

Michele Emmer
Marco Abate *Editors*



Imagine Math 7

Between Culture and Mathematics

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Michele Emmer • Marco Abate
Editors

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Editors

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ISBN 978-3-030-42652-1 ISBN 978-3-030-42653-8 (eBook)
<https://doi.org/10.1007/978-3-030-42653-8>

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Cover illustration: From the catalogue of the exhibition by Mimmo Paladino, Sulla Mathematica, Palazzo Loredan, IVSLA, Venice, March–April, 2019, Centro Internazionale della Grafica, Venezia

This Springer imprint is published by the registered company Springer Nature Switzerland AG.
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

To
Nanni Balestrini

Preface

*Imagine all the people
Sharing all the world . . .*
John Lennon

Imagine building mathematical models that make it possible to manage our world better, imagine solving great problems, imagine new problems never before thought of or imagine combining music, art, poetry, literature, architecture, theatre and cinema with mathematics. Imagine the unpredictable and sometimes counterintuitive applications of mathematics in all areas of human endeavour.

Imagination and mathematics, imagination and culture, culture and mathematics. For some years now the world of mathematics has penetrated deeply into human culture, perhaps more deeply than ever before, even more than in the Renaissance. In theatre, stories of mathematicians are staged; in cinema Oscars are won by films about mathematicians; all over the world museums and science centres dedicated to mathematics are multiplying. Journals have been founded to explore the relationships between mathematics and contemporary art and architecture. Exhibitions are mounted to present mathematics, art and mathematics and images related to the world of mathematics.

The volumes in the series *Imagine Math* are intended to help readers grasp how much that is interesting and new is happening in the relationships between mathematics, imagination and culture.

This seventh volume is dedicated to the Italian poet, visual artist and writer Nanni Balestrini who died May 2019. He took part in the *2015 Venice Conference* with a presentation and an exhibition dedicated to his combinatorial book *Tristano* and his combinatorial film *Tristanoil* (Imagine Maths 5, 2016).

The volume starts with a homage to the Italian artist Mimmo Paladino who created exclusively for the *Venice Conference 2019* ten original and unique works of art paper dedicated to the themes of the meeting. An exhibition of the ten works together with the series of six etchings entitled *Mathematica* opened for 1 month in Palazzo Loredan in Venice, the other venue of the *Istituto Veneto di Scienze, Lettere ed Arti*, where many conferences on *Mathematics and Culture* have taken place in recent years.

After the Homage to the Anniversary of the Bauhaus (1 April 1919), a large section is dedicated to the most recent Fields Medals including a Homage to Maryam Mirzakhani and the story of soap bubbles in mathematics including a presentation of the international exhibition on soap bubbles in art and science with works of art from many Museums of the world that took place in the *Galleria Nazionale dell'Umbria* in Perugia, March–June 2019. A section of the conference was dedicated to cinema and theatre including two living performances by Claire Bardainne and Adrien Mondot and the Portuguese mathematician Telma Joao Santos. A part of the conference focused on the community of mathematicians and their role in literature and even in politics with the extraordinary example of Antanas Mockus Mayor of Bogotá, presented by Carlo Tognato of the *Universidad Nacional de Colombia*. Mathematics in the constructions of bridges, in particular in Italy in the 1960s, was presented by Tullia Iori. A very particular contribution on *Origami* by a mathematician, Marco Abate, and an artist, Alessandro Beber. And many other topics.

As usual the topics are treated in a way that is rigorous but captivating, detailed and full of evocations. This is an all-embracing look at the world of mathematics and culture.¹

Rome, Italy

Michele Emmer

¹P.S. The world, life, culture, everything has changed in a few weeks with the Coronavirus. Culture, science are the main ways to safeguard people's physical and social life. Trust in humanity's creativity and ability. The motto today in Italy is *Everything will be fine*.

Acknowledgement

We thank Mimmo Paladino for his permission to reuse the images published in the catalogue of the exhibition Mimmo Paladino, *Sulla Matematica*, Palazzo Loredan, IVSLA, Venice, March–April, 2019, Centro Internazionale della Grafica, Venezia.

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About the Editors

Michele Emmer is a member of the Istituto Veneto di Lettere, Scienze e Arti in Venice, founded by Napoleon. Former Professor of Mathematics at La Sapienza University in Rome (until 2015), since 1997 he has organized the Mathematics and Culture conferences in Venice. He has organized several exhibitions, cooperating with the Biennale of Art of Venice and the Prada Foundation among others. He is a member of the board of the journal *Leonardo: Art, Science and Technology*, MIT Press; a filmmaker, including a film on M.C. Escher; and author of the series *Art and Math*. He is also editor of the series *Mathematics and Culture* and *Imagine Math* by Springer, as well as the series *The Visual Mind* by MIT Press. His most recent books include *Flatlandia di E. Abbott*, with DVD, music by Ennio Morricone, 2008; *Bolle di sapone tra arte e matematica*, Bollati Boringhieri, 2010, which won the best Italian essay award at Viareggio 2010; *Numeri immaginari: cinema e matematica*, Bollati Boringhieri, 2012; *Il mio Harry's bar*, Archinto ed., 2012; *Imagine Math 3*, Springer, 2013; *Imagine Math 4*, Springer, 2015, *Imagine Math 5*, Springer, 2016, *Imagine Math 6*, Springer, 2018; and *Racconto matematico: memorie impersonali con divagazioni*, 2019, Bollati Boringhieri.

Marco Abate is a Full Professor of Geometry at the University of Pisa. He has written more than 100 scientific papers and textbooks, as well as several papers on the popularization of mathematics. His interests include holomorphic dynamics, geometric function theory, differential geometry, writing (comic books and more), photography, origami and travelling (having already visited Antarctica, his next destination is the Moon).

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Homage to Mimmo Paladino

Dreams and Numbers

*Tout est nombre.
Le nombre est dans tout.
Le nombre est dans l'individu.
L'ivresse est un nombre.*

Baudelaire, *Journaux Intimes*, Œuvres posthumes, 1908.

It was inevitable that the universes of Mimmo Paladino and of the *Imagine Math* conferences would meet again in this imaginary and geometric city which is Venice. Earlier I had written about the *Mathematica* series:

Paladino has always been attracted by numbers, geometric shapes. He depicts shapes and numbers everywhere, on faces, on objects. Numbers that are disturbing and reassuring presences, which are human and divine, eternal and contemporary. The numbers and geometric shapes which attract the artist, with their timeless, immutable and imaginative charm.

It is worth remembering what D'Arcy Thompson wrote in 1917 in his book *On Growth and Form*:

We find more and more our knowledge expressed and our needs satisfied through the concept of number, as in the dreams and visions of Plato and Pythagoras. Dreams apart, numerical precision is the very soul of science.

And even mathematicians dream, as the famous mathematician Ennio De Giorgi repeatedly emphasized:

I think there is a generally indistinct capacity to dream as generally indistinct is the feeling which the ancients called philosophy, or love of wisdom ... I have developed over the years the idea that all sciences and arts share a common foundation.

The famous English mathematician G. H. Hardy stated: "the mathematician's patterns, like the painter's or the poet's must be beautiful; the ideas, like the colours or the words, must fit together in a harmonious way. Beauty is the first test: there is no permanent place in the world for ugly mathematics".

In 1868, Isidore Lucien Ducasse under the pseudonym of Conte de Lautréamont celebrated the fascination of mathematics in a visionary and terrible book, the *Chants de Maldoror*:

O mathématiques sévères, je ne vous ai pas oubliées, depuis que vos savantes leçons, plus douces que le miel, filtrèrent dans mon coeur, comme une onde rafraîchissante . . . Arithmétique ! algèbre ! géométrie ! trinité grandiose ! triangle lumineux !... Aux époques antiques et dans les temps modernes, plus d'une grande imagination humaine vit son génie, à la contemplation de vos figures symboliques tracées sur le papier brûlant, comme autant de signes mystérieux, vivants d'une haleine latente, que ne comprend pas le vulgaire profane et qui n'étaient que la révélation éclatante d'axiomes et d'hyéroglyphes éternels, qui ont existé avant l'univers et qui se maintiendront après lui.

And not by chance the historian of mathematics, Morris Kline, wrote:

Mathematics has determined the direction and content of much philosophic thought, has destroyed and rebuilt religious doctrines, has supplied substance to economic and political theories, has fashioned major painting, musical, architectural, and literary styles, has fathered our logic, and has furnished the best answers we have to fundamental questions about the nature of man and his universe.

This new encounter was inevitable. Paladino's *Manifestos* for the 2019 *Mathematics and Culture Conference*.

Venice, Italy
March 2019

Michele Emmer

From the catalogue of the exhibition Mimmo Paladino, *Sulla Matematica*, Palazzo Loredan, IVSLA, Venice, March–April, 2019, Centro Internazionale della Grafica, Venezia. Reproduced with permission.



Fig. 1 Cover of the catalogue *Mimmo Paladino, Sulla Mathematica* © Centro Internazionale della Grafica, Venezia, 2019

Fig. 2 Sketch for the conference *Mathematics and culture*, 2018. Work on paper, mixed media. 1000 × 800 mm. Private collection



Fig. 3 Sketch for the conference *Mathematics and culture*, 2018. Work on paper, mixed media. 1000 × 800 mm. © Mimmo Paladino



Fig. 4 Sketch for the conference *Mathematics and culture*, 2018. Work on paper, mixed media. 1000 × 800 mm. © Mimmo Paladino





Fig. 5 Sketch for the conference *Mathematics and culture*, 2018. Work on paper, mixed media. 1000 × 800 mm. © Mimmo Paladino

Fig. 6 Sketch for the conference *Mathematics and culture*, 2018. Work on paper, mixed media. 1000 × 800 mm. © Mimmo Paladino



Fig. 7 Sketch for the conference *Mathematics and culture*, 2018. Work on paper, mixed media. 1000 × 800 mm. © Mimmo Paladino



Fig. 8 Sketch for the conference *Mathematics and culture*, 2018. Work on paper, mixed media. 1000 × 800 mm. © Mimmo Paladino

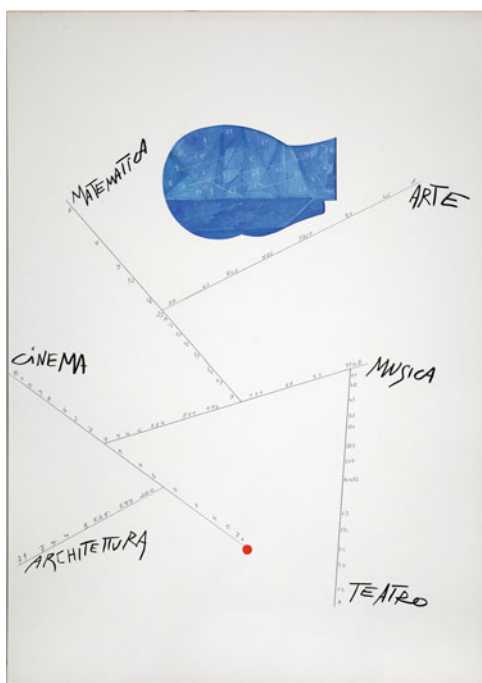


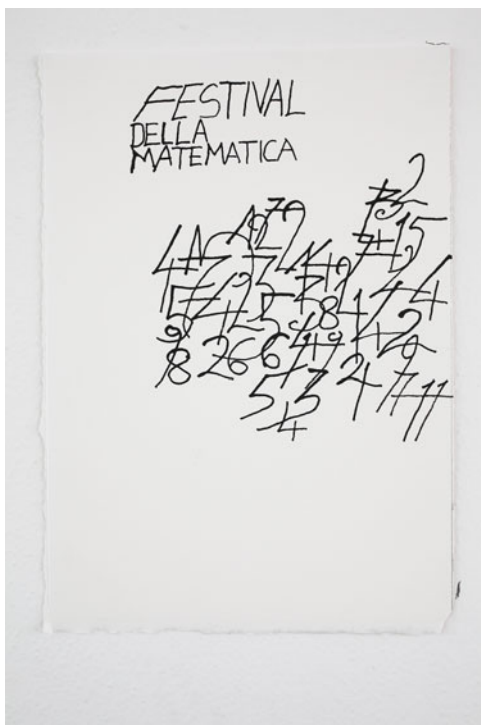
Fig. 9 Sketch for the conference *Mathematics and culture*, 2018. Work on paper, mixed media. 1000 × 800 mm. © Mimmo Paladino



Fig. 10 Sketch for the conference *Mathematics and culture*, 2018. Work on paper, mixed media. 1000 × 800 mm. © Mimmo Paladino



Fig. 11 Sketch for the conference *Mathematics and culture*, 2018. Work on paper, mixed media.
1000 × 800 mm. © Mimmo Paladino



Paladino's Matematici

Immobile, silent, solemn indecipherable, mysterious even impenetrable in their sacred stillness, these six figures have a great deal to do with the hieratic “white sculptures” of the 1990s disseminated among the olive trees of Paduli, near Benevento in the south of Italy. Though they have been called “witness”, Paladino says that they are thinkers, philosophers, perhaps shamans or “mathematicians”.

In some way it is one and the same because, in the end, the philosophy of numbers can coincide with that of forms. If a great Greek mathematician could declare that “everything is number”, a great philosopher, he too Greek, later clarified that “everything (in the visible world) is form”. One can, therefore, say that number and form make up “the real immutable essence of reality”.

Paladino's absorbed and motionless figures—surrounded by symbols, numbers and geometric forms—appear indifferent to our gaze. Perhaps because they have already “calculated the number of particles in the 3000 worlds” beyond which as has been said “what cannot be calculated begins”.

The unreasonable “philosophy of numbers” ends, and perhaps the illogical “theory of forms” begins; both nonetheless capable of interrogating and unveiling the memory of the world. Thus, the “mathematicians” come into play, those creatures Paladino depicts as “thinkers of numbers and forms”, of which they are, in fact, adorned in ineffable representation.

Perhaps they possess the power of magic, a word so often misunderstood because the magician was once a “wise man”, the one who knew what to do and how to do it. Or perhaps they are shamans, endowed with extraordinary powers, trustees and custodians of a community's “conscience and knowledge”. If, then, we speak of forms, number and figures, attention must also be given to alchemy, a wisdom that is mysterious, timorous and at times even victim of persecution, of apparent meanings.

These figures by Paladino could even represent medieval alchemists, those thinkers who said they possessed the “stone of madness”, the mythical “philosophers' stone”. Yet it is essentially the numbers and the geometric forms that attract and “condition” the artist because they are essential tools of his imaginative alchemy.

In our culture, the concept of perfection is entrusted to number; it is the only instrument we have to define the incommensurable, the infinite. Aesthetic expression and the golden section have, moreover, always had something to do with “measure”, that is, geometry.

Surely Paladino's six “mathematicians” manipulate Fibonacci's magic numbers and already know “zero and fire”, but they also have the aura of unspeakable seduction, dressed in sumptuous clothes. The forms and the numbers that adorn their figures appear clearly symbolic, like the decoration of a priestly vestment.

These figures pose continuous questions without worrying much about giving credible or comprehensive answers. Perhaps this is because—as Duchamp once said of the alchemic artist and even himself—Paladino and his mathematicians think in the dream of art and as such “know not what they do”.

Venice, Italy
March 2019

Enzo di Martino

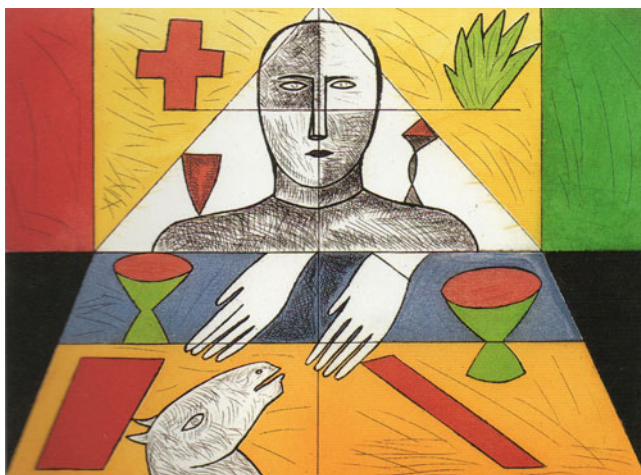


Fig. 1 *Matematico 1*, 2001 etching, 8-colour aquatint, 300 × 408 mm slab, © Mimmo Paladino & Art of this Century, New York—Paris



Fig. 2 *Matematico 2*, 2001 etching, 8-colour aquatint, 300 × 408 mm slab, © Mimmo Paladino & Art of this Century, New York—Paris



Fig. 3 *Matematico 3*, 2001 etching, 8-colour aquatint, 300 × 408 mm slab, © Mimmo Paladino & Art of this Century, New York—Paris



Fig. 4 *Matematico 4*, 2001 etching, 8-colour aquatint, 300 × 408 mm slab, © Mimmo Paladino & Art of this Century, New York—Paris

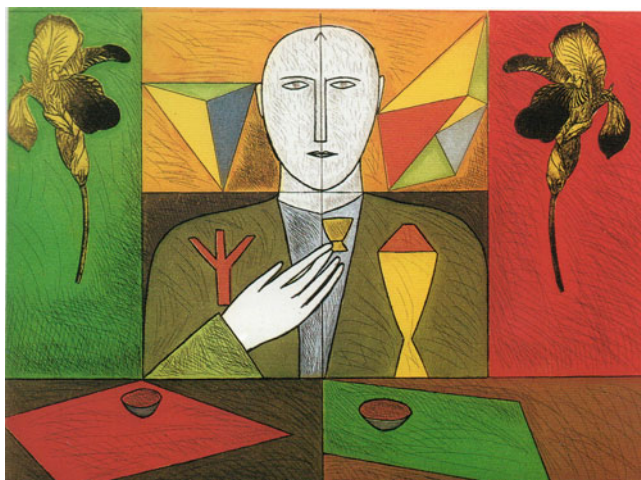


Fig. 5 *Matematico 5*, 2001 etching, 8-colour aquatint, 300 × 408 mm slab, © Mimmo Paladino & Art of this Century, New York—Paris

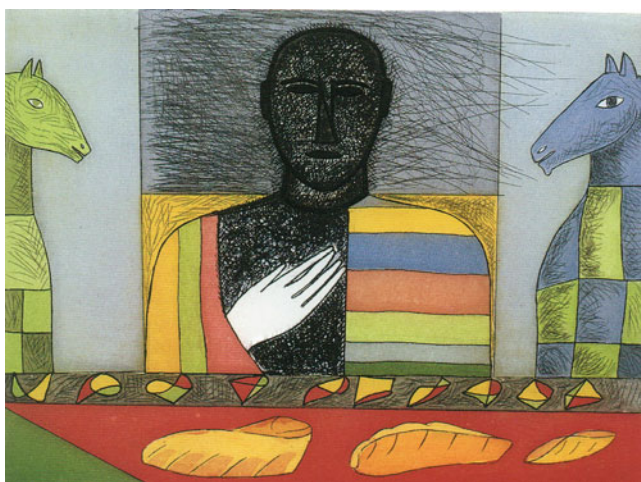


Fig. 6 *Matematico 6*, 2001 etching, 8-colour aquatint, 300 × 408 mm slab, © Mimmo Paladino & Art of this Century, New York—Paris