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Collecting Light: Q&A with Bill Endres

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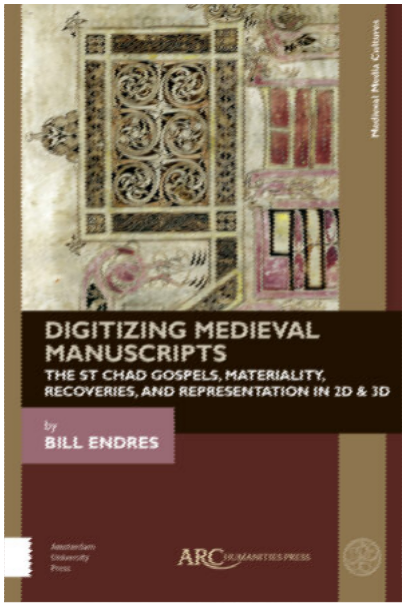

How do you digitize the complex materiality of a medieval manuscript? With features such as layered pigments, what happens to a manuscript's intricate play of light? What excesses are possible, that is, how can digital technologies extend our knowing beyond human senses? Bill Endres explores these questions in his new book, *Digitizing Medieval Manuscripts: The St Chad Gospels, Materiality, Recoveries, and Representation in 2D & 3D*. The book is a culmination of years of digital imaging in which Endres applied a range of advanced imaging techniques and devises new approaches to explore and present the eighth-century St Chad Gospels.

In your new book, *Digitizing Medieval Manuscripts*, you mention unriddling light. What do you mean by this? How does light become riddled and can it be unriddled?

The scribal art of script is an art of generating contrast with reflected light. The contrast makes script written on parchment visible. Parchment reflects frequencies of light that generate a cream color. Inks, such as iron gall, absorb most light and appear dark brown or black. This difference generates visibility. Through aging, wear, and natural threats, such as water damage, ink disappears from the page. Contrast is lost.

However, inks form a molecular bond with parchment. Remnants generally exist, but they don't absorb enough light to generate the needed contrast for the eye to discern the script. Thus, the light is riddled.

The obscure clues of the riddled light, however, have a chance to be unriddle through photography. It can capture frequencies of light beyond the range that the human eye sees, such as ultraviolet and infrared. These frequencies can sometimes reveal clues to read damaged text. The digital also adds further opportunities. Because digital imaging records numerical values for reflected light, mathematics can be used to aid in unriddling light.

Advanced imaging techniques seem well beyond the mathematical and technical expertise of medieval scholars, let alone the general public. Are these techniques becoming accessible and available for wider use?

Happily, yes! One of my goals for this book is to make digital techniques accessible and available to any medievalists or enthusiast. In each chapter, I include a methods section to provide specifics for anyone to get started. Also, I use and discuss the free graphics analysis software ImageJ. It was developed by the U.S. National Institute of Health for analysis of medical images. Since manuscripts are made from parchment (animal skins), analytical approaches for medical images regularly align with manuscripts. ImageJ has a robust community of uses that develops new, easy to install plugins for newly developed imaging techniques.
ImageJ provides multiple options for unriddling light.

Some advanced imaging techniques, such as reflectance transformation imaging, have very affordable technical needs. Multispectral imaging, which captures images for different frequencies of light, requires a more expensive camera. However, many digital projects make available multispectral and/or high-resolution color images of manuscripts. If these images are available, any scholar or enthusiast can use ImageJ and attempt to recover damaged content.

For many years, photographers have captured manuscripts and other cultural heritage. Can we rid our libraries and archives of these photographs, freeing up valuable space? New advanced imaging techniques suggest that photographs now capture more nuanced and complete visual information.

Absolutely not. We tend to think of technology as always progressing, generating new and better results. In the case of the St Chad Gospels, the 1911 photographs are stunningly sharp. But in many ways, sharpness isn't the issue. Manuscripts, no matter how good the care, are aging. Earlier photographs reveal a younger version. These photographs need digitized to preserve how a manuscript once looked.

However, perhaps more importantly, these earlier photographs provide irreplaceable information to assess aging. Once photographs are digitized, their content is malleable. The content can be stretched into alignment with other photographs, a process called registration, easily done with ImageJ. Registered images can be overlaid and the transparency of the top one adjusted to assess changes. Also, registered images can be subtracted to discover minute changes. For this, photographic efforts, such as those produced by Photostat machines, the precursor to the photocopier and popular in the 1930s, are highly important. Photostat copies are many times the earliest reproduction of a complete manuscript. Photostat copies can include information that is now lost to aging or helps assess aging, such as lost chips of pigment or deterioration of the edge of a page. In some ways, any photographic effort increases in value as time progresses, capturing how a manuscript once reflected light.

You have a chapter on virtual reality (VR). It seems futuristic and designed for gaming and escapism. How might it be important for study and knowing manuscripts?

Care and rigor should always be key in any approach to a new technology. However, it is impossible to know what opportunities a new technology offers until we experiment with it. In my experiments with VR, I have found it a wonderful environment for transcription. Not limited by the space of the screen, I always know where I am in the text in relationship to the whole page. Also, I can juxtapose pages generated by different light frequencies and post-processing techniques for recoveries. I can enlarge pages to the size of buildings and move back and forth among them easily, never losing my place. I can speak each letter for recording and later use voice recognition software to generate the transcription. This approach vastly

improves my speed and accuracy.

Also, we have to remember that manuscripts were the iMax movie of their day. They startled medieval viewers with their colors and intricacies. It is worthwhile quoting the reaction of Gerald of Wales, a twelfth-century traveler writing about his experience of an eighth- or ninth-century Irish gospel book: But if you take the trouble to look very closely, and penetrate with your eyes to the secrets of the artistry, you will notice such intricacies, so delicate and subtle, so close together and well knitted, so involved and bound together, and so fresh still in their colouring that you will not hesitate to declare that all these things must have been the result of the work, not of men, but of angels.

Gerald captures the sense of awe and wonder of a medieval viewer seeing a manuscript, as we experience with iMax movies. VR allows a page of a manuscript to be a commensurate size, translating scale for today's expectations. Also, it affords a magnified view of details and intricates. But perhaps most importantly, it enables someone to share the same space with a manuscript. I am intrigued by how sharing space is key to forging relationships.

Do you have a favorite advanced imaging technique? If so, what makes the technique so appealing and valuable?

 ach technique generates its own marvels and advantages. If I had to choose one, it would be reflectance transformation imaging (RTI). I've always loved the play of light when encountering an illuminated manuscript. RTI allows me to bring this play of light to people who are not as fortunate as I am and cannot encounter the physical manuscript. Also, RTI has a low bar of entry, done with a regular digital camera and flash.

To be able to show someone the results, allow them to see intricate surface details, such as dry-point writing or the rise of layered pigment, provides an intimate view of the manuscript.

Finally, you propose another name for the Middle Ages, The Age of Visual Wonder. Why? Weren't medieval times simply a waiting period until the Enlightenment, a period full of barbaric activity, earning it the earlier name of the Dark Ages?

 or a long time, people viewed the Middle Ages as intellectually bankrupt, when classical achievements were lost and/or corrupted and intellectual and artistic activity was at a low point. But nothing could be

further from the truth. With the invention of the printing press, over the past five hundred years, people have relied so exclusively on the book and text for intellectual activity, it is easy to miss the mental activity and inventiveness of medieval imagery, encouraging a mental chewing, ruminating on the dialogue between text and image. But on a pure aesthetic level, the black and white space of a page of print is sterile. In a manuscript, even the eloquent flow of ink on parchment and the subtle variations of a human hand speak of artistry. But when you add the colors and intricacies of decorated initials, their inventiveness and engagement with the text, you have a visual wonder that rises above any prior or preceding approach to preserving and transmitting knowledge.

By Bill Endres

* Decorated initials from the St Chad Gospels, MS Lich 1, Lichfield Cathedral, England (CC BY-NC-SA UK).

Gordon Taylor LRPS © Hereford Cathedral, 2016.