

## EDITORIAL

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# Manuscripts in the Making: Art and Science

Paola Ricciardi\*

As brought to light by the increasing number and variety of research papers reporting the results of scientific analyses of medieval and Renaissance manuscripts, the role of analytical methods as indispensable tools for the comprehensive study of manuscripts is no longer in question. Most manuscript scholars are well aware that ‘hard’ sciences have much to offer to manuscript studies, and are more reliable for material identification than visual analysis, traditionally their primary identification method. Conversely, scientists have moved past the naïve enthusiasm that used to follow every identification of a (often very common) pigment on a manuscript page, and now routinely engage in constructive dialogue with the whole range of professionals involved in the study and care of these incredible testimonials of humanity’s past.

Over the past few years, several publications have discussed in varying detail the analytical techniques useful for the examination of illuminated manuscripts. Mark Clarke’s extensive review, published in 2001 [1], remains a key read for researchers in the field and is just about to be updated with a focused examination of the techniques employed since that date [2]. Since Clarke’s survey, the emphasis has been on the application of non-invasive and imaging methodologies, as well as on the increasing use of portable instrumentation. These developments have resulted in increased access to manuscript collections in an ever-growing number of institutions worldwide. The fifteen articles included in this thematic collection of *Heritage Science* open a window on this expanding world of possibilities and showcase the broad range of technical and analytical approaches that are currently being employed by scholars for the scientific analysis of manuscripts.

Most of the articles published in this collection were presented as posters during the international conference *Manuscripts in the Making: Art and Science* held in Cambridge (UK) on 8–10 December 2016. Supported

by the Association for Manuscripts and Archives in Research Collections (AMARC) and by the Samuel H. Kress Foundation, the conference was organised by the Fitzwilliam Museum’s Department of Manuscripts and Printed Books. It accompanied the Museum’s bicentenary exhibition *COLOUR: The Art and Science of Illuminated Manuscripts* (30 July 2016–2 January 2017), extending its disciplinary, thematic, chronological and geographical span. Forty-two papers were presented by 62 speakers over 3 days, many of them stemming from cross-disciplinary collaborations. In addition to Western European illumination, the sessions included papers on Byzantine, Islamic and Mesoamerican manuscripts as well as panel paintings, frescos, textiles, ceramics and architecture. Many papers combined recent art-historical and scientific discoveries with insights offered by historical research on the production and trade of materials, the development of medieval optics or the social and economic circumstances in which the original works were created.

The lecture theatres of Cambridge University’s Chemistry Department welcomed over 230 delegates during the conference, including leading experts in a wide range of fields, as well as numerous students. The conference created a forum for the exchange of ideas, the questioning of methodologies and the exploration of innovative approaches to cross-disciplinary research as well as opportunities to forge new collaborations. The overwhelmingly positive feedback received after the conference reflects the considerable value of new encounters between experts in vastly different fields.

Thirty-three of the conference papers were edited by Stella Panayotova and Paola Ricciardi and have been published in two volumes by Harvey Miller/Brepols [3]. Two further papers as well as numerous posters were written up as articles and appear in this thematic collection. They were written by 52 authors based in Portugal, Italy, France, Austria, the United Kingdom and the United States of America, in collaboration with researchers in Australia and Brazil. They are, for the

\*Correspondence: [pr364@cam.ac.uk](mailto:pr364@cam.ac.uk)  
The Fitzwilliam Museum, Trumpington Street, Cambridge CB2 1RB, UK

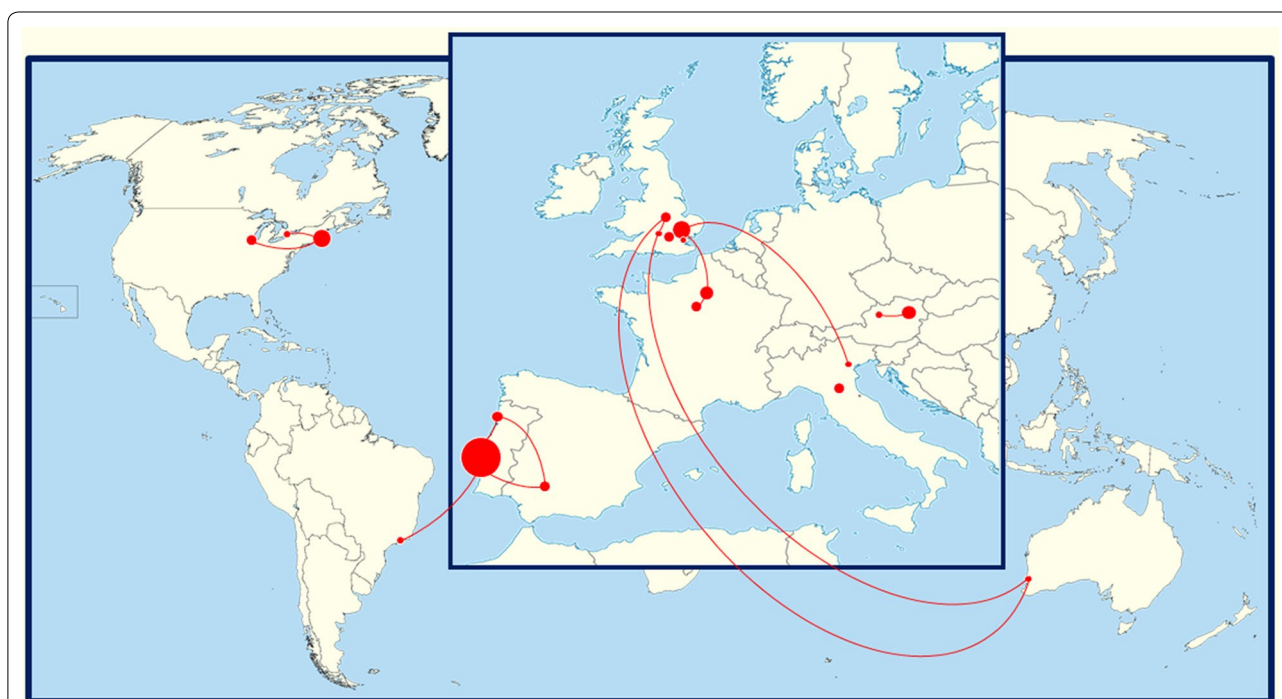
most part, highly collaborative pieces of research; only one of the papers is signed by a single author, whereas another one lists eight different authors. Nine researchers contributed to at least two articles, with two of them appearing four times each. The importance of cross-disciplinary, cross-institutional and international collaboration is apparent throughout the collection and is clearly brought to light by a ‘network map’ based on the location of the 52 authors’ home institutions (Fig. 1).

The articles can be grouped according to the main themes they address. Some authors employed methodological approaches, often to study historically accurate reconstructions and compositionally-controlled replica samples. Nodari and Ricciardi investigated the influence of different pigments on the ability of FTIR to identify binders in paints laid over parchment [4]; Díaz Hidalgo et al. implemented a multi-technique approach, which included Raman and infrared spectroscopy as well as HPLC, to study iron-gall inks [5]; Nabais et al. used a combination of microspectrofluorimetry and chemometrics for the identification of medieval lake pigments [6]; and Ali discussed his practice-based research into colourants made from aphid insects and ivy gum, based on medieval recipes [7].

New research into—and re-interpretation of—well-known medieval recipe collections was also the focus of the articles by Frison and Brun [8] and by Melo et al. [9]. The latter, in particular, which discusses a

fifteenth-century Portuguese Hebrew illuminators’ manual (Ms. Parma 1959), provides a direct link to a contemporary Hebrew manuscript produced in Germany, the so-called ‘Oppenheimer Siddur’, which Wijsman et al. [10] analysed to identify the pigments used for text and images.

A direct link also exists between research by Araújo et al. into the degradation of silver paint [11] and the investigation of a mid-fifteenth-century French Book of Hours (*Cofre no 31* from the National Palace in Mafra, Portugal), reported as a case study by Carvalho et al. [12]. Additional case studies include two articles published by separate research groups, one in France (Denoël et al. [13]) and one in Austria (Frühmann et al. [14]), discussing eighth- and ninth-century manuscripts from Carolingian scriptoria; the Emerson-White Book of Hours, whose late fifteenth-century Flemish illuminations were investigated by Mayer et al. [15]; and a study of the materials used in other parts of manuscripts, such as the decoration of the sunk-panel binding of a Venetian ‘Commissione Dogale’, reported by Rampazzo and Di Foggia [16]. A survey of the materials used in over 50 Islamic manuscripts, carried out by Knipe et al. [17], significantly expands the geographic origin of the original material investigated and emphasises the importance of moving beyond the well-known Western European tradition of manuscript



**Fig. 1** ‘Network map’ indicating the location of the authors’ home institutions (larger dots indicate a larger number of authors). Co-authorship of an article across sites is evidenced

illumination, to reveal ever-expanding connections with artists working in other cultural traditions.

Finally, the complex mathematical methods used by Calatroni et al. [18] for the digital ‘restoration’ and interpretation of manuscripts—and their provision of additional multi-media content linked to the published article—serve to bring cross-disciplinary research on medieval manuscripts fully into the digital era.

With the growing numbers of analytical methods at our disposal, and the promise of more numerous and increasingly sensitive ones to come, the integration of scientific analysis into the study of illuminated manuscripts seems destined to become the standard. I note, however, that—as brilliantly shown by the articles collected here—the results of scientific analyses can only be fully understood, interpreted and contextualised by close collaboration between a broad range of researchers with different backgrounds. The heritage scientists engaged in this work should not limit themselves to performing the best possible scientific experiments; their role is also to act as interpreters and translators, in order to promote cross-disciplinary communication and to contribute to an increased understanding of the original manuscripts. Institutions can do much to support this effort, by promoting collaboration at all levels as well as the open dissemination of research. It is only by sharing our findings that we can hope to start drawing a clear picture of manuscript production not only in medieval Europe, but across and beyond both temporal and geographic borders. Our heritage links us all in many ways that are still for us to discover, appreciate and reflect on, as we move forward in an increasingly more ‘connected’ world.

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#### Authors’ contribution

PR guest-edited this themed collection and wrote this editorial. All authors read and approved the final manuscript.

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The author declares that she has no competing interests.

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