of local authorities and the fallacy of direct labour, (1928) right up to the current debates on contracting-out. There are several publications, including the journal *Building Guildsman*, from the National Building Guild, which sought to spread the ideas of Guild Socialism and workers' control through the industry.

Material on working conditions in other countries is very patchy, but it does include reports of the International Labour Office Building, Civil Engineering and Public Works Committee from 1946, and various publications and periodicals of the International Federation of Building and Woodworkers, including Bauarbeiter-Internationale (1920-1929).

The Library has a collection of material on the economic structure and development of the construction and building materials industries, particularly in both post-war reconstruction periods, but much of this consists of official reports and publications available elsewhere. Non-official publications mainly cover arguments around centralised planning and nationalisation. There is little technical material except in relation to health and safety issues and specific areas of research and development (e.g. reports of the Building Research Board and the Research Station).

Of more interest to C.H.S. members might be the large collection of material on housing policy. From the 1900s, there are many pamphlets indicating concern over the condition of working class housing in both urban and rural areas and its link with poor health and 'social problems'. T.P. Ritzema, How to rehouse the working classes and save 200,000 lives per year (1909) is a typical example. Post-war slum clearance campaigns and the garden city movement produced a mass of literature arguing that an expansion in house building would help solve the unemployment problem. This enthusiasm for new towns and suburban housing estates had by the 1930s produced a rival concern over the social problems inherent in their design, and the need for construction of community centres, etc. Illustrative of this period are the numerous

publications from town planning associations and the *Design for Britain* series in the 1940s.

The John Burns Library was the Liberal M.P.'s personal collection and is not confined to labour history. The catalogue therefore includes such items as The gentleman and tradesman's complete assistant or the whole art of measuring and estimating made easy, (1781); Crosby's builder's new price book. (1841); the balance sheets of the London Building Labourers' Strikes 1859-60 and 1896; various union (and anti-union) publications: and pamphlets by hygiene reformers on 'housing the poor'<sup>1</sup>. The Library also holds a large collection of Robert Owen's works including his schemes for 'villages of cooperation' and plans for the communities at New Lanark and New Harmony.

The Gertrude Tuckwell Collection includes several files (mainly of press cuttings) on wartime housing problems which would be useful, notably 'Housing and hostels for women 1910-1919', and material on garden cities and accommodation for munition workers<sup>2</sup>.

The T.U.C. Library is open to visitors Monday-Friday, 10 am -5 pm by appointment only. Enquiries should be addressed to the Librarian, Trades Union Congress, Congress House, Great Russell Street, London WC1B 3LS (Tel: 01 636 4030).

Trades Union Congress Library

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## Construction history and urban sites: recent work by the Venetian school on the construction history of Venice during the Long Renaissance

## by Donatella Calabi\*

For several years now 'Venice during the Long Renaissance' has been one of the research topics pursued by the Department of the History of Architecture at the University Institute of Architecture. Venice (I.U.A.V.). In that historical period we see plans and pressure for urban renewal, opposition and resistance, religious ferment, material interests, developments in construction, technique and science, and rivalry both between 'engineers' and 'architects' and between theory and practice. From this a central chapter in the history of the city republic of Venice and its construction now emerges in a new light, while overall the research project has also been regarded as an experiment in historiography.

In the first part of this article I shall make a brief point-by-point summary of the main topics being investigated in this project. In the second part I shall look in more detail at the book by Ennio Concina, *L'Arsenale della Republica di Venezia* (Milan 1984), which I think exemplifies our studies.

#### The project

The list of 'objects' or titles of research projects which follows should be seen not so much in terms of inherent links between the various items as in terms of a group of topics being explored by similar methods. These latter require a short prefatory comment.

The guiding principles behind our studies are the aspiration to rigour in relating what took place and in analysing what was constructed (be it sign, text or image) and the equally rigorous pursuit of the complex causation of these phenomena. Buildings, drawings and documents are used as sources, as instruments of perception or interpretation. In this sense the method, insofar as there is one, depends on the subject of each individual 'history': advance judgements and all-embracing assumptions are as pointless and irritating as they are impossible to sustain.

The first topic of study, seen in the writings of Manfredo Tafuri and Antonio Foscari, has included architecturally significant buildings, and through them the interlinking connections between politics, science and architectural knowledge; the links and conflicts between the technical and the institutional from the Middle Ages to the modern age are also involved. Important here are the plans drafted by the *proti* (technical staff working for the republic as salaried officials attached to one of the magistracies), including Giorgio Spavento, Bartolomeo Bon, Tullio Lombardo, and also some of the Venetian work of Jacopo Sansovino.

The main projects were the church and convent of San Salvatore (which stands at the Grand Canal end of the Mercerie, the main route to the St Mark's complex), the Scuola della Misericordia, the Palazzo Grimani at S. Samuele, the church of S. Martino and above all the church of San Francesco della Vigna. In all cases the final outcome of the project depended on the weight exerted by the commissioners of the various buildings (whether they were special in any way, cultivated or representative of a particular tendency, like the Grimani family or the Doge Andrea Gritti), on the relative ascendency in Venice of

\*Translation by John Millerchip and Mark Swenarton the scientific tendency or humanist culture, and on the nature of the decision-making powers and interests involved in such a complex governmental structure as that of Venice in the mid-sixteenth century<sup>1</sup>.

Another object of study has been a series of focal points in the urban history of the city. These include:

- a) the dynamics of the structure and use of the area designated for the production of ships and military engines – the Arsenal, the great naval and civil shipyard of the state of Venice – and the interaction within it of technique, science and architecture (the subject of the study by Concina discussed below).
- b) the places which expressed the image which the various powers and magistracies of the government wanted to offer to themselves, whether an image of change or of the continuity of republican freedom: the Libreria Marciana and the



*Figure 1.*Jacopo de' Barbari, view of Venice, 1500: detail of the Rialto Island (Biblioteca del Museo Civico Correr, Venice)

projects for the Procuratie Nuove and the completion of St Mark's Square (studied currently by Manfredo Tafuri).

c) the weight and restricting influence of the traditions and customs of the longestablished landowning interests, and the attempt during the sixteenth century to create new or traditional images of a mercantile Venice in the central part of the city, i.e. the Rialto island (Fig. 1). A major element here is the history of the proposals for the reconstruction of the Rialto market complex after the destruction of the whole island in the catastrophic fire of 1514 (Figs. 2 and 3). Factors involved in the eventual solution included the interaction between public ownership of land and private enterprise management of the stalls, offices and waterside facilities along the Grand Canal: the importance of the Rialto as a source of income for the Signoria (it was in fact the main item in the state budget); the importance of the administration of justice there in maintaining a proper balance between the interests of the various magistracies and those of the various crafts and trades operating in the area (nobles and merchants, citizens and non-Venetians, the poor, hawkers, those for whom the zone around San Giacomo provided an opportunity for meeting, for international exchange, important trading contracts or even simply day-to-day subsistence). Then there is the parallel, almost century-long history (1501-1591) of the plans for a stone bridge over the Grand Canal linking up with the market (Fig. 4). This involved a series of proposals by famous engineers (Fra' Giocondo, De' Guberni, Sansovino, Palladio, Vignola, Michelangelo), whether these were actually designed, presented orally or merely invented subsequently by historians; a sequence of uncertainties, of repeated restoration and partial rebuilding of the wooden bridge (see Carpaccio's Miracle of the Cross); and disputes both as to the shape of the stone bridge (should it be a single arch, in response to the requirements of traffic using the Grand



Figure 2. The Rialto island before the Great Fire of 1514: graphic traduction into plan of the view by Jacopo de'Barbari



*Figure 3.* Montalboldo, view of Venice, 1517: detail of the market area before the Great Fire (Biblioteca del Museo Civico Correr, Venice) Canal, or should it be three arches, in accordance with antique precedent?), and over the technique to be adopted (should the weight be borne vertically on piers or in such a way as to counteract diagonal thrust?). These topics are dealt with in the partially published studies of Donatella Calabi and Paolo Morachiello<sup>2</sup>.

Another area of study involves military architecture, theoretical knowledge and the political control of land and sea attained by Venice through the building of cities and fortresses on the mainland and the islands of the Levant. In this period, when her colonial power had declined and when she found herself in a difficult international position in the strategic and economic manoeuvring to establish a balance between the European states and the Ottoman empire, Venice set about building and reinforcing her macchine territoriali (fortresses, defensive walls, ramparts, castles) as just one of the means to be used, not so much in preparation for war, as in a final, unconvinced attempt to preserve peace (on which the commercial prosperity of the Republic depended).

In this context the role of the engineer, the technical expert, was of special importance; as was the significance attributed to the design, desirability and ways of financing the fortificatory structures. In this connection we have the recent publications of Ennio Concina and Paolo Morachiello; the Third International Seminar on Venetian Military Architecture in the Sixteenth Century, with contributions from, among others, members of the Department of the History of Architecture of I.U.A.V.<sup>3</sup>; and the exhibition Venice and the Defence of the Levant: from Lepanto to Candia, 1570-1670, organised by Venice City Council and due to open at the Palazzo Ducale in February 1986.

Exploration of the questions raised by these various histories has led to a fruitful exchange of ideas at an international level. Thus 'Renovatio Urbis': Venice in the Age of Andrea Gritti was the subject of an international conference in 1983. This was a meeting of scholars from several European countries and the U.S.A., specialising in various disciplines (history, economic history, the arts, music, architecture, literature, politics) organised by the Department of the History of Architecture. The proceedings of this conference have been published recently<sup>4</sup>.

The research studies described above have also prompted new lines of research, comparing the urban policies pursued in various situations. A number of these studies have only just been started while others are complete. Arising out of this was the international conference organised by the Department in 1984, Arsenals and their Cities: from Byzantium to Amersdam. For the participants (experts on the history of ports and ship-building in virtually every country of Europe), a central question was this: how was it that the theoretical studies and technical experimentation undertaken in Venice in the fifteenth and (especially) the early sixteenth centuries ended up not in transformation but in conservation - becoming inward-looking, moving into other economic and political contexts and bearing fruit only elsewhere, in the countries of northern Europe? Through the specific case of the Arsenal, the question opens up much wider concerns over developments that extended over an enormous geographical, political and cultural area for a considerable period of time. Beyond this it also raises the question of the significance and possible results of comparative studies of the city.

#### The Venice Arsenal

In presenting the history of the Venice Arsenal (Fig. 5), Ennio Concina identifies in his book *L'Arsenale della Republica di Venezia* (Milan, 1984) two major periods of discontinuity in the transition from the medieval to the modern age.

The first period is marked by the reestablishment of the great public shipyard during the fourteenth century, coinciding with a considerable increase in technical and practical attention to urban questions (the digging of canals; the building of grain stores at San Biagio, new salt stores at the Punta della Dogana, and a lighthouse in the harbour tower at the Lido; work on the Palazzo Ducale and St. Mark's Basin; and the restructuring



Figure 4. The Rialto Bridge: plan showing the position of the wooden bridge, and the proposed new stone bridge (dotted line), as described by the Senate in 1587 (Author's elaboration)



of the market area). Between 1435 and 1439 the Venice Arsenal thus became the most important structure of its kind in the western world. The second period is marked by the complex of proposals, policies, cultural projects and work on the physical structure of the Arsenal which led to its reorganisation between 1525 and 1570. The research carried out by Concina shows clearly the development of the Arsenal during these two period; his work provides a meticulous study not only of proposals made for the organisation of the Arsenal in relation to its buildings, but also of pressures towards change in ship design, methods of administration and regulatory provisions, and of the resistance that these pressures encountered.

The work is not therefore a flat chronological description of everything that happened from the original foundation of the Arsenal until the fall of the Republic, but rather an attempt to focus on certain significant moments of change. The author reexamines previously accepted views as to attributions, dates and reference models. Take

for instance the notion that the Venetian Arsenal derived simply from the Byzantine model. Comparison by Concina of the organisation of space and work and the hierarchy of relationships in both cases shows that common to Venice and Constantinople were the specialised manual workers and proti (the repositories of considerable empirical knowledge and experience), but that Venice lacked the theoretical knowledge of the architect, the mechanicos, who stood at the peak of the whole organisational structure of the shipyards in the Ottoman Empire. One thing that the book repeatedly shows is that the fundamental aspects of the development cannot be understood unless they are systematically related to the presence or otherwise in Venice of a managerial approach to the levels of knowledge involving technique and design.

The constructional work of the first half of the fourteenth century, involving the addition of the fortified basin ('Arsenale Nuovo') to the old storage area for war materials, proceeded as the institutional support which

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*Figure 6*.Angelo Gambin, student at the school for naval architecture of the Venetian Arsenal: scheme for a ship with 74 cannons (Biblioteca Querini Stampalia, Venice)

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regulated its activity was defined. This was all a part of a wider urban, social and governmental programme in which the fundamental political value was caution. Innovation was renounced in favour of, at most, the pursuit of what was called a 'major alteration' in shipbuilding techniques and ship design. As Braudel has observed, medieval Venice was not in advance of her time: she was less bold than other city republics in order to make herself less vulnerable. Concina shows that this was particularly true in the case of the Arsenal, where alteration (not innovation) meant essentially transfer, shifting a technique or object that already existed from one place to another, as with the introduction of ships from the Atlantic into the Mediterranean.

The opposite approach is exemplified in what happened at the Arsenal in the sixteenth century. This involved the great humanist Vettor Fausto, the introduction of the famous quinquereme galley in 1529 and the renovation of the shipyard itself. Following the battle of Cambrai, in a climate which favoured the revival and refitting of the Venetian fleet in order to come to grips with the problem of piracy in the Mediterranean, Fausto - an expert in early military science and classical history to the extent of writing a Latin translation of Aristotle's Mechanics presented the 'bellissimo modello' of the ship to Doge Gritti. Questions which Concina reexamines include the fact that Fausto managed to have a yard placed at his disposal in the Arsenal to test and complete his work; the emergence of the 'Queen of the Navy', fully fitted with artillery, from the public dockyard; the debate which arose in the city and the supposed propaganda campaign orchestrated by Fausto's humanist friends; and the prestige Fausto seemed to enjoy in other surroundings, exemplified by the fact that he was involved in negotiations to attract Michelangelo Buonarroti into the service of Francesco I. Concina traces the history of the quinquereme (which, despite several accidents was not a technical disaster, was not laid up and indeed took to sea many times up to the eve of Lepanto) and on the basis of

minute examination of the evidence arrives at conclusions which differ in part from those of Lane and Aymard<sup>5</sup>. The coordinated experimentation of Vettor Fausto; his relationship with the Duke of Urbino, Francesco Maria della Rovere, then Captain General of the Republic; Fausto's public employment for some twenty years at the Arsenal, culminating in 1543-44 with his appointment as director of all the yards under construction in the Arsenale Novissimo; all these aspects are relocated historically, not without reference to the work of Lucien Febvre.

If, as Concina maintains, Fausto was setting out directly to revive the traditions of naval construction of the ancients, which had declined after the Augustan Empire, not simply by updating a formula, but rather from the desire for a renewal using the ratio as a method of design, then the scope of the subject is inevitably enlarged. The subject now centres on the debate in sixteenth century Venice as to the merits of architecture as a science compared with the mere technical skills of the proti. 'There is no profession which requires greater acquaintance with almost all the knowledge which studies have produced than that of architecture, and Vitruvius emphatically pointed out how small a part of it is covered by the practical skills of craftsmen builders .... And if it is certainly difficult to acquire an understanding of the architecture of buildings on land, how much more so must it be to be an expert in the architecture of sea-going craft?' Litterae et disciplinae, which used mathematics (Aristotle, Archimedes, Vitruvius) as principles to order experience, were the concepts involved in Fausto's attempt at a redefinition of cultural projects (archaeological investigations as much as civil, military and naval architecture): in place of merely empirical construction, the demand was for a firm mathematical basis as the means of eliminating the technical quirks of individual craftsmen.

All this occured as part of a great reorganisation of the Arsenal, extending from the overall review of its function as a state dockyard to the rationalisation of its actual

layout. In terms of building, the picture is one of uninterrupted construction of the open-air shipbuilding yard (most notably in the period from the early years of the century until 1595), with continuity resulting from the coincident interests of trade, defence and social policy. The space of just a few years saw the completion of twelve volti da terra in the Arsenale Novissimo (1524-1525), two watchtowers along the Novissima dock-side, work on the boundary walls (1525-1528), new workshops and foundries for the manufacture of bronze artillery with warehouse and coal storage facilities (1526-1539), the acquisition of a plot of ground previously owned by the Convento della Celestia (1535) as the site for a mill for grinding gunpowder (1535-1540), and the reorganisation of the sail-making workshop and the creation of covered building-yards (1542-1544). The fleet itself underwent reorganisation from 1545 on, and the introduction of new regulations for fitting out ships of war made it necessary to build sheds along the wharves from which hulls were fitted out, in the Loggia dell'Ammiraglio and in the building overlooking the Rio dell'Arsenale. At the eastern end of the Strada di Campagna, store-rooms for sea-going artillery were built to replace the old gun-rooms and entirely new ones were installed near the Porta di Terra, the land entrance to the Arsenale.

The author thus enables us to follow the production process of a narrow galley from the construction of the hull in the Arsenale Novissimo, through its launching from the Novissimo slip-way, to its passage through the Rio delle seghe towards the Arsenale Nuovo, where it was fitted with its rudder, artillery and munitions; sails, cables and rigging were fitted in the Arsenale Vecchio and finally the oars were added in the Rio dell'Arsenale.

Thus by 1545 there existed in the Arsenal a tendency toward specialisation of function, which corresponded to that 'wonderous order' that Daniele Barbaro celebrated in the *Commentari*<sup>6</sup> on Vitruvius; producing in the second half of the century a clear demarcation in the complex of six principal sections and a clear separation between those areas used in the construction of new boats and those used in the renovation or repair of existing craft.

Though at the level of the history of ideas Fausto played an important role in stimulating the 'renaissance of mathematics' in Venetian circles, his organisational proposals and those of the political circle that supported him were dropped.

From Fausto's architecture the Arsenal drew only short-term technical benefits; in the long run the opposition of the craft corporations and the resistance of the skilled workforce nullified some of the innovations introduced (such as the central timber stores constructed in 1568). Instead of becoming the centre of a process of territorial renewal, by the early seventeenth century the Arsenal was no longer capable of producing merchant vessels and warships of European standard, and the Republic was forced to resort to chartering or buying Dutch ships. The world of craft-based practices, the 'conservative' tendency, was victorious at the Arsenal. The Republic found itself prisoner of its own example of the careful balancing of forces, a principle originally adopted in medieval times and which, in the formula of wise caution (accorta prudenza), had formerly been at the base of its fortunes.

Concina adds to our knowledge of the subject in many key respects: the precise identification of the work of some of the 'proti' (Antonio Da Ponte, Alessandro Tremigno): the new attribution of several projects (the porta magna at the land entrance and the via lata linked to it, the Corderia della Tana, the entrance to the Strada di Campagna); and answers to problems of chronology (the dating of construction work, from the establishment of the earliest boat-building yard through later plans and work actually carried out involving both new building and modification of old, up to Napoleonic times). Concina's books is thus a fundamental contribution to the specific history of a particular urban location, at a time when professional and political interests and proposals for its use in the future have prompted many popular publications (some of them inaccurate). But as well as this specific contribution, the book moves from the object of the research (the Arsenal of the Republic) to more general questions of cultural history (the ferment in humanist circles in Venice) and to an understanding of more complex economic and political balances (the place of the Venetian republic in the context of the great powers of Europe).

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# Early carpenters' manuals 1592-1820

### by David T. Yeomans

Wittkower<sup>1</sup> has discussed the English literature on architecture up to the end of the eighteenth century, principally in order to illustrate the literary background to the Neo-Palladian movement and hence considering the books as a medium for the transmission of architectural ideas. While these new ideas were being disseminated there were also changes taking place in the way in which buildings were being designed and built. Until the early eighteenth century the construction of great houses was often undertaken by the owners, either acting directly or through their clerk of works. Architecture was the pursuit of gentlemen who might write on the subject<sup>2</sup> or subscribe to architectural publications. But as the new architectural ideas were adopted and the planning, construction and decorative forms became more sophisticated it became more common to use the services of an architect.

The interests of those architects and their patrons can be traced in the kind of books discussed by Wittkower: English editions of Palladio, books on Chinese or Gothic designs, books of house plans and designs of chimney pieces and the like. Naturally when there were few professional architects not all who wished to enjoy the new architectural forms could employ an architect and many requiring more modest houses - the mercantile or professional classes - might instead turn to tradesmen who were capable of putting up a building in the required style. These tradesmen might have acquired their knowledge of architecture from the same books or from the 'vulgarisations' to which Wittkower refers, but during the same period the carpenters' manuals which dealt with the more practical aspects of building also appeared. These dealt with the structural and setting-out problems presented by the new architectural forms. They were books to be used in the daily tasks of construction, and hence were sometimes produced in pocket format. It is possible to see in the appearance and contents of these books, not only the development of architectural ideas, but also something of the changes in building practice and the development of new skills that accompanied the demand for new architectural forms.

Why were books on building addressed largely to carpenters? As Wittkower points out, surveyors provided the first professional services associated with building and it was from books for this group that books on architecture developed. The surveyors managed the estates which provided the wealth to build the great houses and they not only dealt with land but also with the construction and letting of buildings. Of books for surveyors Primat's City and country purchaser and builder (1667) is typical<sup>3</sup>. It deals with valuations and rents, the business of the various tradesmen and the problems of measuring. An extant copy of Neve's City and country purchaser provides a good indication of the daily concerns of the original owner. This is a second edition of the book (1726) now in the Yale Center for British Art. The book was a dictionary of building terms and included the prices of various kinds of building work. In his preface to the second edition Neve noted that the book was originally produced for workmen but that additions were made to make the book more 'fit for gentlemen's use'<sup>4</sup>. The Yale Library has two copies of this edition which have been interleaved with blank pages for the owner's notes. In one of these the manuscript additions deal with the prices of building materials such as nails in various parts of the country, mainly to the south of London, where the owner of the book presumably travelled and worked.

These books show the surveyors in roles similar to those that they perform today although without the degree of specialisation now found within the profession: as managers of buildings and property and as supervisors