

Chapter 12

Re-Visualising Giotto's 14th-Century Assisi Fresco "Exorcism of the Demons at Arezzo"

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ABSTRACT

In this chapter, Giotto's Assisi fresco, "Exorcism of the Demons at Arezzo," was modelled and analysed in three-dimensions. The process revealed that Giotto's techniques for creating the illusion of depth in his paintings were more advanced than initially thought. His Exorcism fresco was chosen as it is often heralded as an exemplar of the initial shift to the later perspective style of the Renaissance proper. The 3D modelling of the fresco revealed much that could not be deduced by other means. An aerial view of the architectural elements in his fresco shows Giotto's ordered urban layout. That a fully perspective view can be generated, which closely matches the original fresco, suggests a deeper understanding of the geometric construction of depth cues in Giotto's work than previously reported.

INTRODUCTION

Much has been written about preserving artefacts and sites of cultural heritage significance. Laser scanning and photogrammetry are now routinely used to digitally preserve and record ancient tombs, frescos and other interior and exterior archaeological and architectural sites and artefacts (Cameron & Kenderdine, 2010; Fotakis, Anglos, Zafirooulos, Georgiou, & Tornari, 2006; Ch'ng, Gaffney, & Chapman, 2013). Similarly, much has been reported on the mathematical, scientific, and anthropological analysis of paintings, sculpture,

and architecture (Marijnissen, 2011; Schaefer, Von Saint-George, & Lewerentz, 2009; Baxandall, 1988; Loran, 2006; Hours, 1977; Askew & Wilk, 2002). However, apart from x-ray imaging, few such scanned recordings or analyses extend beyond the surface of the artwork itself or attempt to reconstruct the spatial arrangements depicted within it. What this chapter reports on is the three-dimensionalisation of Giotto di Bondone's (1267-1337) thirteenth-century Assisi fresco: *Exorcism of the Demons at Arezzo* using standard architectural 3DCAD methods. By re-visualising Giotto's fresco as an interactive 3D model it was

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possible to analyse Giotto's depth of knowledge and understanding of spatial concepts. The 3D model provides an insight to Giotto's concepts of spatiality not possible from the surface alone. The results of this study reveal that Giotto had a more profound understanding of spatial relationships than previously reported.

Some authors are critical of Giotto's understanding of spatial depth. They variously cite a lack of any coherent spatial unity in his paintings; missing the necessary depth cues typical of a perspective; more reminiscent of the Byzantine style than the perspectives of the renaissance; and, an intellectual rather than phenomenological exploration of depth (Damisch & Goodman, 1994; Edgerton, 1991, 2008; Ruskin, 2009; Gombrich, 2000; Panofsky, 1991; Elkins, 1994; Perez-Gomez & Pelletier, 2000). Yet, many of the same authors concede Giotto's understating of spatial depth was nonetheless the precursor to the invention of the rules for linear perspective that came later in the renaissance proper (Ruskin, 2009; Gombrich on Fry, 1934, 2000; Perez-Gomez & Pelletier, 2000; Elkins, 1994; Edgerton, 1991, 2008; Wolf on Vasari, 1550, 2006; Vasari, 1998; Panofsky, 1991; Kemp, 1990). It is against the background of this apparent contradiction that this project was initiated.

The project began in 2004 as an attempt to analyse Giotto's *Demons at Arezzo* fresco to better understand the depth of his spatial conception. This fresco is often referred to as the first experimentation in spatial depth that showed a mathematical rationale (Wertheim, 1999). However, little remains of Giotto's notes. Hence, we can only know his genius through his work. Due to its apparent mathematical construction, his *Demons at Arezzo* fresco is particularly effective at demonstrating his explorations in spatial depth. It provides a clear source of detail for analysis by 3D reconstruction. This chapter plots the path of that reconstruction – the foundation of perspective in the Italian Renaissance, description and 2D analysis of the *Exorcism of the Demons at*

Arezzo fresco, modelling and 3D analysis of the fresco, revelations from the investigative modelling process, an overall discussion of findings, conclusion, and future research directions.

THE FOUNDATION OF PERSPECTIVE IN THE ITALIAN RENAISSANCE

From the late Gothic period in Tuscany, Italy, there occurred a transition from representational space: an image of the world – religion, magic, the metaphysical – to the representation of space: world as image – organised, geometrised, in-perspective. With the introduction of the Renaissance perspectival representation of space came a new *production* of space. It was a space that was reproducible – industrious repetition and mechanical *re*-production were deliberately given precedence over religious works (Lefebvre, 1991). Artisans of the period began to understand nature as observers looking on, rather than as innate, looking out from. At this period in time, Western culture experienced a paradigmatic shift from an internalised, religious, spiritualism to an externalised, physical, observism (Wertheim, 1999). It was a shift to a time when the infinite space of God was outside human space but accessible through *mimesis* (Perez-Gomez & Pelletier, 2000). It was a time when artists strived for naturalism in their religious art towards a new kind of devotion for the illusion of how things 'actually' appear in nature (Kemp, 1990). At the same time, the shift to a more systematised mercantile society demanded an organised way of seeing nature reproduced in art. Prior to the Renaissance, there was no need for a systematized perspective, as space was largely the domain of religious spiritualism (Panofsky, 1991). During the Renaissance, there occurred a transition to a scientific discipline.

Before the twelfth century, philosophers believed the soul was a complete world unto itself – the act of perception was the entering into the

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