

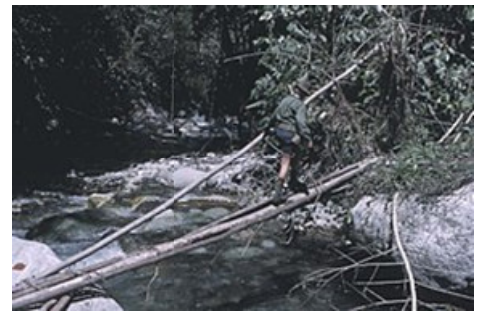
## ARCHITECTURE

### November 2018: History of Bridges

Altogether there are over 50 different types of bridge, so this meeting looked at just a few of these. In a nutshell a bridge is a structure built to span a physical obstacle. The type of bridge used depends on the specific situation, the terrain, its purpose and available materials. Note – unless otherwise stated all photos are from Wikipedia and reproduced under the Creative Commons licence or are public domain.

#### Early Bridges

The simplest early bridge was simply one or more logs used to span a river (Photo: Colin Freeman). An early bridge which survives today is the Arkadiko Bridge, Mycenaean bridge made of stone and located in the Greece Peloponnese. It is an example of an arch bridge.



#### Arch Bridges



The greatest bridge builders of antiquity were the Romans, and they have left behind some remarkable arch bridges and viaducts, such as the one at Alcántara, Spain (photo: Alonso de Mensoza). Originally 190m in length, it used cement, adding to the strength of the natural stone.

Early arch bridges were also built in China, but here the materials were mostly wood and bamboo. Although built over 1,000 years ago, many are in daily use today. The oldest surviving stone arch bridge in China is the Anji Bridge, constructed over 1,400 years ago (Photo: Zhai Xhou Qiao).



#### Suspension Bridges

The simplest type of suspension bridge is a rope bridge. They were common in the Inca empire prior to the arrival of the Spanish in the 16<sup>th</sup> century. More modern well known suspension bridges include the Clifton Suspension Bridge near Bristol and the Albert Bridge in London.



#### Iron Bridges

A major development in technology was the use of iron as a bridge building material, the world's first such bridge being the one at Ironbridge in Shropshire (left), built 1779. However, wrought iron does not have a high tensile strength so larger bridges had to wait for the development of steel. Another development was the welded road bridge, the first of which was the Maurzyce Bridge in Poland built in 1929.

## Beam Bridges



These have metal girders and are supported at each end by an abutment or pier. Since they are relatively cheap to build they are quite common. A disadvantage is that their span is limited. They come in a variety of formats – beams side by side with a deck over the top, box girder and plate girder etc. Studies of compressions and tensions in such bridges have led to innovative designs, such as the lenticular truss bridge. A good example is Brunel’s Royal Albert Bridge across the River Tamar (Photo: Geoff Sheppard).

It is also quite common to have multiple piers creating viaducts, such as in the Feiyunjiang Bridge in China or on the plate girder beam bridge across the Iowa River (Photo: Douglas W. Jones). The largest beam bridge viaduct in the world is the Sanshuihe Bridge in China, which has five beam spans of 185m each. The tallest of its six piers is 183m high and its total span is 1,688m.



## Bascule Bridges



This is a moveable bridge, a bit like a drawbridge. It has a counterweight that balances a span or “leaf”, that can be lifted to allow passage of ships beneath. Their design means that they use little energy and can be raised and lowered quickly. A good example in England is the Rotherhithe Street Bridge (Photo: John A King). You sometimes find a bascule section in a longer bridge such as in the low level trestle bridge forming the 38km long Lake Pontchartrain Causeway in Louisiana.

## Timber Bridges

Going beyond log bridges, timber bridges take a variety of forms, such as truss, trestle or beam. One of the oldest is the Holzbrücke Rapperswil-Hurden bridge crossing upper Lake Zurich in Switzerland (Photo right: Roland zh). Its prehistoric piles were found to date back to 1523BC. Another well known



timber bridge is the covered Kapellebrücke in Lucerne, an example of a truss bridge (Photo: Simon Koopmann). This was built around 1365 as part of the town’s fortifications. Originally 890ft long, various changes have reduced its size to 672ft today.



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## Bridges of Interest

The talk continued with a succession of slides showing some iconic London bridges of various types including Tower Bridge, Hungerford Bridge, Blackfriars Bridge and some outside London including the Gateshead Millennium Bridge and more locally the swing bridge in West Mills.