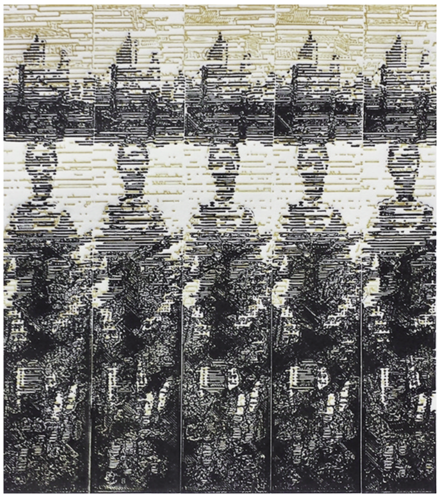

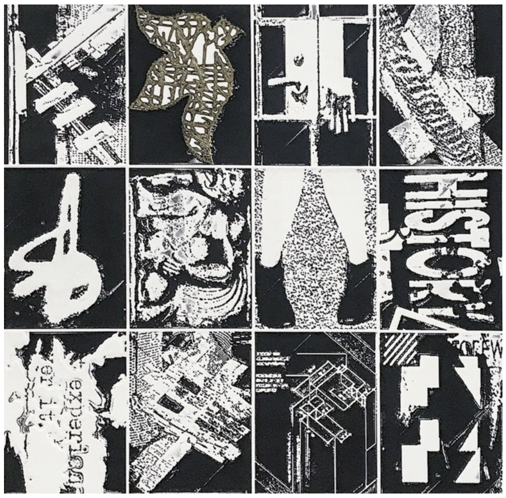

Print to Plate to Print

TECHNICAL Combining digital technology with traditional techniques, printmakers and bloggers **Phyllis Merriam** and **Victor Merriam** explain the process they have developed for producing 3D relief plates which has attracted almost 7,000 online followers

As *thepostdigitalprintmaker*, we have created a vibrant community of close to 7,000 followers on Instagram, Tumblr, Facebook and Twitter (as *@postdigprinter*) who, like us, are exploring ways to incorporate digital technology into their printmaking practices. It offers a unique opportunity for printmakers to showcase their work and share ideas. This article is an example of how we investigate new technologies and bring them into our practice.

Much of our artwork is the result of a deep exploration of specific places. We may return to a place again and again, at all times of day and in different seasons where possible, taking photos that capture its vitality and visual vocabulary through the surprise of discovery. A rock or a scrap of debris may be just as interesting to us as a mountain or a building. Once in the studio, we experiment with our images, altering their context by reducing them to their essential forms. We set no boundaries for ourselves in our experimentation, letting the process inform the choices that lead to the final image. We often employ a grid so that each image takes up the same physical space in the print regardless of the original size.

As part of our process, we incorporate deeply etched copper plates for embossment, viscosity printing and relief printing. This is both time-consuming and expensive, limiting the amount of experimentation that we can do with each image. We began investigating the possibility of using a 3D printer for fused deposition modelling (the most common way a 3D printer works; by building the model in layers). Fused deposition 3D modeling has moved to a more affordable realm that allows for experimentation without making a major investment since printers are now available at lower price points as are free versions of all of the necessary software. We developed a method of producing plastic plates that provides a more seamless and less expensive workflow from image to plate. This allows a deeper exploration of the possibilities within each image while at the same time preserving many of the qualities of the copper plates. Our 3D printed plates hold detail well, have a significant useful life and are easily cleaned without the use of solvents.

Process overview

Our method employs 3D modeling software to emboss or 'etch' a virtual plate using a black and white image as a template. This is known as displacement mapping. The virtual plate is then exported for fabrication to create the physical plate. The workflow for creating and printing these plates is: image preparation, virtual plate creation and fabrication, inking and printing. Each of these steps in the process will be discussed.

Image preparation

The image preparation in this process is similar to the one we used in our traditional sugar lift method. We start by using a high contrast black and white image. Using photo-editing software, we remove details that we feel create too much noise, draw into the image to accentuate areas of interest, remove any grey pixels and flip the image horizontally. The final saved image must be the same size as the plate that will be fabricated.

In the final plate, the areas corresponding to black pixels in the image will be lower and those corresponding to white pixels will be raised. Compared to traditional etching methods, the black pixels represent the etched surfaces and the white pixels represent the surfaces with resist. If the plate is used for relief printing, the white areas of the image will be black in the final print.

Virtual plate creation

We use a 3D modeling application to create our virtual plates. We have used several programmes to do this and found that each one produced a good result although the process can be more or less complicated.

We start with the application's standard cube shape and modify the length, width and height to match the size of our finished plate. The length and width are limited only by the bed size of the 3D printer that we use for fabrication but they must be the same as the image that will be used. Our copper plates are 1 mm in thickness but we may set the thickness of our printed plates to 1.2 mm to allow for deeper embossing. This virtual plate can be considered to be the same as a copper plate before etching.

Next, we prepare for embossing by dividing the surface into a grid of length and width segments. Each of these segments will later be designated as 'up' or 'down' depending on the value of the corresponding pixels in our image.

The plate will have fewer segments than the image has pixels, resulting in a loss of resolution. Adding more segments will increase the resolution of the final plate. We have to be careful though because adding segments increases processing time and too many may cause the programme to crash. As a rough approximation we found that if we start with a 300 dpi image the resulting print resolution corresponds to about 40-60 dpi, although we have been testing methods that significantly improve this resolution. Experimentation has allowed us to determine how the plate refers to the original image and gave us a great degree of control of our finished print.

Lastly, we emboss the plate by using the displacement modifier in our software to import our image and specify the depth of the embossment. This embossed plate can be considered to be the same as a copper plate after etching. We then export the virtual plate as an .stl file. An .stl file encodes the geometry of the plate in a way that can be imported to a 3D printing application to provide the directions for printing.

Fabrication

A detailed discussion of the process of 3D printing is beyond the scope of this article but what follows is an overview. Fused deposition 3D prints are made up of layers that are stacked one on top of the other. These layers are created as the print head extrudes filament according to a set of instructions that determine where and when the filament is deposited. A 'slicing' application is used to read the geometry of the virtual plate from an imported .stl file, create cross-sections or slices and generate the printing instructions for each layer. The slicer also provides the ability to set many other parameters such as print speed, layer height and extruder temperature.

The .stl file can be used either for printing on a standalone 3D printer or can be sent away for fabrication. We have experimented with using service bureaus for fabrication and they can be cost effective and provide good quality plates. However, for our practice, we find the flexibility and control found in printing the plates ourselves to be superior. If you send your files away for printing, we suggest you find one where you can personally explain your specific requirements. Many universities have fabrication labs that can provide 3D printing services and there are also local maker spaces that provide access to printers.

We use PLA (polylactic acid) to print our plates, which is a plant-based thermoplastic. Every 3D printer and PLA filament has its own specifications and idiosyncrasies so we experimented until we were able to obtain plates of consistent quality. We always read, understand and follow the manufacturer's instructions and material safety sheets for all of the materials we use and suggest that you do the same.

Inking and printing

We have developed 3D printing methods that create unique surface textures on our plates. Depending on how we ink and print the plates, different aspects of these surfaces can be enhanced and varied end results can be obtained from each original image. Through experimentation and practice we are able to control the process to enable us to create editions. We use the same standard oil-based intaglio inks that we do for our copper plates however we thin them a bit for this application.

Our plates can be printed in a number of ways. We can print our plates as we would a traditional woodblock using a baren. One of the distinctive features of our plates is their ability to produce deep embossment. To create the embossment, we print our plates on an etching press or a lithography press using a thin foam layer as we would for printing a collagraph. We also use our plates to make three-colour viscosity prints. Currently, we are working with Purgatory Pie Press to create typeface for use in letterpress.

Teaching

We teach workshops where we have our students go through the entire process to produce a finished print from their own image. We work with our students to select suitable images and discuss how they will translate into a final print. We demonstrate various editing methodologies to identify and modify areas that will not print well and enhance the areas they are most interested in emphasizing. We provide a workflow for our students to finalize their image for import into the modeling software and a step-by-step guide to create the .stl file. Making our students practice with us watching several times ensures they understand the process. We demonstrate how to export the .stl file, load it into the slicer software, show them how to determine how it will be printed, make modifications and then set up for printing. Due to time constraints, we print the plates and bring them to the follow-up printing sessions. We also print background plates, teach proper registration and give our students two sessions to print and discuss how they can use these plates in their practice. Our students first use their plates for embossment and then proceed to ink them. We are impressed by how uniquely and creatively they incorporate their plates into their practices.

We hope this brief overview of our 3D plate-making process will encourage you to explore it further. We are often amazed during our collaborations with other artists how quickly they embrace the technology when they realize the plates can be made quickly, inexpensively and can be reprinted if they want to make changes. We continue to be inspired by our *postdigitalprintmaker* community to find new ways to harness the power of digital technology to drive our own artwork forward.

Contacts

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Images

Untitled (2016) by Phyllis and Victor Merriam, two 3D printed relief plates, 185 x 165 mm, AP

Manhattan Landscape II (2017) by Phyllis and Victor Merriam, 3D printed relief plate with a 3D printed element, 305 x 305 mm

Stop Talking (2017) by Karin Bruckner, 3D printed relief plate with chine-colle, 140 x 102 mm, edition of 1

Yellowstone Winter, on the press with the plate, by Phyllis and Victor Merriam, 3D printed relief plate, 305 x 305 mm

EI referencing the wooden chromatic type of William Page (2017) by Phyllis and Victor Merriam, three 3D printed relief plates, one embossment, 95 x 128 mm