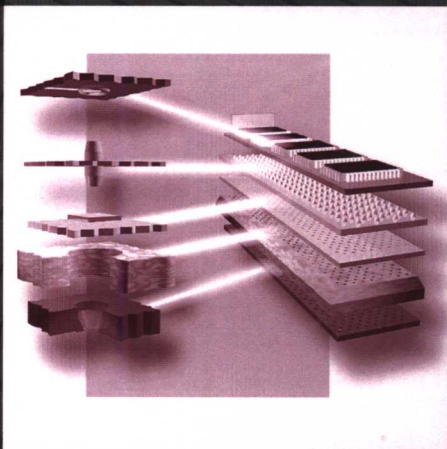


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Digital printing of textiles

Edited by H. Ujiie



The Textile Institute

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Digital printing of textiles

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Total colour management in textiles

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Managing colour from the design stage to the finished product can be difficult as colour perception is subjective and can therefore be inconsistent. *Total colour management in textiles* covers all aspects of managing colour from the design stage to the final product ensuring that the designer's vision is fulfilled in the finished colour. There have been many new developments in the area of colour measurement and colour perception which are discussed. These include discussion of the sensory effect of colour for design and use in product development, and digital colour simulation.

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The evolution and progression of digital printing of textiles

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1.1 Introduction

The saga of digitally printing and dyeing of fabrics, yarns and garments involves a past of a few decades, a dynamic present and likely a bright future. This introduction accounts for the origins and evolution of textile printing to digital solutions. It identifies some of the many creators and pioneers of these technologies and assesses their impact on the textile printing industry. It discusses a few of the false starts that in turn contributed to sustained successes of digital printing technologies for textile decoration. It uses the exhibitions that have witnessed the introduction of innovative digital technologies for textile printing as road marks that indicate trends and point the way to digital textile printing's bright future.

In focusing on the market demand for textile printed applications, it attempts to answer questions such as:

- What are the market forces driving the adoption of digital technologies for printing textiles?
- What are the characteristics and qualities of digital printing that either favor or discourage its adoption for meeting market demand for decorated fabric and fibers?
- What are textile applications that digital printing can supply more cost effectively than existing analog printing methods?
- How is technology evolving to address market demand?
- What are the global trends that shed light on the future of digital printing of textiles?

This chapter opens the door and invites the reader into the exciting world of digital textile printing. It introduces this volume's tour of the many chambers of the digital textile print edifice that subsequent sections describe.

1.2 The origins of digital textile printing technologies

An early example of textile printing is found on a block-printed tunic dated from the fourth century CE.¹ Evidence suggests that carved block printing, also known as xylography, originated about the fourth century in China and initially found use in printing textiles and short Buddhist texts that believers carried as charm protection.^{1,2} Sui emperor Wen-ti ordered the printing of Buddhist images and scriptures in an imperial decree of 593. The British Museum houses the oldest known block-printed book, the Diamond Sutra, dated 868 CE from Dunhuang, China. Block printing of textiles began to flourish in Surat in Gujarat (India) during the twelfth century for the printing of wall hangings, canopies and floor spreads.³ The printing of textiles spread around the world along the Silk Road and through the spice trade.

While we can only infer the origins of textile printing from the few artifacts that have survived, digital printing evolved in an age of record keeping. In 1686, Edme Mariotte suggested the basis for inkjet printing with the publication of his seminal work on fluid dynamics, 'Traité du mouvement des eaux et des autres corps fluids'. It included observations on drop formation of fluids passing through a nozzle. Ebenezer Kinnorsley added to this foundation when he demonstrated that electrical current could pass through water in 1748. During the following year of 1749, l'Abbé Nollet examined the effects of static electricity on the flow of drops from a capillary tube. Lord Kelvin (Sir William Thomson) received the first patent for an inkjet printing system in 1867, 'Receiving or Recording Instruments for Electric Telegraphers'. Eleven years later in 1878, Lord Rayleigh (Sir John William Strutt) described the role of surface tension in drop formation. The 1920s and 1930s witnessed patent applications and issuances for inkjet recording devices, including notable inventions from Richard Howland Ranger and Francis G. Morehouse in 1928, Clarence W. Hansell⁴ for an electrically charged recycling device in 1929, and Kurt Gemscher in Germany in 1938.

During the same year, 1938, Chester Carlson invented analog electrophotography in Astoria, Queens, New York. It took Carlson and his subsequent partner company Haloid over 20 years and a few intermediate steps along the way, such as the Haloid A1 in 1949 and Copyflo in 1955, to deliver a successful office plain paper copier with the Xerox 914 in 1959. The A1 failed for the purpose that Haloid intended it as an office copier, but succeeded as a plate maker for commercial printing. Digital laser versions of electrophotography produced transfers in the 1980s to decorate fabrics, particularly T-shirts and other sewn garments and accessories. Researchers at Georgia Tech and North Carolina State University investigated the feasibility of printing fabric with electrophotography with some success.