

Session Track: Panel Discussion
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Paper: Current Research on Historic Cements and Binders

Presented by

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Speaker(s) Biography

Jeffrey Chusid is a preservation architect and Associate Professor of Historic Preservation Planning at Cornell University, Ithaca, New York. He has taught at Harvard, the University of Southern California, and the University of Texas at Austin. His professional work includes architecture and design, cultural landscape documentation and preservation, materials conservation, and urban design and planning. Projects have been located in California, Texas, China, Bosnia, Ukraine and Fiji. Chusid's research interests include the fate of historic resources in areas of cultural exchange and conflict; California Modernism; and the work of Frank Lloyd Wright and of Joseph Allen Stein in India.

John Walsh is Senior Petrographer and Geologist at Testwell, Inc. in Ossining, NY. Mr. Walsh specializes in the microscopic and chemical analysis of construction materials with an emphasis on historical American masonry. Mr. Walsh is a member of several professional societies including the Society for Concrete Petrographers, the American Society for Testing and Materials International, the Association for Preservation Technology and the Society for the Preservation of Historic Cements.

Magdalena Malaj's specialty is the study of the surface properties of chemically modified clays for environmental purposes and she has published on this topic. In 2006 joined Testwell Inc. in Ossining, NY where she is now Analytical Chemist, solving problems related to the analysis of often complex historic masonry materials using combinations of wet chemical techniques and atomic absorption/emission spectroscopy.

David Gregory Cornelius (AIA, PE) is an Architect and Professional Engineer with Keast and Hood, Philadelphia, who has taught architecture, civil engineering, construction, urbanism and theory and practice of preservation. His research interests include the origins of modern architectural technology (building codes, services, structure, and envelope); material culture of social reform (correctional and therapeutic institutions, social welfare, public health and sanitation); and the adaptation of formal and vernacular architectural language to social and technological change. Professionally, Mr. Cornelius has been involved in the assessment, documentation, preservation and replication of historic building envelopes, structures, interior finishes and furnishings.

Nilufer Yoney is a doctoral candidate in the Faculty of Architecture Department of Restoration at Istanbul Technical University. Her research includes Artificial Stones Used on Building Facades of the Late 19th and Early 20th Centuries in Turkey, and evaluating the Binder and Aggregate Ratios and Types in Late Ottoman Early Republican Period Architecture in Turkey. She is a founding member of DOCOMOMO Turkey and an architect.

Abstract

Dana has the rest of the abstract. Be sure it's included with the information you receive.

This panel is intended to introduce current research on historic cements and binders; part of the mission of the Society for the Preservation of Historic Cements, which was founded two years ago as an outgrowth of the American Natural Cement Conferences. These papers were submitted in response to a Call for Papers issued by

SPHC for this panel for the APT Conference in Montreal. They have been reviewed by the Board of SPHC. The four papers for the panel will be:

Complex Symbioses: Historic Relationships between Cements and Concretes
David Gregory Cornelius AIA PE

We generally assume that the presence of a cement (a material serving as a binder and having at least incidental hydraulic properties) is essential for defining and identifying concrete. This is how concrete has been made for over a century, and also how it was done in the one historical precedent, the pozzolan concrete of the Romans. In more recent studies, including those of Collins, McKee and Peterson, concrete has been proposed as a general term embracing an expanded heritage of monolithic construction, including manifestations of rammed earth (pisé, cob, tabia) and various regional techniques, such as caliche and tabby in ancient and colonial North America. In some of these technologies, there was a definite presence of an hydraulic component; in others, the familiar association of concrete with cement could become tenuous, accidental, or nonexistent. Does the term concrete, then, remain valid? This paper will not so much seek definitive answers as reframe the questions. Cement and concrete will be reviewed in various historic relationships, emphasizing cultures bordering the Atlantic and Mediterranean. The integration of cementitious stabilizers into the mix design has historically been only one of several methods used to ensure durability for monolithic construction. The other technique of interest is the external use of hydraulic plasters, such as tadelakt in North Africa, as well as several of the early artificial cements that were marketed as external waterproofing rather than as a concrete or mortar component. While these two models of the relationship between concrete and cement were distinct, they were not necessarily mutually exclusive within a given technological culture. Furthermore, the evolution of modern cements in the eighteenth and nineteenth centuries led from weatherproofing, to integration with masonry mortars, and only then to inclusion in artificial stone and concretes.

An Examination of Chemical Techniques for Mortar Analysis: A Defense for the Collaborative Approach between Chemists and Geologists.
John Walsh and Magdalena Malaj

In the United States, mortar analysis test methods are specified by ASTM C1324. The methods and interpretation require collaborative efforts between geologists (specifically petrographers) and analytical chemists. This interdisciplinary approach can provide for the successful forensic examination of historic masonry materials. Unlike simple acid digestion methods often used by non-technical practitioners, the ASTM method provides guidelines that require educated decision-making during the process. These decisions require both the knowledge of the great variety of historic binders as well as an understanding of analytical methodologies and potential sources of error.

The starting point for the analysis is the qualitative petrographic examination as this is a direct observational technique. A skilled petrographer can identify most mortar components and where uncertainty exists can ask appropriate questions geared toward further analysis. This information is then passed on to the analytical chemist who must choose a methodology. The resultant chemistry represents the quantitative component of the process and it is crucial that the generated numbers do not simply represent the bulk composition of the whole material but rather partition each mortar component accurately. In this way, component proportions may be estimated. In this way, component proportions may be estimated. In many cases, interesting properties of the binders are revealed through their chemistry.

There is no turnkey approach available to the chemist. This should not be surprising as mortars are mixtures of material many with components unique to the region in which they are found. The qualitative identifications of the petrographer suggest potential analytical problems to the chemist. For instance, some sands may produce a signature in the chemistry that make a fat lime appear as an hydraulic lime under simple sample preparations. The petrographically identified binder type will dictate which method is sufficient to dissolve the binder without affecting the sand and whether this is even possible. The chemist chooses the best approach and then the residues of the chemical technique are returned to the petrographer to determine whether the method has effectively separated the desired components for measurement. If not, another approach is tried informed by the

shortcomings of the first. This reiterative and interdisciplinary approach is the hallmark of routine forensic techniques.

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The Use of Pre-Modern and Modern Cements in Istanbul, Turkey.
Nilüfer Baturayolu Yöneş, Ahmet Erşen
Faculty of Architecture, Istanbul Technical University

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Totten and Gilmore: Natural Cement and the Origins of Building Science in the US
Jeffrey Chusid, Cornell University.
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