

# BUILDING SITE

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Marko Pogacnik

Both in *the Atlantic and Madrid Codexes* there are Leonardo's drawings that show his studies on the balance of elementary structures. Leonardo does not employ calculation procedures then in use, he does not rely on sizing methods *more geometrico* based on the proportional ratio between section and height of the different elements, but submits the operation of structures to a mechanical study. Cables are connected to an arch keystone with counterweights attached at their opposite ends. A pulley allows to increase or reduce the action of the counterweight and thus to precisely estimate the value of the horizontal component of the force that allows to keep the keystone in balance under the parallel counterforce of the arch. In further drawings, this method is expanded to all the arch ashlar so that the simultaneous action of each element can be studied. Ashlars are hinged to one another and the arch thus becomes an unstable structure whose balance is the result of the action of forces that the builder must reduce to exact mathematical calculations. The forces' action is conveyed in numbers, such as the maximum value allowed, the ultimate weight of the arch.

A century and a half later, Galileo carries out a similar procedure in his *Discourse and Mathematical Demonstrations Relating to Two new Sciences* (1638). To simplify the reduction to calculus of the stress that a ledge undergoes when loaded on its apex, its mechanical behav-

our is compared to a lever action, where the locking becomes its foothold.

Levers, pulleys, wedges, cogged whelms, sloping planes, the static operation of a building is reduced to its resistant structure which, in turns, is equated to a working machine, such as those that had been in use in building sites to lift components, to move weights or to dig excavations. The building site in antiquity — in the fine image that we borrow from Giorgio Benvenuto — was a sort of theater where machines, scaffoldings and provisional supports enabled to represent components during their installation and therefore, still undergoing the dangerous influence of loads that could unbalance or crush them: the action of an arch on its pier, the strain of a beam caused by its own weight and the span it has to cover, the thrust of a vault on its side walls. At the end of construction, though, when scaffoldings and provisional works are removed, the ancient building is shrouded in a stillness that obliterates the previous turmoil and ornament is established, the column and the beams become the referrers to a *firmitas* based on *venustas*, and therefore not on technical perfection nor on the appropriate sizing of a structure. In the modern age, on the other hand, once construction is over, the machine does not disappear, but is incorporated within the building, enabling us to read the functioning of its parts as if they were pulleys and valves moved by invisible cables. This is obvious when dealing with a work whose meaning is mainly technical: a bridge, a skyscraper, a large span roof but, as Pierluigi Nervi once noticed, large building contrac-

tors have the resources to state their authority and to put their mark on the style of an epoch. Minor builders refer to it. To build a five-meters-span is not a challenge but this can be evoked in a certain arrangement of the building parts or in an extreme reduction of the sizing of the structural elements in the same way in which the streamlined outline of a refrigerator does not enable it to fly better, but gives it a shape that partakes a collective fascination for speed.

Mechanical sciences, greatly influenced by Galileo, reestablished a centrality to the building site that had been contested in the humanist age to the benefit of a design concept (*lineamentum*) that had to be mechanically translated in the finished work (*structura*). The architect's authority was not based on the building site, where his presence was not even required, but in the project drawing that was given to the workers who had to take care of its faithful translation into the built work. His prestige was authorial, representing a liberal art that was free from mechanical duties.

Galileo makes sure to give back to the construction site the authority of a place where the translation of an architectural idea into built work is an operation that is mediated by procedures that need a continuous testing. In the Eighteenth Century, the site of St. Genevieve in Paris (designed by Soufflot with the aid of Rondelet) becomes a laboratory for the testing of the strength of different kind of stones and for experiments on the efficiency of various kinds of arch sections. In the previous century an equal character was expounded by the building site of the cathedral of St. Paul in whose project the mathematician Christopher Wren had engaged Robert Hooke (the scientist to whom we owe the explanation of the principle of the elasticity of materi-

als). In the Nineteenth Century, the development of architecture could be written again as the history of the exemplary building sites in which it was established the authority of new construction techniques (Navier), of new practices tied to the employ of materials such as iron and of new professional figures such as the engineer. The great building sites of the Nineteenth Century such as the Britannia Bridge by Robert Stephenson, the Crystal Palace by Joseph Paxton and the works of the 1889 Paris Universal Exposition (Tour Eiffel and Galerie de Machines) push architecture to confront the new technical forms, a challenge that will be taken by the construction sites of the Neues Museum in Berlin (Friedrich August Stüler), of the Bibliotheque St. Genevieve by Henri Labrouste, of the Mole Antonelliana in Turin (Alessandro Antonelli) of the Paris Opera (Charles Garnier), of the Reichstag in Berlin (Paul Wallot) and of the Sagrada Familia in Barcelona by Antoni Gaudi. The most important european magazine of the Nineteenth Century, the *Allgemeine Bauzeitung*, printed in Vienna by architect Ludwig Förster, starts its long editorial cycle with an issue devoted to the building site of Schinkel's *Allgemeine Bauschule* (known as *Bauakademie*). The text issued by the foreman, Emil Flaminius, is a literary masterpiece for the way in which the narrative of the construction succeeds in weaving together technical and formal observations showing how detail choices can condition the general balance of the architectural outlook (format and color of the cladding bricks, window design, terracotta applied works).

In the Twentieth Century, the building site does not lose the aura of a collective endeavour related to the collaboration of different knowldges to whom the architect affixes that seal of unity that no other technical figure can guarantee. The building sites of the

Beaubourg (in the tale of Peter Rice), of the Sidney Opera House (architect Jorn Utzon) and of the Olympiapark in Munich (Frei Otto and Fritz Leonhardt with Jörg Schlaich) are key points in a history of architecture that does not endorse only technical achievements. In these examples, the building site is still the physical place where the project takes shape as a complex negotiation among architect, technicians, contractors, construction industry and, last but not least, the client. Everything happens within codes and norms that public institutions issue to exercise a control on the finished work; these have gradually become more and more prescriptive ending up depriving the building site of its original meaning. The digital revolution described by Mario Carpo is getting ready to transfer the construction site in a virtual environment such as the *BIM (Building Information Modeling)* where different figures involved in a project can interact by avoiding a noisy and dirty place such as the building area.

Having lost any sense of a collective adventure (epic and playful), the building site is reduced to an individual experience (getting inebriated by smelling fresh mortar) or to an historical event. Works such as Terragni's Casa del Fascio in Como acquire a completely different meaning if the deciphering of the abstract architectural language is combined with the reading of the construction phases as done by Sergio Poretti.

In the Palazzo della Regione by Adalberto Libera in Trento, the design is finalised on the site through a complex dialogue between the architect and his structural engineer, Sergio Musmeci. Without the timing of construction, the architectural work cannot ripen the issues that the project defines in a still incomplete form. In what other places or dimensions can we obtain that time if the building site is precluded as a con-

text where to practice architecture as a constructional event?