



Chair:
Prof. Carolina Di Biase

DOCTORAL PROGRAM IN PRESERVATION OF THE ARCHITECTURAL HERITAGE

The PhD programme in “Preservation of the Architectural Heritage”, first activated at the Politecnico di Milano back in 1983, is organized in a renewed form. In addition to the professors of architectural restoration, history of architecture and structural strengthening of the Politecnico di Milano, the Faculty Board includes representatives from other well-known universities and research institutes (professors of the Università di Genova, IUAV, Venezia; experts at the highest level in the field of preservation of cultural heritage and of the administration of cultural heritage in Italy: Istituto Superiore per il Restauro e la Conservazione ISCR, formerly Istituto Centrale del Restauro, Soprintendenza Regionale della Lombardia); they collaborate actively in the teaching and research activities.

The ultimate purpose of the enlarged Faculty Board not only resides in broadening the experiences that the PhD candidates acquire over the first three years of the course, where they have the opportunity to interact with scholars from different backgrounds; it chiefly aims at providing the PhD candidates with a unique training experience in the Italian panorama, so far unparalleled also in domains other than the preservation and restoration of the cultural heritage. Such context, where different traditions and approaches are compared, investigates the synergies and responses to the modern themes of cultural heritage protection.

The PhD programme is meant as the place where theorization, methodology, investigation into the most significant chapters of the protection of historic architectural and cultural heritage are connected to complex, challenging operating research themes, on-site and lab experimentation of analytical and diagnostic stages and, finally, the experimentation at building sites which cater for the foremost Italian works.

The relationship with Italian Ministero per i beni e le attività culturali e il turismo, Mibact, has been definitely fruitful, especially when we consider that many among the best PhDs in Preservation of Architectural Heritage have been hired as officers and executives to the above ministry.

Teaching aims

The Faculty Board organization allows to investigate and share extremely relevant, up-to-date topics that, architectural heritage being the high spot of research, describe the complex domain of preservation, a strategic field and, at the same time, one of the chief resources of the Italian economy and future.

Being a mix of differentiated research, experimentation and operating

methods, the PhD programme provides the candidate with a rich and very interesting experience.

The on-going contact with the breakthroughs from studies and research carried out in Italian and international contexts and the will to promote joint projects are fostered through expanding the network of relations the university entertain with other universities and research centres in different geographic areas of the world.

In this regard, over the past 3 years the PhD programme in Preservation of the Architectural Heritage has been committed to promoting and coordinating inter-doctoral courses contributed by foreign professors from different European countries (lately the Course of the PhD School Tradition and Perspectives of Polytechnic Culture in Europe).

Such activity will further benefit from the co-operation with other PhD programmes in the Politecnico di Milano and the universities that collaborate with the PhD programme activities.

Coursework

The PhD programme, lasting three years, calls for the acquisition of 180 credits overall.

Thirty credits are concentrated in the first year and are divided as follows: 25 (minimum) offered by PhD courses organized by the PhD programme in Preservation of the architectural heritage, and 5 credits offered by the PhD School. The academic plan of the PhD programme revolves around 5 main research areas:

1. Preservation culture and practice; 2. Diagnostics of materials and structures and rehabilitation of historic buildings; 3. Methods and themes of historical research; 4. Construction history; 5. Historical territory and landscape.

The remaining credits are aimed at personal study and research for the PhD thesis. Moreover, for each PhD candidate a specific study path is organized and PhD candidates may attend courses offered by the School for Specialists (Scuola di Specializzazione in Beni Architettonici e del Paesaggio - SSBAP) in Milan and in Genoa, in relation to the various topics of their thesis.

The activities undertaken during the second and third year also include attendance of workshops, seminars, national and international conferences related to individual research, with great attention to conferences wherein PhD candidates present the results, even partial, of their research theses.

Research organization and topics

Educational activities are related to research either under way or at an early stage of development, some of which addresses major monumental structures and some of the most renowned sites of the world.

To the aim of their thesis research, PhD candidates have the opportunity to rely on facilities and laboratories, both inside and outside the University, the breadth and width of which provides them with a crucial support to the aim of acquiring “competence for highly qualified research activities” in the



1. Overall perspective of Hunedoara Steelworks, 1970s. Source: CSH Photographic Archives, Hunedoara (Ro)



2. The ruin of Union Church at Shanghai, built in 1886 by Arch. William Dowdall. Shot by the author in 2006 before the reconstruction.



3. The vulnerability status of Shikumen house at 393-14 Wujin Rd, Shanghai. Shot by the author in Sep 2010.

domain of cultural heritage protection. In this connection, the PhD programme deems to carry on the long - standing collaboration with the ICVBC-CNR (the Institute for the Preservation and Enhancement of Cultural Heritage) "Gino Bozza" Unit, Milan, and the CNR-Isac (Institute of Sciences of Atmosphere and Climate) of Padua. As for the thesis research, candidates thus have the opportunity to address and investigate in-depth the wide-ranging themes connected to heritage knowledge and preservation broadly meant, such as advanced methods of investigation; knowledge management and preservation processes applied to historic buildings tradition; twentieth-century heritage and cultural landscapes, as in the thesis dealing with historical event and destiny of Hunedoara plants, in Romania (figure 1), or in that of "Energy" technological landscape in Valtellina, committed by A2A Energia. This aspect increases the technical aspects, and will make PhD immediately competitive at the European level. The multi-disciplinary nature of the doctoral

courses, encouraged in the framework of the PhD programme since its establishment, equally values the fundamental contribution of historical research alongside its methods (see the thesis on "blue and red wall" buildings in Shanghai, China. figures 2, 3); at the same time it features innovative, pioneering themes: research about the energy response of buildings targeted to the reuse of existing technical systems and to reducing the impact of new systems which, since long, have been extensively addressed by the PhD programme and at the heart of an International exchange with European universities and research labs; the research about BIM technologies applied to architectural heritage, as evidenced by "Building Information Modelling for the current architectural heritage (Albergo dei Poveri, Genoa), or the studies carried about the seismic vulnerability of buildings, which will be keyed to investigating the cognitive methods underlying the "Guidelines for the assessment and reduction of the seismic hazard the cultural heritage" (Ministerial Circular n.26 of 2nd October 2010, D.P.C.M. 9th February").

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THE BLUE AND THE RED: THE PLAIN BRICK WALL IN ARCHITECTURAL HERITAGE OF SHANGHAI 1866 - 1929

Shu Changxue - Supervisor: Prof. Carolina Di Biase

The research focuses on Shanghai's historical buildings of which the plain brick wall is constituted of both blue brick and red brick. They are lost in translation and transformation in the rapid and massive redevelopment nowadays. Thereupon the dissertation argues that this sort of duotone plain brick wall is a specific built heritage in Shanghai, their historic value, documentary value, and age value are disregarded but actually retained in the existent architectural evidence, with the inevitable deterioration continuously added. The disregard is ascribed to both the problematic "conservation" at Shanghai and the inadequate historical studies on the architecture, which is a first step in organizing the issues and the present state of knowledge on the matter. It starts with the status quo of such heritage through an investigation of the historical architectures and areas. Their situation displayed in the space of Shanghai City and in the space of Shanghai's protection system involves the laws, policies, and the administrative service of cultural heritage in China at different levels, as well as the recent history of the development. It thus clarifies the official tools and the problems in the protection system in terms of such heritage. The Chinese

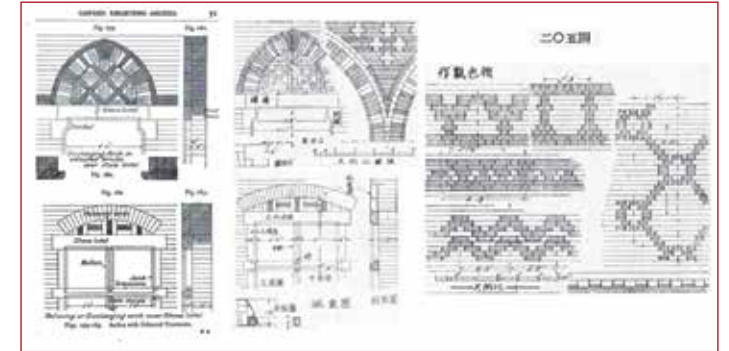


1. The first high form of duotone brickwork architecture, Holy Trinity Church at Shanghai, 1869, by Sir Gilbert Scott (1811-1878) and William Kidner (1844-1900). (the photograph of the architecture in: Chen, Congzhou, Zhang, Ming (eds), *Shanghai jindai jianzhushi gao*, 1988, p.89)

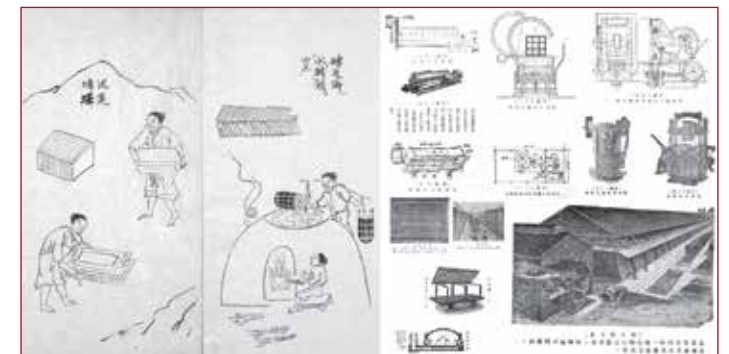
concept on protection and the way of intervention made to such historical architecture are also examined. Furthermore, the scholarly changing vision is explored through an overall review of the historiography upon such architecture, revealing the hidden ideas and views that have influenced the fate of such buildings. The historical study centres on rediscovering the above-mentioned values and the continuities embedded in such historic buildings in different levels of urban, architecture, technology and material. Particular attention is paid to the historical contexts. It is assumed that the Victorian architects and architectures from UK are the primary sources of such dichromatic language of architecture. For this assumption

the research explores the links between the British culture in Victorian architecture and the contemporary buildings erected at Shanghai. These links are excavated mainly through the British architects and their ideas, the extension of the Victorian space, and the Victorian architectures in building Shanghai during 1866-1929. The research explores at different levels how the language of constructional bichrome was imported, localized, and diffused in Shanghai through the architectures across cultures and countries in the dynamic contexts. It also explores the translation and the adaptation of the language embedded in the specific models of architecture through different approaches, with the contribution from the native clients, builders, and

artisans also. The architectural evidence has interwoven the tangible material substance and the technology. Based on a comparative literature review across cultures and countries, it explores the western sources of the Chinese technique publications related to the object architectures, including their links and lacunas. Based on a multi-disciplinary research and the field investigation, it rediscovers both the continuity and the decay of the long-term tradition of Chinese blue brick and the solid constructing system of Chinese architecture testified by and documented in the duotone plain brick walls. Moreover, it rediscovers the other reasons of the arrival and the prevailing use of the western red brick in building the international Shanghai. It rediscovers how the modern brick materials and the localized Victorian techniques determined the forms in those dichromatic architectures and how they favoured the decay of the Chinese architectural tradition. Thereupon, it argues for the fact that the foreign language of constructional polychromy was embedded in local culture of architecture due to the interactions and the transmission of knowledge and technology, which is proved by the craftsmanship presented in those walls through a



2. The brickworks in technique books, comparing the English source and the Chinese one. (in: C. F. Mitchell's *Building Construction and Drawing*, 1888, and *The Builder*, Shanghai, Nov-Dec 1935.)



3. The change of brickmaking: the fabrication of traditional blue brick and the modern industry at Shanghai. (presented in *Tian gong kai wu* (1st ed. 1637), and *The Builder*, Shanghai, Apr-May 1935)

comparative reading between the western source and the Chinese source, and between the textual evidence and the architectural evidence. Besides, it re-defines the prevalent terms "blue brick" and "red brick" based on the changing industry of brickmaking, and

pays special attention to the historical data on those bricks produced in the modern period, aiming at a further study on their characteristics and the deterioration.

ARCHITECTURAL HERITAGE PROTECTION SYSTEM IN CHILE: SUSTAINABILITY AND OPPORTUNITY FOR THE FUTURE OF THE PAST

Oana Cristian Tiganea - Supervisor: Carolina Di Biase

During the last 20 years the derelict industrial structures, especially from the field of heavy industries, became a common feature for the entire Romanian territory in a context of general deindustrialisation and globalisation. Of great impact are the frequency with which these derelict industries can be found and their fast pace of decay and disappearance. Indeed, their territorial diffusion is linked with the 1945 - 89 Socialist hyper-industrialisation process that marked Romanian passage from agricultural to industrial based economy, in an overall post-war context dominated by the rise of the Communist political power in central-eastern Europe. Moreover, during the years of Communism in Romania (1945 – 89), the industry, and metallurgy in a more particular way, attracted the direct involvement of the Socialist State, something that became a common feature for the entire Soviet Bloc. One such example is the case study of Hunedoara, positioned in south-west Transylvania and representing a landmark for both Hungarian and Romanian history. Hunedoara presents a metallurgic site dating the end of the 19th century, fully transformed in a national 'metallurgic icon' starting with 1947 arriving to its industrial and territorial peak during the

Communist industrialisation, and furthermore, subject of advanced abandon and material decay short after its 1999 production shutdown. The research approaches the matter of the built industrial legacy, and in consequence Hunedoara's case, as considered the direct material result of *all* industrialisation phases, and therefore, tangible testimonies of *all* different historic periods connected with its development. Therefore, through the case study of Hunedoara, the research follows at first its construction throughout all industrialisation phases directly linked with the larger economic, political and cultural context, and second, its destiny threatened by disappearance in a context in which the change in attitude towards industrial heritage and built environment dating the recent past is still under process. The thesis' structure is guided by the main research questions approached on the basis of a chronological timeline directly linked with Hunedoara, as follows: *Chap.1 Contextual Consideration of the Romanian Industrialisation during Communism; Chap.2 Built Industrial Legacy in Hunedoara at the End of the Second World War (1884 – 1947); Chap.3 Building Hunedoara Steelworks, 1947 – 89; Chap.4*

The Destiny of the Industrial Past while Chasing Capitalism, 1989 – 99.

From a methodological point of view, the specialist literature was used in order to determine the logic of the metallurgic production, and thereby, the multitude of buildings typologies needed on such a complex integrated metallurgic site as Hunedoara. As concerning directly the production places the analysis had as a starting point the interconnections between the time publications focused on Hunedoara industrial projects and the archival documentation.

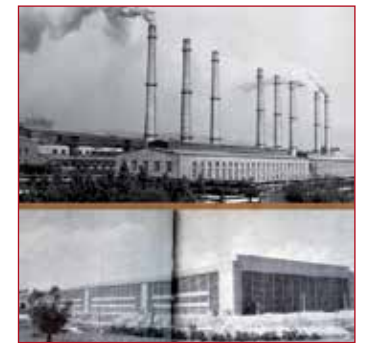
The industrial architecture from Hunedoara proves to be directly linked with the overall regional and/or national architectural scene, this also due to its dominant role played in Romanian industrial context. Moreover, this feature appeared strengthen during the Communist years when great quantity of interventions were directed here, Hunedoara becoming an epitome of the Socialist industrialisation, and therefore, offering the possibility of a critical analysis of the industrial architectural manifestations in a context of centralisation and political direct interference with the architectural practice. In a time when the industrial architecture was a *leitmotiv* of

the Communist propaganda, it brings into discussion important aspects of the Romanian architectural practice such as: territorial systematization through industrialisation, (officially) accepted architectures, architectural models of influence (East vs. West), construction materials, standardization and prefabrication, and not at least, architect's freedom of expression and access to information in a context of political, social and cultural constraints. Thereby, this case-study offers the possibility to analyze the industrial architecture from a *qualitative* point of view, and help formulating hypothesis regarding the architectural practice in communist Romania. Nevertheless, the inquiry of Hunedoara industrial territory continues following the post-1989 political shifts, and even more, the post-1999 production shut down which determined its industrial fall and transition towards an obsolete, abandoned and even partially demolished structure. This passage towards derelict industry is contextualized in the post-1989 Romanian revival of preservation practice, with an interest in the existing protection legal instruments of the industrial heritage. The thesis concludes with a record of the material traces possible to connect with Hunedoara industrialisation, which proved

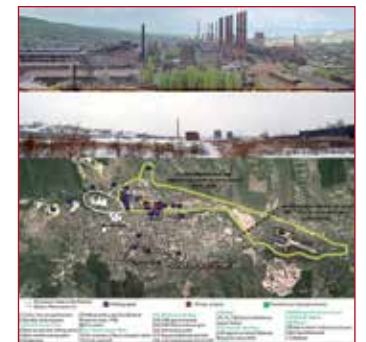
to be rather an industrial architectural glossary of the 20th century for the Romanian context. The purpose is that to establish a starting point in the further on intervention projects directed towards Hunedoara industrial past, endorsing its patrimonial values, while taking into account *all* remained traces from immediate surroundings, to ex-industrial site and to the urban environment still surrounded by the local community bearing strong ties with their recent industrial past. The understanding of the complex evolution of Hunedoara Steelworks over such a controversial historic period could help in shaping a new idea of 'social awareness' concerning the built environment inherited from a political regime of the recent past. Moreover, the analysis of nowadays Hunedoara industrial territory, always keeping as primary its material substance perspective, intends to rise further debates concerning the perception, and furthermore, approach of industrial heritage, especially in a context in which the 'steel landscapes' are threatened by disappearance.



1. (above) Hunedoara Steelworks' master-plan 1962; (bottom) Hunedoara 1992: (red) Hunedoara Steelworks; (yellow) the town.



2. Industrial plants built on the Hunedoara Steelworks site during the period 1947 – 89.



3. (above) Hunedoara Steelworks' various phases of abandon and decay dating 2002 – 2012, (bottom) record of industrial traces.

CENTRALE DI FRAELE. INTERPRETATIVE PATHS BETWEEN CONSERVATION OF INDUSTRIAL ARCHAEOLOGY AND HYDROELECTRIC LANDSCAPE.

Francesco Carlo Toso - Supervisor: Prof. Alberto Grimoldi

This study originates from the disused power plant of Fraele, in the northernmost valley of the Italian Lombardy region, and is meant as a premise to the conservation and active protection of hydroelectric industrial heritage in less dynamic contexts such as the peripheral alpine areas. The change in perspective from the study of industrial archaeology to the acknowledgement of industrial heritage widens the scope of historical infrastructure preservation from a focus on the power plant building, often understandably justified in reference to its peculiar architectural features, to an understanding of both the complexity of the hydroelectric facility as a whole and the history of the construction works, which had a lasting impact on the alpine territories and landscapes. The research aims at investigating the evidential values attached to hydroelectric industrial heritage and the different means of identifying and communicating these values. Different aspects of the design and construction of a hydro-power facility are taken into consideration, leading to the wider notion of a "hydroelectric landscape".

Infrastructure is the result of a careful analysis of the resources and morphology of a territory. During the first decades of hydroelectric development different areas of polytechnic

knowledge were integrated for the first time into large scale designs, making use of interdisciplinary competencies and taking advantage of the wide-ranging preparation of the engineering schools. The education of the virtual figure of a "hydroelectric designer", in fact a team of engineers, within the Royal Technical Institute of Milano is described through its study programs and the specific technical literature available, revealing the attention to international developments and the influence of European technical cultures on Italian mechanical, hydraulic and later hydroelectric practice at the turn of the century. A hydroelectric facility can be read at multiple levels. The territorial level emphasises the historical and geographical specificity of hydroelectric developments, contextualising the infrastructural works in the wider alpine region. The technical dimension shows the strict relation of the design process with the local morphological, hydrographic and territorial characteristics, and the strong interdependency in the design of each part of the hydroelectric system, including the major works, the dam and the power plant. This is further clarified by the power station design criteria, which are always dependent on the external factors, the choices made on

the overall layout of the facility, and the internal factors, namely the requisites of machinery and technical systems. While its technological content may qualify the building as a "technical monument", the power plant is often designed with strong architectural features, often brought at the forefront as the main object of preservation goals. The search for a suitable language for industrial buildings that openly confronted the landscape does not seem to have been openly developed in the Italian designs, which are more attentive to the self-representation needs of the electric industry. It was strongly felt in the German and Swiss architectural discourse, also affecting the design of power plants. The case study takes advantage of the technical documentation, the company records and the photographic heritage of the former Municipal Electrical Company of Milano, AEM, to complement the available literature, focused on the economic and institutional history of the company, with a narration of the technical management of the earliest infrastructural works. The elements of the historical infrastructure are made clear, especially in regard to its configuration on completion of the first phase of development up to 1930. The results aid the assessment of the material



1. Centrale di Fraele and penstocks, Paoletti 1931 (Archivio Fotografico Fondazione AEM)



2. Centrale di Fraele. Cross section on the turbine hall (Archivio A2A, Grosio)

integrity of the heritage, but also reveal the continuous process of accumulation of expertise and the structuring of the construction management process over an uninterrupted series of works, culminating in the great Cancano reservoir. More detailed documentation allows to trace the interplay between the technical and architectural design in the making of the power plant building, revealing the otherwise invisible peculiarities of the construction. The facility design comes from the accurate survey of natural features and resources, but its implementation modifies and imposes its own new rules, turning former rural and high altitude landscapes into industrially productive territories. A hydroelectric development defines a form of "industrial landscape", the meaning of which needs to be

clarified. Industrial landscape may refer to the practice of landscape identification and the significance that is given today to the developments, while it may or may not refer to a conscious process of landscape making during the design and building process. The distinction is exemplified by the reception of the hydroelectric industry by the German and Swiss Heimatschutz movements, showing a more open concern with landscape integration than the Italian case. In the Valtellina context, the identification of a "hydroelectric landscape" does not mean acknowledging an already established historical landscape of hydroelectricity, as much as contributing to the integration of historical infrastructure in the perception of the alpine landscape today. An apparently minor heritage, still fundamental for the hydraulic regulation

and of great importance for both the technological and institutional history and for the shaping of the landscape, is at the centre of some initiatives in the Ruhr region, exemplifying the reappropriation of historical water infrastructure and its integration in the contemporary landscape. In this perspective, actions for the communication of the cultural significance of the remains of unused infrastructure contribute to the identification of a new role for hydroelectric heritage.