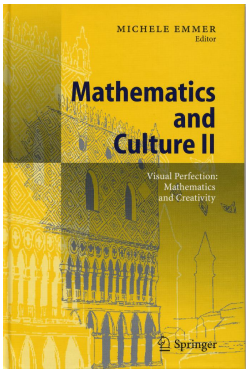
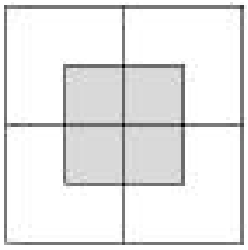
Michelle Emmer (ed.) *Mathematics and culture II, Visual Perfection: Mathematics And Creativity*, Springer, Berlin, 2005 (203 p.) ISBN 3-540-21368-6.



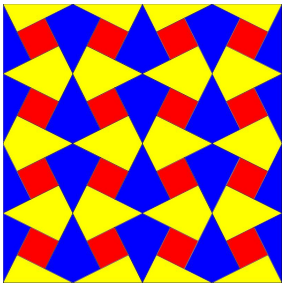
This is another English publication in the series *Mathematics and Culture*. Two other volumes were reviewed in this newsletter (number 50, November 2004). The idea about this series was set up by Valeria Marchiafava and Michele Emmer in 1997. There have been regular Italian issues every year since 2000. The last Italian volume has just appeared mid 2005 just as I am writing this review. The present volume and the two volumes that were reviewed earlier are the only ones that appeared in English until today. Some of the older Italian volumes will probably not be translated cover to cover because the present volume contains a number of papers that are translated from the Italian 2002 volume.

As it is clear from the subtitle, the main theme of the present book is mathematics and 'visual' arts. I include some illustrations, but many more can be found on the web. Some addresses are given in footnotes. Nineteen contributions are divided into three parts with the following headings: Mathematics, art and architecture; Visual mathematics and computer graphics; and Mathematics, literature and cinema. Although most of the authors are mathematicians, there are also contributions by psychologists, physicists, journalists, architects and artists.



Symmetric pattern

I will give a selection of some of the papers in this book that I liked most, which reflects a purely personal taste which should not be used as a valuation of the papers.



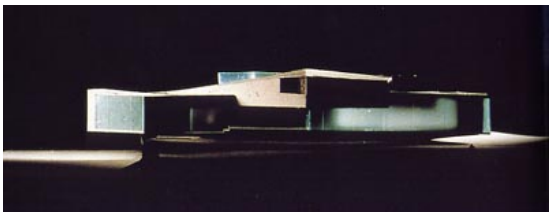
In the architecture related papers, I liked the one about the evolution of tilings used in pavements. From the ancient pavements in churches to modern pavements designed by Carlo Scarpa. His pavement in the museum of the Palazzo Querini-Stampalia which contains almost none of the symmetric modules (with very few exceptions like e.g. the one above appeared only one) of the 256 configurations that are possible in such a module consisting of 4 L-shaped tiles. This illustrates how the strict symmetry of the past can be bent towards some pleasing, more complex, asymmetry. Of course there is much more to be investigated in tilings. The examples are just illustrative. Muslim ornaments are a never ending source of tiling inspiration and these are not treated here since they are not needed to illustrate the point. If you are interested, a simple search on the web will give you dozens of beautiful patterns you can find in Muslim art. The figure on the left is for example inspired by a proof of the Pythagoras theorem by Abu'l Wefa (940 to 998).

Several of the other papers illustrate in other ways the similarity between the evolution in mathematics and arts. New developments like chaos theory and fractals can be found in the work of artists. For example, why does Jackson Pollock (1912-1956) drip-paintings[1]

[1]For his painting *Number 32* (1950) (269 x 457.5 cm) Enamel on canvas, Kunstsammlung Nordrhein-Westfalen, Düsseldorf see `www.abstract-art.com/abstraction/l2_Grnfthrs_fldr/g004_pllck4.html`.

have a fractal dimension of 1.9, whereas fractal dimensions of 1.3 to 1.5 are generally accepted as 'pleasing'. Wouldn't the shape of the concept New Guggenheim museum[2] by Gehry in New York have a fractal dimension between 1 and 2?

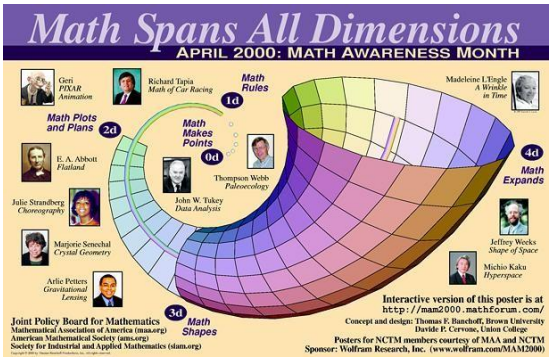
Also topology plays a role in arts. The *Endless ribbon* (2004) by Max Bill (1908-1994) is the best known example, but also the *Moebius House* (1993-1997) by the Dutch architect Ben van Berkel is very famous.



Moebius House

In the computer graphics part of the book, the first paper explains the ideas that were behind the design of the poster for the Math Awareness Month 2000. Each year it is the responsibility of one of the organizing societies (AMS, MAA, SIAM) to set up this month, and in 2000 it was the MAA who had to coordinate. As a theme they chose 'Math spans all dimensions'. The poster can be seen below. You can still use it with all its interactive possibilities if you surf to `www.mathaware.org/mam/00/`. While you are surfing, it is worth having a look at the other years as well (just change the '00' at the end in '01', '02',.... The year 2003 had as its theme 'Mathematics and art'! The most recent is the year 2005 whose theme is 'Mathematics and the cosmos'.

Also topology is treated in several of the contributions. It is certainly an issue in the paper on minimal surfaces and surfaces with minimal curvature, and extreme networks. These do certainly appear in applications such as soap films, soap bubbles, and when studying membranes between two media (just like everything in this book is on the membrane between mathematics and art). A maximum of insight is given almost without any formula.



MAM 2000 poster

Computer graphics come really to the stage in papers dealing with rendering of real-time interactive computer animations, or with virtual sculptures produced with Mathematica[3], the publication of geometry objects[4], or the metaphorical foundation of mathematical art as described by John Sims.

In part three, five articles are included, four of which are translations from an Italian paper. Here we find a 'proof' by Apostolos Doxiadis (the author of the successful novel *Uncle Petros and Goldbach's conjecture*, 2000) that the proof of a mathematical theorem and of the composition of a narrative are isomorphic. In my opinion his proof is not so convincing. More interesting though are the essays treating the increasing interest in literature and stage plays in mathematical subjects, or at least in characters that are mathematicians or are related to mathematics. The last contribution by M. Emmer is about Raymond Queneau (1903-1976). He has been called the creator of *le nouveau roman* a generation ahead of its time.

[2]Some pictures of what it should look like can be found at the website `www.new-york-art.com/e/Guggen-New.htm`.

[3]For the paper and the code see `www.zi.biologie.uni-muenchen.de/~franke/VirtS1.html`.

[4]See `www.eg-models.de/`.



Raymond Queneau

In 1960 Queneau and his friend Fran cois Le Lionnais founded the *Oulipo* (*Ouvrior de Littérature Potentielle* – some members were Georges Perec, Jacques Roubaud et Italo Calvino) who invented constraining mechanisms to produce literature. For example, the method $S + 7$ which replaces in an existing text every important word by the word that is found 7 places further in the dictionary. This is how Queneau transformed de La Fontaine's *la Cigale et la Fourmi* into *Cimaise et la Fraction*. Another famous example is George Perec's novel *la Disparition* in which not a single letter 'e' is used. To be a mathematician for him meant to be a reader of mathematical games (i.e., the column by Martin Gardner in Scientific American), or of the history of mathematics or of gross mathematical stupidities (the never ending stream of proofs for squaring the circle etc). Nevertheless, he became a member of the SMF in 1948 and wrote several essays about mathematics. He also wrote shortly before his death in 1976 *Les fondations de la littérature d'apres David Hilbert* which was an axiomatic approach to literature, a tranlation of Hilbert's *Grundlagen der Geometrie*, but where Queneau had replaced the words 'points', 'lines', 'planes' by 'words', 'sentences', and 'paragraphs' respectively. However his interest in mathematics was more than casual. He published one serious mathematical paper: *Sur les suites s-additives*, J. of Combinatorial Th. (A), vol. 12, pp.31-71, 1972 which appeared in an earlier form in the C.R. Acad. Sci., Paris, Sér. A 266, 957-958 (1968). Perhaps he considered this the most perfect example of literature with 'Oulipian' constraints.

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