A feasibility survey of the 19th century Woodburytype print process and its potential relationship to 20th century rapid prototyping technology

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PROJECT DETAILS:

This project was a feasibity study for the adaption of 19th Century print processes for 20th Century use. The Centre for Fine Print Research has a track record of investigating a variety of photomechanical print processes including Collotype, Photogravure, Flexography and Heliogravure. Further study of other tonal print processes, in this instance Woodburytype, first patented in 1864, was a complementary project. The process could be considered as printing in three dimensions, which are built up by a series of contours. Subsequent photographic processes have not surpassed the quality of the printed image.

The period 1850-1880 saw an explosion in the development of photo mechanical print reproduction. Poitivin developed Collotype as Neipce and Klic developed Photogravure. The Woodburytype was a result of refinement to Collotype. Through the influence of photography, 19th Century print processes had to compete and emulate the tonal quality of a photograph hence the quality of tone was extremely fine and did not suffer from an underlying dot structure. Unfortunately, many of these complicated, time-consuming processes fell into disuse as economic restraints led to methods requiring less skill from the operative. This included the halftone system of printing.

With the advent of digital technology the aesthetic quality of image tone has been reappraised. 20th Century technology has the ability to produce prints quickly and economically but has not managed to surpass the tonal or organic quality of these earlier print techniques. The significance of this tonal quality is also benefical for printing methods beyond the standard four colour separations. In modern four colour printing a combination of CMYK (cyan, magenta, yellow and black) is used to simulate a complete colour range. Processes such as Woodburytype predate the implementation of the CMYK process used today. Therefore the randomly generated dot of the Woodburytype would enable multiple colour printing beyond the restrictions of just four colours.
The objective of this study was to combine the organic tonal quality of 19th Century printing with 20th Century digital media and processing.

Woodburytype, along with Collotype and Photogravure have undergone a reappraisal as some experts belive the qualities of these processes have never been surpassed (Luis Nadau, Encyclopedia of Photomechanical Processes, 1986. William Crawford, The Keepers of Light, 1979 Morgan and Morgan). The essence of the Woodburytype process relied on the creation of a relief plate of hardened bichromated gelatine where the peaks were the dark areas and the troughs were the light areas. From this relief plate a printing matrix was created by impressing a relief plate into a lead sheet under extreme pressure. The complex nature of creating this matrix meant that the process was highly specialised and died out as a result of technical problems after a very short span of time by the 1890s whne more efficent processes took over.

Rapid prototyping systems are a family of computer controlled manufacturing processes, the first of which was developed as recently as 1987. Rapid prototyping processes represented a total departure from conventional techniques in that they are additive – depositing small amounts of material exactly where required to gradually 'grow' the object. The technique of additive fabrication is best described by considering the first Rapid prototyping system to be developed – StereoLithography (SLA). The starting point of the SLA process is a 3D model of the object to be manufactured. This computer model is then sliced into a very series of fine (typically 0.1mm) horizontal cross-sectional layers. The geometric information contained in the bottom-most layer of the part is then fed to the SLA system, where it is used to guide an ultraviolet laser beam as it scans across the surface of a vat of liquid photosensitive resin. Wherever the laser strikes the resin it solidifies, and in this way the first layer of the object is created and bonded to an elevator platform. The elevator platform then indexes downwards in the vat by exactly the thickness of one part layer. The second slice of computer data is then accessed and used to drive the SLA machine as it solidifies the second object layer, this time bonding it to the first. The cycle is repeated until the entire object is compete. This process allows the rapid, fully automated manufacture of one-off components directly from CAD data, and for this reason have found their main use in the manufacture of prototypes during product development activity. However this technology increasingly finds applications in many other sectors of industry in situations where a 3D computer image needs to be realised very quickly.

This study determined whether it is possible to create bump mapped images through digital software and obtain the tonal range for printing using Sterolithography. A similar process to Woodburytype was employed by utilsing gelatin to produce a print and testing photopolymer resins for producing print matrices. Rapid prototyping technology was tested to achieve high definition images with a complete organic tonal range similar to the Woodburytype. Mthods for producing accurate colour separations for multiple colour prints were also tested.