

## ARCHED BRIDGES: HARMONY, COMPOSITION, MEANINGS, PERCEPTION

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### SUMMARY

The design of the bridge is, in the most classic consideration, a cultural act that has its roots in the ancient triad *firmitas*, *utilitas*, *venustas*, which Vitruvius himself coined, wherein structural form and function coincide. But the theme of the bridge can become thought and communicate its "being" as an object loaded with identity, with its own poetic intrinsic nature and means through which we can perceive and experience the place, a unique fact that, through the form exalted by the structure, confirms the true identity of a context, and can take on various different facets.

This way, the aim of the paper is to investigate the approach to the work-context-landscape-suggestions "dialogue", which is fascinating not only in the research into the type as the founding moment for the structural design, but also as a basic assumption to encourage ongoing research into the formal potential that arched bridges offers in order to understand the meaning and the perception of the infrastructure in/of the landscape.

**Keywords:** *Bridges, arch, landscape, harmony, composition, meaning, perception.*

### 1. LANDSCAPE AND HISTORY

Landscape is associated with two fundamental semantic values: the subjective and the objective one. In its subjective dimension landscape is the result of our perception, of a multi-sensorial image where all our faculties are summoned up to experience the stimuli coming from the outside. In historical research, it is in the sources offering a personal and descriptive vision of the territory that landscape presents itself in such a subjective dimension, as for example, in travel reports, literary works and paintings.

Since the late Middle Ages, the first idea of landscape as a "painting of towns" developed within history of art. The second semantic value of landscape – the objective dimension – developed later in European culture, from the beginning of the 19th century on and mainly due to German geographers. Landscape in its objective dimension represents the set of elements and processes which can be found in a specific area, not thought as single phenomena but rather as part of an interconnected system.

On the historiographical level, the most appropriate sources to investigate the objective dimension of landscape are the "objects" themselves, the elements of anthropic or natural origin, which have survived the passing of time and have been preserved on the territory. The objective landscape is thus an element of research, but it is also a set of

resources to be defended. What survives of it represents valued evidence which must be recognized, safeguarded and enhanced.

Landscape is a multi-layered phenomenon formed by different levels piled up throughout time, thus modifying and working on previous layers. The territory under our eyes is like an “open book” telling its own story, and we need to learn how to read and interpret it. The fundamental idea is that past landscapes keep working on the present. Their possibility of action depends on the value of what has survived, on the importance that its evidence keep maintaining. Sometimes we speak about landscape-inertia as the tendency to keep in time the deepest and most persistent lines which have marked its history, despite the continual modifying interventions by man.

Young Goethe, while crossing the Alps and overlooking the vast plain underneath him from the Garda heights, wondered: “*There are no words to give the idea of the splendour of the new Region the eye can catch while going downhill. It is just a garden, several miles long and wide, kept with the utmost care, lying at the feet of high mountains*”. The garden traces have not wholly disappeared: the settlement texture and the agricultural organization are still there, a strong substratum reaching our days, keeping the marks of land division, its original architectural structures, its road network, and the formation of the oldest inhabited areas.

Landscapes are influenced by anthropic structures or perceptions, affecting their formation; we can thus speak of *sacred landscapes*, *work landscapes*, or *power landscapes*. A structure is not an immutable phenomenon, but rather a form of social organization lasting for some time and providing stability to a system. Like any social phenomenon, the structure represents different values and it interacts with the economic, religious and cultural life of populations. As Lucio Gambi has suggested, the structures governing landscape “are not visible”, they are socio-economic realities which do not fall into the field of perception. However, they take form in the country, they become visible manifestations expressing its social function.

A feudal power cannot be seen, but the castle where its lord lived remains as a sign reminding of that power. Any structure on the territory can be interpreted as signs and shapes reminding of specific functions, such as: fortifications, buildings, infrastructures, land arrangements, field weaving. The morphology of natural environments is thus given recurring model traits, which sum up their meaning.

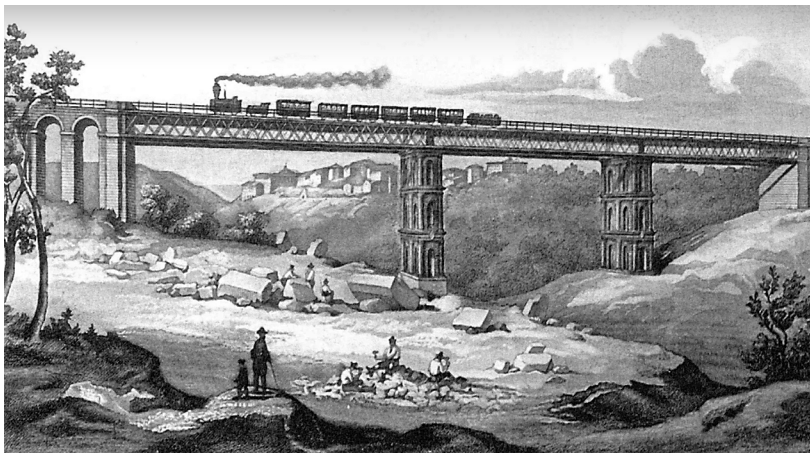
In a passage of Dante’s *The Inferno* (XXVI, 25-30), the writer speaks about a farmer resting on a knoll, looking at the valley one summer evening, while the first glow-worms are coming out. The farmer’s look does not dissolve into the beauty of nature at twilight, rather he looks for fields and vineyards, his properties, “where there’s grape harvest and ploughing”, the landscape of his efforts.

It is the management of environmental resources which can give birth to landscapes. In the past, farming affected the use of resources and the layout of the country. Up to the beginning of our contemporary age, rural landscape was definitely dominant in all European countries. From the spatial point of view, the distinction between the town and the country was clear, marked as it was by the presence of town walls, enclosing the main centres up to the Napoleonic Age. Once going beyond the bastions and the productive villages that were born and developed in the precincts of the walls, the landscape opened to wide cultivated belts supplying urban markets. Undoubtedly the town kept its political, administrative and cultural preeminence over the country, but the economic and productive importance was definitely set in the country.

One of the main characteristics of the first industrial revolution is that cities become key productive centres. The industrial impact, and various associated phenomena, induce farmers to leave the country, thus provoking a slow process of drift from the land, started in the second half of the 19th century and reaching its peak in the 70s of the 20th century (Fig.1). New visual and formal approaches in the interpretation of the urban environment develop right in these years within planning sciences. Since 1960 the concept of "townscape" has become a main subject in English and American architectural culture. Gordon Cullen recalls the perceptive impression of urban architectures: the town is presented as an experience made by visual faculties, able to classify environmental reactions. The town is above all an image, a perceived landscape. First in his paper in "Architectural Review" and then in his book "The Concise Townscape" of 1961, Cullen states that a "townscape" is the art of giving cohesion and visual organization to the set of buildings, streets and squares which build up a urban landscape.

According to Kevin Lynch, too, the physical perception leads the research in the urban area. The idea of "imageability" becomes a key concept, defined as the capacity of a physical object to evoke a strong image in the observer. The spatial experience is associated with a constructivist nature, an active perception which creates images endowed with coherence and cultural autonomy, and the roads and paths are considered "the most powerful instruments" of spatial organization. The references consist of landmarks, spatial pre-eminences represented by buildings and other highly visible elements, which can be identified with the neighbouring urban fabric by contrast.

Even in contemporary geography, the symbolic traits of places are extremely important. The theatre metaphor, used by Eugenio Turri, [1] lends itself to enhance stage perception, where man is recognized as actor and observer of the landscape at the same time. In this way we come to what semiologists call "process of signification", i.e., the attribution of special meanings to nature and cosmos elements, a process in which the objects charged with such representative traits emerge from the natural context and are associated with an identity value for people. Thus, orographic emergencies, hydrography, geological manifestations, and vegetation traits become symbolic forms for a community.



*Fig. 1. The impact of new infrastructures on landscape:  
Railway bridge from Velletri in an engraving by Gregorio Cleter (1870).*

Dealing with the concept of landscape in semiotic terms means first of all being aware that the same notion of “landscape” is to be intended as the result of the interaction between man (his acting in the world, as he lives in it) and nature (the objective space geographically defined, even though through human exploitation of space and only for human purposes). Human activity leaves its mark on nature, and these marks become man-made signs that convert the world into what is called landscape. These marks witness events which become forms carrying a meaning.

Landscape is thus a set of signs made by man. Man, acting on nature (land) more or less consciously and intentionally, produces a sign-activity, and the territory conveys to someone else those marks inscribed on it. An overall interpretation of landscape as a cultural phenomenon - the result of a society settled down in a country - finally takes shape. According to Denis Cosgrove, the scholar has to “decode landscape” in relation to the community which shaped it. A society evolves, different civilizations can find their place in a landscape, but its tangible and intangible marks remain.

Landscape is not just a view, but rather an environment experienced and to be experienced, it is an extraordinary blend of history and experiences, resources to be learnt and decoded in order to be safeguarded and enhanced. Landscape is not just a container of cultural assets, it is rather the system connecting individual qualities among themselves, thus becoming itself a cultural asset. The complexity of a landscape derives from the heterogeneous nature of its elements and from the variety of the relations connecting them. Aiming at enhancing it, complexity is thus a great value. In a semantic vision any cultural asset needs to be contextualized in its landscape, in the same way as a text can be rightly interpreted only if it is inserted in its con-text, that is, in the complete work from which it is taken. Moreover, landscape can be considered as the most shared cultural asset since it is open to be experienced and perceived by everybody.

## **2. THE BRIDGE AS CULTURAL SIGNAL IN THE LANDSCAPE HISTORY**

It is interesting to notice how man, until prehistory, worked to modify nature through his intelligence and building of the first constructions. The primitives solved the problems of living using great technical and artistic ability. In the big hall of the Lascaux cave, France, or in the ceilings painted in the ravines of Altamira, Spain, are found signs of their work where darkness is perpetual. In a cavern, man has demonstrated he does not have to passively accept the space that nature offers to him: he takes possession, equips, decorates and modifies it, marking the distances and the limits which subdivide it. That's why the vault of the cavern of Altamira – with its representative designs, battles between animals and hunting scenes and abstract symbols - has been defined as the “Cappella Sistina” of prehistory. But it is with the passage from the Palaeolithic to the Neolithic that the first great revolution of human history occurred; that men so creating, are striven to construct, to complete and to modify what nature offered.

Exploring the landscape in which these men built the first “infrastructures”, such as dams and deviations of the water course for cultivation of fields; and pushing themselves beyond this, they still had the problem of facilitating communications with other villages, without wading across rivers or avoiding obstacles: from this, the first footbridges and bridges were born. Sometimes these bridges were just fallen logs, sometimes they were made using ropes and wood, taking advantage of the elementary principles of the cables tensions, using structural solutions with stressed cables, cable stayed and suspension bridges, frequently in combination and, where possible, with



wood trunks under a bridge. All of this occurred before the ancient invention of the arch was codified and made famous by the Romans. Structures that were in particular agreement with nature and landscape, not only for the materials or the reduced dimensions, but also because they were signs of the landscape and not just residing in a landscape, as often happens today; works whose presence, like all the great ones, determines and creates a landscape, animating a nature not hostile, maternal, able to receive and not like a step-mother, sometimes seen with fear, like the bridges of the "Devil" in the ancient Medieval tales (Fig. 2) [2].



*Fig. 2. The Devil's bridge in Lucca (Italy).*

Today, as in the past, bridges are therefore important elements, not only from the structural point of view, but also from the cultural one, in relation to their ability to create or modify important functional, social, economic relations in a place. If we put the associations among individuals, different communities, human beings and their environment as the true mechanism of the world, we can understand how important it is to build bridges not only to connect sites, but also to bring together people, cultures, nations and generations, as the motto "Bridging culture and sharing heart" declares. In this way, how can a small bridge be the "maker" of a place's transformation? What might be the reasons for a project, its meanings, and the consequences of the choices? When we talk about the word "value" of a bridge, we mustn't refer exclusively to the economic significance of the thing.

Indeed, we should think about value as a result of a process of recognition of specific qualities of the infrastructure and the relationship between a work and its landscape. In general, a piece of infrastructure can create important relationships between man and

landscape from perceptive, social, economic, and functional points of view. It can also generate negative or positive impacts, alterations or benefits to the urban landscape. It can become a symbol of the place or an important element of connection among different parts of territory from the social and economic points of view. This way, it is fundamental to think about bridges as infrastructures of the landscape, able to connect people and culture and that have been conceived and designed to become part of the culture and of the place and to connect people and culture. An emblematic example is the Bridge of Mostar, which was rebuilt after the Bosnia-Herzegovina war, and which represents a symbol of reconciliation, international cooperation and of the coexistence of diverse cultural, ethnic and religious communities.

### **3. THE THEME OF PERCEPTION**

Reflecting on the social value of bridges, an important role is the perception of the theme that highlights the extent of the design. In fact, apart from a few rare examples, engineers and architects alike focus on the subject which, first designed and then given virtual form, becomes a physical object. Despite the land survey techniques, 3D modelling and photo inserts are able to give good results of the final outcome, the project subject remains the bridge which is what attention and creative forces tend to focus on. Thus, the result is generally the contextualised bridge. However, with this design approach not only is the landscape, a highly discussed topic in recent years with a general growing awareness, put in the background, but, no less important, the overall quality that should also be queried is how the bridge functions are realised, regarding the context of the strategic design, how many and which ties the bridge manages to create with its context (historic, economic, functional, local and network, perceptive, cultural and other points of significance).

Rather in operational terms, where the bridge is contextualised, there is still no idea of the transformed context, i.e. the outcome of a design process that considers the characteristics and vocations engaged in the location and the site for the project, where the continuous symbolic exchanges between the bridge and context can be recognised, until the bridge actually becomes the context, as if it had always been there and to which nothing can be added nor taken away. Consequently, by focusing design attention on the bridge and specifically investigating the context, there is the risk of altering the location, of not going beyond that fine conceptual dividing line of the passage from “Contextualised infrastructure”, where the point of view of the infrastructure dominates, to the “transformed context” where the point of view is directed to the location, to the area overall that is used and affected by the relations. The result is that the bridge often is seen as an intruder, with the resulting public protests.

#### **3.1. The quantity of perception**

There are numerous variables that affect perception of bridges: the season, the type and quality of light during the day and night, when there may be artificial lighting, the light diffusion, and its intensity during the day and night, the orientation of the bridge with respect to its geographic position, any external observation points of the bridge, and the speed with which it is crossed. So, from how a bridge is sculptured by time, light and shade, we move on to “how much”. How much of the bridge do we perceive? Obviously the answer is subjective to each single case, and even though it is complicated to theorise analysis models that are generally valid, we can at least identify those components that come into play in perception and which enable measuring it. One of the main aspects is

proximity. Proximity is also affected by scale, based on the relative position between the plane where the visible surfaces of the bridge stand and the observer's plane.

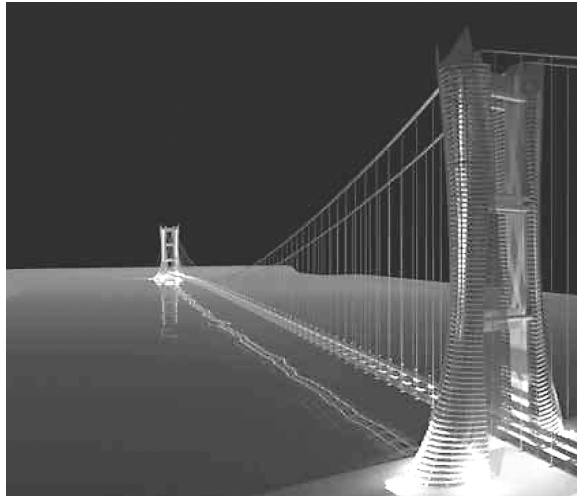
This means that the view of the area from the bridge and of the bridge from the area, a continuing play of marquetry where perspectives and vanishing points are dominating factors. Elevation and central perspective dominate the scene we see if we observe a bridge in the distance on a scale with the landscape, which is amplified in the reflected image if there a river running beneath it. As we get closer to the bridge, foreshortenings and gradual progressive changes in form accompany us until we lose the perception of the structure beneath us and are able to see it in detail. But, if this path, this gradual change in scale, is read as continuity it is just as virtual as the 3D graphic models we mentioned previously. In fact, the problem of accessibility of perception arises. To understand this problem, it is sufficient to take one of the most glaring cases – the organization of the areas around the tallest bridge in the world: Millau in France. Downstream between the two riverbanks a small temporary bridge had been built to enable the heavy vehicles to work on the bridge piers. When the bridge was finally finished, the temporary bridge was not demolished but was included in the new landscape layout as a viewpoint to admire the surroundings which, in this case, is this monumental construction. Apart from the unusual view upwards, the small bridge also offers the chance of understanding the size of the tallest bridge in the world and to grasp its scale with respect to its surroundings.

This case leads us to reflect on the modulation of the ratio of the “quality of the work” / “number of viewpoints” to observe it. Theoretically, the poorer formal quality of the bridge, the more we attempt to deny its visibility, hiding it symmetrically and with attempts of camouflage, also considering the valorisation principles in our “Cultural Heritage Code” – the greater capacity of being a “cultural heritage” the greater accessibility to perception it should have. If we move from the landscape scale to the urban and architectonic scale, the chance of getting a glimpse of the bridge is high, and from the perception of depth given by its width, which we previously saw, we now have the perception of depth given by its length up to the point where the bridge ends on the riverbank or embankment. The regular lines are distorted; the spaces between the horizontal lines of the planking and the arch holding the bridge become “triangle-like”. There is a change in range, a linguistic flexibility that should not be taken as a limitation but as expressive potential.

### **3.2. The Everyday Modellers: Shade and Time**

Another aspect that comes into play in perceiving a bridge is shade, especially in our country where there are not many bridges with large or very large spans, which impose the use of suspended bridges, here the majority are deck bridges or deck arch bridges, where the structural frame is all or partially beneath the deck. Consequently, for the greater part of the day we are only able to recognise the design of the bridge, or structural architecture holding it up, in the half-light or with difficult backlights. This means that shade is also a component that gives depth and substance, but also one that limits perception. Shade also helps to momentarily sculpture other elements in the context: the shade that the bridge throws when it is struck by sunlight, creating fascinating or invasive effects on the surrounding land. The perception time is another “gap” which has been little explored. It is fundamental in the perception of a bridge and has two main ranges of variables. One is of moments, a few seconds or a few minutes we need to catch a glimpse of the slenderness of the structural weave or the convergent lines of a parapet, which, with the deck, guide one's sight to other spaces and places. This is

the time of the person who uses the bridge, who crosses over it. The other temporal range varies from days to a lifetime, and mainly concerns those who live close to the bridge and experience, or suffer it, as part of their everyday life (Fig. 3) [3].



*Fig. 3. E. Siviero. The Messina Bridge. Study of the lighting.*

#### **4. BRIDGES, FOOTBRIDGES AND VIADUCTS BETWEEN ENGINEERING AND ARCHITECTURE**

Today, as in the past, bridges are important elements, not only from the structural point of view, but also from the cultural one, in relation to their ability to create or modify important functional, social, economic relations in a place.

A bridge can create important relationships between man and landscape from perceptive, social, economic, and functional points of view. It can also generate negative or positive impacts, alterations or benefits to the urban landscape. It could be a symbol of the place or an important element of connection among different parts of territory from the social and economic points of view. This way, it is fundamental to think about bridges as infrastructures of the landscape, able to connect people and culture and that have been conceived and designed to become part of the place.

During the aftermath to the second world war, Italian engineering drew international attention with a series of highly original structural works. The reconstruction of the thousands of bridges demolished has not yet been completed and the epic undertaking of the Autostrada del Sole (A1 motorway) is already underway. In this operative fervour, a real engineering school takes shape. The futuristic bridge over the Basento by Sergio Musmeci, the bridges by Riccardo Morandi and Silvano Zorzi are examples of Italian engineering in the forefront (Fig. 4). In the Musmeci's bridge, the attempt to scientifically obtain the minimum form leads to one of the most original, effective symbols of the whole Italian experiment: a powerful, unprecedented plastic form in which the cement surface becomes a specular image of the tensioned membrane (Fig. 5) [4].





*Fig. 4. R. Morandi, the Fiumarella Viaduct, Catanzaro, 1958.*



*Fig. 5. S. Musmeci, The Basento Viaduct, 1967-1976. The eye of the bridge is peeking out into the surrounding landscape as magnifying eye glasses, as a man peering into the world...ES, July 2015.*

Following, some examples of bridges in which the integration work – landscape – meaning is emblematic, are illustrated [5].

The bridge over the Battaglia Canal in the Province of Padua, Italy, (Fig. 6) is in a site of significant historical and architectural interest. In order to conserve the old view of the bridge, which has become a pedestrian bridge, and to improve the layout of the former road junction, the new bridge is 50 m away in the direction of Padua, and is characterised by a depressed single arch, which is monolithic with the foundations and the bridge deck above. The structural solution offers architectural and aesthetic improvements, given the slenderness of the individual elements, and the overall

composition makes the entire work particularly streamlined. Statically, the bridge is configured as a closed frame, consisting of a horizontal deck joined to the abutments and made one with the arch in the middle. This type of arch bridge project is part of a new building philosophy that solves various road problems while respecting the environment and traditions. *"The modern arch recalls the ancient Roman tradition. It reflects in the water and creates an eye that is the heart, the mind, the way to express itself... so the bridge speaks, lives and makes us live..."* (Bridges suggestions. <http://www.uninettuno.tv/Canale.aspx?t=autore&a=Enzo%20Siviero>).

The bridge over the Santa Caterina Canal (Fig. 7) was built in order to support the previous "Ponte della Passiva", which was totally inadequate for the current heavy road traffic. The design solution and the layout ensure the visual "lightness" of this work, and a respectful integration into the natural setting. The final visual effect is a striking reinterpretation of the arch which, by following the inclination of the riverbanks with respect to the road axis, creates a staggered succession of arches emphasizing the width of the deck and consequently the entire structure of the bridge.



**Fig. 6.** E. Siviero, *The bridge over the Battaglia Canal in the Province of Padua.* They show the real situation (left) and the virtual one (right), with the bridge overturned. In both situations, the image of the bridge is the same, and the arch creates a virtual eye looking at you.



**Fig. 7.** E. Siviero, *The bridge over the Santa Caterina Canal.*

The construction of the footbridge over the Bacchiglione River (Fig. 8) to serve the new cycle-pedestrian lanes in the town of Ponte San Nicolò was completed in the spring of 1998. The project addressed the issue of building a reinforced concrete construction, almost entirely precast, using an arched girder type combined with classic elements of the building industry. After installing the arches, the deck was made by placing 4 prestressed concrete girders on each side between the thirds of the arch and the abutments of the bank, which form a reversed “T” section and spread over a 22.3 meter span. The final connection is given by an in-situ cast reinforced concrete slab onto the arch and girders. The choice of this building system, based on the prefabrication of the majority of the structural elements, meant the footbridge could be inaugurated without the use of temporary supports in the river bed and in a relatively short time, and in fact, with the exception of the foundation works, the entire construction was completed only in two weeks.

The bridge over the Sacco River, Rome (Fig. 9), is part of a series of interventions in the new road network organization, due to building the new high speed railway line from Rome to Naples. The bridge has a transversal position with respect to the new railway line, with one of the two abutments very close to the railway embankment. Unfortunately however, the road has to pass under the railway line, which conditioned the planning research, which opted for a construction with a very low geometric profile, a depressed arch deck bridge that is independent from the railway line. The proximity of a historical multiple arch bridge to the small tower that remains of the ruins of an ancient convent, guided the careful planning to ensure the site and previous works were respected. The “permeability” of the structure is the distinctive feature of the bridge and achieves the aim both of overcoming the riverbed without interfering with its natural setting, and of reducing the interference with the water, increasing the rate of flow and reducing the transversal hydraulic thrust.

The bridge in San Donà di Piave, Venice, (Fig. 10) is part of a general road network project, which involved the construction of a new crossing over the River Piave. The site for the new bridge is characterized by the being very flat and with not vertical landscape features. For centuries farming was the main activity here. In Roman times, the farming land was “centurised”, i.e. divided into lots. The southern Piave area had Oderzo divided into “cardo” and “decumanus maximum”, alongside minor and parallel axes to create very precise geometries on the land. In recent decades, major changes related to the sprawl of urban and industrial areas have created an extensive infrastructure network that untidily overlaps the original land design. Currently the landscape is flat, furrowed by a network of water collection and discharge canals that rigidly cut through the countryside. This context has a highly functional topographic layout that is repeated everywhere, without any substantial changes, and the bridge is a very unusual emerging structure. It extends for 500 meters with five arches, each one spanning from 90 to 100 meters, and a height of 7.30 meters. The horizon with no visible vertical elements and the flat squared, territory suggested creating a long continuous mark, as if giving thickness to the “century” signs. This continuity was a key factor, and therefore great attention was paid to joining the deck to the embankment, a very delicate problem that often is not resolved convincingly, and where there is still much room for research. The decision was taken that the pier abutment should literally rise from the ground and begin the horizontal extension of the bridge. The final appearance enhances the sculptural features, which are highlighted through the study of colour: the black and white fronts and the white insides give a very scenic effect. The formal outcome is of a landscape where this bridge, despite its size, has no beginning or end but disappears on the horizon, emphasizing the flatness of the land. It has become a place where the bridge is an infinite





**Fig. 8.** E. Siviero, footbridge over the Bacchiglione River, 1999, BIBM award (European Federation for Precast Concrete).



**Fig. 9.** E. Siviero, The bridge over the Sacco River.



**Fig. 10.** E. Siviero. The bridge in San Donà di Piave, Venice. Perception of the bridge from the road.



and independent sign, where the embankments are maintained and the perspective lines of the river are unaltered. Themes such as *landscape*, *history*, *identity*, found here their realization, and their meanings keep unchanged.

On the *bridge of Borgo Tossignano* (Fig. 11 to the left), the added structure consists of a cycle-pedestrian path flanking the existing structure that can provide a safe route for cyclists and pedestrians. The new intervention complies with the rules of the ancient bridge: the tubular arches followed the curved design of the brick ones, leaving the slits visible at the piling and guaranteeing the transparency and unaltered perception of the ancient bridge, which provides man with the pause and facing out onto the water course.

On the bridge over the *river Tergola in Villa del Conte* (Fig. 11 to the right), in order to view the perspective as a whole, you need to go down onto the small banks of the water course, where the landscape changes from being agricultural to being riverside. Here, the lightness of the bridge, emphasised by the transparency of the parapets and slight curve of the scaffold, connects with the flourishing vegetation at the river banks in a formal dialectic that characterises the place.

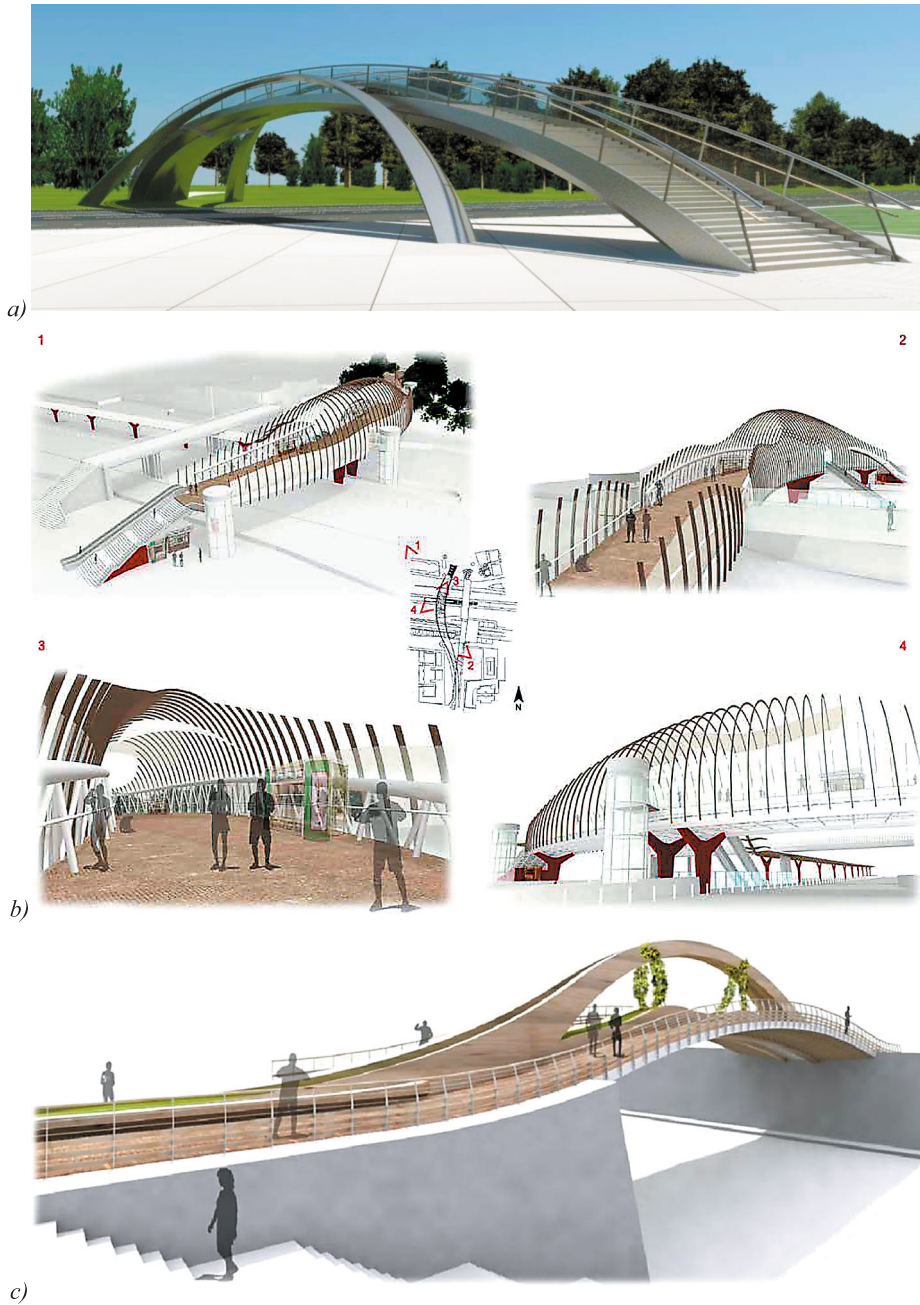
The *LDV Kazan footbridge project* in Istanbul (Fig. 12a) is placed in a new urban area, once upon a time abandoned, and now designed for new urban functionalities, as a park. The footbridge has been developed with the thinking that a connection is able to act as a crossing both physically and culturally. The footbridge is inclined in relation to the project park axis and it develops in a sinuous double curvature. By adopting Leonardo's approach, the working team defined a generally stimulating design which allows the perception of the new place, wanted by inhabitants, in the urban daily living landscape.

The *Şirinevler footbridge project* in Istanbul (Fig. 12b), placed in an urban context formed of different identities, has been developed thinking of not only a physical but also a cultural and perceptive connection. The design of the footbridge in Şirinevler, like those for the Istanbul Park in Kazan, is a design experience which combined an in-depth technological study with an anthropological approach.

The *Gezi footbridge project* (Fig. 12c) is expected very close to one of the main centres of life in Istanbul: Taksim Square. From this square, a major metropolitan hub, a significant flow of people reaches the important and nearby headquarters of Istanbul Technical University. The path between these two poles goes through the urban park



*Fig. 11. E. Siviero: the bridge of Borgo Tossignano to the left; the bridge over the Tergola river in Villa del Conte (Padua) to the right.*



**Fig. 12.** E. Siviero, the projects of the LDV Kazan footbridge, the Şirinevler footbridge and the Gezi footbridge in Istanbul.

designed by Prost. Even in the original design, in this context, there was a lack in the continuity of the park in correspondence with a two-lane street bearing heavy traffic placed below the plane of footpath. The two sides of the park were joined by the badly scratched concrete structure, which showed different points of damage with partial loss of material. The structures crossed the total distance with three spans: main central one and two laterals. The piers were formed of a series of four concrete pillars, which supported the structure of the deck. In accordance with the city's transformation needs, the decision was taken to work on the valorisation of the cultural heritage of the urban texture by implementing a structure able to incorporate Prost's vision thus simultaneously including historic and natural issues as well as technological aspects. The first input project was to use materials very close to the Turkish culture. Wood was a material widely used in constructions in the core of Istanbul and the Wooden Houses are one of the most important examples. The predominant use of natural materials was also dictated by the presence of the characteristic stone water tower, standing as testimony of technological achievement. The slender shape of the segmental arch is made by a structural section of laminated wood reinforced with steel bars. The new footbridge was designed with the aim of giving a sign of tangible and intangible continuity to the connection between the historic past and the living present, using wood with the potentialities offered by current technology. In addition, from a functional standpoint, the footbridge offers two possibilities allowing the continuity of the footpath and the continuity of the park as a green area. The paving stones and vegetation accompany the people as they stroll through the park and do not stop at the footbridge, thus giving continuity. The central pair of arches, observed along the path, rises and opens up to the green grassy areas, until the arches re converge on the deck to form a seat.

## 5. CONCLUDING REMARKS

The bridge is the architectural work that best combines the shape rules with the structure and composition. In this sense, bridges have great plastic potential that must be seen as an opportunity to *design* on different scales: from the small element as part of the composition to create the bridge, as the bridge as a composition element to modify the landscape.

Bridges are therefore important elements, not only from the structural point of view, but also from the cultural one, in relation to their ability to create or modify important functional, social, economic relations in a place.

This way, it is fundamental to think about bridges as *infrastructures of the landscape*, between Engineering and Architecture, able to connect people and culture and to recall the *genius loci*, as my motto "*Bridging cultures and sharing hearts*" declaims.

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