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Book Reviews

CLAUDE P. BRUTER (editor), **Mathematics in Art: Mathematical Visualization in Art and Education**, Springer Verlag, New York, 2002, pp. X + 337, ISBN 3-540-43422-4.

The ancient Romans believed, the genii, as the essence of spirit existed everywhere: *Nullus enim locus sine Genio*. This also applies to mathematics, and certainly even more to mathematics in art. However, it was never said that it is easy to see the genii, let alone to explain them to others: perhaps this could explain the fact that this book is not so easy to understand and to explain. This book is the proceedings of the Colloquium on Mathematics and Art held in Maubeuge in September 2000. It contains 28 articles, some of them in the usual form (with affiliations references, and so on), some as short reports of discussion forums, and some with no discernible form.

It is true that not rarely mathematicians see mathematics itself as a kind of art, but this book, and the colloquium that originated it, seems to be more concerned with mathematics in art, as well as with mathematical art. What does a logician or a mathematician has to say about it? In my case, departing from a modest experience with the aesthetical side of formal science in artificial musical composition[1] and from the experience in working on logical multimedia[2], I can judge how difficult is to organize material of homogeneous quality around the topic of mathematics in

[1] I co-authored, with Wilson Sukorski, Mamede Lima-Marques and Paulo Cohn, a project in music and artificial composition called "Música Pessoal", exposed in the XIX São Paulo International Bienal (1987). This is the most important visual arts event in South America, having being established in 1951.

[2] "NonSequitur: Colagem Sonoro-visual para um Encontro entre Lógica e Música", *MultiCiência* 02, 2004, available at http://www.multiciencia.unicamp.br/art04_ 2.htm, co-authored with Raul do Valle, Adolfo Maia Jr. and Jônatas Manzolli.

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art. However, it seems obvious that neither the editor nor Springer-Verlag took care about selecting the best papers deserving publication.

The conference was sponsored by ARPAM, a kind of open museum project devoted to preservation of objects (p. 9) called folies. It is not clear what folies are, but the book explains that "folies are small buildings", presumably built (or to be built) to illustrate mathematical concepts. ARPAM is the acronym for *Association pour la Realization et la Gestion du Parc de Promenade et d'Activités Mathématiques*, apparently in Maubeauge, France. It is interesting to notice that this park does not really exist, and since one of the commandments of ARPAM is that every one is free to conceive as many folies as he or she wishes (p. 12), ARPAM should in principle be be infinite!

One of the best articles is "Visualing Mathematics–Online" by Konrad Polthier. It is an overview about new ways to communicate, visualize and publish mathematics using Java software, introducing the mysteries of how to include interactive geometrical effects into personal webpages, how to do good quality mathematical publications and where to find mathematical videos. All this is relevant to electronic publications (whether they will supersede or cooperate with paper material) but that subject is not touched upon. Section 2 of this paper explains the amazing result of the Brazilian mathematician Celso Costa[3] who described a minimal surface of genus 1 emendable in $\mathbb{R}^3$ that solved an open problem of two centuries: Is there a non-trivial example of a complete minimal surface with finite (total) curvature, besides the plane, the catenoid and the helicoid (which are somewhat trivial examples of genus 0)? The visualized surface is called Costa-Hoffman-Meeks surface,and would make a marvellous folie.

"The Designs of 2-Colour Wallpaper Patterns using Methods Based on Chaotic Dynamics and Symmetry" by Michael Field investigates tools to construct Alhambra-like wallpaper; examples are given of beautiful results in the colored plates in an appendix of nearly 60 pages.

This suggests that these proceedings might be themselves better suited for an web publication: 127 of the 411 pictures printed inside the articles and in the appendix use several colors or half-tones, which is certainly responsible for making the book more expensive.

"Machines for Building Symmetry" by Maria Dedò is another interesting topic, where kaleidoscope-like mechanisms are used to generate and visualize symmetric groups. Conclusions, however, are naive: "mathematics is beautiful not only for the beauty of some of its images, but, also, for the conceptual beauty of some of

[3] As shown in the Ph.D. thesis of Celso J. Costa, IMPA; Rio de Janeiro, 1982. (in the article wrongly called "Celsoe Costa").

its results". And "In our mirror boxes one can see infinity, and this effect is very strong, very beautiful and also very unexpected in all sort of public" (*sic*). It is impossible for me not to think on the two wardrobes with big crystal mirrors we had at home when I was a child; the rooms were small, and there was no space to put that beautiful furniture inherited from grandmother, but to place then one in front of the other. The effect was that I grew up "seeing the infinity" and I never felt the effect to be that strong. Perhaps this explains my being a logician.

The connections between mathematics and music are well represented in the erudite article by Carlota Simões, "Mathematical Aspects in the Second Viennese School of Music", as well as in the "The Mathematics of Tuning Musical Instruments: a Simple Toolkit for Experiments" by Erich Neuwirth, and in "A Mathematical Interpretation of Expressive Intonation", by Yves Hellegouarch. Simões offers a mathematical account of twelve-tone music rules, and show how to interpret compositions by Arnold Schoenberg, Anton Webern, Alban Berg and Milton Babbitt. Neuwirth's article discusses the arithmetics of music scales, while the contribution by Hellegouarch is an excursion into mathematizing musical aesthetics. These three paper together form a kind of triad, interesting material for using in an introduction to music theory for mathematical trained ears.

"Mathematics and Art: the Film Series" by Michele Emmer describes and discusses a variety of books, catalogues of exhibitions, films and videos which are the basis of the project "Mathematics and Art". The article is complemented by a list of 24 films and videos from 1979 to 1997 that would please a mathematical audience but are unfortunately hard to find.

"A Gallery of Algebraic Surfaces" by Bruce Hunt studies algebraic surfaces in detail and gives several examples of surfaces that anyone can program (and see) using software like *Mathematica*.

But there are also some very odd articles. "The garden of Eden" by Charles O. Perry is a puzzlement. The first sentence announces that "This is the garden of Eden". Period. Apparently, this is about a plastic artist lecturing on his work. Plastic and Socratic, as the one-and half page paper rejoices in realizing "How infinitely small we are and how little we know".

"Symbolic Sculptures" is a four-page paper by John Robinson, who does not give an address or affiliation. He quotes himself, sharing with the world his believe that "the first paintings and sculptures were DOTs, and the DOT can also be looked upon as the beginning of geometry". But there is no clue given what "DOT" means or stands for.

"The Mathematical Exploratorium" by Richard S. Palais describes his suggestions (and dreams) for a cyber museum of mathematical imagery.

Despite some puzzling articles, this collection is a good companion for finding references on the web, for a catalogue of mathematical beauty with educational interest, and for good reading for most of its contents. Not for all, unfortunately.

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