

# Preface

The second Conference of the European Society for Mathematics and the Arts (ESMA) was held at the Department of Mathematics of the University

of Cagliari (Italy, Sardinia) from 18 September to 20 September 2012. This volume

contains the proceedings of the conference. The authors of the papers presented at the conference

Since 2010, when the first conference was held in Paris, minds have been considerably and recently rapidly evolving. It seems now widely and accepted that the marriage of Art with Mathematics has a positive effect on the intelligence and the acceptance of mathematics by most of the public.

When planning the conference, three main themes were defined:

Artistic

*Theme 1:* Mathematical tools and software for the creation of a scientific visualizations

View

*Theme 2:* Analysis of artistic works from the mathematical point of view

*Theme 3:* Pedagogical uses of scientific artistic works.

For new tools to a wide audience could use to create new ideas was not only to invite mathematicians but also to promote the promotion of art. The research are going on now. The first theme, emphasizing the role of other contributions,

is related to the works of the 20th century. At present role they have got played an important role. The models are described and beautiful models in wood

The main scope of the lectures was to give useful old ideas to an audience to get in touch with some mathematics that artists can use in their new works. By focusing the attention on these tools, the aim is to enlarge the possibilities of creation by artists, but also to invite them to maybe locally deepen some of their theories. An other aim is to promote math and art activities in the educational system, which is still very poor. There is only one contribution entirely focused on this third theme: the role of exhibitions associated with lectures, but most of the contributions concerning models, have some connection with it.

The historical article by Livia Giacardi mainly refers to the Italian school at the end of the 19th century and the beginning of the 20th. At that time, algebra and analysis had not taken the importance they have today, and algebraic, analytical and differential geometry played an important role in the teaching at any level. Some models and works of art are analyzed in the articles by most of the speakers. The beautiful

made by Joseph Caron during the same period are now currently exhibited in the library of the Poincaré Institute. They have been mathematically reconstructed by François Apéry. In some sense, Joseph Caron was a pioneer of singularity theory. This kind of work may be understood as an encouragement to study generalizations of physical and mechanical devices to higher dimensions giving rise to richer mathematical configurations and illustrations. A question remains without answer: for which courses did the Italian geometers and Caron use these models, and what was the pedagogical success of that uses? Note that the series

illustrate the sphere since they intend to recipes to build the

in the sense that his known, beautiful, very detailed clues to successful pedagogical groups of students

and Dmitri Kozlov's reconstruction of one of his models. The first series of models realized in metal or in fiberglass, be used in architecture and for flexibility both in the material reformed, so that the same knot or of an hyperboloid. From these as share a new mechanical and ing some new highlights on the n. That is for instance the case dimension hyperbolic geometry lic polyhedra. We are entering om the mathematical world.

which dynamical systems and e scores of some well known igues allow them to propose e content and the structure of ing pieces of music which mix

focused on new mathematical cts, but on a clever artistic use : tools he masters. He is a well

of polyhedra models constructed by Richard Deemer to inversion is typically in the spirit of all the previous models: be used as pedagogical tools. As George Hart did, he gives models.

But George's motivations are different from Richard's: artistic passion was the main incentive to create his well attractive and definitely original polyhedra. He gives the ve reproduce them with a large size, and relates the various suc experiences he made in the American context, where large gather to build up the artwork.

There is some similarity between that presentation and

one. Dmitri shows several people working at a module. These modules are cyclic, periodic mathematical objects in a previous work. Material being able to be constructed at any size, they can education as well. One of their characteristics is sense and in the conceptual sense. They can be d can move into the frame of a sphere, of a torus ( pedagogical point of view, these original modul mathematical interest. Some analysis not only br works, but also allow to improve and extend the of Dough Dunham's study of Escher's work in 2 c from which he constructs aesthetic triply periodic again the domain of real artistic works arising fr

Using various mathematical theories among time series analysis, the refined analysis of the composers by Renato Colucci and his colleagues algorithms which approximatively simulate the these scores. Then they can play to create interesting up different composers.

The work by Francesco De Comite is not a research giving birth to new mathematical objects of former mathematics through recent computer

known graphic artist, and shows a few of his original works coming from his favorite mathematics. Though he comes from computer science, one can say that, being a specialist of anamorphosis, he has a topological mind in the sense

given by the following proposition

in the sense of the following definition: A theory is said to be creative and free

if, without standard symmetry with

respect to mirrors, or affine linear subspaces, without underlying stability. On the other hand

There is no standard symmetry

case of a more general symmetry with respect to

for standard symmetry is a special

be seen first as local. When the manifold is a re-

to any manifold, and which has to

formulation of that symmetry is called inversion

dimensional circle, the analytical

Gregorio Franzoni and Paola Pinna uses this inv-

on. The article by Renzo Caddeo,

Nowadays, with the weakening of the teaching, unfortunately ignored by many students. The

version to fold a beautiful surface

From the fact proved by Nash and Tognoli algebraic model, polynomial representations a

Bouquet of such Dini surfaces,

the mathematical literature devoted to geomet-

ing of geometry, inversion might be

to construct new shapes and which can be use-

you will find here the possibility to

representations of new mathematical objects

to get nice deformations of some

like also to mention the fact that, apparently, mathematical study of this kind of representat-

of works.

I suspect that general cones defined by visualized through the previous means. I shall

that any  $C^\infty$  manifold has a real

During the Conference, we could visit a nice

re the most frequent to appear in

the "Citadelle dei Musei", and applaud a joy-

try and topology. I would like to

It is a pleasure to thank Gaetano and Ann-

ricks used by Daniela Velichova

This publication is made possible through a gra-

ed to create numerical and visual

Investissements d'avenir (Future Investments)

s that artists could use. I would

there is no paper devoted to the

ion.

the last author could be better

not comment anymore this theory,

cle are quite explicit.

ce mathematical exhibition inside

ful play of theater written by our

Renzo Caddeo on the first evening

after warm atmosphere.

Edoardo Balestracci, us at Cassini

ent from Cap' malis as part of the

program.

Claude Paul Bruter