*Discovering China's 'Forgotten' Bridges**

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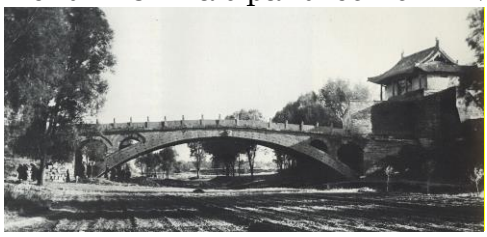
It is just 75 years since Liang Sicheng, China's pioneering architectural historian, "discovered" the Anji [also Zhaozhou] Bridge, which was completed in 605 in southern Hebei province. Today, this structure is considered China's oldest standing bridge and is an iconic element in China's pantheon of "inventions" and "firsts."



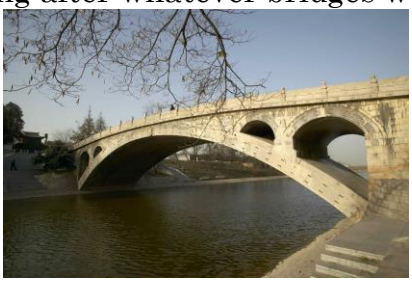
Anji Bridge, Hebei, 1933. Source: Liang Sicheng, 1982: 240

Liang viewed the bridge as an "astonishing" and "superb" structure, noting that a Tang dynasty document reports, "its construction is so strange that no one knows how it was built." Liang's meticulous recording of structural and textual details, excavations, photographs, and drawings remain a testament to his careful field research. At the time of Liang's field research when some restoration work was taking place, the bridge itself was still in regular use as a crossing, although, as Liang's photos show, the riverbed was dry with no boat traffic shown; indeed crops were planted on the fertile riverbed. On the other hand, an undated, somewhat faded, photograph taken sometime before 1928 reveals considerable flat-bottomed shallow-draft boat traffic along a stream that was then clearly more than a trickle. When I first visited the bridge in 1984, fifty years after Liang, what water was apparent was there only because of nearby damming. Today, the ponded water serves as a lake-like water body for pleasure craft for tourists as my photo taken in 2005 shows. It is important that the Anji Bridge not be seen simply as an independent and unique structure divorced from the landscape evolution of which it was a part for 1400 years

However, regrettably, we know precious little about how the Anji Bridge and other numerous similar bridges within the North China Plain fitted into an evolving transportation system, a topic still requiring attention. Old bridges of substantial proportions, distinctive design, and rich ornamentation are strikingly widespread in rural and urban China, although relatively few of them are "known" beyond the communities in which they are located. It may not be obvious that most such bridges once were quite important structures locally and many had countrywide fame. Yet, over the course of time, because of the waxing and waning of fortunes as

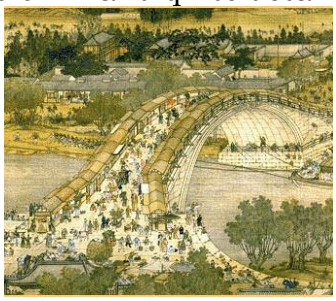
well as inattention and lapses of memory, once important bridges—as well as other buildings—tend to be "forgotten" until some authority recognizes their provenance and calls attention to them.

While the 7th century bridge Anji Bridge was likened to "a new moon rising above the clouds, a long rainbow drinking from a mountain stream" by a Tang [or Ming?] period writer, other bridges in North China also were usually referred to as *hong qiao* 虹桥 or "rainbow bridges." As in the past, the term "rainbow bridge" continues today to be used in China rather loosely to describe bridges that—by the stretch of anyone's imagination—hardly soar, let alone have a rising arc, or even are multicolored. Moreover, the term *hong qiao* remains today as part of numerous place names that might once have been at a bridgehead, but today are mere relict names that have lingered long after whatever bridges were there disappeared.



The Anji/Zhaozhou 'Rainbow Bridge' Photograph by A. Chester Ong, 2005
"… a new moon rising above the clouds, a long rainbow drinking from a mountain stream"
初月出云、长虹饮

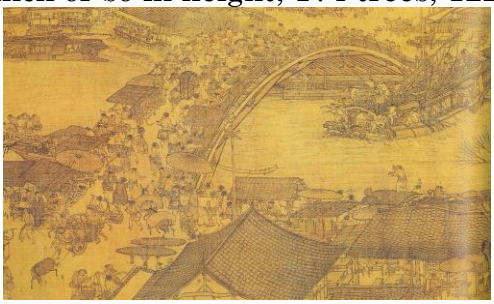
No bridge carrying the label "rainbow bridge" is better known than the one appearing as the visual center of the *Qingming shanghe tu* [Along the River during the Qingming Festival], a handscroll once thought lost and one that has had many subsequent versions—the earliest example of which is attributed to Zhang Zeduan. Until the middle of the twentieth century, all of the known representations of the rainbow bridge in various versions of the *Qingming shanghe tu* were obviously built of stone, some more elegant than others. The best known and regularly exhibited 18th century handscroll, one of seven in the National Palace Museum's collection in Taipei, a version that is both colorful and quite detailed.



Detail of a 'copy' of the Qingming shanghe tu *by court artists, 18th century*
Handscroll, ink and color on silk National Palace Museum, Taipei, Taiwan

The surfacing in 1954 in the Beijing Palace Museum's collection of an 11th or 12th century *original* of *Qingming shanghe tu* by Zhang himself revealed a rainbow

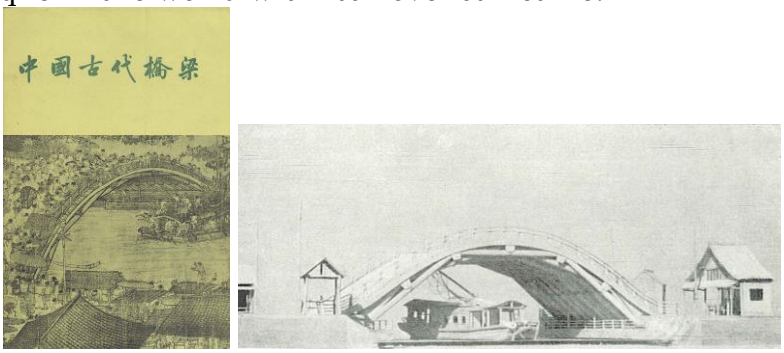
bridge that was structurally at variance with "all" of those better known versions that came later. Whatever the version, this is a remarkable painting—some 9 meters (more than 28 feet) long and 305 millimeters high (about 12 inches)—with 648 individuals, each an inch or so in height, 174 trees, 122 buildings, etc.



Detail of the Qingming shanghe tu *by Zhang Zeduan (1085-1145)*
Handscroll, ink and color on silk, Palace Museum, Beijing, China

As the image above of the Beijing handscroll shows, the bridge is not constructed of blocks of stone, as shown in later and common versions, but instead spans the river via what appears to be a system of interconnected logs, a structure that, as I understand, had never been depicted in a well-known painting before or indeed after. Without a doubt, Liang Sicheng would have viewed this rainbow bridge—as he viewed the Anji Bridge—as an "astonishing" and "superb" structure, certainly pointing out that "its construction is so strange that no one knows how it was built." The celebrated *Qingming shanghe tu* rainbow bridge, of course, is four to five centuries newer than the Anji Bridge and—until fairly recently—was indeed believed to have been a type that no longer existed.

Tang Huancheng a bridge engineer, saw the Beijing scroll soon after it was "discovered" and was among the first to note that the *Qingming shanghe tu* rainbow bridge was "unique in the world with its novel structure."



Tuan Huancheng's book and model of rainbow bridge at Kaifeng

Using an image of the rainbow bridge on the cover of his small book in 1957, he pointed for the first time to an 11th century chronicle that detailed the construction of an ingenious timber framed bridge in Shandong province, which was constructed by a former prison guard who "piled up huge stones to stabilize the embankment, then connected more than a score of wooden logs that gave shape to a 'flying bridge' *feiqiao* with no piers" (1957: 27) Various other historical records revealed that other

bridges were built in this fashion throughout the Yellow River watershed, even into Shanxi, Henan, and Anhui provinces. Local people, Tang pointed out, called this type "rainbow bridges" *hong qiao*, and, according to Tang, it was not surprising that Zhang portrayed such a rainbow bridge without calling special attention to it since the form must have been somewhat commonplace (Tang 1957: 27-28). Tang early on prepared and published a model of the rainbow bridge, as he understood it, emphasizing that its form appeared like an arch from the exterior but had an underlying structure that arose from "piling up" beams. He called this new type a "combined beam-arch" bridge (*die liang gong*), which may translate better as a "redundant beam-arch" bridge.

Meanwhile, Joseph Needham introduced and illustrated the 1950's version of the *Qingming shanghe tu* bridge in his 1971 volume in the *Science and Civilization in China* series on "Civil Engineering and Nautics," yet merely making note of emphasizing the "originality" of the Anji Bridge and other fine structures. Like others, he identified the rainbow bridge as being in Kaifeng, yet cautiously concluded, "So far as is known, there are now no examples of this multi-angular soaring cantilever construction extant in China, but in pre-Ming times there seem to have been many" (Plate CCCXLIII). He continued, "By the time of the Ming (+16th century), the technique which had produced the Khaifêng bridge seems to have been lost (or was at any rate unknown to metropolitan scholars), for the Ming copies of Chang Tsê-Tuan's painting replace the cantilever structures by a single great arch" (1971: 165).

I marvel at Needham's prudence and even his boldness at suggesting that the depicted rainbow bridge had a "cantilevered" *xuanbiqiao* structure with "interdigitating" timber members. Citing the same Chinese sources as Tang and Mao concerning "flying bridges" and "rainbow bridges," he added information concerning other little-known cantilevered bridges in China's southwestern provinces, which he stated "are impressive enough in themselves, but when combined with covered housings and pavilions over each pier … they produce some of the most superb structures of traditional Chinese bridge-building" (1971: 164).

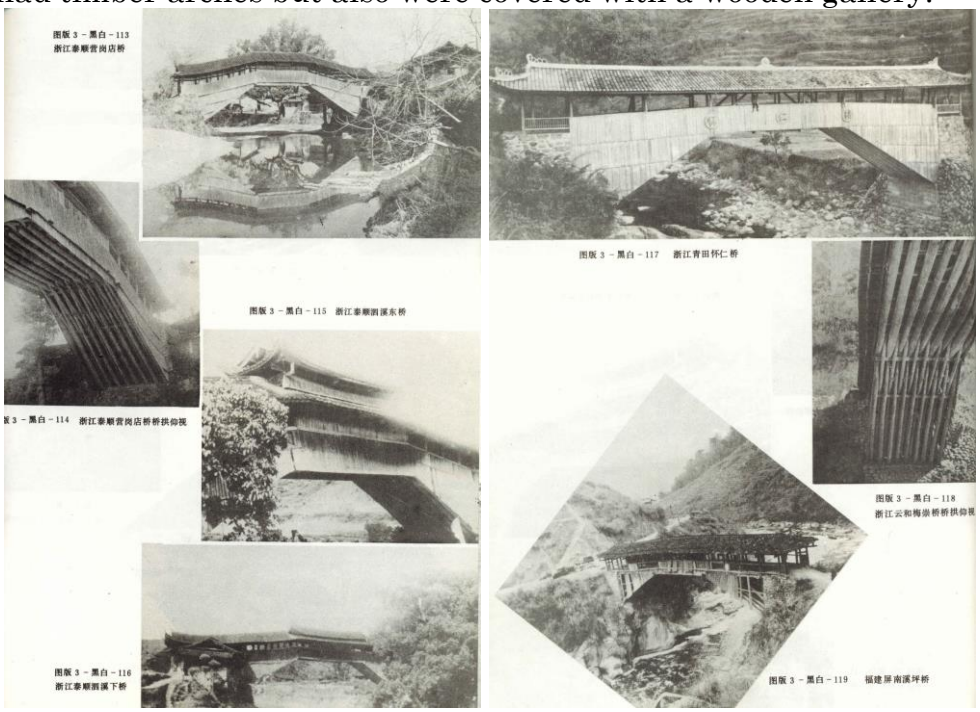
Cantilevered 'wind and rain' Batuan Bridge, Sanjiang district, Guangxi Province. Photographs by Ronald G. Knapp, 2006

As it turns out, the fact that Zhang Zeduan's bridge actually did not have a cantilever structure is somewhat irrelevant since Needham was merely speculating

and was unaware of actual timber frame bridges that were not cantilevered, knowledge of which probably would have changed his thinking.

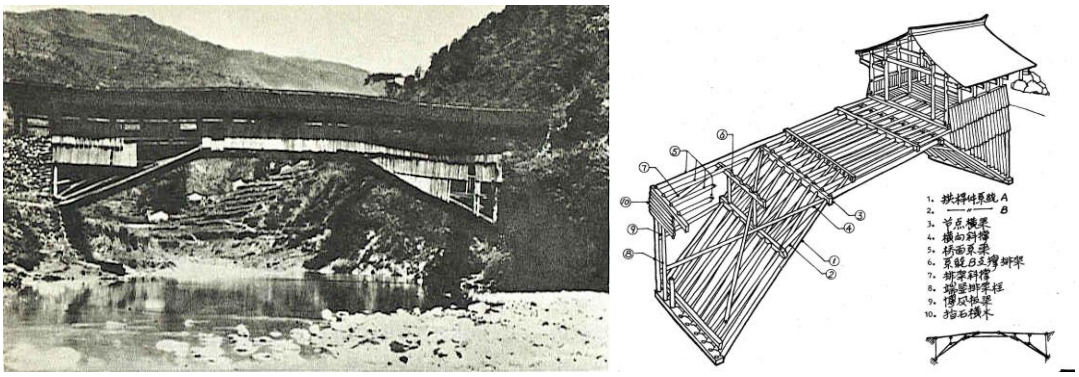
By the early 1970s, a few forays by a small number of Chinese specialists were made into the rugged and generally inaccessible mountains of southern Zhejiang and northern Fujian to document some of the extraordinary timber bridges that were being talked about, but it wasn't until the period 1979-1980 that serious visits were made to document some of what were beginning to be called "rainbow bridges."

Working about the same time as Tang, Mao Yisheng prepared materials for a 1986 book titled *Zhongguo guqiao jishu shi* [Technological History of China's Ancient Bridges]. In that book, he used the term "timber arch" (*mu gong*) to describe the structure of "rainbow bridges" like that in *Qingming shanghe tu* scroll. In addition, he provided the first hazy photographs of ***covered*** timber arch bridges, drawing attention to eleven *existing* bridges—six in Zhejiang, four in Fujian, and 1 in Gansu—whose structure was, he believed, similar to the "rainbow bridge" in Zhang Zeduan's scroll. This provided the first visual evidence that the tantalizing bridges not only had timber arches but also were covered with a wooden gallery!



'Timber arch rainbow bridges' Glimpses of Covered "Rainbow Bridges" Zhejiang & Fujian
Mao Yisheng, 1986:

Just a year later in 1987 and 30 years after the attention he gave to Zhang's scroll painting, Tang provided more historical evidence and deeper, yet still brief, analysis in a competing book called *Zhongguo gudai qiaoliang* [China's Ancient Bridges]. His book, however, included only one hazy photograph and a wonderful drawing of the reasonably accessible and somewhat recent (1802) Meichong Bridge in Yunhe County, Zhejiang province.



Meichong Bridge, Lishui, Zhejiang. Tang Huancheng 1987: 76

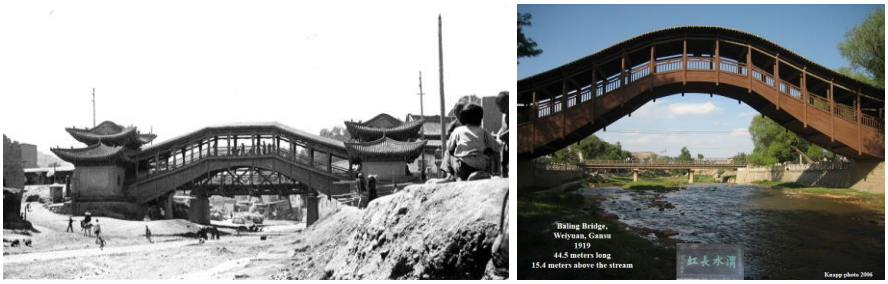
While it is quite striking that two major books on Chinese bridges appeared in only two years, neither author went beyond comparisons to the *Qingming shanghe tu*, certainly neither saw any of the bridges as anything more than structural objects to deconstruct in the literal sense. At the time, neither raised any questions concerning *why* there would be so many bridges in this mountainous region or raised questions as to what role any of the bridges must play in the communities in which they exist.

Given what we know today, they also had no sense of the very large number of covered bridges built atop stone arches or long timber beams that complement the timber arched structures. Both authors were essentially exhilarated by the fact that similar bridges to the rainbow bridge in *Qingming* scroll *shanghe tu* had survived, trying through drawings to draw attention to vestigial structures. **These brief impulses and glimpses, while tantalizing, regrettably led to no further interest for another decade, until the late-1990s**. Somewhat amazingly, Tang offered an uncorroborated estimate that as many as 1048 uncovered "rainbow bridges" had been built in Henan, Shanxi, and Anhui during the Song period (1987: 266). That none of these more than a thousand bridges survived clearly made Zhang Zeduan's portrayal in the scroll of a single structure even more significant to him and others.

There have been some attempts to recreate Song dynasty "woven timber arch-beam" structures using designs by Tang Huancheng. The best known is the rainbow bridge in Jinze outside Shanghai which was constructed as part of a project by WGBH in Boston in 1999. Another is in the Millennium Park in Kaifeng, a theme park based on the concept of the 'Qingming scroll-it is possible that this is the only entertainment venue in the world inspired by a painting!

Puqing Bridge, Jinze, Shanghai Suburbs, built October 1999.
"Rainbow Bridge' designed by Tang Huancheng as part of a project by WGBH Boston

Let's digress just a moment to look at two little known bridges in Gansu that intrigued Tang, Mao, and even Needham, although none of them visited the bridges. These were the Wo Bridge, which some claimed was dated to the Tang dynasty when it facilitated movement across a river on the Silk Road, and the soaring Baling Bridge, which had been built in 1919 across a relatively flat stream in the relatively remote Wei Valley mid-way between Xi'an and Lanzhou.



Left: Wo Bridge, Lanzhou, Gansu. Academy of Natural Sciences, Philadelphia
Right: Baling Bridge, Weiyuan, Gansu. Photograph by Ronald G. Knapp, 2006

The Baling Bridge had been built in the style of the old Wo Bridge in Lanzhou. Sadly, the Wo Bridge was demolished in 1952 because severe rotting and scarce resources made reconstruction impossible. In time, as a few specialists visited the Baling Bridge and looked more carefully at the photographs and a model of the Wo Bridge, it became clear that both had an underlying timber structure that was essentially cantilevered and quite different from both what was being speculated about with the *Qingming shanghe tu* but also was simpler than the timber framed bridges that were slowly coming to light in Fujian and Zhejiang.

Let's turn now to the rugged mountainous areas of Fujian and Zhejiang to look at the large number of significant bridges that have been emerging essentially from the shadows over the past two decades. While more than a hundred timber arch frame bridges, which are structurally reminiscent of the *Qingming shanghe tu* "rainbow bridge" have been "discovered" in the contiguous counties in northern Fujian, which are administratively under Ningde and Nanping municipalities (Shouning, Pingnan, Zhouning, Gutian, Fu'an, and Zhenghe) and southern Zhejiang Wenzhou and Lishui municipalities (Qingyuan, Jingning, Yunhe, Taishun, and

Qingtian), before proceeding, it is important to note—perhaps this is now obvious—that all of these bridges are *covered* bridges unlike the *uncovered Qingming shanghe tu* "rainbow bridge." Here **uncovered** *rainbow bridges* morph into **covered** *centipede bridges*.

Moreover, countless other types of *covered* bridges, which are not at all reminiscent of the "rainbow bridge" but nonetheless noteworthy and often quite beautiful, are found throughout the mountainous region."

Left: Yingjie Temple Bridge, Qingyuan County, Zhejiang
Right: Buchan Bridge, Qingyuan County, Zhejiang
Photographs by Ronald G. Knapp, 2006

The genesis of covered bridges in China, with traditions that predate covered bridges elsewhere in the world, is quite varied and the forms that are still seen are strikingly different from those seen in Europe and North America. Today in North America, where wooden covered bridges are universally recognized as worthy of preservation and valued as emblems of times past, less than a thousand covered bridges remain of the 14,000 once built.

In China today it is estimated that at least 3000 *covered* bridges, called generically *langqiao* 廊桥, still are standing, a number that far exceeds those elsewhere in the world and they are among the oldest structures extant. Old bridges in China, like other old structures, continue to be lost due to floods, typhoons, vandalism, fire, as well as replacement by modern structures to meet current needs. While it is usually difficult to spot the ruins of old covered bridges because timbers and stone were usually quickly scavenged for use as building materials elsewhere, chiseled out rock and approaches continue to hint of past bridge structures.
Some covered bridges here are relatively level structures with gradual approaches, just as they are typically found elsewhere in the world. Others arch up like the rise on the rainbow bridge in the *Qingming shanghe tu* handscroll**.** In Fujian and Zhejiang, many of timber arch structures rear up rather abruptly from their abutments, sometimes seeming to soar dramatically as they cross over a steep chasm or even a relatively level streambed. Local people in southern Zhejiang especially refer to these dramatically ascending types as "centipede bridges" *wugong qiao* 蜈蚣桥 because of their resemblance to the arch-like rise of a long arthropod's body as it crawls.

Here are four of the seven “centipede bridges” in Taishun County, Zhejiang that serve as fine examples.

Xianju Bridge, Taishun County, Zhejiang, first built in 1483. , has a span of 35 meters, just 2 meters shorter than that of the Anji Bridge and it rises higher above the water than the Qingming shanghe tu *rainbow bridge.*
Photograph by A. Chester Ong, 2006

The Santiao Bridge, Taishun County, Zhejiang Province. Photograph by Ronald G. Knapp, 2006

Underside of Santiao Bridge, Taishun County, Zhejiang Province.
Photograph by Ronald G. Knapp, 2006

The Beijian Bridge, built in 1674, rises even higher, some 11.22 meters above what appears to be a sluggish watercourse passing under it.
Photograph by Ronald G. Knapp, 2006

The Xidong Bridge, considered to be the upstream 'sister' of Beijian Bridge, was built in 1570. Photograph by Ronald G. Knapp, 2006

My introduction to "centipede bridges" was in Taishun County after reading increasing amounts of information about the wealth of bridges there. Indeed, there had many as late as 2005 who saw Taishun as ***the*** "rainbow bridge county," presumably the county with the largest and best collection of timber arch bridges. Much of the documentation and popularization of "rainbow bridges" in Taishun owes itself to the energetic efforts of one person, Liu Jie, a young architect at Shanghai Jiaotong University. During a short period of time, he has published four books, arranged three symposia, co-directed two EarthWatch expeditions, among other activities.

It was only after attending a *langqiao* symposium in November 2005 in Taishun that I became aware of even larger numbers of bridges in more remote counties. I returned to the mountains in November 2006, November 2009, and November 2011 spending most of the time in several counties in Fujian as well as Qingyuan county in Zhejiang, with a bit more time in Taishun. I came away somewhat overwhelmed with the potential significance of the bridges as well as other aspects of the built environment.

The statistics in this table relate specifically to timber arch covered bridges—"centipede bridges"—in Fujian and Zhejiang, the type most closely linked to the rainbow bridge in *Qingming shanghe tu*, and thus only hint at the overall extent of existing covered and uncovered bridges in this mountainous region. As the numbers show, there are far more bridges of this type than had been known by Tang, Mao, and others in the 1970s and 1980s, or even known in the late 1990s.

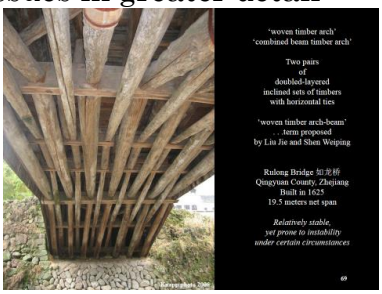
Timber Arch Covered Bridges in Zhejiang and Fujian

Province	City	County	Bridges in 1800s	Surviving Timber-Arched Covered Bridge	National Protection	Provincial Protection	City Protection	County Protection
Zhejiang	Lishui	Qingyuan	226	13	1	1		20
Zhejiang	Lishui	Jinning	94	17				7
Zhejiang	Lishui	Longquan	72	0				
Zhejiang	Wenzhou	Taishun	78	7		2		5
Zhejiang	Wenzhou	Qingtian	64	1				
Fujian	Nanping	Songxi	79	0				
Fujian	Nanping	Zhenghe	199	2				
Fujian	Ningde	Shouning	51	23				2
Fujian	Ningde	Pingnan	---	13		2	11	
Fujian	Ningde	Zhouning	31	9				2
Fujian	Ningde	Gutian	56	6				
Fujian	Ningde	Fuan	96	5			1	
Fujian	Ningde	Zherong	---	2				1
Fujian	Ningde	Fuding	68	1				1
Fujian	Ningde	Xiapu	41	1				1
Fujian	Ningde	Jiaocheng	---	1				
			1155	**101**	1	5	12	39

Source: Que Weimin, Application for 2005 UNESCO Asia-Pacific Heritage Awards

The table reveals that there may have been as many as 1155 rainbow-type timber arch *covered* bridges in the region in the 1800s with 101, slightly less than 10%, remaining today. While these are impressive numbers, I have no doubt that there are may be a small number of other examples that remain yet to be "discovered" and tallied in remote mountain areas. The table shows that there are 5 counties that actually have more timber-arched covered bridges than the 7 better known ones in Taishun. In fact, Shouning County is shown as having 23; with the loss of the Baixiang Bridge in 2006 to fire, this is reduced to 22. In Zhejiang, Jingning County has 17 and Qingyuan has 13 as does Pingnan County in Fujian. I've now visited more than half of the surviving "centipede bridges" in Zhejiang and Fujian. At the outset, I must admit that there is some competitive civic boosterism in the region in which counties vie for the most such bridges and whose is oldest and longest. This is somewhat reminiscent of the contests among villages in southern Anhui in the late 1980s and 1990s as to which village had the most Ming dynasty houses

There are several ideas I want to explore quickly: how are the bridges built; why are they covered; why are there so many of them; what is the status of preservation/conservation of the "discovered" bridges; what historical questions arise from the presence of so many bridges; what does this all mean? Other speakers will address these issues in greater detail



Woven timber arch-beam structure, Rulong Bridge, Qingyuan County, Zhejiang. Photography by Ronald G. Knapp, 2006

From a distance, as we've seen, these bridges appear to be supported by a type of wooden arch, but actually it is an illusionary "arch" that emerges from the interlinking of a series of logs—long tree trunks—that function as interwoven chords or segments of the "arch." The substructure of the newly restored Rulong Bridge in Qingyuan county shows this well. Chinese engineers refer to such a structure as "woven timber arch," "combined beam timber arch," and "woven timber arch-beam" to underscore the use of straight timber members tied together. The basic components are quite simple: two pairs of two layered sets of inclined timbers, with one set embedded in opposite abutments, which stretch upward toward the middle of the stream. To fill the gap between these inclined timber sets, two horizontally trending assemblages of timbers are attached. Transverse timbers tenoned to them and/or tied with rattan or rope hold each of the sets of timbers together. It is these warp and weft elements that give rise to the term "woven." Computer simulation analysis by Liu Jie and Shen Weiping revealed that this woven composition of logs operates like both an arch structure as well as a beam structure in the mechanical sense. Thus, the technical terms describing the configuration, they suggest, is better called a "woven timber arch-beam" structure—with the word "beam" being added—to better describe mechanically its form.

The Rulong Bridge, which was built along a major trade route at the site of a Song dynasty bridge, has a length of 28.2 meters and clear span of 19.5 meters with nine interior modular bays. Adjacent to it is a large temple, said to date from the Song period. Three distinctive pavilion-like structures rise above the roof. The northern one is a three-tiered over-hanging gabled structure, which served as a bell tower with two entries, while the opposite one on the south end is a pavilion with three entries from stone pathways. The central elevated structure houses a complex of altars. It was only in 1997 that the bridge was recognized as a provincial level historic site, after which some restoration work was done. In 2001, the Rulong Bridge was accorded National status.

The Rulong or "Like a Dragon" Bridge was built in the later part of the Ming dynasty in 1625.
Photograph by Ronald G. Knapp, 2006

The downward pressure of the heavy logs compresses all the components together into a tight and relatively stable composition with a significant bearing capacity. Tang Huancheng and Mao Yisheng learned quickly from their models of the *Qingming shanghe tu* rainbow bridge that what is under some circumstances

"relatively stable" was actually inherently unstable. Equilibrium could be quickly upset if forces from beneath—such as might come from torrential floodwaters or even strong winds—pushed upward, especially as the timbers aged and weakened. The periodic sweeping away of such bridges may indeed have contributed significantly to the eventual absence of rainbow bridges made of timber on the North China Plain. Furthermore, as evidence from Chinese environmental history now shows us reasonably clearly, the virtual elimination of forests not only in the plains but also in nearby mountains would have meant that the reduced source areas for timbers was itself also a contributing cause. Moreover, as is the case when any building falls into disrepair, the scavenging and reuse of timbers and stone for other building purposes would have removed in time essentially all of the evidence of any bridge's prior existence. This is as true in the North China Plain as in the mountains of Fujian and Zhejiang, although in the latter case one can still see carved stone sockets in the exposed natural stone along the valley sides.

Builders—especially in areas where timber was abundant— learned no doubt by trial and error—that one way to increase stability to the underlying structure was to add additional weight above by constructing a building atop the bridge. Somewhat counter intuitively, the heavy timber columns, beams, balustrades, and roof tiles add a substantial dead load that actually increases stability to some extent. With the addition of wooden skirts along the side perimeter, moreover, the wooden members would be further protected from weathering and deterioration to create a covered bridge. In North America, covered bridge buildings—virtually all of which were built with patented trusses—are *always* described as being covered in order to protect the underlying wooden structure from weathering, and *never* as adding weight to stabilize the structure.

Most covered bridges, whatever the nature of the substructure, in China are constructed in essentially the same fashion as local houses and temples using timber frame construction and a conventional set of elementary parts. The substructure of the bridge serves as the "foundation," with the floor of the bridge being paved with bricks or stone or overlain with sawn timber.

Construction of the Tongle Bridge, Taishun, Zhejiang, 2004-2006
Photographs by Xue Yichuan

The superstructure of most covered bridges are I-shaped structures, comprised of the number of bays necessary to span a particular distance. Often, as with land-based structures, the number of bays is an odd number since such numbers are considered auspicious. Wooden benches, some quite elaborately made, usually run along the full length of any covered bridge. Some of these covered bridges are analogous to roadside pavilions, differing only in that they span a body of water. Quite a few covered bridges have lofts accessible via a ladder; indeed the upper level space is sometimes considerable.

While "woven timber arch-beam" rainbow bridges in Zhejiang and Fujian, as we have seen, are similar to each other, there are many variations, which resulted from an empirical approach to building with creative mutations arising from local circumstances

The Yuanfeng Bridge in Shouning County, Fujian has a span of 37.6 meters.
Photograph by Ronald G. Knapp, 2006

On the other hand, not all timber arch bridges soar. Some, like the Wan'an Bridge in Pingnan County, Fujian, which is the longest bridge of its type in China, has a length of 98.2 meters with net spans between 10.6 and 15.3 meters for its six "arches." Incomplete records tell us that the Wan'an Bridge was destroyed many times over the years, more because of local conflicts rather than natural disasters. A bridge was built here first during the Song dynasty but was destroyed in 1648 during the turmoil of the Ming to Qing dynastic transition, some say by bandits who made off with the wooden components. Although rebuilt in 1742 during the settled early years of the reign of the Qianlong Emperor, a time of great prosperity, the bridge was put out of commission again twenty five years later. While rebuilt in 1845, the bridge was consumed by fire in the early Republican period of the twentieth century. In 1932, when it was rebuilt, the overall structure was lengthened. Flood damage in 1952 destroyed nearly a third of the wooden structure, which led to reconstruction in 1954 in the form seen today.

Wan'an Bridge, Pingnan County, Fujian
Photograph by Ronald G. Knapp, 2006

Aside from looking at the elevation and structure of the Fujian-Zhejiang bridges and recognizing that the fundamental function of a bridge is to span a gap, it is important also to realize that covered bridges came to serve as multifunctional sites for a variety of activities: a place to rest for travelers, itinerants, and workers; a place for women to make handicrafts and watch children; a site to spread goods to sell; as well as a place for a shrine or temple. Often located at an elevated position in the midst of a gorge usually meant that a breeze passes through the upper structure with the result that bridges are always a cool place to sit and talk, even spend the night.

The association of bridges with temples and shrines is deeply rooted in Chinese culture, even going beyond their construction being supervised by monks and the resources making them possible arising from a quest for merit by the faithful. Bridges often were built adjacent to temples and even inside temple precincts. Sometimes the names of a bridge and nearby temple or shrine were the same, a fact that underscores their interdependence. One still hears the phrase, "where there is a bridge, there is a temple; where there is a temple, there is a bridge." However, throughout the more developed areas of China today, the reality is that once-common shrines and temples—not only related to bridges but also those in rural and urban neighborhoods generally—have been substantially eradicated over the years because of political campaigns and even lack of interest. In newly reconstructed bridges, sometimes only an empty wooden case or small brick structure that once held gods and the paraphernalia of worship are seen.

In the countryside in Fujian, Zhejiang, and even Jiangxi, provinces where folk religion is especially syncretistic, the central portion of most covered bridges contain shrines and altars to major gods in the Daoist or Buddhist pantheon as well as lesser local or regional gods. The wax drippings, darkened beams, and burnt incense suggest regular use that elevates covered bridges as significant community spaces. At one time, a stove for burning spirit money was beside every altar, but, today because of the fear of fire, most are placed outside the wooden structure.

Some altars are attended, but most are not. Visitors can purchase candles or incense and deposit money into a box. There usually are cushions to kneel on. On the altar of some bridges, as in any temple, is a wooden container holding numbered bamboo sticks, each one with a number and writing that represents an idea, action, or suggestion. While many of these gods and goddesses can be approached at any time, most receive special attention on the birthday of the god or goddess. On these special days, the image is removed from the shrine and set into a wooden palanquin, usually stored in the rafters above the altar, and then carried in a noisy procession before the doors of all families in a village. The cycle of the agricultural calendar in Fujian, Jiangxi, and Zhejiang once was replete with dates to celebrate the gods and goddesses. Today, for the most part, these practices no longer recur with the frequency of past times.

Baiyun Bridge, Qingyuan County, Zhejiang Province.
Photograph by Ronald G. Knapp, 2006

Santiao Bridge Shrine, Taishun County, Zhejiang
Photograph by Ronald G. Knapp, 2006

While most altars are inserted in a bay at the middle of a covered bridge or in a shrine at the end of the bridge, there are many bridges with a separate space for worship on a second level at the heart of the bridge. Yuwen Bridge in Zhouling township in Taishun County is an exquisite open wooden structure built atop a stone base with a single arch. Shaded by a pair of old trees, gnarled camphor and a pine, as well as framed by the large boulders of a narrow ravine, the site is indeed magical. It has a surprisingly large devotional space in a loft above the main gallery, all capped with a triple eaved roof. Accessible by a ladder, the main altar is to Wenchang Di, the "Emperor of Prospering Culture," also known as the God of Learning, a stern supernatural official who exemplifies morality. A pair of faithful boy attendants, one named Tianlong, meaning "born deaf," and the other Diya,

meaning "born mute," accompanies him. It is said that he intentionally employs two handicapped boys since the one who can hear cannot speak, while the other can speak but cannot hear, thus ensuring confidence.

Yuewen Bridge, Zhouling Township, Taishun County, Zhejiang
Photograph by Ronald G. Knapp, 2006

Merely focusing on the techniques of building bridges or even their functions as important community spaces unintentionally obscures the fact that no bridge exists in isolation. Each is actually a node, just one link, in an extensive system of bridges, fords, and ferries that themselves are but elements of a wide-ranging network of roads, paths, and byways. The presence of so many extant old bridges, some of which are truly unique structures, and the traces of old paths linking them provide a skeleton for scholars to understand the emergence of a significant regional culture from some early period to the present in an area that seems to be an improbable region to find an integrated traditional transportation network.

Left: Stone path leading over the mountain to Yuanfeng Bridge, Shouning County, Fujian
Photograph by Ronald G. Knapp
Right: Qingyuan County gazetteer, Zhejiang 1877

Even as we now have a rough understanding of the extent of these bridges, it remains reasonable to ask several new questions: How could a distinctive structural form, once apparently common, on the North China Plain ostensibly die out? Is it possible to determine whether the form diffused outward from North China into South China, or did it develop independently in the remote mountains? How could

such a form not only be preserved in a remote mountain region but also continue to be built in the middle of the twentieth century? Of course, how these bridges fit into the centuries-old transportation network of this region has yet to be teased out and it is tempting to relate their existence to the better-known building of megalithic stone bridges in coastal Fujian during the Song dynasty (960-1279).

Unlike palaces and temples—even houses—that are noticeable because of their facades and profiles, bridges, on the other hand, are frequently overlooked as architectural artifacts. Born of necessity to span streams, valleys, and gorges, bridges are literally underfoot and often inconspicuous. Yet, while sometimes merely utilitarian and unnoticed, many of China's bridges indeed are dramatic, even majestic and daring architectural structures that epitomize the refined use of materials to span space.

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