

Conversation Groups Contributions

Monday, October 29th

CG1 We don't teach, but they learn. **Museum/School**

The learning models in a museum (exhibitions and workshops) are not the same than in school. Dynamics, time, relationship and communication are different.

We don't teach. We make self-experience possible.

| Speaker | Contribution: |
|-------------------------------|---|
| Albrecht Beutelspacher | |
| Tiago Hirth | I'm one of the founders of the Circo Matemático, a Maths Outreach project in Portugal, see more here (https://circomatematico.wordpress.com), Interesting points are the work we do and how we approach the general and studying public. Besides this I've worked closely with the National Museum of Natural History and Science and their maths exhibits, among other science and maths outreach and popularization projects. |
| Noel Jackson | Making problems hands on. How classic maths problems can be made engaging for teenage audiences by increasing the scale and making the students become part of the problem |
| Erika Berenice Roldan Roa | I would like to share how allowing students to select a project to work on, after giving them the fundamentals of coding and logic, has been the most exciting learning experience for me as the one leading a workshop. |
| Vinay Kathotia | At Manchester Metropolitan University (joint work with Ricardo Nemirovsky) we are developing open-ended informal learning experiences that foster and support mathematical expressiveness and agency. These interweave creative activity, technology, and pervasive mathematical ideas such as curvature and symmetry. |
| Guido Ramellini | We deeply believe that formal and non-formal learning approach must collaborate. In a museum or a Science Centre we must not repeat school mechanisms. We should not teach, but offer open learning situations. Often, a visit to an exhibition provokes a positive emotion (hearts-on) that can be the seed of a new interest on the STEM. <i>You can teach nothing to a human being; you can only help people to find the answer inside them.</i> Galileo Galilei |
| Jorge Silva | |
| Yordan Hodzhev | |
| Carlos Seara | |

CG2 There are not small mathematics, there are not small mathematicians. **Mathematics and children (0-8)**

Mathematics experiences have to be intense, challenging, stimulating for teachers and students at all the educational steps. How can we support this goal from the museum?

| Speaker | Contribution: |
|----------------------------------|---|
| Montserrat Torra Bitlloch | If you think that only from the age of 8, children start learning mathematics; you are wrong. Up to 8 years, children learn important mathematics. So, very valuable mathematics experiences should be promoted from the early age. The big challenge is to interpret what they do and what they say. |
| Jehad Abualkbash | Museum (3,4 & 5) will be the first of its kind in the world it will services a specific math curriculum and covers the curriculum proposed for third, fourth and fifth grades textbooks and focuses on concepts of mathematical education for this group and gives the students in those levels full opportunity to enjoy going through the exhibits in a period that does not exceed three hours in an atmosphere that stimulates their curiosity and learning. |
| Yordan Hodzhev | Open Geoboard is a wooden geometric board and a platform through which kids explore and learn mathematical concepts like figures, forms, symmetry, 2 and 3 Dimensional space and many more. It can be used as a learning material at home and in the classroom by kids and their parents, teachers and educators. The geometric board and different rubber bands, wooden pegs, templates and other elements are the tools for making diverse forms, figures, objects, art and many more in two- and three dimensional space. Changing the template on the board makes it a base for board games like Ludo, Chess, Maze etc. |
| Jorge Silva | |
| Emilia Vasilescu | |
| Elena Yakubovskaya | |
| Carlos Seara | |

CG3 Is virtual virtuous? **Hands-on and virtual hands-on**

The presence of technology in all social areas (school, home, relationships, information...) is continually increasing and gaining new competences. The math component is enormous and not always evident. Which and how much technology is needed in the museum? What is the purpose?

| Speaker | Contribution: |
|-----------------------|--|
| Ana Cristina Oliveira | <p>Atractor is a non-profit association created in Portugal for the popularization of Mathematics. Atractor gained a large experience in producing virtual contents, offering a wide range of resources. In this session, we intend to present several of Atractor's resources: 1) Atractor's website (www.atractor.pt), which contains more than 2.000 web pages devoted to the popularization of Mathematics, illustrated by a large number of animations, images and interactive materials; 2) some freeware software developed by Atractor - GeCla (a program which allows creating friezes and wallpaper with a given symmetry or classifying existing ones) and AtrMini (a set of virtual games aimed at children, both for computers and tablets/smartphones); 3) A large project, under development, for the study from the mathematical point of view of the patterns found in the Azulejos of the houses all over different cities of Portugal; 4) Atractor's YouTube Channel, with 20 small mathematical films, entirely produced by Atractor.</p> |
| Paul Stephenson | <p>When children are grouped around a physical exhibit, they collaborate and communicate spontaneously. They may do so around a computer screen but, since their normal interaction with a such a device is private, this sharing needs to be encouraged. What can software designers, teachers, explainers do to help? To start the discussion I shall share out real geoboards and invite you to bring up the corresponding interactivity, nrich.maths.org/2883, on your own device and compare the experience. (If it is Flash-enabled, you will have a better version than the default provided.)</p> |
| Jose L. Rodriguez | <p>I would like to talk about the software NeoTrie VR and its potentials for virtual reality exhibitions in museums, science fairs, etc. The aim is to select experiences and activities that can't be done with manipulative materials or other digital supports.</p> <p>Here is the webpage: http://virtualdor.com/es/NeoTrie-VR/</p> |
| Daniel Ramos | <p>Should we use computer exhibits and new technologies in our exhibitions? When? How much? We will bring up some use cases of digital exhibits in museums and exhibitions, which expose different uses, approaches and conceptions of public outreach. We will discuss advantages and inconveniences, tips to add (or remove) technology, and exchange our visions on the topic.</p> <p>If you ever faced this dilemma, share with us your solutions and concerns!</p> |
| Diego Lieban | <p>We are exploring some connections with physical and digital resources for STEAM Education. Our focus is in manipulatives that foster mathematical explorations, either to favor spatial reasoning or to open questions and discussions from their use or their modelling process. Most of the activities were developed through GeoGebra and Tinkercad due to their intuitive interface for educational purposes and friendly connections with 3D printers. Also, we promote student-centered learning approaches where students are encouraged to adapt and create their own materials and they are learning math from these experiences.</p> |

Tuesday, October 30th

CG4 Let's do something together **International Math Week**

The popularization of mathematics through exhibitions, fairs, workshops or individual events is a widespread practice in many countries and that sees all of us involved. Is it time to organize collective actions, exchanging experiences and activities? Which models would allow us to break the barrier of silence?

| Speaker | Contribution: |
|------------------|--|
| Eoin Gill | |
| Tiago Hirth | I've been part of various maths weeks and events with the Ludus Association, jointly we've organized events like mathematics fairs and public sessions part of scientific conferences, I've also played an active role in the organization of Lisbon MathsJam and Celebration of Mind events besides being part of the organizing team for recurring colloquia like the Recreational Mathematics Colloquium or the Combinatorial Game Theory Colloquium. |
| Tom Crawford | I am very keen to foster partnerships with organisations around the world keen to communicate maths and hope that this conversation group will provide an opportunity to discuss possible ideas for collaborative projects. |
| Katie Oldfield | Maths Week Scotland is entering it's 3rd year in 2019. Events have been organised by universities, institutions and individuals. A co-ordinated approach is being developed to support and grow Maths Week Scotland in future years. This approach will aim to create a Maths Week across all areas of Scotland through hands-on and digital activities. |
| Jehad Abualkbash | |
| Naeem Ullah | |

CG5 Don't be so formal! **Museum/Teachers training**

The initial and ongoing training of teachers is conducted in different ways in different countries, but it is difficult to see the entities that educate outside the formal circuit, from kindergarten to university, involved, even when the goal is skills based learning. Do we have alternative models to offer?

| Speaker | Contribution: |
|---------------------------|--|
| Montse Alsina | Non formal training does not mean "naive" training. Discussion sessions conducted by expert and qualified people can be held in museums and other settings, helping to go deeper in both directions: content and skills learning. In addition, a very positive aspect is revealed: mathematics, or science in general, comes close to people, to society. In this sense, museums and similar centers act as true bridges between knowledge and society. |
| Guido Ramellini | Science museum/centers can play a very important role in initial and ongoing teachers' training, especially if we take skills-based education as a reference horizon. |
| Nelo Alberto Blanco | We use "Divermazo", a special deck of cards, to teach childrens different mathemagic tricks and strategy games. They learn all kind of math, and a lot of characters of our science while having fun. Check out www.divermazo.es |
| Vinay Kathotia | At Manchester Metropolitan University (joint work with Ricardo Nemirovsky) we are developing open-ended informal learning experiences that foster and support mathematical expressiveness and agency. These interweave creative activity, technology, and pervasive mathematical ideas such as curvature and symmetry. |
| Ainura Milanés Barrientos | |

CG6 Mummy, I want to be a scientist! **Museums and scientific vocation**

Projects to stimulate STEM vocations are taking place in many countries, to compensate for the lack of professional figures and the demand for an increasingly technological industry. Museums are called to be interlocutors of these projects. What are our peculiarities? How can we measure (and claim) our impact and contribution?

| Speaker | Contribution: |
|----------------------------------|---|
| Francesc Rambla i Marigot | <p>Although there are not studies that confirm that, two groups of students can be identified: those that understand what they are doing in the Mathematics class and those that not.</p> <p>It's not a matter of having higher or lower marks, many of those who achieve high marks do not understand what they are doing but they know how to do it. But if you do not understand mathematics, you cannot feel comfortable and if you don't feel comfortable with maths, you won't probably choose an STEM-related study.</p> <p>How can museums help to better understand Mathematics?</p> |
| Yudelca Ogando | <p>I am a biologist and have always loved math even as a child my son now who is currently 10 years old wants to go into the field of engineering and gaming I want to encourage him to not be afraid of math but to love and enjoy it as much as i have and its a good opportunity for me to learn from other parents as well as share my feelings about having a child wanting to explore math/stem in his career path</p> |
| Marta Garcia-Matos | <p>Explainer Program at CosmoCaixa, where volunteer high schoolers explain the museum to the public (especially families) during the weekend.</p> |
| Elizabeth Rodriguez Acevedo | |

CG7 In the museum and for the museum **Statistics**

The statistic (and probability) is a matter of mathematics that is more present in the social reality than within museums. Is it possible to develop meaningful modules that will allow us to increase the skills to better understand informations and take better decisions?

On the other side, the museums use the property and efficiency of the instruments and the statistics predispose to evaluate the effectiveness and dimensions of their own social and educative skill?

| Speaker | Contribution: |
|---------------------------------|---|
| Pepus Daunis-i-Estadella | <p>Can we pass the social reality of use of Statistics to a museum module? How can we deal with uncertainty?</p> |
| Guido Ramellini | <p>From the very beginning of the MMACA project, it became clear that our desire to show manipulative forms related to statistics and probability clashed with the difficulty of finding materials and dynamics compatible with the times of attention and implementation of an exhibition, and with an assumable cost.</p> <p>Thus, the specific hall of our exhibition often shows the modalities of a guided workshop and, at the same time, the modules presented have generated laboratory activities that we use in the project <i>Come for more mathematics</i>, which aims to stimulate the choice of scientific high school.</p> |

CG8 Go wider, go deeper! **Math/Museum/People Dissemination**

In recent years, mathematical dissemination shows a greater social presence. Books, articles and interviews in newspapers and magazines, collections of games, some movies, fleeting but repeated television appearances ... are more frequent. Can we take advantage of it to be able to impose a more realistic view of mathematics and mathematicians, beyond the easy stereotypes that persecute us?

| Speaker | Contribution: |
|-----------------------|---|
| Jordi Deulofeu | |
| Tom Crawford | I hope to be able to present some of my experiences as the 'Naked Mathematician' and my use of social media with @tomrocksmaths as tools for increasing engagement with maths. |
| Rogério Martins | I would like to share a bit of my experience with the TVShow "Isto é matemática" ("This is mathematics") (www.youtube.com/istoematematica) that's featured in the main Portuguese news channel, from which I'm the author and presenter. This TV show is on its 11th season, has been widely internationally awarded, and shows the connections of mathematics to almost everything: from animal skin patterns, Drake's formula, to the circadian rhythm. |
| Naeem Ullah | To use mathematics as real problems solving by kids. |
| Ana Cristina Oliveira | Atractor is a non-profit association created in Portugal for the popularization of Mathematics. Atractor gained a large experience in producing virtual contents, offering a wide range of resources. In this session, we intend to present several of Atractor's resources: 1) Atractor's website (www.atractor.pt), which contains more than 2.000 web pages devoted to the popularization of Mathematics, illustrated by a large number of animations, images and interactive materials; 2) some freeware software developed by Atractor - GeCla (a program which allows creating friezes and wallpaper with a given symmetry or classifying existing ones) and AtrMini (a set of virtual games aimed at children, both for computers and tablets/smartphones); 3) A large project, under development, for the study from the mathematical point of view of the patterns found in the Azulejos of the houses all over different cities of Portugal; 4) Atractor's YouTube Channel, with 20 small mathematical films, entirely produced by Atractor. |
| Marta Garcia-Matos | Math hands-on activities to complement a museum exhibit about mirrors. |
| Mariela Carvacho | In Chile from 2016 we are organizing a Math festival. I have contributed with several activities. For these reason I want to share my experiences about these activities and the Math festival. |

CG9 Movement and emotion stimulate creActivity. **In-E-motion**

Simulations, applets, transforming shapes, puzzles, fractals, paths, strings... Dynamic images generate emotions and stimulate personal investigation.

| Speaker | Contribution: |
|----------------------|---|
| Maurici Carbó | <p>After my experience developing apps at www.mathcats.com/explore.html I would like to share my experience trying to take advantage of the phone and tablet tactile capabilities for mathematics exploration:</p> <p>Building Blocks, Place value, Prime Numbers, Fractions, Euclidean Algorithm, Euler and Hamilton Path and Voronoi diagram.</p> <p>Tablets and phones allow us to directly touch the screens and allow you to touch on more than one point at the same time. I am just beginning to know what this means in terms of coding. And allow our apps to reach where computers have never arrived before.</p> <p>Here is a triptic about the work I've developed latest 5 years: https://mat.ub.edu/matapps/matefest/wp-content/uploads/sites/4/2018/04/NummoltAppsTriptic_00.pdf</p> |
| Jose L. Rodriguez | |
| Bernat Espigule | |

Wednesday, October 31th

CG10 Banner at the exit of the museum: “You are now entering the real museum of mathematics”.

Museum/Reality modeling

From a certain point of view, if we succeed that our educational discourse is centered on elements of daily life we can reach a greater, less expert, but no less curious audience.

From another point of view, reality is too complex to be contained in a single module. Modeling without losing the essential elements that we want to mathematize is the big bet.

| Speaker | Contribution: |
|----------------|---------------|
| Pelegrí Viader | |

CG11 Is the Big Data a Gentle Giant? Research/Statistics

BigData is breaking into world of statistics as a real challenge, but how can we convert this huge landscape into a museum hands-on module? We are able to use that technology in our benefit?

| Speaker | Contribution: |
|---------------|---------------|
| Marina Brassó | |

CG12 It's easy! Well, it's not so hard! I mean: it's hard, but is fun! Support for new museum

Is it really so difficult and expensive to build a new math museum? Which elements are essential? How to stimulate demand in the area?

| Speaker | Contribution: |
|------------------------|---|
| Fernando Blasco | Intention to create a museum of mathematics in Madrid where outreach and educational activities can be developed |
| Alfonso Peres Osia | Presentación de una futura oferta educativa del Museo Nacional de Ciencia y Tecnología (MUNCYT), en su sede de Alcobendas en Madrid, en torno a una Habitación de Escape (Escape Room) centrada en las Matemáticas. |
| Albrecht Beutelspacher | |

CG13 Sharing is caring **Sharing of exhibits ideas**

In Dresden's first Matrix conference, Imaginary proposed a collaboration protocol between mathematical museums. Although not formalized, a tacit agreement was in fact accepted and contributed to the realization of excellent collaborative experiences. With this baggage and more available connection channels, how can we widen and generalize such collaborations?

| Speaker | Contribution: |
|---------------------|--|
| Daniel Ramos | In this session we will discuss about our community of math communicators, the practices of collaboration we can have, and the future we want for it |
| Marta Garcia-Matos | Game of Life as a museum interactive. |
| Diego Lieban | |

CG14 I had a lot of fun. I have a lot of questions **Emotion vs Fun: A transforming museum**

The emotional (hearts-on) and playful aspects play an essential role in determining the success of an exhibition, but hide the risk of trivializing content and objectives. We must promote a seductive science, which changes the commonly accepted view of mathematics and maintains this new interest for a long time.

| Speaker | Contribution: |
|---------------------------|---|
| Cindy Lawrence | |
| Aniura Milanés Barrientos | I work at the Math Department at the Federal University of Minas Gerais in Brazil. I lead there a team of math students that interact with groups of elementary students that visit us by means of some fun math activities and games. We also organize workshops for math teacher where nice activities and games are discussed. One big challenge is always to hold the interest of the children until we can understand the math behind the fun. |
| Erika Berenice Roldan Roa | I would like to talk about how important is that students or people engaged in any learning experience (in particular in science and mathematics) should feel comfortable about asking any question. Also, questions asked in a workshop or any other outreach activity can (should?) guide the flow and content of the activity. |
| Katie Oldfield | The National Museum of Scotland is a multi-disciplinary museum. Within the museum my role is to engage people with maths. There is an opportunity to use the range of collections and areas to showcase maths across all areas of life, beyond it's usual stereotypes. Where else is this done, and what strategies are there for incorporating maths across a multi-disciplinary museum?' |
| Guido Ramellini | It is evident that nowadays the education system requires many different supports, but in any case it is essential that science museum collaboration is always based on complementing its work, using the assets of the language that belong to the museum. It works with the school, but not for the school The Transforming Science Museum is not obsessed by the number of visitors; its goal is the enlightenment not just the entertainment. It is not trying to put a lot of people in the museum, but a lot of the museum in people. So, it encourages the participation and complicity of users. |
| Mariela Carvacho | |

CG15 Size doesn't matter. **Big or Great?**

Does it make sense to discuss the ideal dimensions of a math museum? Are we able to decide or suggest the best model or different models are equally possible and effective? Which elements are essential for a good activity?

| Speaker | Contribution: |
|----------------|----------------------|
| Tim Nissen | |

CG16 How could I explain it to you? **Museum/University**

Popularization of theory advances in mathematics is an important social goal. Is the museum the right place to do it?

| Speaker | Contribution: |
|---------------------|--|
| Pere Pascual Gainza | |
| Bernat Espigule | My experience introducing the notion of self-similar sets to pre-college students: Activity 1- Videofeedback setup Activity 2- Mathematica CDF Activity 3- 3D-printed objects |