Images of the Euchologium Sinaiticum, Pars Nova (Codex Sin. Slav. NF 1) Provided by the Centre of Image and Material Analysis in Cultural Heritage

Simon Brenner, Heinz Miklas

The Images of the Euchologium Sinaiticum, Pars Nova (Codex Sin. Slav. NF 1) was photographed in fall 2007 at the St. Catherines Monastery, Mt. Sinai, Egypt, in the course of the research project "The Sinaitic Glagolitic Sacramentary (Euchologium) Fragments[1]". The following scientists were involved in the image acquisition:

- Florian Kleber (TU Wien)
- Martin Lettner (TU Wien)
- Heinz Miklas (University of Vienna – Department of Slavonic Studies)

Color images and multispectral images were acquired of selected folia. In the following, the basic principles of multispectral imaging (MSI) and the technical details of the employed imaging setup are described.

Multispectral Imaging

Multispectral imaging measures light in a suitable number of narrow bands of the electromagnetic spectrum apt for a given purpose, in our case the recovering of degraded text in a medieval parchment manuscript.

Electromagnetic radiation is a form of energy that is propagated as time-varying electric and magnetic waves. According to the wavelength, the radiation has different characteristics regarding the interaction with materials.

While conventional color photography captures light in the visible range of roughly 400 to 700nm, divided into three wavebands (red green and blue, corresponding to human tristimulus vision), multispectral imaging offers both an increased spectral range and an increased spectral resolution. Acquisition systems for manuscript analysis typically operate in the ultraviolet (UV), visible (VIS) and infrared (IR) ranges, dividing this spectrum in a number of narrow wavebands.

In multispectral imaging there are generally two approaches used to observe individual wavebands: either the object is illuminated with a broad band light source and the wavelength of interest is isolated with a filter mounted in front of the camera; or, the object is illuminated with narrow bands of light in the first place (e.g. by using light emitting diodes). In combination with a digital sensor with an extended spectral response, the relative reflectivities of surfaces under the selected wavelengths can be measured.

To enhance the readability of ancient documents UV fluorescence imaging is a widely used method. If UV radiation is incident on material, it is absorbed and transformed to fluorescence in the VIS range of the electromagnetic spectrum. The presence of ink residues such as tannins typically inhibit fluorescence of parchment, such that that the corresponding areas appear darker in the resulting image, leading to increased visibility of faded text.

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IR rays have the property of being less scattered than visible light rays and therefore can penetrate material which appears opaque under VIS illumination. This is especially useful in cases where a text is covered by other substances or the substrate is darkened.

Acquisition Setup

The acquisition setup employed makes use of two cameras: a conventional color DSLR camera (Nikon D2X, 4288x2848 pixels) for true color images and UV fluorescence images, and an achromatic scientific camera with an extended spectral range (Hamamatsu C 9300, 4000x2672 pixels) for multispectral images.

The illumination consists of a broadband light source for true color and multispectral images and a UV light source for UV fluorescence images. A filter wheel equipped with seven filters and one empty position is mounted in front of the achromatic camera in order to select specific wavebands from the broadband illumination; the filter characteristics are given in Table 1. Figure 1 shows a schematic of the setup (left) and the system at work imaging the Sinaitic Glagolitic Fragments in the St. Catherine’s monastery.

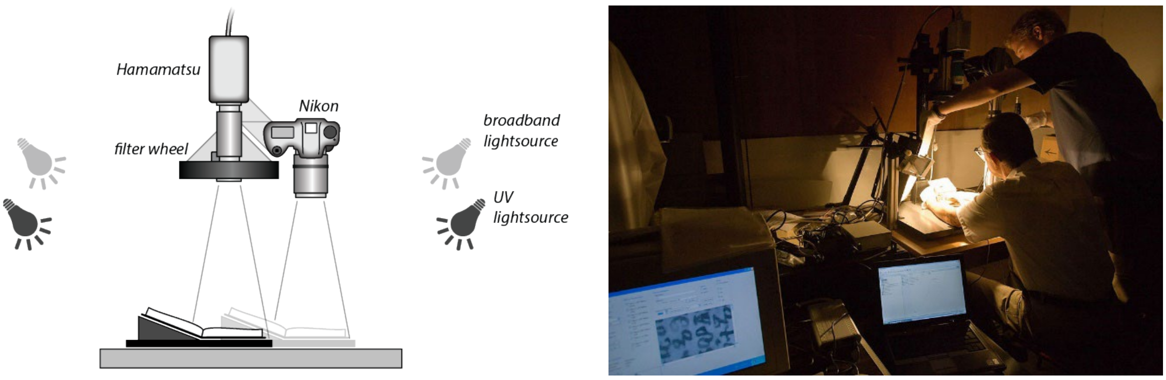

Figure 1: The Multispecral Imaging System. Left: schematic of the setup. Right: System at work in St. Catherines Monastery, Mt. Sinai.

Table 1: Filters used for multispectral imaging.

Filter characteristic	Description
400nm short-pass	UV reflectography
400nm long-pass	UV fluorescence
450nm band-pass	blue
550nm band-pass	green
650nm band-pass	orange
780nm band-pass	red
800nm long-pass	infrared

Using the images

This section explains how the image names can be interpreted, and how the images should be referenced when used in a publication.

Naming Convention

Images are named according to the following scheme:

NF1_*folio*_*camera*[_*filter*]_*illumination*.png

Hereby, *camera* can take on the values “N” for the Nikon D2x or “H” for the Hamamatsu C 9300. The *filter* only appears in the Hamamatsu images and can take on a value from Table 1 or “nf” if no filter is applied. The *illumination* is either “vis” or “uv”.

Viewing the images

We recommend the use of the Nomacs Image Lounge (https://nomacs.org/), an open-source image viewer developed at the Computer Vision Lab, TU Wien, for viewing multispectral images. It offers useful features such as synchronizing multiple windows showing different images of the same page, viewing single channels of RGB images or scaling of gray values.

Usage

Citation

For any use of the images in presentations or further publications the relevant material has to be cited with the following information:

Images: Copyright CIMA, Vienna

Source link: The images were produced within the interdisciplinary project “The Sinaitic Glagolitic Sacramentary (Euchologium) Fragments”, funded by the Austrian Science Fund (FWF), project no. P19608-G12.