INSTITUT FÜR DENKMALPFLEGE UND BAUFORSCHUNG

WAS KANN DIE DENKMALPFLEGE VON DER KONSTRUKTIONSGESCHICHTE LERNEN?

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DARCH

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Construction History, Bautechnikgeschichte, Konstruktionsgeschichte, … das sind Bezeichnungen für einen Forschungszweig, der in den letzten Jahren international grossen Aufschwung genommen hat. Mit der Denkmalpflege und der Historischen Bauforschung verbindet das neue Fach das Interesse und die Arbeit direkt am Objekt. Doch um was geht es der neuen Disziplin überhaupt?
Technikgeschichte, Wissenschaftsgeschichte, Bauforschung unter neuem Namen? Und was kann die Denkmalpflege erwarten? Neue Bewertungskriterien für Denkmale, neues öffentliches Interesse, neue Erhaltungsstrategien?

18. Oktober 2019, ETH Semper Aula (HG G 60)

Ine Wouters
Vrije Universiteit Brussel, Belgien
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Robert Carvais
Université Paris Nanterre, Frankreich
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17. Januar 2020, ETH Semper Aula (HG G 60)

Valérie Nègre
Université Paris Panthéon Sorbonne, Frankreich
History of materials and restoration. The case of southern France bricks (XVIIIe – XIXe centuries)

Werner Lorenz
Brandenburgische TU Cottbus, Deutschland
«*Kulturerbe Konstruktion – Ingenieurbaukunst der Hochmoderne*»

ABSTRACTS

Construction history: one of the many layers feeding building conservation

Ine Wouters (Vrije Universiteit Brussel, Belgien)

Although construction history can act as an independent discipline, construction history enriches conservation of buildings and structures. Thanks to the growing number of researchers in the field of construction history, new research topics are addressed gaining new insights in the production, transport and application of construction materials, the determination and calculation of their properties, the arguments and legal contexts of their use. When it comes to the studied actors a broader range of professions is studied: next to the persons who owned, commissioned or designed a building, the engineers, contractors, the builders and their workshops are the subject of extensive studies. The buildings and structures to be conserved can thus be positioned in a broader context and network and even new gems are discovered which are worth to be conserved.
Via the description of several conservation projects, the input of construction history will be highlighted.

La pratique de l'entretien des constructions parisiennes à l'époque moderne. Quel sens donné à cette protection: volonté de profit ou conscience patrimoniale?

Robert Carvais (Université Paris Nanterre, Frankreich)

Nous avons montré dans un article récent[1] que la théorie architecturale de l'époque moderne avait mis en avant la question des réparations comme essentielle du traitement juridique de l'entretien des bâtiments. En effet, les commentaires des coutumes régissant en grande partie le droit français s'interrogent sur les titulaires de ces obligations d'entretien et sur la natures des opérations suscitées, qu'elles soient nécessaires ou utiles, grosses ou menues, urgentes ou facultatives, courantes ou exceptionnelles. Dans le cadre d'un projet de recherche en cours, nous avons l'opportunité de poursuivre notre réflexion sur ce sujet mais cette fois sous l'angle pratique. Analysant les procès-verbaux d'expertise des bâtiments parisiens de 1690 à 1790, nous nous sommes aperçus de la forte propension, voire de la récurrence constante des visites de réparations. Quelles sont les motivations des requérants: éviter une catastrophe en consolidant l'édifice, réguler économiquement une situation juridique ou conserver le bâti afin de se constituer un patrimoine?

[1]Robert Carvais, «Entretenir les bâtiments. Une préoccupation juridique essentielle chez les architectes sous l'Ancien Régime», in Charles Davoine, Am bre d'Harcourt et Maxime l'Héritier (dir.), Sarta Tecta. De l'entretien à la conservation des édifices. Antiquité, Moyen Age, début de la période moderne, Aix–en–Provence, Presses Universitaires de Provence, 2019, p. 23 – 35.

Die Restaurierungen des Strassburger Münsters im 19. und frühen 20. Jahrhundert

Christiane Weber (Leopold-Franzens-Universität Innsbruck, Österreich)

Das Strassburger Münster zählt zu den bedeutendsten Sakralbauten des Mittelalters. Das heutige Bauwerk steht an der Stelle mehrerer Vorgängerbauten und kann auf eine bewegte und gut erforschte Baugeschichte zurückblicken. Aspekte der Bautechnik blieben bislang jedoch weitgehend unbeachtet. Auch die Restaurierungen, insbesondere die Rekonstruktion des Vierungsturms nach den Zerstörungen im deutsch-französischen Krieg und die Sanierung der Turmpfeilerfundamente zu Beginn des 20. Jahrhunderts in béton armé, bieten spannende bautechnikhistorische Fragestellungen, die im Kontext der wechselvollen deutsch–französischen Geschichte stehen, da Strassburg zu dieser Zeit Hauptstadt des Reichslands Elsass-Lothringen war.
Die Auswertung der in der Münsterbauhütte überlieferten und bisher von der französischen Forschung wenig beachteten – weil in deutscher Kurrentschrift verfassten – Archivalien, der Wettbewerbs- und Bauausführungspläne sowie der Fotodokumentation gibt Aufschluss über die angewandten Restaurierungstechniken sowie die jeweils verfolgten denkmalpflegerischen Konzepte. Für anstehende und zukünftige Sanierungen ist dieses bautechnikhistorische Wissen neben der Bauforschung die wesentliche Quelle, um fundierte Erhaltungsstrategien zu entwickeln.

Les charpentes médiévales françaises: de la connaissance des matériaux, des techniques et des structures à leur restauration.

Frédéric Épaud (Université de Tours, Frankreich)

La construction en bois représente l'un des aspects les plus importants de la construction médiévale en France septentrionale et aussi l'un des plus méconnus. Les récentes études archéologiques des charpentes anciennes conservées en élévation comme celle des cathédrales de Bourges, de Lisieux, de Rouen, et aussi de granges, de logis et de chapelles médiévales, permettent désormais de mieux appréhender les questions de la sylviculture, de l'approvisionnement des chantiers ou des techniques de conception et de mise en œuvre du bois dans la connaissance des structures de charpenterie et de leur évolution au cours du Moyen Âge. Cette conférence montrera en quoi ces connaissances permettent de mieux diagnostiquer les pathologies des charpentes anciennes et de proposer des mesures conservatoires plus adaptées aux matériaux et aux techniques de mise en œuvre d'origine.

Made by stone and stucco. The art of building in Baroque Rome: know to preserve

Nicoletta Marconi (Università di Roma Tor Vergata, Italien)

Precepts and rules of roman building practice between 17th and 18th Centuries and their usefulness for restoration procedures are the subjects of this conference. Through the analysis of some baroque Rome buildings and with the support of archival documentation (also unpublished), stone and brick construction techniques, processing of plasters and stuccoes ornaments, technologies for construction and restoration, organization of work will be described. All the most important papal Rome building sites – including those commissioned in the province fiefdoms – revealed skilled strategies for materials supply, processing and implementation, as well as for work organization and artisans and workers (men and women) selection. A series of previously unknown documents from the Vatican Barberini Archives will be disclose. They explain and summarise construction techniques and decorative devices, as well as the relationship between the dense network of architects, artists and artisan construction companies, who were at that time working in Rome and its provinces. This effective organization made possible perfect and fast construction of the most important monuments of Roman Baroque architecture, but also their restoration, documented since the early 18th Century. So, if in-depth knowledge of construction techniques is the first and indispensable tool for a respectful and compatible restoration project, during the conference examples of good conservation practices, derived from the knowledge of historical building techniques, will be illustrated.

Cracks and Safety: Santa Maria del Fiore and Saint Peter's

Santiago Huerta (Universidad politécnica de Madrid, Spanien)

Masonry architecture moves and cracks. This is natural in structures made of a material with little or none tensile strength. The initial cracking of the structure during the period of soil consolidation under the foundations was inexorable: buttresses would lean and the vaulting would crack. Afterwards, cracks were closed. Any movement in the following decades, centuries or millennia would lead to further cracking. Some cracks were seasonal, open and close following the seasons. Provided the geometry is not grossly distorted, these cracks are irrelevant from the point of view of structural safety (of course, external cracks should be filled to avoid the entry of water and the subsequent degradation of the internal masonry). In general, masonry constructions are cracked: sometimes the cracking is apparent others not, but the cracked state is the natural state of masonry.

The perception of cracks has changed in the last, say, 300 years. Nowadays cracks are considered dangerous. This idea comes from the «new materials» which substituted masonry during the 20th Century. Cracking in reinforced concrete should be severely limited to avoid the corrosion of steel. In a building with a steel skeleton the appearance of cracking indicates that deformations are unduly great. As a result many architects and engineers involved in the inspection or restoration of historic masonry buildings tend to overreact at the presence of cracks and intend to avoid what is, in fact, not only unavoidable but natural, and good. Masonry is «plastic» and adapts to the aggressions of the environment (the change of the boundary conditions) forming cracks and changing slightly its geometry.

It appears that medieval masters did not worry much about cracks. They did worry, of course about excessive, gross, movements. A cracked, not grossly deformed, construction was considered safe. In the expertises and treatises which has come to us from the Middle Ages and the Renaissance no mention is made about cracks, but concern is shown about the correct geometry of vaults and buttresses. Leonardo was perhaps the first to show an interest in cracks.

It is pertinent to study the change of appreciation about cracks. The cases of Santa Maria del Fiore and Saint Peter's show a radical change in reduced space of time. In Santa Maria del Fiore the cracks, which aroused some unrest at the end of the 17th Century, were eventually considered harmless and no action was taken. About fifty years later, in Saint Peter's the same kind of cracks rose such unrest the Pope Benedict XIV made a global call for expertises about the safety of the dome. Around thirty reports were written and they contained the germ of the modern distrust to masonry structures and the also modern drive to make an intervention. This paper will examine this episode with the hope to throw some light in the origins of a distrust to masonry which is causing today a great lot of useless expense and, very often, permanent damages to our historical masonry architecture.

These processes can not be understood within the classic frame of elastic analysis. Very often, the structural consultant tries to convert the building in something essentially different from its nature: a monolithic, elastic structure, similar to a reinforced concrete or steel frame. The intervention then consists in an attack to the very nature of the construction. Along the 20th Century many monuments have suffered the «reinforcement» by means of a massive use of reinforced concrete and steel. These interventions, more often than not, have solved no problem and, in fact, have damaged the structure. We are now trying to remove these extraneous structures.

It all begins with ignorance, a false perception of the meaning of cracks and distortions in masonry architecture. Here Construction History can afford a more balanced view. It is a historical fact that cracks and distortions only bothered master builders in isolated cases. There are no mention about cracks from Medieval times among the numerous expertises which have survived. The same occurs in Renaissance and Baroque. The first instances of «modern» worries about cracking occurred in the mid 18th Century. The cracked dome of Saint Peter's aroused great concern and circa 30 expertises were written. Perronet and his disciples building extremely surbased arch bridges inspected with care the deformations after decentering (but their concern was not safety but aesthetic, the control of the geometry to avoid an unduly sag of the keystone). Viollet-le-Duc associated the capacity cross vaults to adapt to movements to the cracking of the arches (a cracking which he studied with great detail in Vezelay).

In the present paper we will trace along history the changes of perception about cracking, emphasizing the actual situation when any crack is looked at with fear and alarm. We will cite some historical cases in which the fear of cracks has lead to unfortunate interventions which have produced great damages to the monument.

History of materials and restoration. The case of southern France bricks (XVIIIe-XIXe centuries)

Valérie Nègre (Université Paris Panthéon Sorbonne, Frankreich)

My communication will focus on the production and the use of bricks around the city of Toulouse in Southern France. In this area, due to the lack of stones, houses but also monuments were constructed with clay from at least de Middle Age to the mid-20th century. I will show how a local and accurate study of the material can be useful to maintain and restore buildings.

First I will focus on the necessity to cross material sources (scientific analysis of the bricks, tools, surveys) with a wide variety of writen and visual sources (contracts, accounts' books, inventories, technical treatises, patents, advertisements, etc.) in order to understand the technical characteristics of the material. Then I will argue that this technical approach is not sufficent. Other sources like travellers' stories, newspapers' articles must be mobilized to grasp the cultural and social dimension of the material.

In the area of Toulouse this technical and cultural approach show that the value of the brick have changed over centuries. Red brick (rubbed and protected by red paints) was appreciated until the middle of the 18th century. Then brick was hidden under white paints or lime plaster. At the end of the 19th century the brick was shown again and regarded as a local material embodying Southern values. This provides useful information to adress the issue of whether to leave the brick exposed or not. Beyond this case study the aim of this communication is to show that construction history should bring what historians call production and reception into conjunction.

«Kulturerbe Konstruktion – Ingenieurbaukunst der Hochmoderne»

Werner Lorenz (Brandenburgische TU Cottbus, Deutschland)

«Der Wert eines Baudenkmals beruht nicht allein auf seiner Erscheinung, sondern ebenso auf der Integrität all seiner Bestandteile, die es zu einem einzigartigen Produkt einer zeittypischen Bautechnik machen.» (ICOMOS Charta von Victoria Falls, 2003) Dies gilt in besonderem Masse für die Bauten der Hochmoderne (etwa 1880 bis 1970). Oftmals definieren hier gerade die Tragstruktur oder der Herstellungsprozess den Denkmalwert, die Konstruktion selbst wird zum eigentlichen Kulturerbe.

Durch ihre zeitgebundenen Eigenheiten in Struktur, Ausbau und Fassaden entziehen sich jedoch gerade diese Bauten in vielfacher Hinsicht klassisch denkmalpflegerischen, an kunsthistorischen Kanonisierungen orientierten Zugängen. Denkmalgerechte Strategien und Methoden für Bewertung und Erhalt sind nur ansatzweise entwickelt. Es fehlen entscheidende bautechnikgeschichtliche, denkmaltheoretische und ingenieurwissenschaftliche Grundlagen – sowohl für die Bewertung als auch für die Bewahrung.

Am Beispiel dieses Themenkomplexes, zu dem gerade in Deutschland ein grösserer Forschungsverbund seine Arbeit aufnimmt, untersucht der Vortrag, was das Wissen der Bautechnikgeschichte und ihre spezifischen Methoden und Sichtweisen zu einem würdigen Umgang mit dem Ingenieurbaukunst-Erbe der Hochmoderne beitragen können.