

# IMAGINARY Conference 2016 - Abstracts of Workshops

|   |   |
|---|---|
| Resource collection for a curriculum of a University maths/science communication course<br>(Silvia Benvenuti)       | 2 |
| Spherical geometry in a science museum (Ester Dalvit)   | 2 |
| Sorting balls/Algorithme de tri mécanique (Robin Jamet)   | 2 |
| Smartphones in Exhibitions (Philipp Legner)   | 3 |
| WikiMathCom (Daniel Ramos)  | 4 |
| Inspiring Mathematics in Africa (Mark Roberts)  | 4 |
| Mathematical Education TV program (Andrés Sosa)   | 5 |
| Developing The Guidebook of Elevated Polyhedra: Communicating Mathematics with Art<br>(Helen Yu and Rinus Roelofs)  | 5 |
| The SURFER book (Bianca Violet and Oliver Labs)   | 5 |
| Developing a concept for a cutting-edge exhibition on mathematics and music (Norman<br>Friedenberger, Albert Haase) | 6 |
| Augmented Reality concepts using HoloLens in Mathematics Communication (Alexander<br>Werlberger, Sebastian Uribe)   | 6 |

# Resource collection for a curriculum of a University maths/science communication course

**Workshop Leader: Silvia Benvenuti (University of Camerino)**

## Abstract

According to the European Charter for Researchers "all researchers should ensure that their research activities are made known to society at large, so that they can be understood by nonspecialists, thereby improving the understanding of science by the citizens." Therefore, it's part of the researchers' mission to raise the general public awareness with respect to science. On the other hand, science communication requires a specific training, which is not part of the average future researchers education. For this reason, a scientist is likely to fall into many traps, when trying to communicate his research to the general public. The purpose of this workshop is to collect materials and ideas suitable to provide any student from a "scientific" degree course with the basic tools to communicate in matters related to his discipline to an audience of non-experts.



**Further information** The workshop is targeted mainly at an audience of researchers, teachers and science communicators: each of these figures can contribute, from his point of view, to the development of the syllabus, and the integration between the different points of view is functional to the success of the workshop itself. Of course, a general interest with the subject of the workshop is desirable.

## Spherical geometry in a science museum

**Workshop Leader: Ester Dalvit, Marie-Curie-INdAM post-doctoral fellow (University of Camerino and University of Toronto)**

**Abstract:** The aim is to produce images and animations to talk about spherical geometry in a science museum. We will use the ray-tracer POV-Ray and a simple language based on Logo. The animations will be used for projection on the giant NOAA sphere installed in science museums worldwide, including our partner MUSE in Trento, Italy. Proposed themes: Coordinates: longitude and latitude. Straight lines: flight routes. Geometrical properties: parallelism; angle sum of triangles. Regular tessellations and Platonic solids.



**Further information** Familiarity with spherical geometry is appreciated, though not mandatory. Elementary programming experience in POV-Ray, or familiarity with a programming language, is required. The Logo-like language is very simple and intuitive. Learning it is straightforward for anybody with a basic knowledge of any programming language.

Participants should bring their own laptop (any operating system). The working language will be mainly English, however the leader also speaks Italian and German.

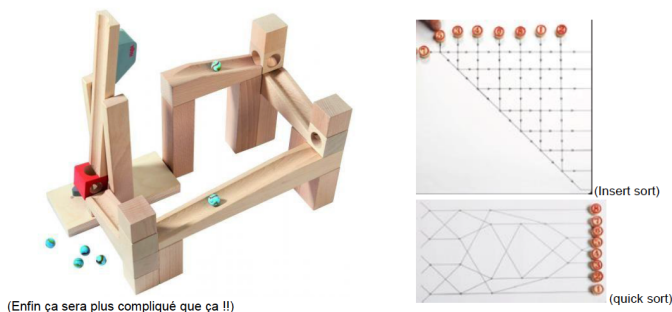
## Sorting balls/Algorithme de tri mécanique

**Workshop Leader: Robin Jamet (Palais de la découverte)**

**Abstract:** An algorithm is a way to solve a problem without reflex ion, mechanically. The sorting algorithms are good examples to show that to general public: a mechanical machine should be able to sort balls from the heaviest to the lightest.



**Resumé:** L'objectif est d'avoir des pistes de billes, reliées par des bascules qui permettent d'envoyer la bille la plus lourde sur l'une des pistes en dessous, et la plus légère sur une autre. Les billes arrivent dans des "cases", rangées dans l'ordre.



### Challenges:

1. Comment construire ces bascules? La bille la plus lourde peut évidemment arriver d'un côté ou de l'autre, et doit pourtant toujours repartir sur la même piste à la sortie.
2. Il faut toujours garder suffisamment de pente pour que les billes ne s'arrêtent pas (problème probablement le plus simple)
3. Toujours sur les bascules : comment faire pour que celles-ci ne se déclenchent pas avant que les deux billes ne soit arrivées ? Sinon, c'est toujours la première bille arrivée qui sera considérée comme la plus lourde, et la deuxième ne sera plus dans le circuit. Une idée à tester : en utilisant des billes métalliques, celles-ci peuvent fermer un circuit en arrivant dans la bascule.
4. Il faut absolument que les solutions techniques trouvées soient suffisamment simples pour que l'aspect mécanique, automatique de ce tri reste visible. Si le public ne comprend pas comment la machine fonctionne, l'objectif est raté : il y verra une nouvelle boîte noire, un tour de magie.

**Further information** This is a bilingual French-English workshop, there will be a translator for those who know only one of the two languages.

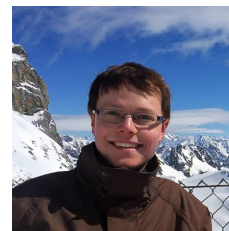
The workshop leader points out that choices have to be made between rigour and feasibility. He welcomes mathematicians and people who are in contact with the general public, but also designers, technicians and carpenters.

L'essentiel est d'avoir des menuisiers, des techniciens, ingénieurs de toutes sortes. Mais il est également important d'avoir des personnes à l'aise dans les mathématiques et le contact avec le public: Il ne faut pas perdre de vue l'objectif de cette manipe, qui est de montrer l'aspect automatique et "bete" d'un algorithme tel que ceux que l'on trouve dans un ordinateur.

## Smartphones in Exhibitions

### Workshop Leader: Philipp Legner (Google, Mathigon)

**Abstract:** While mobile devices are ubiquitous in everyday life, they are rarely utilised in museums and exhibitions, except as guide or to show additional descriptions. In this workshop we want to design exhibits that link with visitors' smartphones on a deeper level: utilising their collective computing power, using them to visualise graphs and networks, or to simulate probability experiments. Combining the expertise of mathematicians, teachers and software developers, we will try to create more interactive, immersive and personal museum experiences.



**Further information** The workshop wants to combine the skills of teachers and museum curators with those of mathematicians and software engineers – with the former focussed on the initial ideas and design, and the latter focussed on the prototype creation.

Hopefully the workshop can accommodate a wide range of skills and interests, but participants with mobile design and development experience will be particularly useful. Participants should have access to a laptop and a smartphone.

## WikiMathCom

**Workshop Leader: Daniel Ramos (IMAGINARY, Université de Montpellier)**

**Abstract:** We will develop WikiMathCom, a wiki page for gathering all projects on math outreach worldwide. We aim to set a reference site to institutions, conferences, museums, exhibits, resources, and much more. Whether you participate or not in the workshop, don't forget to leave a description of your project for the wiki before leaving the conference.



**Further information** The intended audience are people with a trajectory in math communication communities, familiar with the different movements and initiatives in one or more countries. Anyone with interest in the community at broad scale. Experience with management of forums, blogs, Wikipedia editing... is useful but not required.

Participants need to bring their own laptop. Languages knowledge (in addition to English) will be useful to gather international projects.

If you have experience in wiki software, server-client workflow, accounts or similar, please point this out in the comment field of the registration form.

## Inspiring Mathematics in Africa

**Workshop Leader: Mark Roberts (African Institute for Mathematical Sciences, Tanzania)**

**Abstract:** This workshop will masterplan a high profile public engagement campaign to inspire interest in mathematics among school students and broader society in Tanzania. The campaign will pilot innovative new approaches which can then be used elsewhere in Africa. A key aim will be to communicate the importance and excitement of mathematics and its relevance to African life and careers. The campaign may include performances, exhibitions, traditional/new media, stakeholder workshops, etc. An action plan for implementing the masterplan will be developed.



**Further information** Useful skills and experience will include:

- Experience of living or working in Africa and of (mathematics) education in Africa
- Experience of promoting the relevance, importance and excitement of mathematics anywhere
- Design, construction, IT or performance skills for public engagement events / exhibits

The lingua franca of the workshop will be English.

## Mathematical Education TV program

**Workshop Leader:** Andrés Sosa (Facultad de Ciencias, Universidad de la República)

**Abstract:** The idea of this workshop is design the format of a mathematical education TV program for a general audience. The format of the TV series should be designed to be easily adapted for different regions and languages.

**Further information** The workshop is targeted for everyone who is interested in the idea of the workshop. Any skill is welcome but it will be great to have graphic and audiovisual designers, mathematicians, and people with experience in media communication.



## Developing The Guidebook of Elevated Polyhedra: Communicating Mathematics with Art

**Workshop Leader:** Helen Yu (TWeducare & Partners) and Rinus Roelofs, Sculptor

**Abstract:** Elevation is a concept introduced by Leonardo da Vinci and Luca Pacioli in their book ‘Divine Proportione’ (1509). Rinus Roelofs, a sculptor and also a mathematician, was inspired by the concept and has developed a set of simple paper elements to form up models of elevated polyhedra. Through artistic explorations, mathematical concepts have been communicated. During the workshop, we would like to formalize a guidebook on hands-on activities as well as exhibits to facilitate people in mathematics communications with the publication of the guidebook and modules for printing on IMAGINARY platform.



**Further information** Our workshop is targeted at any kind of mathematics communicators, e.g. teachers, artists, designers, etc. Interests in polyhedra and/ or familiarities with 3D software would be a plus.

The main language of the workshop will be English; however, the workshop leaders also speak Dutch or Chinese.

## The SURFER book

**Workshop Leader:** Bianca Violet (IMAGINARY) and Oliver Labs (Potsdam University, Mainz University, MO-Labs)

**Special Guest:** Stephan Klaus

**Abstract:** The aim of this workshop is to create a draft version of the SURFER book. SURFER is the Java-based extension of the program SURFER2008 that was developed for the IMAGINARY exhibition in the year of Mathematics in Germany (see <https://imaginary.org/program/surfer>). SURFER allows users to create beautiful images by typing in the equation for a surface in space.

The content of the book is based on so called SURFER experiments which are short and creative tutorials on how to create a variety of surfaces. It shall be an open source book written by the community. The

SURFER book will be available for free download in pdf format. There will be a printed version to be bought (for low cost).

The experiments are of different levels of difficulty from very easy to quite challenging. The contributions are typically two to four pages long with step by step instructions and accompanying images. The majority of the experiments, especially when dealing with a mathematical phenomenon, should be suitable for school classes and/or math students in the first semesters.

**Further information:** Our workshop is targeted especially, but not only, to the following groups of participants:

- Publishers or participants with experience in creating books
- Surfer “experts” that can write a tutorial about an experiment of their interest
- Surfer fans that test some of the tutorials we have so far and give us feedback



## Developing a concept for a cutting-edge exhibition on mathematics and music

**Workshop Leaders:** Norman Friedenberger (IMAGINARY), Albert Haase (IMAGINARY, FU Berlin)

**Abstract:** Both mathematics and music are universal languages that can reach high levels of abstraction. This workshop aims to explore a specific part of the interconnectivity between both worlds with an artistic, musical and communicative approach. Inspired by some recent selected contemporary works, we aim to address a generative system able to sonify mathematical models. The goal is to jointly collect ideas and to create a basic concept for such a system by describing requirements in terms of functionality, interactivity, design and sound. Interested workshop attendees will have the chance to later work on the implementation together with IMAGINARY, in order to create a new future exhibit to be premiered at upcoming exhibitions and, possibly, a music festival in 2017.

**Further information:** Participants can come from all fields of mathematics, computer science, music, or design and should have an interest in applying their skills towards composing or visualizing music.



# Augmented Reality concepts using HoloLens in Mathematics Communication

**Workshop Leaders:** Alexander Werlberger (Holo-Light company, Austria), Sebastian Uribe (software developer Berlin, Germany)

**Abstract:** Microsoft HoloLens is a new augmented reality technology designed to allow us to interact with high-definition holograms in our world. In this workshop, we will explore new concepts of using this technology for interactive mathematics communication. A HoloLens kit plus development technology will be on site in order for us to explore the possibilities of augmented reality live. New concepts might be a “Live Mathematical Experience”, where a mediator guides the public through a holographic maths world, explaining mathematical and physical phenomena (to be shown in museums), or “Interactive drawings of mathematical objects and geometries” like polyhedra, knots, and wallpaper in your living room. A first prototype of a simple maths application (for example mathematical 3d painting) with HoloLens shall be developed during this workshop and a list of possible (more elaborate) future concepts shall be presented as a result of the workshop.

**Further information:** All participants interested in augmented/virtual reality, persons with a software background (computer graphics, computer vision, Unity/C#), designers/animators (Blender, etc.), innovative thinkers/communicators to devise novel concepts are welcome.

