

# La Maison des Mathématiques et de l'Informatique. The House of Mathematics and Computer Science in Lyon

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The role played by the mathematics laboratories in the dissemination of scientific culture to the public is difficult to overestimate.

It is crucial to enable a larger number of people to comprehend different aspects of mathematics, to find the “Ariadne’s Thread” to a better understanding of the science that is becoming more and more subtle and powerful, and is often the “cornerstone” of knowledge in the modern world, which in turn is getting continuously more complex.

La Maison des Mathématiques et de l'Informatique (MMI – the House of Mathematics and Computer Science) was created in 2012 through the initiative of Etienne Ghys, Bertrand Remy and Vincent Borrelli<sup>1</sup> within the framework of the “LabEx MILyon”<sup>2</sup> which groups together the scientific communities of mathematics and fundamental informatics of Lyon. The aim of this laboratory of excellence is “creating a synergy between mathematics and fundamental computer science in order to found a house of mathematics and computer science to attract the best researchers in these fields”. The idea to put an emphasis on dissemination (which is unique and original in such a context) marks the will of the participants of the project to react to the strong demand for better understanding of the rapidly developing world. The mathematicians wanted to put together and amplify

the numerous dissemination initiatives that have been developing locally over the last 20 or 30 years, especially in the direction of a younger audience, such as lectures, meetings with researchers, presentations during large events and an international exhibition “Pourquoi les mathématiques?” at the Museum.<sup>3</sup>

The main goal is to arouse the interest of the largest possible number of young people towards mathematics and informatics, to show them the picture of a science in the process of active development and to reorient the representations, often negative, that one comes across regarding mathematics.

Since its creation, the MMI has favoured an open approach, which helps to mix and intertwine science, arts, music, history, etc.

This is both a space of mediation, with a large opportunity for dissemination, and a meeting space for all those who are curious and seek for an approach to mathematics and informatics that is simultaneously alive, entertaining and multidisciplinary. The House of Mathematics and Computer Science develops new projects and accompanies pre-existing projects, giving the audience a better overview and visibility of the available opportunities.

Let us, from the very beginning, stress two important points:

research and higher education centres for mathematics and computer science and to become an international reference point. It pulls together more than 350 researchers and three research centres that are internationally recognised for their tradition of excellence:

- the Institut Camille Jordan (ICJ) – which, in turn, includes participants from the Claude Bernard Lyon 1 University, École Centrale de Lyon, INSA de Lyon and the Jean Monnet University of Saint Etienne;
- the Computer Science and Parallelism Laboratory (LIP) and the
- Laboratory of Pure and Applied Mathematics of the ENS (UMPA).

<sup>3</sup> See “Why Maths?”, Régis Goiffon, EMS Newsletter, September 2015, pp. 59–60.

<sup>1</sup> In 2015, Étienne Ghys received the first edition of the “Clay Award for Dissemination of Mathematical Knowledge” for “his important personal contributions to research in mathematics and his remarkable work for promoting mathematics” (see <http://perso.ens-lyon.fr/ghys/accueil/>).

Bertrand Remy was the first head of the LabEx MILyon and he is currently a professor at the École Polytechnique (see <http://bremyperso.math.cnrs.fr/math.html>).

Vincent Borrelli was the first director of the MMI (see <http://math.univ-lyon1.fr/homes-www/borrelli/>).

<sup>2</sup> The LabEx is one of the instruments of the “investment to the future” programme launched in France in 2011 with the goal of supporting the research activities of all the teams within a given scientific subject. Located in the heart of the second scientific hub of France, MILyon aims to establish the Lyon – Saint-Etienne hub as one of the leading French



House of Mathematics and Computer Science, 1 Place de l'École, Lyon.

- The MMI is fully piloted by researchers and professors, out of their passion and on a voluntary basis,<sup>4</sup> via a directing committee that meets every month.
- The aim of the MMI is to become a permanent establishment, going beyond the lifetime of the LabEx. The analysis of the structures to be organised and of future financial tools is a constant preoccupation of the directing committee and of the LabEx. As a future educational and cultural actor, the MMI wants to claim its position with the local decisionmaking authorities and ensure long-lasting collaborations.

The main mission of the MMI is to:

- Provide a place specifically conceived for the actions of dissemination and exhibitions.
- Unite and amplify the actions of dissemination of mathematics and informatics in Lyon and its greater region.
- Support the actions and associations of popularisation of mathematics and informatics.
- Develop actions aimed at supporting and promoting mathematics and informatics in the public and political arenas.

### Some actions realised since 2012

#### *A place for dissemination and exhibitions*

The House of Mathematics and Computer Science has been installed in a space rented at the ENS,<sup>5</sup> situated in a rapidly developing district in the heart of one of the scientific poles of Lyon, close to the recent museum of the “Confluences”. This space of 450 m<sup>2</sup> includes an exhibition hall of 200 m<sup>2</sup>, a conference room for 40 people with multimedia equipment, the “ateliers” area (a hands-on workshop), administration space with a meeting room, offices and storage space also available for our partners (like the IFE<sup>6</sup> and the associations like “Plaisir Maths”,



A view of the exhibition “Surfaces”.



Mix-TeeN association activities.

“ÉbulliScience”, “Math à modeler”, “Les Bricodeurs” and “Mix-TeeN”). It welcomes school students for the whole year, and a general audience on Wednesday and Saturday afternoons and during the school holidays, for seminars and conferences.

To stress the presence of mathematics and informatics in all branches of the society, the MMI develops annual on-the-spot exhibitions (which are always original) and, for several years, has invited artists working on the topic “art and mathematics/informatics”:

- In 2013–2014, “Entropie / Néguentropie”. Guest: artist Sophie Pouille.<sup>7</sup>
- In 2014–2015, “Surfaces”. Guest: artist-mathematician Pierre Gallais.<sup>8</sup>
- In 2015–2016, “Musimatique”, an interactive visual exhibition with sound, highlighting the convergences between music, mathematics and informatics. Guest: Denys Vinzant (composer and visual artist) and the GRAME national centre for musical creation.
- In 2016–2017, “Magimatique”, a show-exhibition mixing magic and science and showing aspects of magic based on mathematics and computer science. Guest: Yves Doumergue, French champion of illusion.

The MMI also exhibits permanent exhibitions on its premises, such as a Turing machine in Lego<sup>®</sup> bricks, ellipsoids and a flat torus.

The MMI has also presented some of its exhibits “out of the walls”, in city-halls, university sites and state libraries, as well as associated parts of the show (for example, the scientific fairytale “Lune”, directed by Marie Lhuisier).

As mentioned, it welcomes classes during the week and a general audience (with more than 2000 visitors in 2016–2017) on Wednesdays, Saturdays and during school

<sup>4</sup> The dissemination of knowledge is formally a part of the mission of professors and researchers at the universities, as well as at CNRS and INRIA.

<sup>5</sup> Ecole Normale Supérieure de Lyon – one of the French “Grandes Écoles”, the leading research and teaching institutions in France (see <http://www.ens-lyon.fr>).

<sup>6</sup> L'Institut Français de l'Éducation (French Institute for Education) is an entity within the ENS de Lyon that succeeded the National Institute for Pedagogic Research (INRP): <http://ife.ens-lyon.fr/ife>.

<sup>7</sup> Sophie Pouille continued her collaboration with the MMI for the exhibition “Formes élémentaires, mouvements et géométries de la pensée” (Médiathèque Jean Rousselot de Guyancourt, 10 October–1 December 2013) and the exhibition “Espaces intuitifs” (Abbaye Espace d'Art contemporain d'Annecy le Vieux, September to December 2016): <http://www.sophiepouille.com>.

<sup>8</sup> Pierre Gallais has also developed several original “ateliers” with the MMI that have been integrated into the exhibition “MathαLyon” (see <http://institutdemathologie.fr>).



Club de Mathématiques Discrètes – 90 participants of the last course, in the Square Evariste Galois.

breaks. For schoolchildren, from kindergarten to final grade level, about 20 “ateliers” are offered.

The privileged axes are research actions and an approach using games and hands-on material.

In parallel to these actions, the MMI offers, for a general audience, within its walls, a “ludothèque” (entertaining activities, run by Plaisir Maths) and some activity-based clubs in subjects like maths and magic, electronics, robotics and mathematical origami.

“Math  $\alpha$  Lyon: Meet the Mathematicians!” is a particular action of the MMI. Initiated by the UMPA and the ICJ in 2008 (and supported by the Institute for Research on Teaching Mathematics of Lyon and the Department of Mathematics of the Claude Bernard Lyon 1 University) to respond to the demand formulated right after the presentation of the UNESCO exhibition “Pourquoi les mathématiques?” in the museum (which welcomed more than 7000 visitors in two months), this is one of the key actions of the MMI. Researchers intervene in classes at high school to present about 20 hands-on stands. Some of them have been developed by PhD students for Math  $\alpha$  Lyon (for example, the workshop “Peaucellier-Lipkin mechanism” or “The hanging of paintings”, a workshop that aims to solve a concrete problem using algebraic topology, which is a current field of research). On the other hand, three or four students in mathematics accompany the researchers during the presentations for two years. It is, for them, a first experiment in the dissemination of mathematics. Every year, about 5000 schoolchildren (and not necessarily from scientific classes) profit from this very popular action (the waiting time is currently two years).

#### ***Unite and amplify the actions of dissemination of mathematics and computer science***

Since its creation, the MMI has participated in major events like the Fête de la Science (Science Festival), which is a national event (in partnership with the ICJ, the UMPA and the LIP), and the week of mathematics, as well as supporting “girls in maths”.

Concerning the week of mathematics, on top of lectures and interactive exhibitions in schools, in 2016 the MMI organised a “Forum des Mathématiques Vivantes”, which takes place in the heart of the city (a mathematics

rally for all ages in the old town of Lyon, lectures, interactive workshops in the Academy of Sciences, Letters and Arts of Lyon and mathematical competitions at the ENS). Its successful reception by the public (about 2000 participants) resulted in it being repeated, with similar success, in 2017.

#### ***Support the popularisation of mathematics and informatics***

The MMI has organised and piloted summer schools for young mathematicians: International Summer School of Mathematics for Young Students (ISSMYS), 20–30 August 2012 (110 participants), and Modern Mathematics International Summer School for Students (MoMISS), 20–29 August 2014 (eight series of lectures with 81 participants from 38 countries).

In 2016, the MMI organised “MathInfoLy”, which gathered together 96 students who were 15 to 18 years old with good potential from 13 countries.<sup>9</sup> The goal was to encourage these students by suggesting mini-courses and scientific activities guided by real researchers. MathInfoLy concluded with presentations of the posters of each group (of six to eight students).

“Les Soirées Mathématiques de Lyon” (Mathematical Evenings): these are co-organised by the MMI and the mathematicians of the ENS de Lyon (UMPA), the INSA de Lyon, the Lycée du Parc and the Claude Bernard Lyon 1 University (ICJ). In these sessions, renowned mathematicians deliver popular lectures (that take place in one of the organising institutions) aimed at an audience of students in mathematics.

“Hippocampe Camp on Robotics” internship on robotics: high school students learn to “construct the intellect”, i.e. how to create artificial intelligence. There are activities initiating research (lasting from a couple of days to a week) to understand what a robot is and to build it. This initiation of mathematics research covers common subjects but with several ways of reflecting on

<sup>9</sup> Applications were submitted by 260 candidates from 21 countries (Algeria, Morocco, Congo, Romania, Togo, Switzerland, Italy, Tunis, Senegal, Czech Republic, USA, Thailand, Dubai, Laos, Germany, Ethiopia, Canada, Saudi Arabia and France). The selection was carried out by specialists in mediation.

solving the problem. The students work in small groups and give an oral presentation on their results, which they also formalise on a poster. The subjects are suggested by the supervisors.

“Séminaire de la détente mathématique” (mathematics entertainment): this seminar is organised by PhD students of the ENS de Lyon. It takes place in the MMI, mathematicians meeting in an informal and relaxed setting to discuss fun mathematics. Every week, there is a new lecture, a new speaker, a new subject and new mathematical perspectives. The speakers can be students, PhD candidates and researchers at one of the mathematical laboratories in Lyon (e.g. UMPA or ICJ).

The MMI obviously supports the “Lyon Discrete Math Circle”, run by Bodo Lass for 15 years, which prepares high school students who are passionate about mathematics for maths contests, particularly the International Mathematical Olympiad.<sup>10</sup>

**Develop the actions aimed at supporting and promoting the position of mathematics and informatics**

The MMI gives its support to:

- The Mathematics Rally of the academy of Lyon<sup>11</sup> (every year since 2005, it has gathered together almost 900 classes from about 200 educational institutions, with 25,000 students taking part).
- The “Statistic’s Café” (an original initiative that takes place in a big café in Lyon every month).
- Students of the PiDay association, who, in 2017, presented their mathematical and musical show in Marseille, Lyon and Paris.

For the general public, in partnership with l’Université Ouverte (the Open University) of Lyon 1 University, the MMI organises conferences on subjects as varied as algorithms, artificial intelligence, history of mathematics, mathematics and literature, etc.

The MMI presents a stand at the Salon de la Culture et des Jeux Mathématiques (Mathematical Culture and Games Event in Paris), which is organised by the CIJM.<sup>12</sup> The MMI supports the “filles et maths” (girls and maths) days, which promote the parity and equality of the sexes in mathematics and informatics. In 2014 and 2016, in partnership with IREM, the MMI supported the organisation of the regional congress Math.en.Jeans, which groups together teams from the south-east quarter of France for three days. Math.en.Jeans is an association that permits students from colleges and lycées to do

research in mathematics, supervised over a period of six months.

In collaboration with the University Theatre Astrée of Lyon 1 University, the MMI presents a series of performances combining dance, theatre and music that are also an opportunity for the general public to explore science.

So, at its halfway point, the summary of the MMI in terms of initiated actions, as well as impact on the scholarly world and the general audience, is very encouraging. Here are some key figures:

- In 2014, 20,000 hours were spent with schoolchildren and the general public.
- 150 classes benefit from “Math  $\alpha$  Lyon” workshops every year (about 5000 students).
- 1500 students have so far come to the House of Mathematics and Computer Science to attend workshops.

This success shows that the response of the specialists in mathematics and computer science to the demand from the audience is being well received and corresponds to a defined need.

Maison des mathématiques et de l’informatique (MMI)  
1 Place de l’École, 69007 Lyon, France

Webpages: <http://www.mmi-lyon.fr/> and <http://milyon.universite-lyon.fr/en/mediation/maison-mathematiques-informatique/>.

Open to a general audience:  
Wednesday from 11:30 to 18:00  
and Saturday from 13:30 to 18:00.  
Open to all and free of charge.



Régis Goiffon is a researcher associated to the Institut Camille Jordan and is one of the three Vice-Directors of the House of Mathematics and Computer Science (together with Natacha Portier (LIP) and Alexei Tsygvintsev (UMPA)). For several years, he has been involved in the dissemination of mathematics and, together with Vincent Calvez (ICJ), Thomas Lepoutre (ICJ) and Adrien Kassel (ENS), he manages “Math  $\alpha$  Lyon”.

All the pictures were taken by Régis Goiffon. For more pictures, the reader is encouraged to visit the webpage of the MMI.

<sup>10</sup> See “Club de Mathématiques Discrètes” – Lyon Discrete Math Circle, Bodo Lass, EMS Newsletter, September 2016, pp. 45–46 (see [http://mmi-lyon.fr/?site\\_club=club-de-mathematiques-discrettes](http://mmi-lyon.fr/?site_club=club-de-mathematiques-discrettes) and <http://math.univ-lyon1.fr/~lass/club.html>).

<sup>11</sup> Academy is the name of the high school administration in France.

<sup>12</sup> Comité International des Jeux Mathématiques, International Committee for Mathematical Games (see <http://www.cijm.org/salon>).