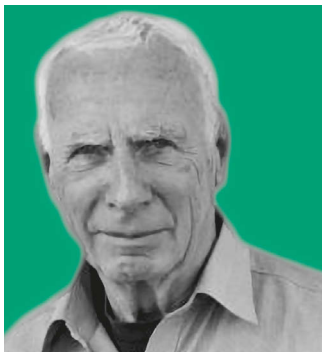

AMIN AKHTAR

Obituary

# Jörg Schlaich, 1934–2021

Jörg Schlaich was born in 1934 in the village of Kernen near Stuttgart, the third child of Elisabeth (neé Weiss) and Ludwig Shlaich. After his school years in the village of Stetten and small town of Waiblingen, he trained in carpentry before studying architecture and engineering at Stuttgart, Berlin and Ohio universities, followed by three years working for civil contractors in Stuttgart. By the 1980s, Schlaich had become the leading engineer in the Stuttgart cluster centred around the university.

To understand how this came about, one has to go back to 1960 or so when Fritz Leonhardt, the highly respected bridge engineer, was Professor of Engineering and President of Stuttgart University. Frei Otto was in Berlin investigating lightweight structures and designing experimental tents that were built by his tent-builder friend, Peter Stromeyer.

Around 1961, Leonhardt – together with Curt Siegel, Professor of Structural Design at the Faculty of Architecture – arranged for the appointment of Otto as Professor of Lightweight Structures at Stuttgart and founded an institution, known as the IL (*Institut für leichte Flächentragwerke*), that undertook research into those subjects. This was followed in 1969 by the founding by Leonhardt and Otto of SFB 64, a 'special research area'.

SFB 64 brought together several other departments of the university, including the *Institut für Anwendungen der Geodäsie im Bauwesen* (IAGB) led by Professor Klaus Linkwitz and the Institute of Statics and Dynamics of Aerospace Structures (ISD) led by Professor John Argyris, which was developing applications of digital computers.

Schlaich joined Leonhardt's partnership with Wolfhart Andrä (LAP) in 1963, and in 1964 he became a lecturer at the university, teaching structures with a focus on design aesthetics.

Around this time, the Berlin architect, Rolf Gutbrod, had been appointed to design the West German pavilion for the 1967 Montreal Expo, with Leonhardt as engineer and Otto as design adviser. The design was to become a cluster of large cable-net tents.

Otto developed the designs using stretch fabric models. The agreed design was then made using tensioned wires that became the scaled geometric definition of the structure. The forces would have been estimated using hand calculations so that the components and connections could be suitably sized. The trial structure was made by the steel and cable contractor and, after use, was re-erected at Vaihingen where it became the building to house the IL.

Shortly after the Expo 67 project, work began on the structures for the 1972 Olympic Games that were to be held in Munich. The selected architect was Günter Behnisch from Stuttgart and he was supported by the members of the SFB 64. The appointed engineers were LAP, with Jörg Schlaich the Partner in charge of the project. The engineers' task was to calculate the static forces in the structures.

Schlaich would have known how the Expo structure was designed and built, but this was much larger. There were three major tented structures on the landscaped site: the main stadium, the athletic arena for gymnastics, etc., and the swimming hall. Otto and his collaborators at the IL had made stretch fabric models for all of them and also tensioned wire measuring models to define the geometry and the forces. The IAGB measured all the models and processed them using their software based on their force-density method to obtain greater accuracy.

The pattern models for the swimming hall and stadium were accepted for ongoing development. That for the athletic arena was felt to need further optimisation. At this time, there was no software available for analysing a flexible cable-net, but Schlaich asked Argyris, who was at the forefront of the development of finite element analysis and was working on methods to analyse geometrically non-linear structures.

Argyris was asked to apply this to the roof of the athletic arena to check the accuracy of the wire model and to calculate the forces. The analysis was successful and gave results that could be passed on to the engineers and the builders of the cable-net. This work started the use of computer analysis for cable and fabric structures.

The IL was in a central position in the design development of the structures: it was building the measurement and testing model and specified the prestress forces, too. The engineers also had a voice in the definition of the prestress forces and recommended higher forces. This led to a disagreement between Otto and Schlaich. Eventually, the higher values were used, but many years later Schlaich told me he thought the prestress a bit high.

In 1974, Schlaich became a full professor at the *Institut für Konstruktion und Entwurf,* a post he held until 2000. After the excitement of the Olympic structures, Schlaich stayed on at LAP until 1979 when he started his own firm with Rudolf Bergermann. SBP continues to this day and has a remarkable catalogue of projects that includes TV and communications towers, cable-stayed and other road bridges including the second Hooghly bridge in Calcutta, and many lightweight footbridges.

SBP also developed systems for so called spoke-and-wheel cable structures for stadium roofs built in many parts of the world. It introduced many variations and improvements to this system and became the leading engineers for such stadium structures.

Schlaich was also engineer for several concrete shell structures. Of particular note was the roof of a swimming pool at Alster, Hamburg, where the roof was formed of three hyperbolic parabolas fitted together on three primary supports. This structure was investigated using a Perspex model. He also designed a replica of Candela's Xochimilco restaurant shell, made in glass fibre-reinforced concrete, which was installed in a park in Stuttgart as a tribute to the Spanish-Mexican engineer.

With one of his doctorate students, Schlaich designed systems for building very light and transparent grid shells to cover courtyard spaces within a building.

Schlaich inspired many students to become structural engineers, several of whom worked with his firm, SBP, and went on to start other engineering businesses that helped to make the city renowned for design engineering. He was awarded the IStructE Gold Medal in 1990 and the IABSE International Award of Merit in Structural Engineering in 1991.

Jörg Schlaich died on 4 September 2021. He is survived by his wife, Eve, children, Michael (also a renowned structural engineer), Frieder, Sibylle and Anne, and several grandchildren.

**Ian Liddell**

Second Hooghly Bridge, Calcutta