SIXXI
STORIA DELL'INGEGNERIA STRUTTURALE IN ITALIA

a cura di
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Una ricerca entusiasmante

La ricerca Sisto (Twentieth Century Structural Engineering: The Italian Contribution) ha lo scopo di ricostruire – e raccontare – la storia dell'ingegneria strutturale in Italia. Dalla sua origine ad oggi. È una storia avvincente, a tratti gloriosa, e comunque singolare. Enigmaticamente, infatti, accade che in un paese in cronicor ritardo nel processo d'industrializzazione, come l'Italia, si sviluppi fin dai primi anni del Novecento un'ingegneria strutturale in linea con le più avanzate frontiere europee, che desta vengono assumendo negli anni dell'autarchia una propria originale identità, che nel fervore della ricostruzione e del miracolo economico generi un patrimonio di eccezionale qualità ed emerga alla ribalta internazionale come una Scuola tra le più prestige del mondo, che negli anni successivi, con la stessa rapidità con cui si era imposto all'annamiro mondo, scompaia completamente dalla scena.

L'esigenza di ricostruire questa storia deriva dal fatto che, al termine della sua breve parabola, la Scuola Italiana viene subito dimenticata, anche in sede storica. La curiosa circostanza rende la ricerca Sisto per noi entusiasmante: la storia che veniamo riscoprendo, giorno dopo giorno, è praticamente sconosciuta. Al grande pubblico certo, ma anche, incredibilmente, agli architetti, agli stessi ingegneri. Perché è vero che qualche protagonista è famosissimo. Nel caso di Nervi è esplosa una vera e propria moda. È anche vero che esiste una tradizione di studi sulle opere strutturali. Ma si tratta di sondaggi episodici, rassegne analitiche, lavori interessati a costruire una tassonomia delle tipologie strutturali.

Il progetto Sisto si propone invece di innescare un processo di storicizzazione della Scuola Italiana d'ingegneria. Collocandone l'origine, lo sviluppo e il declino nella prospettiva storica: sullo sfondo dell'evoluzione dell'ingegneria moderna in campo internazionale, nelle ricche interazioni con la tormentata storia del Paese, in rapporto alla ben più nota storia dell'architettura italiana del Novecento.

Il fatto che non si sia ancora messo mano a questa storia non è inespugnabile. Anche la storia mondiale dell'ingegneria strutturale appare trinomia in confronto alla storia dell'architettura. Alla base dello stentato sviluppo c'è un motivo: la scarsa simpatia tra l'ingegnere e la storia. Non ci si può aspettare che sia l'ingegnere – l'ingegnere ortodosso che ammira a progettare il futuro – a ripensare la storia, si tratti pure della propria. D'altra parte, la ben più consolidata storiografia architettonica, che pure ha sempre guardato con curiosità alle strutture moderne (basta pensare allo spazio che Giedion riserva a Eiffel e a Mallart) non è però attrezzata per spingere l'indagine fino alle implicazioni scientifiche, che nella progettazione strutturale svolgono un ruolo vitale.
Sixti - History of Structural Engineering in Italy

English Texts

The fact that this history has not been traced, yet, is not without reason. Even the world history of structural engineering seems to be quite scanty as compared to the history of architecture. The reason for such a fragmented development is to be seen in the little sympathy engineers have for history. An engineer, conventionally trained as the profession considers it and the future, cannot be expected to care for history, even if it is his own history. On the other hand, the more accepted architecture historiography has always been intrigued by modern structures (think about the attention Gidon gives Eiffel and Maillart!), but it is not prepared for a push into investigation into scientific implications, which play a key role in structural design.

In other words, there is an objective difficulty to see the history of structural engineering against a specific disciplinary context. However, a structure requires a radically trans-disciplinary approach. To promote the development of the Italian school, the theoretical contribution made by scientists like Menabrea, Castiglione, Danusso, Colonnelli is no less important than the work of designers like Nervi, Marconi, Zorzi and Musolfi. If we want to get the secret of the originality of the great post-War achievements — from the viaducts to the Autostrada del Sole, the Olympic stadium, the works made for the centenary of Italy — we should reconceptualize accurately the close collaboration between scientists and designers on which the whole activity of the relevant building sites was based. An operator or a theoretician, the protagonist of the Italian school is a multi-faceted figure that is at the same time a scientist, an entrepreneur and a craftsman, a reincarnation of the 19th-century engineer that in a pioneer's spirit prefers the use of concrete instead of steel in the construction of major public works. Based on that strange combination, he finds the conditions for a short, but effective survival in the unique setting of Italian (betrayed and constantly proto-industrial) modernization. His heterogeneous innate characteristic cannot be decoded by conventional interdisciplinarity, but require a different strategy that is not based on a specialists' team. The challenge faced by the Sixti research is to discover the history of structural engineering by applying the approach that is used by the history of construction. Being this a 'material history', it is prepared to recreate the design in the construction phases as practices: definite moments of a material culture. Since any practice is heterogeneous, but essentially unitary, a historian wishing to bring it back to life cannot use an interdisciplinary approach but has to get ready to take transversal paths on his own. The creator of a major structural work passes easily through the great epistemological areas, from sciences to techniques and arts. The investigator wishing to trace his works has to go the same way.

In order to carry out the research, a Sixti team has been set up, whose membership includes some young and very young researchers. This has been a first step toward the ambitious, primary goal of the project: to start a new, independent course in research in Italy in that be dedicated to history of engineering, and be borderline between history of science, history of technique (just a bracketed) and history of architecture.

To this end, the study has been based on previous work and continues in different directions. The most challenging task is to follow new clues to find the previous events that have not been investigated yet. This is the exciting part of the research: to investigate vast and unexplored territories, be the first to lay our hands on never-before-documented, raw, unfiltered material from different architecture archives, an author's production, the micro-stories of a single work. The fragments reconstructed by the team's investigation, episodic of a different nature, that have had an impact on the overall development of the Italian school of engineering: the scientific contribution that at a certain time facilitated structural calculation, the inventions of equipment that is peculiar to the Italian building site, the activity of a specialist lab, the creation of a thousand-year-old enterprise (from architecture journals), an author's production, the micro-story of a single work. The fragments reconstructed by the team's investigation, episodic of a different nature, that have had an impact on the overall development of the Italian school of engineering: the scientific contribution that at a certain time facilitated structural calculation, the inventions of equipment that is peculiar to the Italian building site, the activity of a specialist lab, the creation of a thousand-year-old enterprise (from architecture journals), an author's production, the micro-story of a single work. The fragments reconstructed by the team's investigation, episodic of a different nature, that have had an impact on the overall development of the Italian school of engineering: the scientific contribution that at a certain time facilitated structural calculation, the inventions of equipment that is peculiar to the Italian building site, the activity of a specialist lab, the creation of a thousand-year-old enterprise (from architecture journals), an author's production, the micro-story of a single work.
In 1961, the wake of the Italian economic miracle, the Fiera di Modena was fully transistorized with colour photo-cube, articles with photos and drawings, the number of pages and collaborators increased. The journal shifted attention to the various preconceived concrete works; moreover, special supplements were published on the occasion of the FIP international conferences taking place during four years. Hence, the Fiera di Modena started to become: because of the increasing difficulty in finding and addressing outstanding works in Italy, the focus shifted towards research and development and remarkable achievements of Italian structural engineering and its first-choice material: cement.

**Gianna Caprotti**

**ISMES, the Experimental Institute for Models and Structures, the Template of Italian physical modelling.**

In 1928, one of the tests carried out on a large model of the arched dam across the Piave river, the basis for the establishment of a modern experimental organization was laid. Following initial testing, the companies involved in the studies agreed on extending investigations to all building sectors. So in 1931 the Experimental Institute for Models and Structures was founded. Based on an idea by Arturo Danusso and Guido Oberti from Milan's Politecnico, ISMES was intended to carry out scale model-based investigations on large structures in order to promote technical and scientific development of the building arts, to further scientific research, and to model-based research in particular represented the natural link between theory and intuition: a model was a valuable tool to inspire thought. Danusso and Oberti had made statically-adequate decisions, suggested him cost-effective solutions and checked calculation results. Based on a model theory, according to which two systems are physically similar if there is a geometrical correspondence between their points, modelling techniques distinguished between cases with a complete mathematical formula and those that could not be supported by a mathematical formula. In the former, the model was a powerful "stress calculating machine" (mechanical model); in the latter a structure's ultimate capacity was evaluated with the use of structural models, exceeding the elastic limit up to the point of failure. The above model categories include static and dynamic effects, and have been carried over to bridge design. At a closer look, the enormous contribution made by F.I. Nervi's works to the development of construction techniques and also another key element of the structural relationship between Italian engineers and ISMES was the 'factor' that made the Institute renowned worldwide, but at the same time gave rise to structurally complex, hyperstatic structures that are symbolic of the Golden Age of Italian engineering.

**Guido Caprotti**

The Italian-Style Skyscraper. The Construction of High Rise Buildings in the Fifties and Sixties

While Italian engineering is praised internationally, many architects, impressed by the media success of Italian structuralism, explore the relationship between structure and architecture in their works.

Research on high-rise building is the privileged meeting point for architects and engineers. Under the assumption in which the same importance, they devise new forms of interaction between structure and architectural appearance, dismissing the traditional "internalist" style solutions. Giorgi Perng, Luigi Moretti and BBPR tighten professional partnerships with Pier Luigi Nervi and Antonino D’Andersù, the designers of most Italian skyscrapers built in the Fifties and Sixties. Among them, at least three masterpiece are worth mentioning: the Velasca Tower, the Pirelli skyscraper and the stock Exchange Tower in central, which, when completed, was the tallest reinforced concrete building in the world. The rigidity of these works is evident as against restless American skyscrapers from the same period. On the other hand, Danusso and Nervi’s approach is radically detached from that of American engineers, who had already become extremely experimental. As a matter of fact, Italians developed a renewed unity between a building, architect, and engineer’s skills. The Italian feature on the skyscrapers appears in the typical national post-war building techniques, and in the use of original structural schemes developed to meet a sophisticated architectural purpose. The load-bearing structure was the most appealing feature of the Viadotto dei Parchi in Milan, with the ultimate slab structure design can be seen in the viaduct’s solid, continuous deck connected to the piers to create a sequence of asymmetric portals. During construction, a moving formwork with a top load-bearing structure was used. One of the most appealing features of the viaduct was its coexisting in harmony with the surrounding natural environment.

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