Journal of Micropalaeontology, **14**: 118.

MICROPALAEONTOLOGY NOTEBOOK

Digital imagery for making plates

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Although the resolution and depth of focus provided by scanning electron microscopy (SEM) revolutionized the examination of several groups of microfossils, conventional photographic techniques are normally outlined in instructions for preparation of micrographs for publication (Whittaker & Hodgkinson, 1991). While the quality of results attainable by following these methods is very high, digital image recording and processing techniques are now well developed and readily available. This note outlines some advantages of digital techniques in the preparation of SEM images for publication.

DIGITAL RECORDING

Secondary electron and other detectors attached to the SEM produce analogue (waveform) signals. In early instruments only these analogue signals were processed and displayed. Modern designs quantize signals from the detector as pixels (picture elements) which represent grey levels along scan lines. Pixel information is processed by the SEM on-board computer and saved as an image file. Importantly, the basic hardware to convert the analogue signal to digital form is simple and can be readily retro-fitted to early instruments. Our Philips PSEM 500 was adapted to record 128 grey levels at 800 pixels/line over 600 lines/frame, a minimum specification for professional work. Many micropalaeontologists will find that their SEM laboratories can supply digital files at higher resolutions. However, an essential point is to work with images recorded digitally directly from the SEM video channel, so avoiding potential degradation due to scanning of images recorded on film from the SEM monitors.

DIGITAL PROCESSING

I use Photostyler (a PC image editor by Aldus Corp.) for plate composition. It resembles personal computer paint programs but includes many advanced features. An image file (8-bit grey level, TIF format) is created whose dimensions (in pixels/line horizontally, lines/inch vertically) match the plate size in the intended publication (×1 composition); the background colour (usually black) is specified. Specimen images are opened from their individual SEM files. Adjustments are made to the size, contrast, brightness and sharpness of images and imperfections (e.g. areas of charging) are retouched with paint tools. The background colour around specimens (seldom uniform in SEM images) is changed using the 'bucket' tool to match exactly that of the plate file. This tool virtually eliminates 'painting' around specimens by manually guiding the mouse. Cropped specimen images are imported into the plate file via the clipboard and positioned; identifying text is added (Fig. 1). Specimen illuminations may be adjusted to achieve a balanced presentation. The completed plate file is printed at a commercial imaging bureau on bromide paper or film using an imagesetter with a resolution of 2400 dots per inch. Similar procedures are used to include SEM imagery in line drawings created by CorelDraw (PC drawing software by Corel Systems).

Most of the digital techniques mentioned have counterparts in conventional plate composition. However, editors like Photostyler (and equivalent Apple Macintosh products) provide tools which are more precise, yet simpler to use than their darkroom equivalents. Integration of images with the background is greatly facilitated. Digital processing may also lead to advances in presentation. Conventionally, specimen information is placed in the caption, not on the plate. Often, this is visually disruptive to the reader. The ease with which text can be placed on a digitally-composed plate should lead authors to insert identification and interpretative data adjacent to the images (?where they belong). Although aesthetics are important, surely the objective is to enhance the transfer of information.

While plate-making might be a useful application of digital imagery in micropalaeontology, the technology has wider implications. Systematics remains wedded to qualitative visual assessment, yet the human visual processor is poorly adapted to discriminate between groups of individuals. One reason for the relatively minor impact of biometry in this context has been the problem of data acquisition. Digital imagery considerably facilitates the capture of quantitative data and is the basis of many techniques for feature extraction and recognition. It provides a platform for new advances in systematics.

Manuscript received February 1995
Manuscript accepted March 1995

REFERENCE

Whittaker, J. E. & Hodgkinson, R. L. 1991. On the preparation of specimens for scanning electron microscopy and a simple technique for plate making, using a black background. *Journal of Micropalaeontology*, **9:** 219–220.

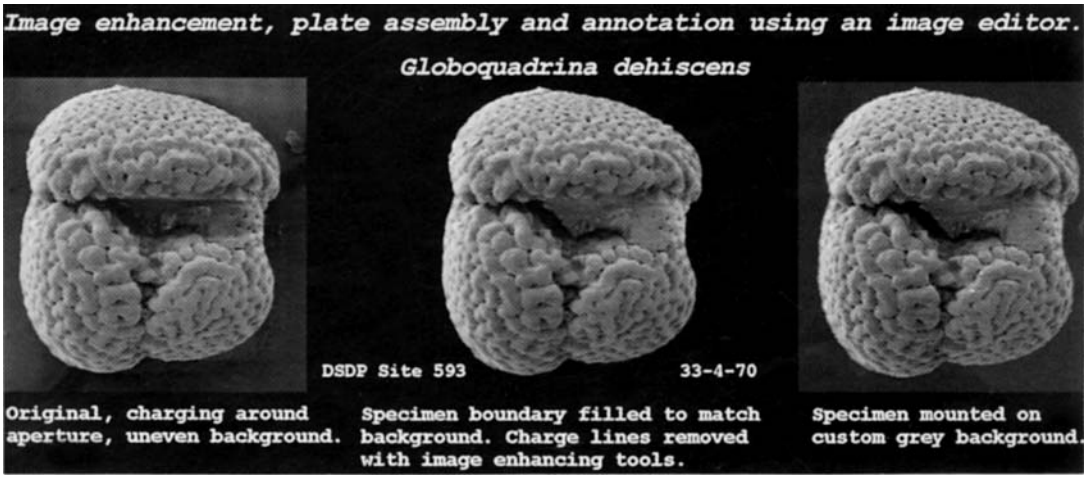

Fig. 1. Example of plate composition using digital techniques. A PC file (GQDPC.ZIP) of this figure is available on Internet host LHN.GNS.CRI.NZ, directory ANONYMOUS.IMAGES. A Macintosh version is available on request. The author's Internet address is SRLNGHS@LHN.GNS.CRI.NZ.