Events

Faces of Geometry. From Agnesi to Mirzakhany

Michela Rossi

The 12th of May is the day dedicated to the worldwide celebration of women in mathematics , coordinated by EWM, European Women in Mathematics, and supported by the African Women in Mathematics Association, by the Colectivo de Mujeres Matematicas de Chile, by the Indian Women and Mathematics and finally, by the Women's Committee of the Iranian Mathematical Society, which was founded with the intention of promoting the dissemination of the contribution that women have provided to research in the area of this discipline and its many applications, which unfortunately has not yet been properly acknowledged.

Among the 32 events organized on the occasion of the Women in Mathematics Day in Italy, on May 13, 2019 the International Conference *Faces of Geometry. From Agnesi to Mirzakhani*, was held in the evocative setting of the Aula Magna of the Rettorato of the Politecnico di Milano with the patronage of the Unione Italiana per il Disegno and the support of the Department of Mathematics of the University.

With this initiative, the scientific coordination composed of Paola Magnaghi Delfino, Giampiero Mele and Tullia Norando, wanted to celebrate the day with a new tribute to the contribution of women to mathematical research, particularly in the field of geometry, after the one previously dedicated last year to Maria Gaetana Agnesi, an 18th-century Italian scholar considered one of the greatest mathematicians in history, who in replacing her father at the Università di Bologna became the first woman to obtain a chair of mathematics.

The international conference was therefore intended to promote the interdisciplinary confrontation between mathematics and geometry, in particular, as well s other disciplines, underlining the often neglected importance of the work done by women in this field, through the presentation of theoretical research and concrete applications focused on the many implications that make it an essential reference for many disciplines, especially the projectual disciplines such as architecture, design and engineering, the formal arts and music. The new edition recalled Agnesi's topicality with reference to the figure of Maryam Mirzakhani, former professor of mathematics at Stanford and author of important contributions to hyperbolic and symplectic geometry, and in the field of ergodic theory, which studies the medium- and long-term behavior of dynamical systems.

The intense day of study began with the institutional greetings of Donatella Sciuto, Vice Rector of the Politecnico di Milano, to the participants, of the director of the Department of Mathematics Giulio Magli, who stressed the centrality of the discipline in the culture of the Politecnico and its transversality, of Fiammetta Costa, President of the Guarantee Committee of the Politecnico di Milano, who underlined the importance of enhancing the work done by women, also in academia, and finally, the Vice President of the Unione Italiana per il Disegno, took the floor in place of the recently deceased Vito Cardone, of whom she presented a brief but moving recollection.

After the ritual welcome, the conference entered into the thick of the intense program planned by the organizers. About twenty speakers, with a strong female prevalence, followed in documenting with their presentations the liveliness of research and the variety of scientific and educational applications of the theoretical developments and practical applications of mathematics.

The event opened with a session chaired by Tullia Norando and dedicated to the formal and mathematical nature of patterns, to their organic reference and their renewed projectual interest as an effect of the affirmation of digital tools and computational calculation. Maria Zdimalova of the Slovak University of Technology in Bratislava introduced the topic by illustrating the theoretical principles of the different

https://doi.org/10.26375/disegno.5.2019.29

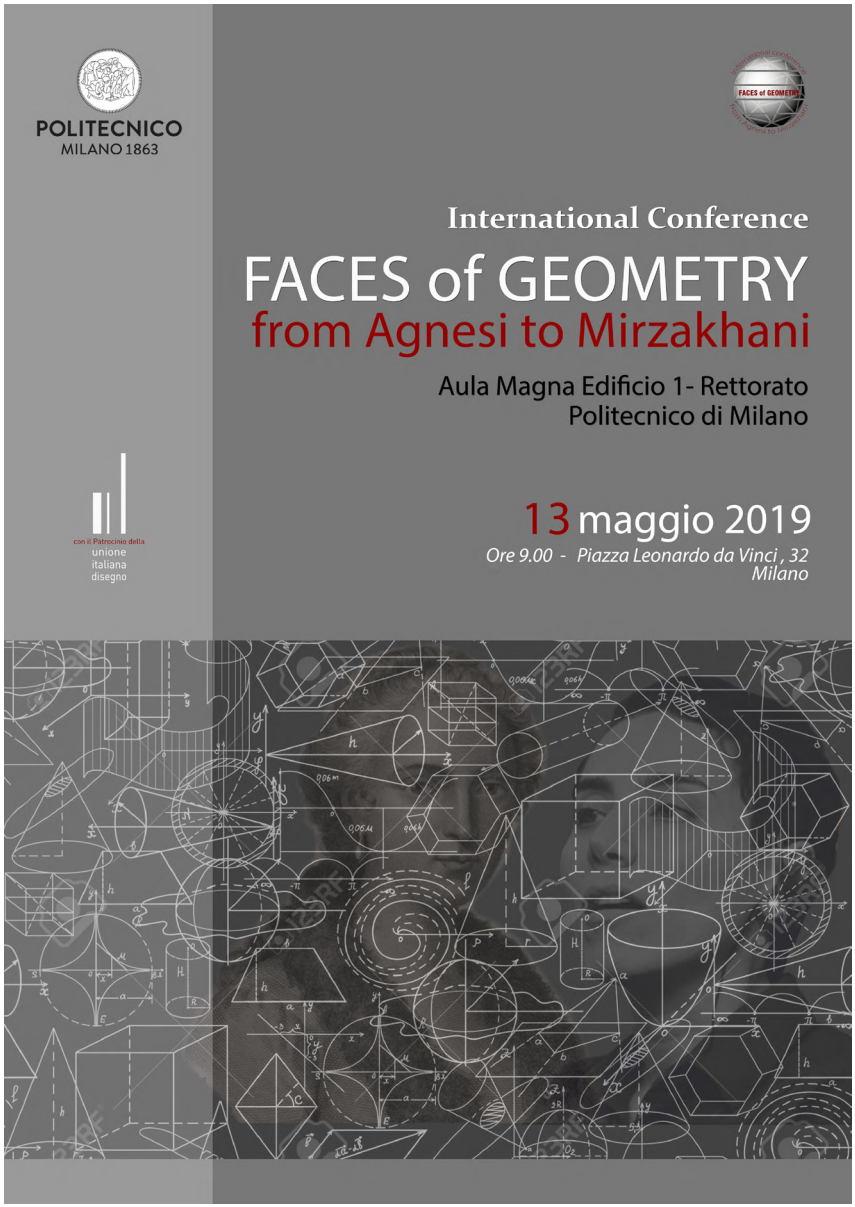

Fig. 1. Faces of Geometry. From Agnesi to Mirzakhany, poster.

groups of symmetries and the articulation of the tessellations of the Alhambra. Michela Rossi then delineated the scientific foundations of the project's references to the imitation of natural models, underlining the evolution over time of the imitative principle, from the external form of antiquity to the responsive processes of contemporary design, through five stages, in parallel with the deepening of knowledge and the refinement of mathematical models developed to explain natural phenomena. Then Giorgio Buratti went on to explain how the computational process translates the principles of form into generative codes directly applicable to the solution of countless projectual problems through the search for maximum efficiency in design. Mine Ozkar and Sibel Ozgan from MEF University in Istanbul closed the session with an application to historical architecture, showing the geometric genesis from the divisions of the sphere in domes of medieval Anatolia.
The second session of the morning was chaired by Giampiero Mele of the Università E Campus and was dedicated to the different roles of Geometry in architecture, from training to projects. Alessandra Capanna opened the session with a reflection on the research of the fourth dimension in architecture which, unlike mathematics, based on the rigor of postulates, is conditioned by the experience of physical space, and then showed the suggestions proposed by Steven Holl and Zaha Hadid. After her, Barbara Messina described the importance of the female contribution in the teaching of Descriptive Geometry in the Italian University. Immediately afterwards, Cristina Candito presented Anne Tyng's contribution to the design of Louis Kahn's architecture, underlining how her role was unacknowledged by both her partner as well as by critics. Kay Bea

Jones of Ohio State University, unable to attend, sent a paper on geometry in Franco Albini's projects, which was read by Sylvie Duvernoy. Chiara de Fabritiis of the Università Politecnica delle Marche then spoke about the use of Geometry in musical composition, while Maria Teresa Bartoli of the Università di Firenze closed the session by illustrating how survey reveals the existence of unexpected geometries in the Gothic city.
The afternoon opened with the welcome of Elisabetta Lorenzetti, President of Mathesis Nazionale and then continued with the session led by Paola Magnaghi Delfino, dedicated to the relationships between the theoretical foundations of Geometry and the design applications that result from it, opened by Biagio di Carlo of the Design Science Studio in Pesaro with an incursion into the world of triangles and geodesic and tensegrity structures derived from the observation of the stability of the triangular conformation in natural structures. After, Giuseppe Conti and Raffaella Paoletti of the Università di Firenze illustrated the applications of the Reuleaux triangle in architecture and engineering, thanks to its particular geometric properties. Emanuela Ughi of the Università di Perugia then addressed the problem of teaching in primary schools, proposing a concrete approach to Geometry for educating in mathematics starting from early childhood and developing creativity, while her colleague Anna Salvadori closed the session by bringing attention back to the theoretical level, speaking about inverse formulas from elementary geometry to differential calculation.
After a short break, there was a parenthesis dedicated to editorial activity which started with the presentation of the book *The Square Root of Life*, written by Lorella Carimali and published by Rizzoli. The author herself, a math teacher at the Liceo Scientifico Statale Vittorio Veneto in Milan, spoke with enthusiasm and abundance of explanatory details about the motivation of the text, the plot of the novel that she has dedicated to young people, schools and teachers, but especially to Mathematics, able to offer a solution to the daily problems we each face, explaining how positive an unconventional approach to the subject can be. A second presentation was dedicated by Sylvie Duvernoy to the story *The Little Prince's Universe* written by the recently deceased Italian astrophysicist Francesco Palla; she also presented the book, first published in Italy and then translated into many other languages, which she herself illustrated.
This was followed by the presentation of the works produced by the high school students in the context of the contest *La potenza compositiva dei poligoni e poliedri* (The compositional power of poligons and polyhedrons), a competition open to secondary school students and university students, for works of sculpture, painting, drawing and graphics inspired strictly by the theme suggested by the title of the competition. The award-winning participants presented works in which they translated into images the reflections of a personal research resulting from geometry, demonstrating to those present how the stimulus offered by their teachers can lead young people to develop original responses.
The day then ended with the afternoon session, resumed with lectures by several other professors of the Politecnico. Federico Brunetti presented his reflections on the relationship between geometry and form in drawing and design. Paolo Dulio reasoned on scaling in vector space. Finally, the two mathematicians Franca Caliò and Elena Marchetti brought attention back to the didactic problem in the university context, with a speech focused on the current methods of teaching Geometry in the schools of Architecture and Design of the Politecnico.
Between one session and the next, the day also offered the opportunity for the presentation of the newly formed International Association in Mathematics and Art - Italy (IAMAI), promoted by Italian scholars from various academic, disciplinary and cultural backgrounds. The association's mission is to promote research and the dissemination of results in the various fields of application, enhancing the interweaving and convergence between areas that link Mathematics to Art and with an openness towards forms of collaboration and involvement of other subjects, bodies and organizations. As the promoters stated in their presentation, Mathematics is, in fact, the result of a thought at once creative and logical, inspired and deeply linked to beauty, recognizable in various manifestations of Art, from architecture to design and fashion, from painting to sculpture, from music to dance and theater, including their digital and virtual forms. The international association was founded in Italy because, over the centuries, the encounter between Art and Science has left a legacy of signs and testimonies here by which the association is inspired.
The success of the event has been emphasized by the announcement of its next edition in May 2020.

Author

Michela Rossi, Department of Design, Politecnico di Milano, michela.rossi@polimi.it