

# Math Creations - A Math-Art Competition

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## Abstract

We describe a math-art contest for new creative ideas and their realizations based on modern mathematical concepts currently worked on in two Berlin-based collaborative research centers. By combining mathematics with art and design the power, the fun, and the beauty of this interdisciplinary connection is shown.

## Introduction

Science outreach has become common practice at research institutes, universities and various other institutions. The goals are to improve public perception and understanding of science, as well as to increase the engagement with science and technology in general. Mathematics in particular needs a boost in reputation, when compared to more popular sciences like astronomy and space technology.

When the collaborative research center<sup>1</sup> “Discretization in Geometry and Dynamics” (CRC DGD) [2] was looking for ways to better communicate their mathematical research, they came up with an unusual idea—a contest for art, design and mathematics. The goal of CRC DGD is to find and investigate structures preserving discretizations of smooth geometric objects and dynamical processes. CRC DGD has 16 investigatory projects and one outreach project “Communication and Presentation”. The outreach is realized mainly with use of the highly attractive visual aspects of modern discrete geometry and dynamics. Additionally, a second CRC was invited to join the initiative—“Space - Time - Matter. Analytic and Geometric Structures” (CRC STM) [3], and IMAGINARY—a non-profit organization for interactive and open mathematics [4]—lead the coordination of the contest. IMAGINARY’s expertise is communicating modern math in an aesthetic, interactive, and collaborative way [5]. As a think tank for modern mathematics communication IMAGINARY specializes in developing exhibition content as well as organizing public exhibitions and events worldwide [6]. Even though IMAGINARY has organized many math-art competitions in the past, internationally and locally ([7, 8, 9]), this contest was special, because of its tight bonds to current mathematical research.

## Preparations

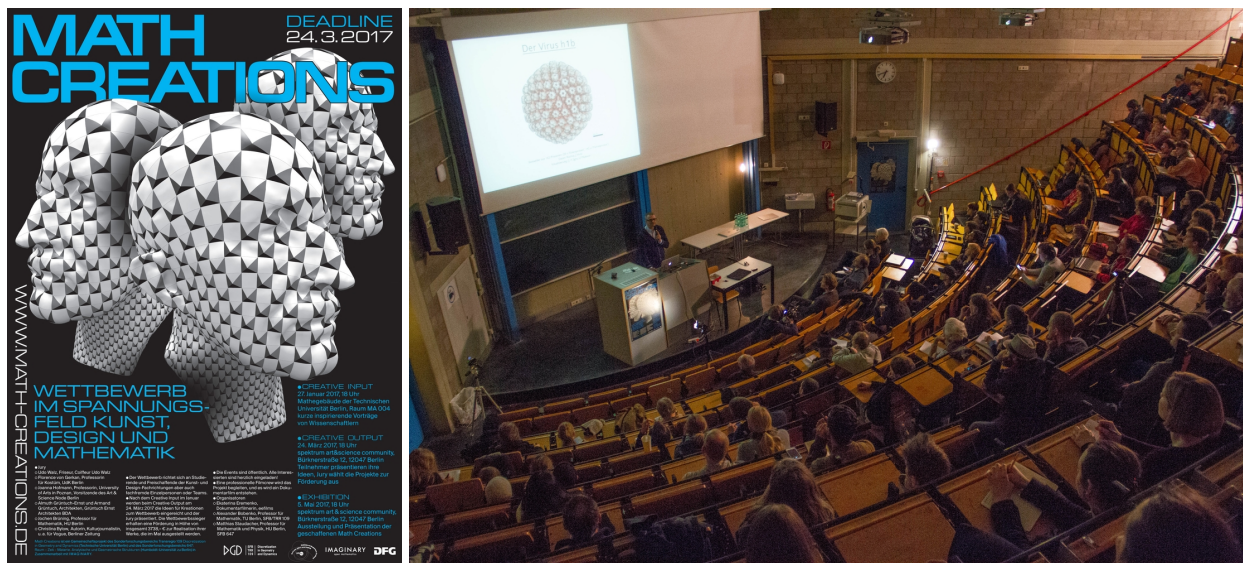
All organizers came together and discussed a basic outline of the project: The goal of the contest would be new creative ideas based on the mathematical concepts currently worked on in the two collaborative research centers and the realization of these ideas. The contest’s main focus are students of the art and design fields as well as independent artists and designers. However, it is open for everyone to participate. Berlin, Germany, is the hometown of the universities Technische Universität Berlin (TU Berlin) and Humboldt Universität zu

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<sup>1</sup>Collaborative Research Centers (CRC) are long-time research projects supported by the German Research Foundation. [1]

Berlin (HU Berlin), at which the two collaborative research centers are based. Three events were scheduled, all being staged in Berlin.

The shape of an octahedron can be used to symbolize the connections between space, time, and matter, which is the basic research interest of CRC STM. One of the research topics of CRC DGD are discrete conformal maps [10]. These two topics were combined by mapping an image of an octahedron conformally onto a triangulated surface of a man's head, which was used for the poster design, see Figure 1 a). It is actually the head of Max Planck. A conformal map preserves angles locally, so even though the pattern needs to be distorted to match the shape of the head, the image of the octahedron does not really seem distorted. We hung the poster in many art and design schools, in many Berlin universities, and in the surrounding areas to announce the competition and to invite artists, designers, and others to participate. Additionally, we sent out invitations by email and social media, distributed flyers at art and design events, and gave introductions to the contest in person during school classes and university lectures.



**Figure 1 :** a) Poster of the Math Creations project. b) Creative Input event

## Creative Input

The first public event of the Math Creations project—the Creative Input—took place on January 27, 2017 in the main lecture hall of the math building of TU Berlin. After a welcome and an introduction, six speakers of the collaborative research centers presented their current work in short, science-slam-like talks. In particular the coordinators of both CRCs, Prof. A.I. Bobenko and Prof. M. Staudacher, gave lectures about their latest work. Aimed at a general public, the talks were informal, inspiring, and were not supposed to contain formulas. The topics ranged from beautiful circle patterns of modern geometry, mathematical beauty of virus architecture to a hologram of particle physics and other interesting subjects of current research. Each talk was followed by a lively discussion, and the event closed with detailed information on the contest and individual discussions between researchers and participants.

Videos of the talks are available online [11] as well as the slides and additional background information such as papers, animations, figures etc. The participating teams are in close contact with the organizers and researchers to get specific answers and individual feedback on their ideas.

## Creative Output

We chose the SPEKTRUM art&science community as the venue for the second public event—the Creative Output—on March 24, 2017. It is a space of convergence for cultural communities and cross-disciplinary groups emerging and operating in and near Berlin [12].

Fifteen teams presented their ideas to the Math Creations contest. Among the participants were high school students, 3D animation artists, math students, sculptors, design students, even one math professor from another university, and many more. Ideas included a variety of formats, such as an interactive installation, animations and films, jewelry and iron railings, an interactive app, 3D printed and hand-made sculptures, a wearable dress installation, oil paintings, a piece of furniture etc. All of them are within the scope of the contest, the format is not restricted at all.



**Figure 2 :** *Examples of the ideas: a) Seating furniture b) space-filling animals c) 3d printed teapot*

All ideas were presented on stage in front of the jury, other participating teams and interested guests. People from different fields of art and science were invited to be members of the jury. They evaluated all submissions and selected seven participants to be supported with grants adding up to 3738 EUR<sup>2</sup> for the realization of their creative work. All participants, not only the selected ones, are invited to show their final Math Creations at the exhibition event.



**Figure 3 :** *a) The jury b) Presentation of a hanging sculpture c) Draft for an oil painting*

The organizers and researchers are in close contact with all teams during the production process of their Math Creations. We give advice regarding technical and scientific details, provide expert knowledge in exhibition design and offer local contacts as well as a large international network of science communicators and math artists.

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<sup>2</sup>The total sum of 4000 EUR is provided by CRC DGD and CRC STM, though taxes need to be subtracted.

## Exhibition

At the final event of the Math Creations project—the exhibition—the developed artworks will be presented and exhibited. It will take place on May 5, 2017. Together with all participants, organizers, jury members, representatives of the press, artists, designers, mathematicians and anyone interested, we will celebrate the power, the fun, and the beauty of the interdisciplinary connection between mathematics and art.

## Conclusions

A professional film crew will record all three events as well as the realization process of the artworks. A feature film will be produced and screened internationally, starring all participants and their Math Creations. All artworks will be published under a creative commons license on the IMAGINARY platform. These licenses allow the Math Creations teams to choose which rights they reserve and how others are allowed to use, recreate or adapt their work. After the Creative Output event, the German Patent and Trademark Office (DPMA) invited all Math Creations to be showcased in their location in Berlin. This second exhibition has already been scheduled to take place in June 2017, and we expect the Math Creations to be shown in many more exhibitions.

This not only disseminates the scientific results of the two collaborative research centers CRC DGD and CRC STM to a wider community, it hopefully inspires more researchers to reach out and connect with other disciplines. Through the Math Creations project the fun and excitement of mathematics is shared and an interest and appreciation of science in the general public is cultivated by combining it with art and design.

## References

- [1] “German Research Foundation”, <http://www.dfg.de/en/> (as of Feb. 28, 2017).
- [2] “Discretization in Geometry and Dynamics, SFB Transregio 109”, <http://www.discretization.de/en/> (as of Feb. 28, 2017).
- [3] “SFB 647: Space - Time - Matter. Analytic and Geometric Structures”, <http://www.raumzeitmaterie.de/> (as of Feb. 28, 2017).
- [4] “IMAGINARY - open mathematics”, <https://imaginary.org/> (as of Feb. 28, 2017).
- [5] Andreas D. Matt, Bianca Violet, “Collaborative Mathematics Communication—Experiences and Examples”, *ICMI-13 post-congress monograph of Topic Study Group: Popularization of Mathematics*, to appear. accessible via <https://imaginary.org/background-material/collaborative-mathematics-communication-experiences-and-examples>
- [6] Andreas D. Matt, “IMAGINARY— a How-to Guide for Math Exhibitions”, *Notices of the American Mathematical Society*, Volume 64 (April 2017), Issue 04, pp. 368–373.
- [7] Christoph Pöppe, “Mathematik-Kunst-Wettbewerb: Die Ergebnisse”, *Spektrum der Wissenschaft*, 08 (2008), pp. 94–97.
- [8] “New MPE-Exhibits”, <https://imaginary.org/mpe-competition> (as of Feb. 28, 2017).
- [9] “MathLapse”, <http://ic16.imaginary.org/mathlapse/> (as of Feb. 28, 2017).
- [10] Alexander I. Bobenko, Stefan Sechelmann, Boris Springborn, “Discrete Conformal Maps: Boundary Value Problems, Circle Domains, Fuchsian and Schottky Uniformization”, *Advances in Discrete Differential Geometry*, A.I. Bobenko (ed.), (2016), Springer, pp. 1–56.
- [11] “Math Creations”, <https://imaginary.org/project/math-creations> (as of Feb. 28, 2017).
- [12] “SPEKTRUM art&science community”, <http://spektrumberlin.de/project.html> (as of Feb. 28, 2017).