

Review

This tribute to Eduardo Torroja's contribution to structural engineering celebrates his diverse achievements and how these were intended to bring the greatest benefit to society, writes **Bill Addis**.

Eduardo Torroja – the man and his legacy

Author: Pepa Cassinello
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EDUARDO TORROJA (1899-1961) WAS ONE of the greatest structural engineers of the 20th century, and was the youngest of the four great pioneers of reinforced concrete (RC) structures – the others being Robert Maillart, Eugène Freyssinet and Pier Luigi Nervi. This is the first biography of Torroja and covers every aspect of his remarkable career and widespread influence in the worlds of engineering and architecture. It is written from a very personal viewpoint. Its author, Pepa Cassinello,

is the director of the Eduardo Torroja Foundation and founder of the Eduardo Torroja Museum in Madrid, Spain. Her father, Fernando, worked with Torroja at the Eduardo Torroja Institute for Construction Sciences (IETcc) and she knew many members and friends of the Torroja family. The author makes use of personal archives of the Torroja family as well as organisations with which he was associated.

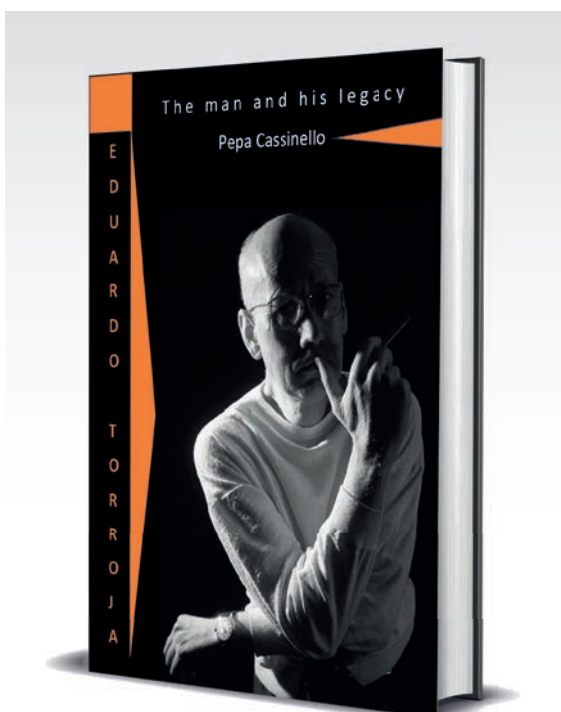
Torroja studied civil engineering and then joined the firm run by one of his professors. From the beginning he wanted to innovate and, at the age of 26, designed one of the first structures using prestressed concrete. Two years later he set up his own civil engineering firm setting him on a 'path of creative autonomy, a path based on technical and scientific research that would give him the freedom to devise structural forms never imagined before'. In the years leading up to the start of the civil war in 1936, he built several large bridges and viaducts as well as a number of buildings, including a house in which he lived from 1932 until his death. But, most spectacularly of all, he built his first thin-shell, RC structures, for which he is probably best remembered – the market hall in Algeciras, the spectator stand at the Zarzuela Racecourse in Madrid and the Frontón Recoletos, a covered court for the Spanish game of pelota. Shell structures were still in their infancy and their behaviour was still not well understood. To overcome this uncertainty, Torroja pioneered the use of tests on reduced-scale models to investigate their behaviour and support the theoretical design calculations.

Following the end of the civil war in 1939, Torroja's firm became engaged in many reconstruction projects including the Martín Gil Viaduct, which was, at the time, the largest RC arch in the world. He also began building steel bridges and other structures constructed using welded steel. In parallel with his project work, Torroja began broadening his activities in various ways. He had already founded the IETcc in 1934,

and in 1941 he was appointed as the new director of the Central Laboratory for Testing Construction Materials. He commissioned a new building which opened in 1943 and included a laboratory for the testing of reduced-scale models in the design of structures which soon became known worldwide.

During the 1950s Torroja devoted an increasing proportion of his time to research activities, teaching and delivering lectures worldwide. In 1957, he founded the International Association for Shell Structures (IASS), now known as the International Association for Shell and Spatial Structures, which is the leading organisation that brings together engineers, architects and builders with an interest in lightweight and innovative structures. Also in the 1950s, Torroja wrote his well-known books *The structures of Eduardo Torroja* (1958) and *Razón y ser de los tipos estructurales* (1957), one of the most remarkable books written about structural engineering, titled *The philosophy of structures* in English.

Cassinello's book is not a comprehensive study of Torroja's work as an engineer – that will be a huge undertaking (his archive lists around 1800 projects). Rather, it is a tribute to the man and his contribution to his profession and his influence on people from so many different disciplines. The book celebrates his diverse engineering and professional achievements and how these were intended to bring the greatest benefit to society. The author is the one person who could carry this out – she was invited to do so by Torroja's son, José Antonio – and she has done this with consummate skill, endearing enthusiasm and passion.



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Bill Addis is an engineering historian and author of *Physical models: Their historical and current use in civil and building engineering design* (Berlin, Ernst und Sohn, 2021).