

# Fellows in Action

Congratulations to **Professor Jean Marcel Tirole HonFRSE (r)**, Scientific Director, Institut d'Economie Industrielle (IDEI), Toulouse, who has been awarded the 2014 Nobel Prize in Economics for his analysis of market power and regulation. Regulators and competition authorities have obtained "a whole new set of tools" from Professor Tirole's work, according to the Royal Swedish Academy of Sciences, which announced the award.

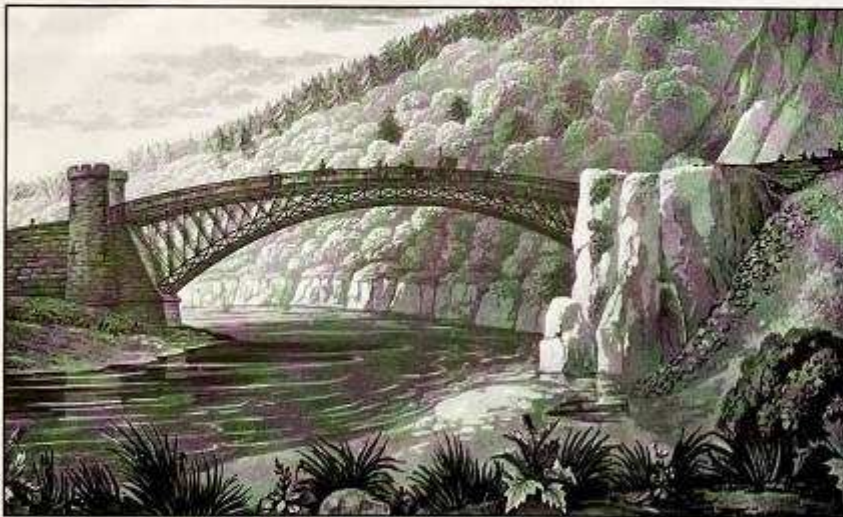


**Professor Philip Schlesinger (r)**, Professor in Cultural Policy, University of Glasgow, has been appointed a non-executive member of the Ofcom Content Board to represent the people of Scotland. He has been a member of Ofcom's Advisory Committee for Scotland since 2004 and its Chairman since 2009, a role he will continue until the end of 2014. His three-year appointment to the Content Board begins on 1 December 2014.



## Something like a Spider's Web

From RSE Fellow, Professor Roland Paxton MBE FICE's lecture delivered in Craiggellachie Village Hall on the Bicentenary of Craiggellachie Bridge.



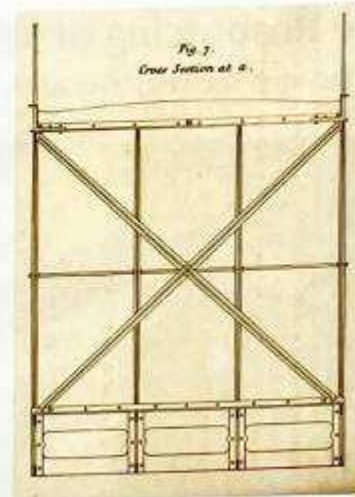
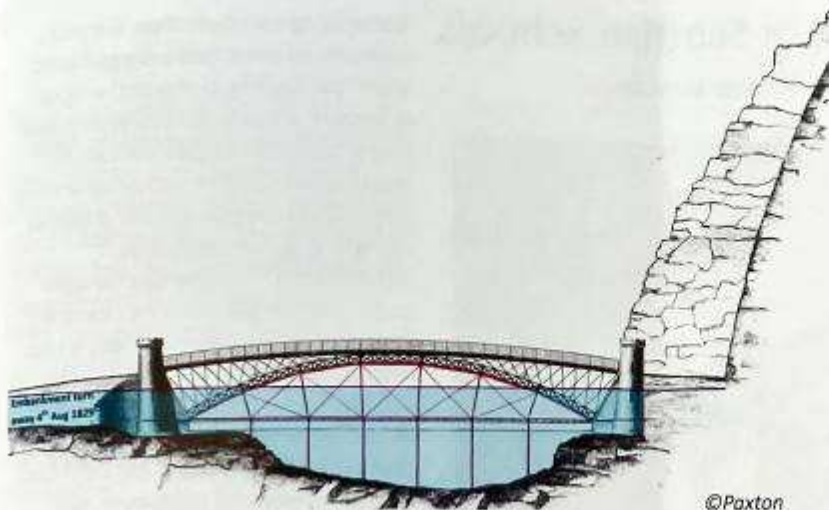
*Craiggellachie Bridge soon after completion. Drawn and published by J. Grant, Elgin. ©Paxton*

The Craiggellachie Bridge is a cast iron arch bridge located at Craiggellachie, near the village of Aberlour in Moray, Scotland. It was designed by the renowned civil engineer Thomas Telford FRSE and built between 1812 and 1814. The bridge has a single span of approximately 46 metres (151 ft) and was revolutionary for its time, in that it used an extremely slender arch which was not possible using traditional masonry construction. The ironwork was cast at the Plas Kynaston iron foundry at Cefn Mawr, near Ruabon in Denbighshire, by William Hazledine, who cast a number of Telford bridges. The ironwork was transported from the foundry through the Ellesmere Canal and Pontcysyllte Aqueduct, then by sea to Speymouth, where it was loaded onto wagons and taken to the site. Testing in the 1960s revealed that the cast iron had an unusually high tensile strength. This was likely specified by Telford because, unlike in traditional masonry arch bridges, some elements of the arch and spandrel struts are not in compression under loading. At each end of the structure there are two 15 m (49 ft) high masonry mock-medieval towers, featuring arrow slits and miniature crenellated battlements.

In 1812, Telford wrote: "Having measured the width of the river and learned the height to which the floods rise, and having considered the nature of the foundations, the depth of water, and other circumstances, I became satisfied that any stone bridge with piers in the river would cause an expense and continual risk, but an iron arch .... of 150 ft, I am convinced might be accomplished for about £8000".

This indeed proved to be the case during the great flood of 1829, when other bridges down the length of the river were washed away but the Craiggellachie arch survived. The figure (top left, facing page) illustrates the depth the water reached on that occasion and, in red, a notional idea of the larch centering used to support the ironwork during fixing in 1814.

Craiggellachie Bridge is technically outstanding as the world's earliest surviving example of an innovative, light-weight, prefabricated cast iron bridge type, which made a significant contribution to Britain's roads before the railway age. With spans longer than then practicable in stone, and exhibiting an unparalleled combination of strength, economy and intuitive design. By 1830, the genre had been adopted in nearly half of all the world's cast iron bridges with spans over 32 m. It achieved a unique 'spider's web' lightness by distributing forces throughout the whole framework, using high quality ductile castings of nearly half the tensile strength of modern mild steel and, in addition to traffic loads, has been able to accommodate a temperature range of movement of about one inch.



After 150 years of valuable service, surviving the great flood, deck strengthening in 1902, and carrying 'extremely heavy' military vehicles from 1939 to 1945, the bridge was closed for a major refurbishment in 1963–64. The bridge was reconstructed above its original ribs and cross-bracing, with care taken to retain its original character. This involved replacement steel spandrels, deck beams and railings, but the original deck plates were retained to support a reinforced concrete deck. A 14 ton restriction was placed on the bridge at this point. This, along with the fact that the road to the north of the bridge takes a sharp right-angled turn against a 100 ft-tall excavated rock face, made it unsuitable for modern vehicles. Despite this, it carried foot and vehicle traffic across the River Spey until 1972, when its function was replaced by a steel and reinforced concrete bridge, which carries the A941 road today.

In 2007, this A-listed bridge was dubbed an International Historic Civil Engineering Landmark and this was recognised at the bridge by the knowledge-promotion plaque presented by the American Society of Civil Engineers and erected by Moray Council on a masonry plinth. Professor Paxton worked to this end, on behalf of the Panel for Historical Engineering Works of the Institution of Civil Engineers and with support from Moray Council, local people and the American Society. Professor Paxton is pictured below (on right) at the International plaque unveiling in 2007 with Dr Henry Petroski, American civil engineer, historian and author.



Since being bypassed in 1972, the bridge has received little maintenance. In July 2014, the Concrete & Corrosion Consultancy Practice Ltd, at the initiative of Moray Council, inspected the bridge (left) and found it to be in generally good condition, but in need of refurbishment, costing in the order of £400,000, to keep in good order. With its use now limited to recreational, educational and environment enjoyment as an international historic monument, this is too large a sum to expect the Council to find from its bridge maintenance budget. Help with funding to obviate further deterioration of the bridge is now being sought and the 'Friends of Craigellachie Bridge' has been established, hopefully to provide the essential local support to ensure the bridge's preservation for the next 200 years.

(Extracted from article by Professor Paxton that appeared in the November 2014 issue of the *Knock News*, Banffshire).