

# Editorial: IMAGINARY – Mathematics Communication for the 21st Century

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IMAGINARY is the name of a collaborative mathematics outreach project that aims to improve the image and understanding of mathematics and in this way awake an interest and fuel passion for the subject in children and adults. This goal is achieved in different ways: on the one hand by showing the beauty and art in mathematics and on the other hand through surprising applications. To best understand the project we have to go back to its beginning.

IMAGINARY was born at the Mathematisches Forschungsinstitut Oberwolfach (MFO) in conjunction with the Year of Mathematics in 2008 in Germany. It started with the travelling exhibition “IMAGINARY – through the eyes of mathematics” shown in 12 German cities. Due to its tremendous success, follow up exhibitions were soon organised in Austria, Switzerland, Spain, UK and Ukraine. The program SURFER, developed for IMAGINARY, became a centrepiece of the exhibition. It teaches in a playful way the connection between formula and form, between algebra and geometry through beautiful 3D surfaces. In this way, it bridges the gap between art and mathematics. An example of such a surface, Citrus, is seen on the front cover of this issue. The visitors of the exhibition get the chance to alter the algebraic equations, see the effects on the displayed surfaces in real time and even get to take a printout back home.



IMAGINARY exhibition at the Leibniz University, Hannover, 2009.

Since 2008, the IMAGINARY exhibition has been shown in over 60 cities in Germany alone but has also travelled further afield to 4 continents, 29 countries and over 120 cities with more than 1 million visitors in total. In Europe, IMAGINARY has been presented in 17 countries with talks, workshops, media activities and, in most cases, exhibitions.

What made the exhibition unique from the beginning is its highly interactive and intuitive nature and its open access and open source philosophy. This is also reflected in the many positive comments left in the guest book:

- This already beautiful exhibition is obtaining a special liveliness by excellent leadership.
- Mathematics makes happy.
- Super, especially that you can also use the program in the school.
- A wonderful exhibition. I have spent much time here and met many beautiful things, it had to take place more often and actually as a permanent event!
- Thank you and keep it up!
- It is a fantastically beautiful exhibition.
- The magic world of mathematics is not easy to understand. But you can bring them closer.
- We were again there, because it was so fascinating.
- I should have perhaps studied math...
- Simply gorgeous, cool programs.



IMAGINARY exhibitions and events have been organised in more than 120 cities.

However, the original exhibition was not enough; it focused on a very beautiful yet small part of mathematics. The project needed to grow further and the Mathematics of Planet Earth Year 2013 (MPE) presented a good opportunity to do so. A competition for virtual exhibition modules themed around MPE was announced and IMAGINARY offered to provide the required web infrastructure in order to make the modules of the competition available online. At the launch of the MPE year in Europe at the UNESCO in Paris, the web interface to IMAGINARY ([imaginary.org](http://imaginary.org)) went live, displaying entries for the competition and, of course, the winners.

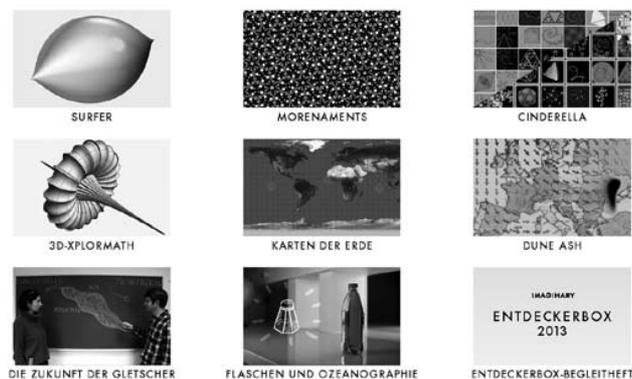
The web platform provides an online resource for mathematics outreach. One might think of it as a “pick

and mix science stand”, like a pick and mix sweets stand but instead of sweets one gets to choose between different mathematical tools, all for free. Everything should be easy to digest but also awake an interest to learn more about the non-trivial mathematics behind it.

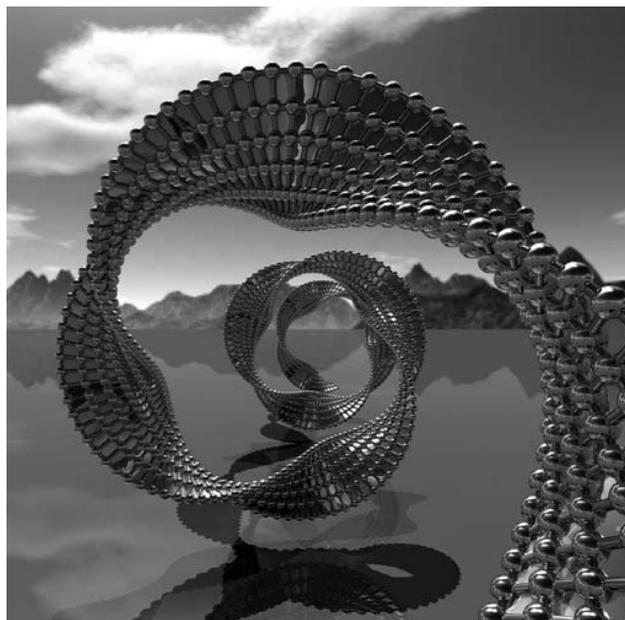
The tools are grouped into different categories, such as exhibitions, galleries, films and hands-on exhibits with instructions on how to recreate them at home, school or university. Currently [imaginary.org](http://imaginary.org) hosts two full exhibitions: the “IMAGINARY – through the eyes of mathematics” original travelling exhibition is available and free to download; at the same time, a complete MPE exhibition is also available, consisting of a series of modules with a more applied mathematics focus, such as a program that calculates the displacement of volcanic ash clouds (Dune Ash) or a film discussing how mathematical modelling of glacial movement works in order to predict the future behaviour of glaciers. Of course, exhibits from both exhibitions may be mixed. Furthermore, IMAGINARY also ventured into school education. In December 2013 the so-called ENTDECKERBOX (discovery box) was launched. It is primarily aimed at use in the classroom and provides resources for teachers in order to make mathematics lessons more interactive and interesting for the pupils.



Interactive station Dune Ash at the UNESCO in Paris, 2013, simulating volcanic ash dispersion in real time



Nine programs and films included in the IMAGINARY discovery box for schools.



The Björling minimal surface by Ulrich Pinkall – part of the “IMAGINARY – through the eyes of mathematics” exhibition.

Who is behind IMAGINARY nowadays? IMAGINARY is a project by the MFO, accounted by its director Gerhard Huisken, with funding from the Klaus Tschira Stiftung. It is maintained by a committed core team (mathematicians, software engineers, graphic designers, etc.), who run the project, develop the internet platform and give advice on how to coordinate exhibitions, but also dream up new ventures of where IMAGINARY will go in the future. At the same time, and most importantly, it is community driven. This means that anyone who has an interesting piece of software, film or other type of interactive material can upload this to the website and make it available to the rest of the community. In this way, the community becomes an integral part in the communication process by not only experiencing but also creating content and thus advancing mathematics communication to the 21st century. Of course, anyone can just use the material and create a mathematics event, exhibition or workshop. Due to this community driven aspect of the website, the German news outlet “Spiegel ONLINE” called it the “YouTube of Mathematics”.

As a result of its success in general, and particularly in the last two years, IMAGINARY has seen a lot of media coverage across Europe for its numerous successful exhibitions. Gert-Martin Greuel, the former director of MFO and scientific advisor of IMAGINARY, and Andreas Daniel Matt, the curator and project manager of IMAGINARY, both also initiators of the project, were awarded the German Media Prize for Mathematics in November 2013. In the first half of 2014, a new exhibition was launched at the Technische Museum in Berlin, showing three MPE related pieces until 24 June 2014. Furthermore, IMAGINARY has started a collaboration with the African Institute for Mathematical Sciences (AIMS) and, in association with AIMS, an interactive IMAGINARY event was organised for the first time in Africa



**SURFER installation at the IMAGINARY exhibition in Belgrade, 2012.**

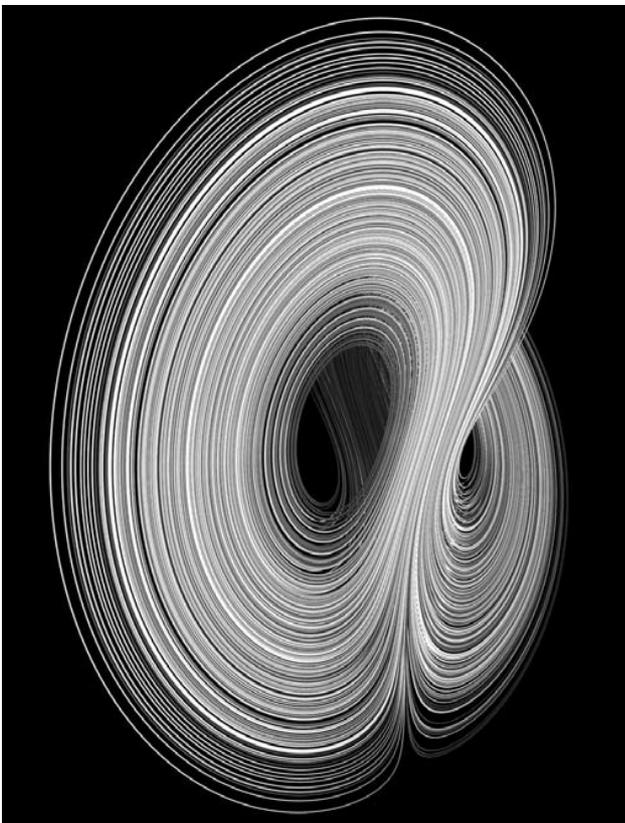
at the 10th anniversary pi-day celebrations in Dar es Salaam, Tanzania. The event was attended by over 2000 schoolchildren and their teachers from three universities, 33 secondary schools and 14 primary schools. In November 2014, a workshop and exhibition will be organised in Cape Town to plan future mathematics communication activities with partners on the African continent. At the same time, IMAGINARY's travelling exhibitions are currently on tour or planned for the coming months in Germany, Russia, Spain, Norway, Portugal and Hungary. But most certainly, the planned highlight is an IMAGINARY exhibition organised by the NIMS institute at the



**Cedric Villani inaugurating the IMAGINARY exhibition in Paris, 2010.**

ICM in Seoul, South Korea, in August, which will be the largest IMAGINARY exhibition yet, featuring all modules of previous years, as well as new software, images, films and sculptures. Following the IMAGINARY philosophy, we invite all mathematicians to send us their latest images, films or software programs to be included at the ICM exhibition.

The IMAGINARY pick and mix science stand has become a franchise (non-commercial and open), where you can taste new maths and bring your own ideas. It has grown from a single exhibition into a collaborative framework and community driven movement with IMAGINARY teams in several countries. The Royal Spanish Mathematical Society (RSME), for example, has already organised more than 15 exhibitions and several museum installations. The question now is how does IMAGINARY continue? A new project is to connect modern mathematics and current research to outreach. Mathematicians visiting the MFO are asked to write about their current work but for a general public. These so-called "snapshots of modern mathematics" are then reviewed and edited and distributed through the project. Another new idea is to increase networking between mathematics communicators. To kick start



**The Lorenz attractor by Jos Leys, an image submitted at the MPE competition.**



**Young IMAGINARY fans, 2008.**

this, an open map of all mathematics museums on our planet was prepared – yes, there are many more than one might think!

IMAGINARY is constantly evolving and always welcomes exciting new contributions and ideas (for example the game <http://2048.imaginary.org>).

*The Newsletter thanks IMAGINARY, and in particular Andreas Daniel Matt, for providing the cover illustration.*



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*Andreas Daniel Matt is a mathematics communicator at the Mathematisches Forschungsinstitut Oberwolfach. He studied mathematics and computer science and did his PhD in mathematics in machine learning at the University of Innsbruck and the University of Buenos Aires. Since 2007, he has coordinated the project IMAGINARY.*

*He also curates the MiMa Museum for Minerals and Mathematics, Oberwolfach.*



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# AMS-EMS-SPM International Meeting 2015, 10–13 June 2015, Porto, Portugal

The meeting will bring together the American Mathematical Society (AMS), the European Mathematical Society (EMS) and the hosting Portuguese Mathematical Society (SPM) in the UNESCO world heritage city of Porto.

The scientific scope of this meeting ranges from plenary talks of general interest to special sessions focusing on current research in specific areas. There will be distinguished Invited Addresses, an evening Public Lecture and a variety of Special Sessions.

List of invited speakers:

Marcus du Sautoy (evening Public Lecture), University of Oxford, UK  
 Rui Loja Fernandes, University of Illinois, USA  
 Irene Fonseca, Carnegie Mellon University, USA  
 Annette Huber-Klawitter, Albert-Ludwigs-Universität Freiburg, Germany  
 Mikhail Khovanov, Columbia University, USA  
 André Neves, Imperial College London, UK  
 Sylvia Serfaty, Université Pierre et Marie Curie Paris 6, France  
 Gigliola Staffilani, MIT, USA  
 Marcelo Viana, Instituto de Matemática Pura e Aplicada, Rio de Janeiro, Brazil

For more information see <http://aep-math2015.spm.pt/>