

**A Joint meeting of  
The Newcomen Society  
and  
The Institution of Structural Engineers History Study Group  
to be held in the Director's Suite, the Science Museum, London SW7 2DD  
(note: access is via the North Door - see map)  
on  
Wednesday, 8<sup>th</sup> April 2009  
At  
5.45pm**

**The Polonceau roof and its analysis  
by  
Professor Stefan M Holzer  
Professor of Civil Engineering  
University of the Federal Armed Forces, Munich**

The roofing system named after Camille Polonceau (1813-59) was invented around 1840 and quickly became popular for large-span roofs in France and Germany.

The paper will follow the development of the wide-span timber roof from the last third of the 18th century to the middle of the 19th century. The contemporary state of technology of the traditional timber roofing provides the backdrop for various attempts to introduce iron elements into the timber roof. It will trace the "Polonceau" roof back to the cable-trussed beams of military bridges and describe the "invention" of the "Polonceau" roof around 1840 and the evolution of its construction until the late 19th century, in particular, its rapid transformation into an all-iron roofing system.

The second part of the paper deals with the methods of analysis employed in the design of "Polonceau" roofs. We find two distinct lines of tradition, one based on the analysis of individual components, making use of Johann Albert Eytelwein's *Handbuch der Statik* (1808), as well as another one based on the incipient methods for the analysis of statically determined trusses, particularly on graphical methods (Maxwell, Rankine, Culmann). We observe that both traditions – incompatible with respect to the underlying modeling assumptions – co-existed for quite a number of decades, and even mixed occasionally, with disastrous consequences for the validity of the analysis.

The paper concludes with an evaluation of both lines of tradition and highlights the eminence of novel approaches attempted by Castigliano.

The paper provides, in a nutshell, both a history of the Polonceau roof and a history of structural analysis in the 19th century.

**Biographical note:**

Stefan M. Holzer is Professor of Civil Engineering, University of the Federal Armed Forces in Munich. Born in 1963 in Germany, Stefan M Holzer studied Civil Engineering at the Technische

Universitaet Munich, where he obtained a PhD degree in 1992. He spent the year 1993 as a PostDoc at Washington University, St Louis, with a stipend of the German Research Foundation DFG. Subsequently, he returned to Germany and worked as a structural engineer for HOCHTIEF, Frankfurt, during the years 1994 and 1995, in the Power Station Division. He was appointed professor for applied computer science in structural engineering at the University of Stuttgart in 1995, where he stayed for six years. In 2001, he moved to the University of the Federal Armed Forces, Munich, Germany. At that university, he holds the chair for Engineering Mathematics.

Besides contributions to the development of numerical methods, his research focus has widened in recent years to include structural analysis of historical buildings, as well as the history of structural engineering as a scientific discipline. In 2006, he organised a book exhibition on the historical development of civil engineering at the library of the university, and in 2007, a monograph on 17th-18th century timber roof trusses in Germany will appear.



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