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BOOK REVIEW

# Manifold Mirrors: The Crossing Paths of the Arts and Mathematics

## Felipe Cucker: Cambridge University Press, 2013, ISBN 978-0-521-72876-8

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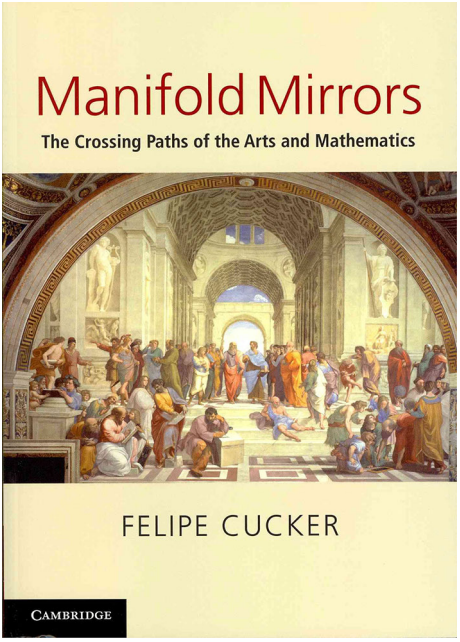


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**Abstract** A review of Felipe Cucker's book 'Manifold Mirrors: The Crossing Paths of the Arts and Mathematics', which examines the rules, laws and mathematical principles underlying music, painting and other creative arts.

This is an impressive and ambitious book and is one well-worth taking time to work through. The impetus, and the content for the book comes from Cucker's lectures within a 'liberal arts' course for university-level students of mathematics. The book's stated aims are to show the 'crossing paths' of mathematics and the creative arts. This 'mathematics' though doesn't just include the perhaps more well-trodden relationships between the arts, number and geometry, but includes 'rule-driven' creativity, such as acrostic texts, and a broader examination of symmetries, patterns and structures in, for example, poetry, architecture, dance and music. Cucker is a mathematician, and he is clearly driven to find patterns, in both senses of the word, and to find general principles that inform, underlie or govern human creation, and creativity. This in itself leads to interesting discussion in the book about rules and laws, how they become established, or are discovered, and how artists and mathematicians question orthodoxies, break new ground and shift paradigms. This of course includes shifts in our understanding of space itself, and here the inhabitants of E. A. Abbott's Flatland, who can only perceive two dimensions, are brought into the discussion to demonstrate, by analogy, the probable limits of our own spatial perception. This, in itself, amply demonstrates the book's and the author's enthusiastic engagement with the intersection of rational and imaginative investigation and creativity, wherever it's found.

The book includes an invitation to engage with, and work through, the mathematical proofs that accompany most sections of the book. And I do mean work through: while I might have considered myself to have a slightly above average knowledge of math, some of these sections certainly made me realise that I need to revisit my waning grasp of the methods and language of mathematics. However, the beauty of these sections also reminded me of the need, and the pleasure, of returning to first principles when encountering any kind of problem.

The crossing paths analogy of the title is important to keep in mind when reading the text; the author doesn't fall into the trap of trying to explain or account for every creative process by implying that they all have an underlying mathematical imperative, and thereby inadvertently creating a false hierarchy. In fact, he comes across as being completely respectful, at ease, and fascinated by what artists do, the decisions they make, and the constraints they impose on themselves and their practice. This is perhaps most interestingly demonstrated by the artists whom he considers, which ranges from Andy Warhol, to Agnes Martin to Piero della Francesca—though clearly M. C. Escher holds a special place in his heart. Perhaps what links all of these choices of artists, is that they stimulate and raise key questions about the relationship between form and content, which relates to questions of meaning in art works—where and how that meaning, if any, is held, and in turn, questions regarding artists' intentions. These discussions are evident throughout the chapters, and it was certainly a brave person who, within a series of

liberal arts lectures, decided to tackle some of these thorny and sticky problems in front of an audience of mathematics students.

The book is a testament to what an extraordinary set of lectures these must have been, and I think that if I had been a student of Felipe Cucker, I would have been very well-served by the breadth and depth of his knowledge and interests—not only in mathematics, but across the humanities. But its breadth is also one of its shortcomings; each of the areas that he tackles within the arts inevitably has its own extensive body of literature and scholarship that perhaps he would have been wise to point his readers to, rather than attempting to navigate and sum up what are invariably complex and contested fields.

The sections that I was most interested in reading were those relating to linear perspective. There is though nothing here that couldn't be gleaned from standard texts such as Dubery and Willats' *Perspective and other drawing systems*, and Martin Kemp's *The Science of Art: Optical Themes in Western Art from Brunelleschi to Seurat*, which surprisingly isn't included in the bibliography. Again these sections would have benefitted I think from the reader being pointed to a more comprehensive set of references where the complexities of the subject's history and its varied use in both painting and architecture could be better appreciated. He does, to his credit, later acknowledge the 'imperfect narration' in these sections.

Equally, the discussions around aesthetics and the nature of perception, where he engages with the pivotal texts of Arnheim and Gombrich, and the deliberations over the definitions of applied, decorative and fine arts, are perhaps too complex to be usefully summarised without additional references. On this point, some of the referencing in the book would not stand up to close academic scrutiny. The use of English is also occasionally clumsy, and his terminology is occasionally inexact, resulting for example, in the term 'illustrative' art where perhaps 'visual' art would have been a better choice, and at one point he also suggests that Piero della Francesca's work fits into the category of decorative arts. The book can also feel slightly disjointed, and it probably could not be considered to be a body of academic research as such—or a 'reference point' in the field. However I would argue that all these things are forgivable given the pedagogic origins of the material, the addition of generous pages of mathematical discussion and proofs, and the fact that he is bravely stepping into and tackling areas of creativity and visual culture that are potential minefields, even for a subject specialist. Perhaps for Nexus readers there is not a huge amount of discussion here centred on architecture, but nevertheless, this is an ambitious and valuable book. After all, which specialist would have been able to draw attention to the fact that the choreographer Balanchine and the art historian Gombrich shared the same thoughts on the nature of vision?

**Richard Talbot** studied at Goldsmiths' College and at Chelsea School of Art in London, and was awarded the Rome Scholarship in Sculpture in 1980. In 2004, he was awarded a major AHRC Fellowship in The Creative and Performing Arts at Newcastle University. He is now Head of Fine Art at Newcastle University.

He is particularly known for his large pencil drawings, which have been seen in exhibitions such as the Jerwood Drawing Prize, the Jerwood 'Drawing Breath' exhibitions, and more recently in 'Inbetween the

Lines: Contemporary British Drawing' at Trinity Fine Art in London. He is also known for his investigations into the nature and history of linear perspective, and more recently he has begun to use some of the drawings and some of his theoretical investigations as the basis of video installations. He has published two papers in the Nexus Network Journal in 2003 and 2006, and his essay 'Drawing Connections' was published in 'Writing on Drawing', Intellect Books, Bristol and Chicago, 2008. He has also presented research at conferences, including the European Conference on Visual Perception (ECVP 2007), the Association of Art Historians, Glasgow, 2010, and the Renaissance Society of America, Venice, 2010.