How to Make an IMAGINARY Exhibition

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Abstract

IMAGINARY started as a math art exhibition by the *Mathematisches Forschungsinstitut Oberwolfach* and evolved into an open source platform for interactive math exhibits. This paper presents hands-on advice on how to make an exhibition using the platform and covers topics like team, budget, venue, production, media work and guidance. It is based on our experience with more than 80 *IMAGINARY* exhibitions in 20 countries. Most of them were organized independently by universities, research institutes, museums and schools.

Introduction

IMAGINARY – through the eyes of Mathematics is a math and arts exhibition created by the *Mathematisches Forschungsinstitut Oberwolfach* (MFO), an institute of the *Leibniz Association*. It was created in 2008, the German Year of Mathematics, and quickly became one of the most widespread traveling math exhibitions in the world, attracting more than 800,000 visitors in over 20 countries, see [6].

This paper provides a brief overview of the main steps needed for organizing a math art exhibition. As *IMAGINARY* visited more locations, we realized the need for providing some hints and advice based on the experience of former exhibitions. Our goal is to motivate you to make your own exhibition and to contribute to the *IMAGINARY* platform with your own exhibits.

In the first section, we will explain in detail what the exhibition and platform are, and what content they provide. In the second, we will go through the main issues related to the creation of an exhibition: forming a team, finding a good venue and setting a date for the event, choosing the content, defining your budget and sources of finance, promoting your exhibition, producing the exhibits, surviving during the actual exhibition and finally wrapping up. We conclude the paper with a short discussion on what we think the future might hold for this type of exhibitions.

The *IMAGINARY* Exhibition and Platform

IMAGINARY – through the eyes of Mathematics contains different types of exhibits, among them:

- Static content, mainly large-scale images showing beautiful representations of algebraic surfaces and their singularities. Examples can be seen in most of the images presented in this paper.
- Films showing mathematical concepts in an enjoyable and easy to understand way, like *DIMEN-SIONS* [3], a film that offers a look into the fourth dimension.

- Physical objects, like sculptures made using 3D printing technology.

- Interactive software, including among others: *Surfer* [12], which allows users to visualize algebraic surfaces in real-time; *jReality* [10], a tool for navigating from a first person perspective through 3D environments and minimal surfaces; *Morenaments* [11], a painting application for exploring different symmetrical patterns on the plane.

One interesting aspect about *IMAGINARY* is that users can add new exhibits to make their exhibitions unique. Over the years, as it was brought to different countries and cities, people have added content ranging from images, videos, and new ways to showcase the content, to live performances with generative music and new software. To facilitate this interaction, the open source platform *IMAGINARY – open mathematics* (`www.imaginary.org`) was developed and launched in March 2013. This platform hosts all the official content of the *IMAGINARY* exhibition: high resolution files of all images together with their explanation boards in several languages, all films and programs for download, templates for posters and flyers, and manuals on different topics related to the organization of an exhibition. Apart from the official content it also provides all content its users might want to share, using an open source license [8]. In that way, every new exhibition created can potentially enhance all future exhibitions. This represents a new way of communicating science: collaborative, global and free.

The platform currently hosts two exhibitions, the original *IMAGINARY – through the eyes of mathematics* and *Mathematics of Planet Earth* (MPE) which was developed for the worldwide initiative *Mathematics of Planet Earth 2013* [7]. The platform is supported by the Klaus Tschira Stiftung.

In the following sections we will describe the main steps for mounting the original *IMAGINARY* exhibition, but this can be generalized to any math art exhibition.

Making an Exhibition

In this section you will find a chronology of exhibition tips with references and examples of the *IMAGINARY* exhibition. The word "imaginary" can also be interpreted in its original sense: you can apply these tips to any (math art) exhibition! A good reference for general hands-on science communication is [2].

Remember that science communication, and communication or collaboration in general, is changing. The gap between content producers and the audience is narrowing. The public might be more interested in creating an exhibition than in going to one. They are motivated to get involved and learn more about research [1] and open questions.

Forming a Team. In many cases, your team is already formed: it is just you! But you will probably have some colleagues also interested in making an *IMAGINARY* exhibition, and if you are really lucky, you might have resources to hire professionals for some tasks. To plan ahead, it is necessary to know which roles are involved. They main ones are:

- Content editor: responsible for the content to be included in the exhibition. A background in science and/or education is useful, but also a good sense of aesthetics.

- Installation Manager: even if you hire people to install your exhibits and equipment, someone has to decide where everything will go, and be present both during setup and the closing of the exhibition.

- Official contact: the visible head or spokesperson for the exhibition. Someone who can answer the phone and emails, deal with the press and provide more information to any interested party.

- Guide(s): someone should give background information to visitors at the exhibition and answer questions. Additionally, they are present to watch the exhibits and prevent any theft or damage.

Fixing the Venue and Date. *IMAGINARY* has been exhibited in the most diverse places: museums, schools, train stations, banks, universities, planetariums, fundraising dinners and more, see Figures 1 and 2. Most of the time, you won't have many options, and will have to choose among just a few available spaces.

- Secure a place and dates as soon as you can, as it is the first step towards many other tasks: finding sponsors, communicating the event, and defining the scope of the exhibition.

- Plan how you will use the space. Account for visitors and guides, not only for the exhibits.

- Take note of any restrictions the location imposes on the exhibition, like entrance fees, security for your equipment, emergency or fire police restrictions, sharing of space with other activities, infrastructure problems (too hot or cold, too much light for the screens to be visible, too dark, etc.).

- Be sure it is easily accessible for your target public (usually, by public transportation).

- Make sure the place communicates the mood you want for the exhibition. Do you want it to look formal? Strictly academic? Family-friendly? Artistic?

- For a school or university, it might be wise to present the exhibition during the term but not on exam weeks, so you can have students as visitors, and maybe also as guides.

Figure 1 : *Left: IMAGINARY exhibition with the picture cube at the chapel Santa Agata in Barcelona. Right: IMAGINARY at the Lichthof of the Technical University, Berlin*

Choosing and Creating Exhibits. There are many possible types of exhibits: you can organize a math art exhibition with large pictures, a huge video wall, or touch screens and 3D displays, or a hands-on exhibition with puzzles and tables. The *IMAGINARY* platform offers a good starting base for material in four categories: pictures, films, interactive programs and physical exhibits. In Figure 3 you see examples of pictures, interactive and hands-on stations. We recommend interactive exhibits that encourage visitors to participate, like *Surfer* [4], which allows them to create algebraic surfaces, print them, and take them home.

- Giving the visitors the possibility to create content usually raises their level of interest in your exhibition. Children specially like to touch and try things.

- Films shown should be short and attractive, as most people will not have time to watch long films, and will probably switch their attention elsewhere (even if the film contents are great).

Figure 2 : *Clockwise from top left: Bank hall in Kassel, art gallery in Saarbrücken, school in Saarbrücken, science fair in Stuttgart*
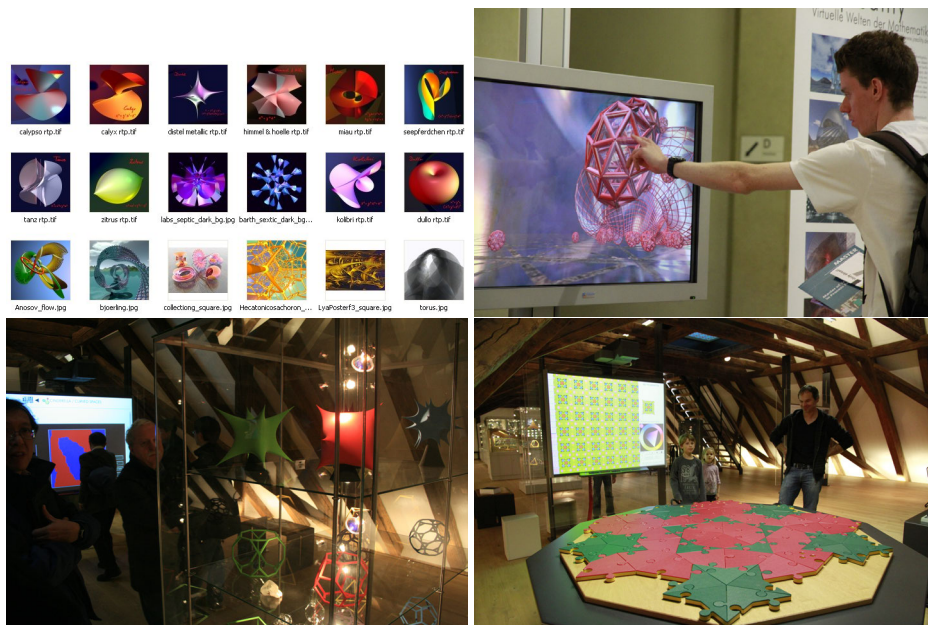

Figure 3 : *Clockwise from top left: some images that can be downloaded from the IMAGINARY platform, interactive exhibit jReality, algebraic surfaces as 3D prints, the Penrose puzzle game*

- The exhibits should look professional, not like improvised posters or home made software. This is influenced by many factors, including building materials, design, location, illumination and mounting.
- If you use software, it should be able to run in "kiosk mode", i.e. the users can not exit from it or see the operating system below.

- Try to have a unifying idea or theme for your exhibition. It will make it more coherent, and will also help you in communicating it. You can also connect related exhibits, for example images, programs and sculptures of the same topic.

- Do not hide the math behind the exhibits: if they are good, they will raise the curiosity and interest of visitors for learning the background theory behind them.

- Allow users to continue playing with or to modify the exhibits, for example by using open source ones.

- Use the *IMAGINARY* platform! Get inspired from what others have made, modify it, make it better (and share your creations with the community).

Defining the Budget and Finding Sponsors. While you might have some resources from your institution, including volunteers, there are usually additional costs associated with setting up an exhibition, like: building the exhibits, transporting, insurance, inaugural/closing events, printing flyers, etc. You can look for sponsors to cover most of your costs. Note that there have been great exhibitions organized with very little budget (several hundred dollars) and others costing dozens of thousands of dollars.

- Make an initial budget estimation as soon as possible. Include minimum and maximum estimates for each item. Plan different budgets according to how much money you can get, having an absolute minimum version and extended ones. Maintain it updated as often as you can.

- Make sure there is no conflict of interests between sponsors, venue, your organization or any other party involved. Also make sure they agree on how they will be named (partner, sponsor, "media" sponsor, etc.) and presented when you communicate your event.

- Be very clear and responsible in how and for what you will use the money you are asking for. This is important when talking to sponsors but also for the institution you will be representing.

- Getting an institutional sponsor (local/regional government, university, foundation or an NGO) early on can be useful for convincing companies to jump on board. Many do not like being the first to accept and will ask who is already sponsoring.

- Sometimes you can get equipment or services for free, in exchange for showing the sponsor logo. This can be particularly useful for computers, screens, and other electronic equipment.

- As obvious as it might sound, try to get at least two or three estimations from different providers for each item in your budget. Prices can vary a lot.

Doing Media Work. You want people to visit your exhibition, so you should communicate when, where, and how it is happening to your target audience. Even if the event is internal to your school or university, it might be interesting to invite people from the press and from other institutions. You might have the aid of a press person or agency, but in the end, it will still be your job to make sure the right message is communicated. Good advice on how to do scientific media work can be found in [5].

- Plan an "angle" for your exhibition that would help it attract more attention. Sometimes catchphrases work. "Where math and art meet" or "Mathematicians are the artists of the future" might attract more eyeballs than "An exhibition about mathematical visualizations". Check the material from previous and other exhibitions to get ideas.

- Start compiling a list of potentially interested media contacts (science or education journalists) from the beginning. If you have no experience with the press, check online resources and look at releases from other exhibitions so you can have an idea on how to write yours. If you target school students, try to get a list of contact data from nearby schools and invite them directly.

- Try to get a quote from a relevant and well-known person for your press release, explaining why your exhibition, or the topic in general, is important. It could be an institutional figure from a university, a well-known artist or scientist.

- Double-check all the information you will release: dates, venues, names, sponsors, websites, etc. Ask someone else to check it as well; if you are the one who wrote it, you will often not recognize small mistakes.

- Design attractive flyers for visitors to take with them. Include your website, emails and other contact information, as well as some nice images from the exhibition. You will find templates of flyers and posters on the platform.

- Remember to take pictures and record videos of the exhibition. You might need them for press work and for future projects!

Producing and Mounting the Exhibition. You have the team, place and budget, the world knows about your exhibition, and you have chosen what to show. Now it is time to produce your content. You will need to print the exhibits, prepare computers with the software you are showing, configure the equipment and move everything into place.

- Double-check the material before printing and all computers and equipment before dispatching them.

- When mounting the exhibition, try to create a unified space: it is better to close a hallway and put everything there instead of distributing all exhibits on four floors. Also make sure there is resting/sitting space for your team and the visitors.

- Prepare a "to-do list" for setting up the exhibition, including the day to day setup or trouble shooting if the programs crash.

- Plan enough time to set up the exhibits well in advance. You should especially check the software and its compatibility with your operating systems, hardware, drivers, etc. Also plan ahead the dismantling of everything: you will be tired by the end and it is better to know well beforehand what needs to be done.

- Do not trust the schedules your providers will give you, and plan for some extra time just in case something goes wrong.

- Make sure that the exhibits are secured and cannot be taken away easily. You may also insure them if they will be left unwatched.

- If you plan a traveling exhibition: do not underestimate logistics! Prepare good packing material and boxes, and work with a good team to transport and mount the exhibits.

Surviving the Exhibition. Now the exhibition is mounted and everything is set up. Think about planning an official opening event, maybe with some "important person" (this can be an official representative of your hosting institution, a politician, etc.) giving a speech, a VIP guided tour, and some food and drinks. Such events are also a good opportunity to invite the local press and get publicity.

- It is important to keep the visitors interested and informed. This is the work of the exhibition guides (see left picture in Figure 4). Most visitors want to have fun and learn or explore without being lectured at.

- Keep in mind that people might be afraid of mathematics and related topics so they tend to not touch things or ask questions at all. Approach them in in a friendly manner and encourage them to play around with the programs and exhibits.

- It is usually a good idea to have at least two people of your team on site at all times to talk to visitors, answer questions and to deal with technical problems (that *will* eventually occur).

- Before the visitors leave, encourage them to continue at home for example by downloading content from the *IMAGINARY* platform.

- It is helpful to have flyers with the webpage of the exhibition and the names of your local sponsors and partners to give to the visitors when they leave.

Figure 4 : *Left: a private tour by a math student in Stuttgart. Right: Preparing the surfer invaders performance at the Planetario in Buenos Aires*

If you are cooperating with a university or high school, it can be a good idea to hire some students (from math, physics, computer science or related subjects) who can offer guided tours for school classes and individual visitors:

- School tours usually take about one hour. This gives enough time for the students to play around with the exhibits and try things out themselves.

- Make sure to prepare a good concept for the tour that can easily be adjusted to different levels of knowledge. You can find a document describing a standard guided tour on the *IMAGINARY* platform.

- If you are a teacher organizing an exhibition at your school, encourage your students to create guided tours for classmates and family. This takes some additional preparation time but it is a valuable experience and lots of fun for your students. Teaching is the best way to learn something!

- Also check for videos of guided tours at other exhibitions, like the one from the Newton Institute in Cambridge, 2010 [13].

If you have the resources, organize some additional events, for example lectures/talks in the evenings, a family day with special activities, a concert of math music, etc. See the right image in Figure 4 for an example of a live video performance. Competitions (like: *Who creates the "best" surface with Surfer?*) are also very popular [9].

Cleaning up. Even after the exhibition closes, work continues.

- Pay all bills and write any formal follow-up or finance report you might be required to.

- Thank everybody for their help and support: the team, institutions, sponsors, and any other person involved in the exhibition.

- Offer your exhibits for further use (to a school, gallery or science museum), as for sure you will be left with a lot of beautiful exhibits.

- Share your experience (what went well and what not) with other people. Write a report, participate on the *IMAGINARY* platform. And do not forget to upload your pictures and videos!

- You can write recommendation letters for the tour guides, students will especially appreciate this.

Future

There are many ideas for the future of *IMAGINARY*, like exploring more fields of mathematics in exhibitions, or working closer with artists and art galleries. The main idea though is to stay dynamic and constantly improve contents and to offer a creative environment—during the exhibition, but also while making it. Sharing experiences plays an important role and we hope that the *IMAGINARY* platform can provide a powerful infrastructure for communicating these experiences. Creating exhibits, organizing exhibitions and experiencing them will not be three independent tasks anymore. Please let us know if you organize a math art exhibition, announce it and share your exhibits.

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