Journal of Sedimentary Research
An International Journal of SEPM
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Review accepted 29 January 2008

Geomaterials in Cultural Heritage, edited by Marino Maggetti & Bruno Messiga, 2007. Geological Society Special Publication 257. The Geological Society of London, The Geological Society Publishing House, Unit 7, Brassmill Enterprise Centre, Brassmill Lane, Bath, BA1 3JN, United Kingdom. Hardback, 351 pages. Price GBP 85.00; USD 170.00 (fellow price GBP 42.50; corporate affiliates price GBP 68.00; other societies' price GBP 51.00). ISBN 978-1-86239-195-6.

This book starts from a symposium at the 32nd International Geological Congress held in Florence on 20-28 August 2005. Maggetti and Messiga have produced the volume by assembling papers of participants of the Florence meeting, as well as invited contributions, to present a wide view of the interdisciplinary application of geoscience disciplines, and to reaffirm the important contribution of geosciences to the solution of problems concerning the study of complex materials such as minerals, rocks, glass, metals, mortar, plaster, slags and pottery. Actually, it is not really the application of geosciences to materials, it is more the application of materials science to the geo-world; a very welcome approach.

It is a book of sections. Two introductory essays are followed by seven papers on pottery (BC), then four papers on pottery (AD), four papers on glass, seven on stone, and one on mortar and plaster. The introductory essays are impressive. Maggetti sets the scene for the study of the science of archaeometry and examines its status and prospects. He suggests that the scientific study of raw materials and products used in prehistoric and historical time involves an interdisciplinary collaboration between archaeology, art history, preservation of cultural heritage, ethnography and science. This area of research, in which these disciplines overlap, is known as archaeometry or archaeological sciences. The term "geomaterials" includes rocks, soils, mortars, pigments, ceramics, glass and slags. Scientific analysis of these objects aims to answer the following questions: (1) Where does the raw material come from? (2) Where was the object manufactured? (3) How was it manufactured? (4) What was its purpose/function? (5) When was it manufactured? Maggetti's brief paper is most useful because of its large bibliography; a very impressive set of references. The other introductory paper is a long piece by D.C. Smith, who provides a review of the non-destructive identification of diverse geomaterials in the cultural heritage using different configurations of Raman spectroscopy.

There is one paper on bricks: a study by Bianchini, Marrocchino, Moretti & Vaccaro on the chemical-mineralogical characterization of historical bricks from Ferrara. They take an integrated bulk and micro-analytical approach. They looked at the ancient bricks from Medieval and Renaissance buildings in Ferrara in N.E. Italy, using bulk techniques that analysed a few grams of homogenized powdered samples, and microanalytical techniques which allowed composition analysis of single phases of materials that are heterogeneous at the micrometre scale. The aim was to provide useful clues about the provenance of the original raw materials and the historical firing techniques – which will then assist in the understanding of the physico-chemical behaviour of the studied bricks, which will be helpful in future preservation and restoration strategies. Many of the investigations reported in the book were aimed at providing data which would be useful in restoration projects.

Glass features in four papers. A notable contribution is by I.C. Freestone, who gives a geochemical perspective on glass production in Late Antiquity and the Early Islamic period. Small glass objects, such as beads and pendants, are reported from the archaeological record as far back as the third millennium BC, but production of glass vessels on any significant scale

seems to have begun in the Late Bronze Age, in the late sixteenth century to mid-fifteenth century BC, in northern Syria and Mesopotamia and at about the same time in Egypt. Glass at that time was strongly coloured and a rare material of high status, equated with semi-precious stones such as lapis lazuli.

The great majority of ancient glass was based upon silica, fluxed with either soda or potash. Before the medieval period, lead-rich glasses were rare, excepting some strongly coloured opaque glasses and certain glass in the Far East. The Freestone paper focuses on soda-lime-silica glasses, which generally lie in the low melting-temperature region of the ternary system. Glass provides an excellent example of the importance of the production model in the interpretation of archaeometric data. The recognition that production was divided into primary and secondary workshops is at last allowing compositional data on glass from the period of interest to be interpreted in terms of origin.

There is only one paper on mortars: the Caro, Giulio & Marmo study of textural analysis of ancient plasters and mortars. This paper explores the possibility of applying image analysis techniques to the textural characteristics of ancient plasters and mortars. The authors looked at 22 mortars and 11 plasters from three historical buildings in Pavia, northern Italy, and their results essentially indicate that poorly sorted or very poorly sorted aggregates were commonly used for the preparation of bedding mortar mixtures, whereas moderately well sorted or moderately sorted aggregates were used for plasters and fine mortars. It is interesting to note that they cite Krumbein and Pettijohn's famous "Manual of Sedimentary Petrography" – a sedimentological classic which has lasted very well since 1938. In fact they demonstrate very clearly the crossing of sedimentological techniques into the study of ancient constructional and cultural materials. The other classic which makes several bibliographical appearances is Folk's "Petrology of Sedimentary Rocks" from 1968. One of the Folk appearances relates to the detailed paper by Miller, McGibbon, Caldwell & Buckley on the use of geological tools to interpret Scottish medieval carved sculpture. This is a very considerable piece of work and their table of the petrology of the potential source rocks from the Lower Old Red Sandstone of East Central Scotland is a very impressive achievement. Among their general conclusions they state that, in terms of the art-historical interpretation of stone sculpture, consideration of the origin of the stones is central to the thinking about economic implications for the procurement and movement of raw materials and about the place of sculpting. Petrological techniques have a place in refining models of procurement and movement of stone for sculpture during the medieval period.

This is a handsome Geological Society book, well-produced and well-presented. The questions that need to be asked when such volumes are reviewed are "does the book have a focus?", "is it a viable package in scholarly terms?", "is it a satisfactory collection or assemblage?" This Maggetti-Messiga volume scores well, and it appears as a most satisfactory volume. If it is true that most advances are made at the interfaces between disciplines, it provides a feast; several interfaces are present. The book works at the junctions of geology/sedimentology with materials science and with archaeology/archaeometry. Plenty of interfaces for everybody.

References

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Krumbein, W.C., and Pettijohn, F.J., 1938, Manual of Sedimentary Petrography: New York, Appleton, 549 p.

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