorative patterns of flying dragons, galloping horses, running sheep, floating clouds and peonies and

lotuses were carved in the arch-shape facial stones of all arches of the Xiaoshang Bridge in Lingying city (Henan province) as if a decorative border was mounted in the arches. Sometimes, figures and decorative patterns were carved on the tops or bottoms of arches or in other fitting positions.

(7) *The steles with words and the steles with pavilion* The construction of a bridge was the action which made transportation convenient. The action was ever called a project or a magnanimous act, officially called benevolent rule. Because the good incidents should be recorded and praised, steles and stone with words were often erected to make the incidents permanent. The construction time, cost, managing official, craftsmen and the names of contributing-money men were recorded on steles. Those recored are important historical data for the study of bridges. Some steles for bridge constructions were also decorated sumptuously. some important steles had guarding pavilions. The stele and the pavilion of the Lugou Bridge, called "The Lugou's moon at dawn", not only made the bridge more artistic, but also they were valuable artistic works themselves.

3. The harmony and coordiation with environment

Addition to modelling and decoration arts, the harmony and coordination with environment was a important art of the ancient chinese bridges. a bridge's shape and structure had to be considered when the bridge was designed between high mountains, gullies, over rivers or on the coasts of seas. The bridge's function had to be emphasized at first, but its form, decorative arts and the coordination with environment should be considered too. Ancient poets described the fine scenery in countryside by a beautiful poetic line "The household by a small bridge and a flowing water". The harmonous environment gave appreciators a beautiful metre. Dufu, a poet of the Tang Dynasty, ever vividly described the artistic conception of perfect harmony between ancient bridges and natural environment, the scenery of mountains and rivers by the poetic line "The willion by the bridge is slender and the wild plum by the river is fragrant". Baijuyi (a poet of the Tang Dynasty), also described the artistic conception by the words "The inverted image of the bridge appears in summer and the swaying-scul voice comes in fall".

The harmony and coordination between bridges and environment are extremely outstanding in gardens because bridges are necessary part of garden arts. In the Fugue of the Epang Palace, Dumu (a poet of the Tang Dynasty), ever wrote such a description as the lines "A long bridge is lying over waves, where does the dragon come