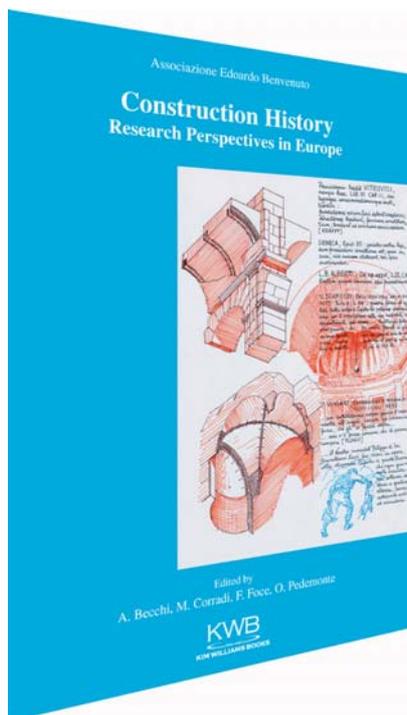


Riccardo Gulli “Margin Notes on Construction History in Italy”

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Construction History **Research Perspectives in Europe**

A. BECCHI, M. CORRADI, F. FOCE AND O. PEDEMONTE, EDS.

This is vol. IV in the book series “Between Architecture and Mathematics”. The Associazione Benvenuto for research in the Science and Art of Building in their historical development assigned to a few international “observers” the task of styling a map of Construction History in their various countries. Obviously, we are not dealing here with an exhaustive map, but rather with a first attempt to identify some of the significant lines of research and to put into contact the individual scholars. A small step towards the constitution of an international scientific community that is interested in architecture as well as mechanics; in construction as well as its history. A community which, up to the present, has not known how to find the essential points of contact and dialogue, and which has avoided the onus of long-term initiatives. The present volume is an aid for establishing solid collaborative research projects, knowing that this can happen only if the studies are so rigorous and detailed that those emphatic recall to arms of interdisciplinarity, sure signs of problems set forth badly, are rendered superfluous.

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MARGIN NOTES ON CONSTRUCTION HISTORY IN ITALY

Riccardo Gulli

Reporting on the state of the art of Construction History in Italy is a task both risky and uncertain, one that defies descriptions that are exhaustive and all-comprehensive. Therefore it is possible to set forth only a few observations with the intent of furnishing a synthesis that is representative of the various threads of research which, though in some cases is not explicitly declared and in other cases pertains to disciplines other than Construction History, share a particular attention to the relationship that links a historical investigation to the different expressions of knowledge regarding construction, both in the area of scientific speculation as well as in that of practice.

One point of departure is the results of the recent international congress of Construction History which took place in Madrid in January of 2003. Of the 250 contributions presented, about one-third were of Italian origin, a fact that already provides a clear indication of the relevant interest in the theme of the conference. The groups of researchers and the departments to which they belong are distributed in homogeneously throughout the Italian university system, representing twenty-seven institutions, and are divided fairly equally between faculties of architecture and engineering. A more focused analysis of the contents of the research presented permits the identification of three principle areas of investigation to which the studies can be ascribed, that is, one of a historical-critical nature, a second of technological-structural nature, and a third of structural analysis. This tripartite division reflects and reaffirms the traditional separation already present at the birth and early development of modern constructive knowledge, in keeping with the trend, already prefigured by the ideas of Illuminism, of the ever increasing compartmentalization of competences. On the one hand, this can be interpreted as the most obvious limitation of the structures that govern the organization of such contributions. As in a puzzle, the final image is lost in the fragmentation of the pieces that make it up; its re-composition requires the action of a participant who can reconnect the lines, the links, that hold the various points of view together. On the other hand, this fragmentation can be considered as a necessary process for the promotion of knowledge through the progressive refinement of the instruments of investigation which, as a consequence, have to act within spaces that are circumscribed and specialized. The recognition of the legitimacy of both these observations does not however necessarily lead to the acceptance of an absolute

division between the two approaches, but perhaps instead to the perception of their possible complementariness.

For example, concerning the reflection of the scientific and practical value of these typologies of research, the most direct reference is generally to the field of restoration, adaptive reuse, and structural rehabilitation. These are disciplinary differentiations that delimit professional competences but at the same time are informed by the indispensable necessity of establishing a stable relationship with the historical disciplines in all their diverse and various forms, which does not always and not solely fall within the historian's traditional sphere of action. In fact, the complexity and transversality of the knowledge about construction—mediating between scientific components and creative moments, between *science* and the *art of construction*—leads one to leap over the barriers that have been artificially placed and to venture fearlessly into unexplored territory where the processes of science, technique, and architecture, legitimizing each other reciprocally, are interwoven:

...Cacciari contains illuminating passages about this meeting between disciplines that are instrumentally separate, referring in the end to the necessity for collaboration between diverse figures: in substance, between "historians" and "technicians". But the same objective, we might say, could be pursued in the conjugation of two disciplinary methods or apparatuses, not necessarily between two people. It might be possible to assert strongly that the cases in which the transformative design response to the historical patrimony is most authentic are due to the capacity for synthesis on the part of a single operator, gifted with an adequate disposition for listening and an inductive capacity [Manieri Elia 2003: 246-247].

These words of MARIO MANIERI ELIA follow along the lines of the argument I set forth above, underlining the necessity of establishing forms of transdisciplinary collaboration, aimed at reordering, in a single vision of synthesis, the complex articulation of specialized knowledge.

According to these precepts, Construction History does not necessarily require recognition as a discipline, indeed, the opposite may be true: its *raison d'être* is in fact best represented by its heterogeneity, in its primary effort to sound out common expressions of knowledge, putting them into their proper relations, the origins of which were successively, as an epilogue to a positivistic model, fragmented in the act of interpretation produced by disciplinary specialization.

Turning our attention to the situation in Italy, a detailed answer to the questions of the meanings and expectations of studies in Construction History is provided by the work, by now of some twenty years ago, conducted by SERGIO PORETTI with the research group of the faculty of engineering of Roma Tor

Vergata.¹ Following the rough indications sketched in the reflections of EUGENIO BATTISTI, who, as long ago as a meeting in 1988, indicated “History of Technology” as a new frontier of history, the research has dealt prevalently with the analysis of the nexus that exists between the architectonic language and the technological content in the Italian experience between the two World Wars. The basic thesis that supports and justifies this course of research is best summed up by Poretti himself when he says,

...regarding modern and contemporary architecture, ample historical-critical synthesis has preceded the reconstruction of the events and the analysis of the works. And even now, in the face of the insistent and sometimes repetitive recognition of the most sophisticated cultural developments, simple material history has remained almost completely unexplored. The Italian story is no exception, which after being long ignored has polarized, it's true, the attention of the historians, but almost exclusively because of the vicissitudes and controversies that have characterized the relationships between the culture of architecture and fascist politics. So much so that, in spite of the proliferation of studies, the intrinsic characteristics of the vast patrimony realized in the period between the two wars are little known, as is unequivocally shown at every occasion for interventions of conservation and reuse. It is easy to foresee, and to wish for, the development of a new phase in the historicizing of contemporary architecture in which, as happens in periods having a more consolidated historical tradition, the historical reconstruction, even while not renouncing the interpretation of the global picture, in any case assumes the form of a process of continuous, collective, plural, articulated accumulation, which goes along step by step enriching itself as well with the contribution of diversified specialized competences. Into this prospectus are to be inserted the studies of a group of researchers in faculties of engineering who have been working in the area of Technical Architecture for a number of years. These are historical studies which, however, have a well-defined objective: to reconstruct the evolution of the ways of construction, not by means of abstract conceptual models, but through the actual developments in Italy in the twenty-first century, in relationship to particular architectonic characters of the buildings” [PORETTI 2001: 5].

The published outcomes of this course of research are contained in part in the editorial stance of *Modo di Costruire*, which starting from the first essay on the story of the design and construction of the Roman postal buildings of Libera, de Renzi, Samonà, and Ridolfi [PORETTI 1990], has become a constant point of

¹ In particular I refer to the contributions of RINALDO CAPOMOLLA, STEFANIA MORNATI, ROSALIA VITTORINI and TULLIA IORI. Among the latest works are [IORI 2001], [PORETTI, CERRINI and LIBERTINI 2002], and [CASCIATO 2002].

reference both for the publication of specialized essays as well as for the proceedings of conferences dedicated to the theme of modern construction in Italy. In particular, the two volumes entitled *Studi sull'edilizia in Italia tra Ottocento e Novecento* and *La costruzione moderna in Italia: Indagine sui caratteri originari e sul degrado di alcuni edifici*, gather together the results of two national research projects that took place in the 1990s,² and which bills itself as a select recognition of architectonic models that are representative of the Italian architectural production of that period, investigated by means of a reading of the relationship between formal expression and technological content, extended to include a detailed graphic description of various solutions. These are research projects that have included the participation of groups from diverse universities and institutions prevalently in the area of Technical Architecture: universities of Ancona, Bari, Cagliari, Florence, Naples "Federico II", Rome "La Sapienza", Palermo, Pisa, Turin, Trent, Trieste, and Udine.³

Turning again to the earlier considerations about the outcome of the results of such studies on an operative level, one specific area of interest can be identified in the restoration interventions regarding modern architecture. The close ties established with the international institution DOCOMOMO clearly demonstrate the intent, outlined in the introduction to the Proceedings of the First National conference held in Rome in 1998:

In spite of the genuine interest on the part of historians, in fact the studies of the evolution of modern constructive technology remain episodic and fragmentary and have difficulties even today

² This project was funded by the MIUR for 1993-1995. Another research project, entitled "La costruzione moderna in Italia: il patrimonio edilizio dell'ina-casa (1949-1963). Modi e tecniche per la conservazione ed il recupero riguardante la vicenda dell'INA casa" was funded for 2001-2003 and is now in print.

³ Co-funded by MIUR 1998-2000, entitled "La costruzione moderna in Italia: indagine sui caratteri originari e sul degrado di alcuni edifici," the research groups were: Politecnico di Torino: P.G. BARDELLI (director), C. CALDERA, C. MELE, O. OSTORERO, E. GARDA; University of Udine: M. BERTAGNIN (director), F. CHINELLATO, G. TUBARO, A. DINI, V. BROI, C. MUNGIGUERRA, E. PIETROGRANDE; University of Trent: G. CACCIAGUERRA (director), M.P. GATTI, R. PAPARELLA, C. ALESSANDRINI, G. MARZANI; Politecnico di Bari: R. CERVINI (director), M. DI MARZIO, G. FUZIO, M. SCIONTI; University of Cagliari: E.A. CORTI (director), S. CASU, L. MAREDDU, G. LODDO, P. SANTJUST; University of Palermo: A. COTTONE (director), S. PENNISI; University of Naples "Federico II": B. DE SIVO (director), M. FUMO, R. BARALDI, F. POLVERINO, G. AUSIELLO; University of Pisa: M. DRINGOLI (director), C. CACIAGLI, D. CARTEI, R. CASTIGLIA; University of Ancona: R. MONTAGNA (director), G. MOCHI; University of Florence: F. NUTI (director), C. BIGINI, F. BAZZOCCHI, P. CAPONE, M. COZZI, L. IPPOLITO, L. MARTELLI, R. BERNARDINI; University of Rome "Tor Vergata": S. PORETTI (national and regional director), S. STUCCHI, R. CAPOMOLLA, T. IORI, S. MORNATI, C. VITTORI, R. VITTORINI; University of Rome "La Sapienza": F. STORELLI (director), E. COLLENZA, M. REBORA, C. PAOLINI, D. ORAZI; University of Trieste: E. VALCOVICH (director), P. PIVA, F. ROVELLO.

finding a collocation in the field, which is anything but elastic, of academic research. An excellent reason to host such studies during a conference on restoration. It is, in fact, the direct connection with the emerging problem of conservation and reuse of modern architecture that makes the perspective of a rebirth of Construction History concrete...And Construction History as well, in spite of the position of the boundaries between technology and history, will finally find a home. It is not a question of the formation of a new field: rather, restoration of the modern is a new theme that has to be assimilated into the various fields already in existence [PORETTI 1999].

As an outgrowth of the work by the original research group working on national research projects, the studies undertaken in the department of engineering in Turin under the coordination of Pier Giovanni BARDELLI, prevalently oriented towards investigating architectural events in Piedmont,⁴ developed along these same lines. The research contributions of ANNA MARIA ZORGNO, whose premature loss is much regretted, are to be seen in this same context, even though they arise from different disciplinary origins, because they too are aimed at shedding light on the relationships between language and technology, with specific reference to the birth and development of the technology of reinforced concrete and steel in the architecture of the end of the 1800s and the beginning of the 1900s.⁵ This is a topic that has been developed as well by the studies of VITTORIO NASCÈ of the University of Turin, whose work is influenced by his background as a structural engineer but which at the same time is characterized by a constant attention to the historical component of technical knowledge.⁶ Coming also in Turin, from the faculty of architecture and in particular the area of restoration, is the research group headed by LUCIANO RE,⁷ which focuses on the theme of conservation of historical buildings in

⁴ In particular, see the proceedings of the first national meeting of DOCOMOMO Italy [BARDELLI, FILIPPI, and GARDA 2002].

⁵ A few of the most recent publications relative to Construction History are: [OLMO 1994]; [ZORGNO 1994]; [ZORGNO 1995]; [BOIDO, RONCHETTA and VIVANTI 1995]; [ZORGNO, BARELLI and GARDA 1995]; [ZORGNO 1999].

⁶ In particular we refer to the participation of local research groups under the national direction of SALVATORE DI PASQUALE in the 1998 Cofin project entitled "Costruzioni voltate in muratura" (Vaulted masonry constructions), centered on the analysis of individual monuments of particular historic interest built in the territory of the Sardinian states over the course of the seventeenth to nineteenth centuries. Other specific relevant studies are found in [ROSSO 1989], [NASCÈ 1982], and [BENVENUTO and NASCÈ 1984].

⁷ With the collaboration of MARIA GRAZIA VINARDI, BARBARA VINARDI and MONICA FANTONE. This group participated locally in MURST national research projects on vaulted structures under the national direction of SALVATORE DI PASQUALE, on the atlas of traditional construction

masonry—treating both architecture and infrastructure—and of the traditional construction technologies of Piedmont. Of particular interest is their work regarding bridges in cut stone and in masonry of the 1800s in Piedmont, on the suspended bridges along the roads and in the parks of the Savoy of the mid-1800s, the analyses of the work of Antonelli and Caselli, and the investigations into the techniques and execution of implementations and restorations of the architecture of the 1800s in Piedmont.⁸

The attention given to the study of historical construction technology as a preliminary investigative tool for forming hypotheses for architectural restoration distinguishes the lines of research followed by GIOVANNI CARBONARA of the faculty of architecture at Rome’s “La Sapienza” University as well.⁹ His specific field of research, the object of government funding, is primarily the study of the constructive technology in the areas of Rome, Latium, Umbria, and Abruzzo, and the analysis of the means of construction of masonry structures in some historic nuclei of the Middle Ages.¹⁰ Also reflecting an interest in the restoration of monuments, and consequently in an analysis of historical constructive technology, is the research undertaken by VANDA ROSA SAVI of the Politecnico of Bari, successively taken up by MAURO CIVITA as part of the national coordination of research Cofin 2002, entitled *I rapporti tra le sponde del mare Adriatico attraverso lo studio dell’architettura nella storia: sistemi e metodi per la conservazione del patrimonio architettonico*.¹¹

techniques under the national and regional direction of G. FIENGO, and on the works of fortification in the modern period, in the sector of masonry structures in Piedmont and their conservation under the national direction of M. Viglino.

⁸ Of the many publications dealing with this topic, we refer to [RE 1993; 1999; 2002a; 2002b, 2003], [VINARDI 1998], and [FANTONE 2003].

⁹ The research group was composed of DONATELLA FIORANI (Università degli Studi dell’Aquila, Facoltà di Ingegneria “Monteluco di Roio”), DANIELA ESPOSITO (Università degli Studi “La Sapienza”, Roma, Facoltà di Architettura “Vallegiulia”), RENZO CHIOVELLI (Università degli Studi della Tuscia, Viterbo), ILARIA PECORARO (Università degli Studi “La Sapienza”, Roma, Prima Facoltà di Architettura “Ludovico Quaroni”), e i dottorandi MAURO DE MEO, LAURA MENGALI, e CESARE CROVA. Doctorate studies undertaken during these years have been concerned with the following themes: construction techniques of medieval masonry; fortified architecture of the Sacco Valley; masonry techniques “a tufelli” in the area of Rome; masonry in isometric courses in S. Pietro in Tuscia; origins, geometric constructions and conservation of vaulting systems in Salento from the sixteenth to the eighteenth centuries; construction techniques of medieval masonry in Sabina; analysis of fortifications in the late-medieval in San Pietro in Tuscia; masonry construction techniques in the medieval epoch in Terra di Lavoro.

¹⁰ Publications on historic construction techniques include: [BOZZONI and CARBONARA 2002a; 2002b; 2002c; 2002d]; [BARELLI 2002]; [CHIOVELLI 2002; 2004]; [RAMACCINI, SALVO, and VIRILLI 2002]; [FIORANI 1996]; [ESPOSITO 1998]; [PECORAIO 2003].

¹¹ The local research group included R. GORI (University of Padua), A. CECCOTTI (IUAV-Venice), M. D’ANSELMO (University “D’Annunzio” of Chieti-Pescara).

Also within the disciplinary sphere of restoration, at the University “Roma Tre”, is the research developed starting in the 1980s by PAOLO MARCONI, with contributions from FRANCESCO GIOVANETTI, ANTONIO PUGLIANO [1997: 261-313], MICHELE ZAMPLILLI, and GIOVANNI CANGI, which led to the founding of a series of publications of *Manuali di Recupero*, published in Rome [MARCONI 1989], Città di Castello [GIOVANETTI 1992], and Palermo [MARCONI 1997]. In parallel with this, during the same years but in a different disciplinary context, was developed the research of ANTONINO GIUFFRÈ [1990], who also passed away prematurely, who produced the *Codici di Pratica* of Ortigia, Palermo, and Matera (this last in collaboration with CATERINA CAROCCI), and contributed to the *Manuali di Recupero* the sections regarding pre-modern techniques of prevention of damage from earthquakes [GIUFFRÈ 1993; GIUFFRÈ and CAROCCI 1999]. Although differentiated in their lines of cognitive investigation—the former more oriented towards the formalization of a repertoire dedicated to the *art of construction* in relation to diverse local characters, and the latter instead more attentive to the comprehension of the structural function of historical typologies—in both cases these studies place have as their center the role played by the knowledge of pre-modern constructive culture, in the sense of a concise vision of technological, typological, and static characteristics that underlie the constitutive nature of historic building. On this point, Giovanetti writes,

Conscious integration of architectural restoration and structural restoration in a global vision of historic architecture is a recent acquisition. It deals with an assumption that is in conflict with the hasty extension to the historic patrimony of recent safety standards (seismic, anti-incendio), of accessibility, and of comfort, to which buildings can be made to conform only at the price of an irremediable corruption of their very historicism. In place of *making adequate* we might suggest rather the *improvement* of the buildings’ performance, making as much use as possible of the repertoire of solutions suggested by a renewed confidence in the rules of the art [GIOVANETTI 1993: 18].

The investigations into the documentary evidence, the detailed registration of constructive models that extend to a description of constructive details, and the attention placed upon a reprise of the rules of local construction technology are all aspects that, even if they cannot be entirely classified as belonging to the specific theme of Construction History, furnish a useful and significant contribution in terms of a theoretical analysis of the problem at hand as well as on the level of the cognitive results.

The approach followed by Giuffrè, which as was mentioned can be integrated with that expressed by Marconi, can be seen as one of the clearest examples of that which appertains to a neutral territory between *science* and *the art of*

construction, as SALVATORE DI PASQUALE would say, a territory in which structural design, the nature of technology, and historical content can coexist within the same dimension of knowledge. The reference to Di Pasquale is emblematic in this context. Together with EDOARDO BENVENUTO,¹² of whom I shall say more below, the contribution furnished by Di Pasquale is also significant on a cultural level, since it is one of those rare examples of the integration of scientific investigation and historical research. His two most recent works, *L'arte del costruire, tra conoscenza e scienza* [1996] and *Brunelleschi: La costruzione della cupola di Santa Maria del Fiore* [2002], synthesize research that was conducted for decades around the theme of the mechanics of historical masonry, with the objective of “connecting the themes and the problems in an organic vision from which can emerge some ideas for the definition of the relationships between architecture and structure, especially before the birth of the modern science of construction” [1996: 17]

The question posed by Di Pasquale, which can be summarized as raising doubts about the efficacy of the actual “models” of representation of modern science and construction technology, also forms a part of the reflections by SALVATORE D'AGOSTINO of the Faculty of Architecture in Naples. These are neatly summarized in the essay “Un programma di ricerca per l'ingegneria strutturale”, co-authored with Edoardo Benvenuto, published in the proceedings of the first conference entitled “Manutenzione e Recupero nella città storica”, sponsored by the Associazione per il Recupero del Costruito (ARCo)¹³ in 1993:

...we are referring to the works of historic architecture on which today the attention of the structural engineers is mostly focused, with a view to interventions of conservation and restoration...Even here, at least in part, there is a breaching of that separation between means and aims that, in the light of Hegel's lesson, represents the intimate root of today's *techno-logia*. On the other hand, reawakening the enchantment of such works with regards to their harmonic, architectonic, complexity (including, obviously, their structural-constructional dimension) that today make up the science

¹² In 1998 funding was obtained for a Cofin research project entitled “Costruzioni voltate in muratura” (Vaulted constructions in masonry), directed nationally by SALVATORE DI PASQUALE with the local participation of EDOARDO BENVENUTO, later substituted by B.P. TORSELLO (University of Genoa), V. NASCÈ (Politecnico of Turin), P. JOSSA and S. CASIELLO (University of Naples “Federico II”), G. CrOci (University of Rome “La Sapienza”), G. MENDITTO (Politechnical University of the Marches), G. CREAZZA (IUAV-Venice), M. CUOMO (University of Catania), and R. PARENTI (University of Siena).

¹³ The Associazione per il Recupero del Costruito (ARCo) and the Associazione Italiana Recupero e Consolidamento Costruzioni (ASS.I.R.CO) are the two largest Italian associations dealing with recuperation and structural consolidation. While the former is more in favor of an approach that connects historical/critical examples to those of a technological and structural nature, the latter largely concentrates on problems of rehabilitation and structural consolidation.

and technology of construction is not at all something banal that can be left to the generous enthusiasm of the neophyte, or to the pure philology of the hungry, if not starving, historian, of the knowledge and the methods. ... Even though the convergence of such vast and articulated competences appears arduous, this is the “risk” that, to our judgment, must be taken by the scientific community of those cultivating science and technology of construction: we are dealing with a complex “research program”... that cannot be pursued without the help of a vast interdisciplinary effort (with historians of architecture, restorers, historians of science and technology, and perhaps with the technicians of the building construction), but which must involve the scholars of mechanics and structural engineering in an essential way, leading them towards an apt critical (not only historical) reflection as to the fundamentals and the methodological presuppositions of their disciplines [BENVENUTO and D’AGOSTINO 1993: 17].

The relationship between the evolution of scientific thought and the theory and practice of building—between *mechanics* and *architecture*—constitutes, together with the considerations set forth above, the nucleus of the research interests that have characterized the activities undertaken in the last ten years by the research group of the Faculty of Architecture of Genoa,¹⁴ which grew up around the figure of Edoardo Benvenuto and is now the backbone of the association named after Benvenuto that was founded in 1999, a year after his death. On the occasion of the symposium entitled “Between Mechanics and Architecture” that took place in Saragossa, Spain, in August 1993, at the time of the XXI international Congress of History of Science, the outlines of an international research project were laid out, which aimed at investigating, as Benvenuto himself wrote in the introduction to the proceedings, “les procédés techniques qui, depuis des temps immémoriaux, conforment l’art e la science de la construction au développement (...) de la mécanique des matériaux et des structures” [RADELET-DE GRAVE and BENVENUTO 1995]. According to the investigative methodology proposed by CLIFFORD TRUESDELL in his studies of the history of the mechanics of solids, and in harmony with the reflections of JACQUES HEYMANN starting from the 1960s on the history of structural engineering, the original project “Between Mechanics and Architecture”, which was followed by successive meetings in Genoa (1996), Liege and Louvain-la-Nouve (1997), and Pescara (1998), found new impetus for development in the activities of the ASSOCIAZIONE EDOARDO BENVENUTO, which centered around the themes of the science and art of construction in its historical development.

¹⁴ In particular we refer to ANTONIO BECCHI, MASSIMO CORRADI, and FEDERICO FOCE. Significant contributions have been made by the research of ANNA SINOPOLI (Rome “Vallegiulia”) and ORIETTA PEDEMONTE (director, Dipartimento di Scienze per l’Architettura in the Faculty of Architecture of Genoa).

In this context are to be placed the annual meetings of the association in Genoa that have taken place since 1999, the results of which are gathered in the *Towards a History of Construction* [BECCHI, CORRADI, FOCE, and PEDEMONTE 2002], which forms part of the book series entitled “Between Mechanics and Architecture”.

Particularly noteworthy is the recent publication by Antonio BECCHI and Federico FOCE of the Genoa research group, entitled *Degli archi e delle volte: Arte del costruire tra meccanica e stereotomia* [2002], which certainly has the most extensive and detailed bibliography on the topic of vaulted masonry construction and which, as stated in the authors’ own words, best expresses the meaning and value of this kind of study: “...the book...addresses some aspects of vaulted masonry construction: on the one hand, in the context of stereotomy and its relationship to the art of construction; on the other hand, with reference to the static theories formulated from the end of the seventeenth century on and by means of which mechanics becomes science “applied” to architecture” [BECCHI and FOCE 2002: 8]. The two essays “Chambre H. Per una storia del costruire” (by Antonio Becchi) and “Sulla teoria dell’arco murario. Una rilettura storico-critica” (by Federico Foce) take into consideration texts that are by now celebrated and others that are almost completely unknown, with the intent of offering critical revisions and new keys for understanding the problems connected to the mechanics of arches and to the relationship between mechanics and stereotomy. The bibliography assembled during the research has been made available to other scholars as a research tool, making immediately evident the complexities of a body of knowledge that is still little known. The book, further, can be considered an introduction to the research themes that were the focus of the first international Congress on Construction History (Madrid, 20-24 January 2003), organized by the Sociedad Española de la Construcción together with the Associazione Edoardo Benvenuto.

Further, similar in intent to the research conducted by Poretti and by Maristella Casciato in the context of DOCOMOMO, a central question that validates a line of research of a historic nature is represented by the simple consideration that the analysis of specific aspects of construction, whether in the nature of mechanics or of a technological order, eludes the comprehension of anyone who is not in possession of an adequate scientific and technical preparation to that end. This is an aspect that attracts the loudest and most deeply-rooted criticisms from exactly those practitioners of history who are generally inclined to sustain that an invasion of their field is unjustified. As mentioned at the beginning of this essay, this is not the place to open a detailed discussion of this argument, which requires a different and detailed analytical context. In this sense it can be said only that there is a partial opening to this kind of possible interdisciplinary collaboration and interest which has been made

explicit by some studies and research in which, along with the consolidated historical-critical investigation, there is room for a specific attention to the more strictly constructive and structural aspects of building. For example, on this front is focused the research undertaken by VITTORIO DE FEO¹⁵ and CLAUDIA CONFORTI of the Faculty of Engineering of Rome's "Tor Vergata" University, aimed at investigating not only the figurative and symbolic aspects that are present in a significant way in works of architecture, but also the reasons and instruments that permit their realization in built form, transferring the interrogatives from *why* to *how*. In the introduction to the volume *Lo Specchio del cielo. Forme significati tecniche e funzioni della cupola dal Pantheon al Novecento*—a contribution that represents the conclusion of research promoted in the 1990s by PAOLO CUNEO, VITTORIO DE FEO, and CLAUDIA CONFORTI—the importance given by the research to the investigation of construction skills and to historic construction techniques as auxiliary instruments for historic investigation clearly emerges when they write:

If in fact in the last fifty years there have been frequent, or better, not completely unusual, reflections on the meaning and the symbolic variations of the dome, studies centered on the means of its construction, the materials used, and the geometric schemes adopted (or contradicted), and on the techniques on site are much more sporadic. Definitely, the concrete materializations that this great symbolic catalyst has assumed over the centuries and across the various geographic latitudes have been investigated in a somewhat episodic way, adapting criteria of formal analogy, typological comparisons, and so on; methods that limit themselves, in the most part of the cases, to immediately visible exterior or interior superficialities of the dome. A great deal of the technical-constructive components, which can only be revealed by an autopsy of the monument and its most intimate parts, remain obscure or little known. [CONFORTI 1997: 7]

Also within this thematic context are the study interests of the research project entitled "Epistemic History of Architecture" sponsored by the Bibliotheca Hertziana in Rome and the Max-Planck-Institut für Wissenschaftsgeschichte in Berlin. The early results of this project were presented at the international conference organized by the Hertziana entitled "Building and Knowledge. Contributions to an epistemic history of early modern Italian architecture" held in Rome, 18-20 September 2003.

¹⁵ In particular we refer to the Cofin research of 2000 coordinated nationally, until his premature death, by VITTORIO DE FEO, entitled "Il cantiere e l'acqua tra rinascimento e barocco: le macchine, i materiali, le tecniche, l'organizzazione del lavoro" [DE FEO 2002], which involved the following local research groups: F.P. DI TEODORO (University of Reggio Calabria "Mediterranea"), R.R. TAMBORRINO (Politecnico of Turin), D. BATTIOTTI (University of Udine); F. BELLINI (University of Camerino), and A. BELLUZZI (University of Florence).

A specific interest in the knowledge of historic construction techniques and practice is present as well in the research conducted by LUCIANO PATETTA on the Construction History in Italy from the fifteenth to the seventeenth centuries in the Lombardy and Rome. This research has as its objective to "...demonstrate the potential of this area of research and its possible positive fallout on the study of architecture in the modern age as a whole, as is clear from the bibliography on building sites and the building production in Italy from the Quattrocento to the Settecento, for all that it is recent and as yet limited."¹⁶

Technology and Structural Analysis

Less stringent under the profile of historic investigation and so only partially applicable to the context of the interests of Construction History are a series of research papers that come from various sectors of technology and structural analysis. These represent a vast and articulated panorama, a detailed description of which is neither possible nor meaningful for the present paper; as a consequence I shall only make reference here to some of the papers of which I have first-hand knowledge.

The proceedings of the conference "Tradizioni del costruire nel territorio nazionale. Continuità ed evoluzione delle tecniche edilizie per la salvaguardia ambientale del contesto insediativo minore" (Building traditions in the national territory. Continuity and evolution in building techniques for protecting the environment in the context of minor settlements), which took place in Bologna in October 2001 (the proceedings of which are in print at this writing), made public the results of government-funded research during the two-year period 1998-2000. Each of the eleven institutes that participated,¹⁷ under the national coordination of ADOLFO CESARE DELL'ACQUA, made an individual contribution to a detailed overall depiction of the specific nature of the ways of building, by means of which the forms of each local tradition—in the sense of

¹⁶ Quoted from the Cofin research program 2000 entitled "Innovazione e tradizione della produzione edilizia nei cantieri storici. Confronti fra Roma e le città lombarde dal XV al XVIII secolo" (Innovation and tradition in building production in historic worksites. Comparison between Rome and the cities of Lombardy from the fifteenth to the eighteenth centuries). Local research groups under the national coordination of L. Patetta (Politecnico of Milan) were E. VALERIANI (University of Pavia) and P.N. PAGLIATA (Rome Tre University).

¹⁷ The institutions involved were: University of Bologna (A.C. DELL'ACQUA, national and local coordinator); University of Rome "La Sapienza" (C. CECERE, local coordinator); University of Catania (F. FIANCHINO, local coordinator); University of Naples "Federico II" (R. IOVINO, local coordinator); University of Pisa (P. MAFEI, local coordinator); University of Padua (A. MONACO, local coordinator); University of Rome "Tor Vergata" (L. RAMAZZOTTI, local coordinator); University of Bologna (S. SANDOLINI, local coordinator); University of Cagliari (A. SANNA, local coordinator); Politecnico of Turin (G. SCARSELLA, local coordinator); University of Aquila (L. ZORDAN, local coordinator).

precise relationships between typological, material and construction characteristics—can even today be outlined coherently. The primary result of this line of research can therefore be found in the possibilities for adoption and application of traditional materials and building techniques in relationship to the necessities of restoration and new construction in areas which show certain morphological, technological and environmental characteristics. In this context, closely related to the interests of the field of building engineering and specifically to the disciplines of Technical Architecture, particular mention should be made of the research conducted now for many years by LUIGI ZORDAN in engineering in Aquila.¹⁸ This work aims at investigating the specific building characteristics that underlie historic city centers of Abruzzi, by means of an interpretation that proposes the answers to various questions—such as the insertion of the individual building into the urban context, the rediscovery of the rules and principles that governed building techniques and practice, the identification of the technological and construction problems and pitfalls, and the possible choices for intervention, specifically with regard to pre-modern solutions to seismic risk factors—as design tools for restoration.¹⁹

Within the same thematic framework, although marked by a different contextual and constructive reality, falls the research of ANTONELLO SANNA of the Faculty of Engineering of Cagliari, oriented towards the organization of a system of information about local variations of ways of building according to an analytical methodology that takes as its point of departure the study of historic documents, informed by first-hand knowledge obtained through the investigative tools of architectural and engineering surveys of buildings, which attempts to provide a criteria for the classification of invariant typologies and technologies as a base for the definition of guidelines for restoration.

The research conducted by GIUSEPPE FIENGO²⁰ of the second University of Naples is likewise centered on the creation of an organized repertoire of traditional, regional, building techniques from the fifteenth to the nineteenth centuries, outlining local characteristics and identifying parameters that permit them to be dated. This has as its aim to contribute to the setting forth of strategies and interventions oriented towards conservation by means of technical methods that are non-invasive.

¹⁸ The research group included the contributions of R. MORANTI, G. Di GIOVANNI, O. DE BERNARDINIS, and A. BELLICOSO.

¹⁹ The conclusions of this research were presented in [ZORDAN 2002].

²⁰ The Cofin research project for 2000 entitled “Atlante regionale delle tecniche costruttive tradizionali (XV-XIX)” (Regional atlas of traditional construction techniques (XV-XIX)) was coordinated at the national level by GIUSEPPE FIENGA and included C. VARAGNOLI (University “D’Annunzio” Chieti-Pescara); M.G. VINARDI (Politecnico of Turin), E. VASSALLO (IAUV-Venice), and F. TOMASELLO (University of Palermo).

The research coordinated by CLAUDIO D'AMATO GUERRIERI of the Politecnico di Bari,²¹ even if oriented towards the themes of design and composition, has as its objective the investigation of the typological and constructive roots that have historically informed the evolution of dwellings of the Mediterranean area, with specific attention given to the methods of building based on the use of stone masonry.

An analogous theme is pursued by ANTONIO DE VECCHI of the Faculty of Engineering of Palermo, regarding the analysis of typological and constructive characteristics of historic building of the early 1900s in the area of Palermo, in order to outline an adequate strategy for interventions of maintenance, restoration and functional recuperation.²²

In the sphere of structural engineering, the research of ENZO SIVIERO of the IUAV of Venice shows a particular interest with regards to the correlation between examples of conservation of the historic / constructive content and the methods of projects for the rehabilitation or consolidation of structure, with a specific reference to vaulted masonry constructions and the structure of bridges. A similar interest can be found in the work of CLAUDIO MODENA (Faculty of Engineering of Padua), LUIGIA BINDA (Politecnico of Milan), and VITTORIO PASTOR (IUAV),²³ which focuses on the study of aspects of construction of historic buildings and has as its aim the analysis of vulnerability to earthquakes and of projects for building conservation and consolidation. Other researchers of note are FRANCESCO GUERRIERI of the Faculty of Architecture of Florence, editor of *Manuale della ricostruzione e riabilitazione postsismica degli edifici* [1999], who made a specific contribution to the interventions following the

²¹ The Cofin research project for 1999, under the national coordination of C. AMATO GUERRIERI (Politecnico of Bari) included the participation of M. APRILE (University of Palermo); G.C.A. ARCIDIACONO (University "Mediterranea" of Reggio Calabria); A.R. BURELLI (IAUV-Venice); F. Prati (University of Genoa); and F. CELLINI (Roma Tre University).

²² See the Cofin research project for 2002, coordinated at the national level by A. DE VECCHI, is entitled "L'edilizia del primo novecento tra tradizione e innovazione: studio dei caratteri tecnologici e funzionali per la sua conservazione e manutenzione" (Building in the early years of the 1900s between tradition and innovation: a technical and functional study for conservation and maintenance).

²³ In particular we refer to the following projects: MURST co-funding "Metodologie di indagine non distruttive e limitatamente distruttive nel recupero e la conservazione di strutture di interesse storico"; "Progetto Arsenale (Arsenale storico di Venezia)", Coordinator V. PASTOR (IUAV-Venice) – 2000/2002; MURST cofunding "Danneggiamento, conservazione e manutenzione di strutture murarie e lignee: diagnosi e modellazione con riferimento alle tipologie costruttive ed edilizie", Coordinator L. BINDA, Politecnico of Milan – 2000/2002; MURST co-funding "Costruzioni in muratura di pietra e mattoni soggette ad azioni sismiche e di lunga durata: studio di tecniche di miglioramento adatte alla tipologia costruttiva e muraria e di tecniche di controllo della loro efficacia", Coordinator L. BINDA, Politecnico of Milan.

earthquake of 1997 that hit Umbria and the Marches; CARLO GAVARINI, specifically in reference to his activities regarding the definition of the direction of research of the Comitato Nazionale per la Prevenzione del Patrimonio Culturale dal Rischio Sismico (national committee for the prevention of earthquake damage to the cultural patrimony)²⁴; and SERGIO LAGOMARSINO of the Faculty of Engineering of Genoa, for works aimed at understanding the rules for historic construction in order to define methods of intervention within areas at high risk for earthquakes (see, for example, [BOATO, LAGOMARSINO and PITTALUGA 2003]). Finally, mention must be made of a long and detailed paper by TIZIANO MANNONI,²⁵ also from Genoa but from archaeology rather than engineering, which reflects in particular an interest in the relationship between archaeology and architecture and in the historic evolution of technical knowledge in relationship to the artifacts produced by the material culture.²⁶

Acknowledgment

As I stated at the beginning, and underlined in the course of this paper, given limits of space it has not been possible to mention all of the contributions and specialized reports. This is certainly in part due to the limitations of the author, who asks in advance that the reader excuse him for missing information. On the other hand, the recognition of ongoing or completed research is the fruit of collaboration with various research groups that have responded positively to my requests for brief descriptions of their work in the field of Construction History. To these I extend my heartiest thanks.

²⁴ In this regard, see the Proceedings of the II national study seminar, *La protezione del patrimonio culturale. La questione sismica. Le linee di sviluppo della ricerca universitaria. Contributi preliminari* (Rome: Gangemi, 1997).

²⁵ TIZIANO MANNONI taught methodology of archaeology at the University of Genoa and was a founder of the Istituto della Cultura Materiale di Genova.

²⁶ As Mannoni himself noted, "...the archaeology of production...becomes automatically defined as a special field in the history of material culture; it is the study of artifacts in order to shed light on the elements necessary to reconstruct the relationship between the men and men and men and objects in diverse historical situations and as regards that part which is connected, in a direct sense, to the operations of acquiring and transforming raw materials into durable goods and, in an indirect sense, to the various processes that were active within individual social, economic, technical, cultural and settlement systems. It is therefore one part, the most ascertainable beginning with material archaeological sources, of the true story of social development and of the ways of production" [MANNONI and GIANNICCHEDDA 1996: xviii-xix].

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