



INSTITUT de MATHÉMATIQUES de MARSEILLE

Marseille Institute of Mathematics

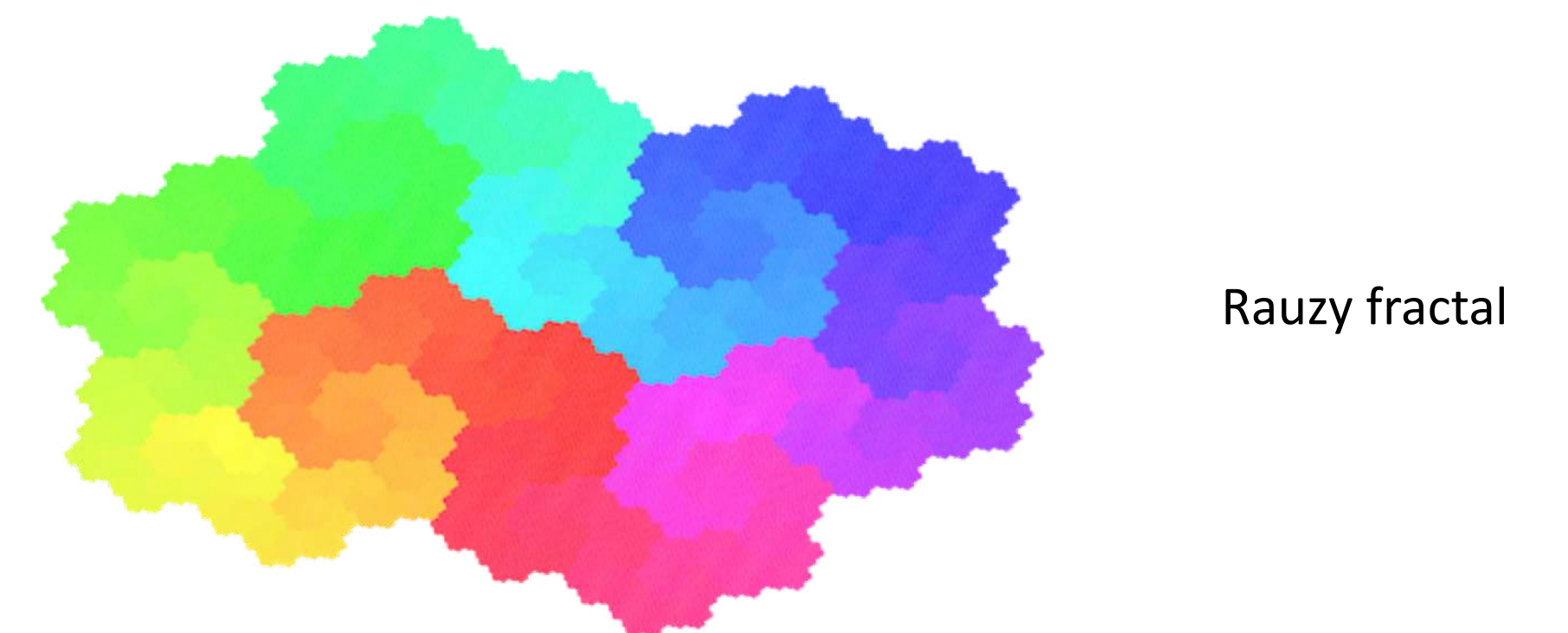
Director: Peter Haïssinsky - Assistant directors: Fabienne Castell, Laurent Regnier

Created on January 1, 2014, the **Mathematics Institute of Marseille (I2M)** is a state research center (UMR 7373) of the CNRS (National Center for Scientific Research) linked with Aix-Marseille Université and the École Centrale de Marseille.

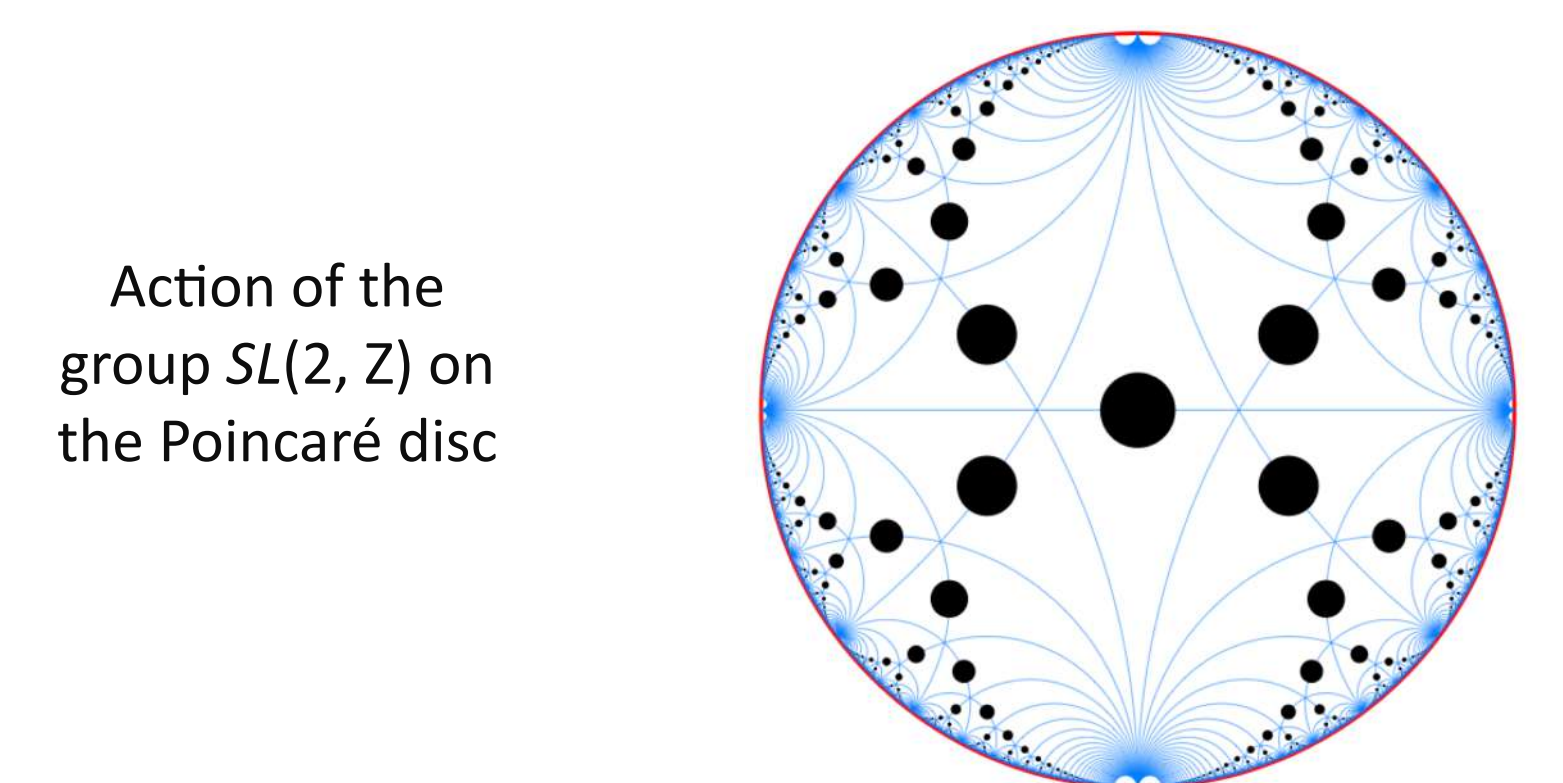
The institute covers a broad spectrum of pure and applied mathematics, as well as a large number of application fields (scientific or industrial). He is involved in numerous national and international research and action projects, and is a partner of Institute Archimède, AMIDEX, Jean-Morlet Chair, SATT Sud-Est and also a member of FRUMAM, SMF and SMAI. Moreover, it benefits from the proximity of the CIRM for the organization of its conferences. It is located on the Technopole of Château-Gombert (CMI and IMT), on the campus of Luminy and on the center St Charles.

The I2M in a few figures:

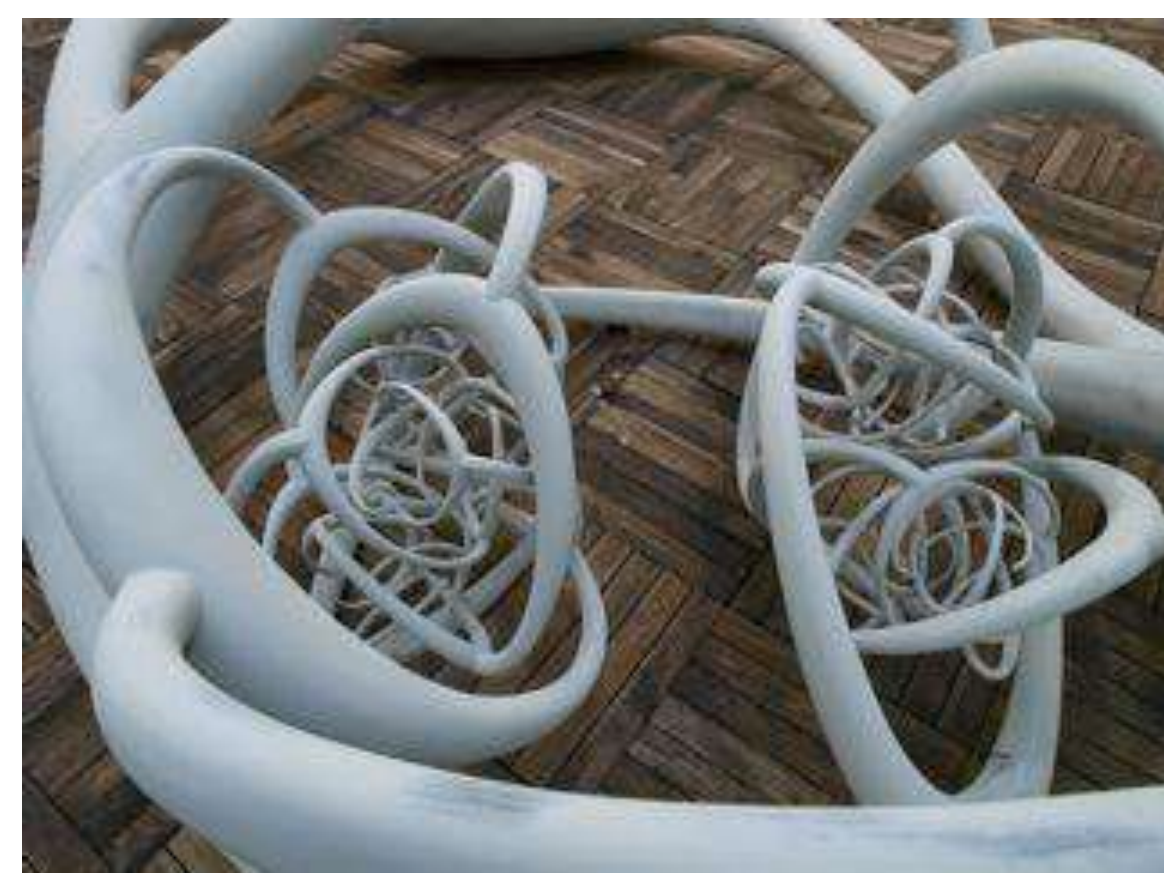
- 160 permanent members (CNRS researchers, associate/full professors AMU, ECM, USTV) including 15 engineers, technicians and administrative
- 120 non-permanent members (trainees, PhD students, postdocs and ATERs)
- Around 275 publications a year in leading international journals
- More than 40 public and private non-mathematical partners in many sectors (Physics, Chemistry, Life and Health Sciences, Social Sciences, Industry)
- 2 Masters and 12 M2 courses
- Around 40 thesis in partnership (AXA, CEA, EDF, IFP, IRSN, Renault, SCOR, SEMM, TOTAL and various small businesses) or in co-tutoring (Polytech, French and foreign universities,...)
- Multiple national and international collaborations (6 ANR projects, 17 GDR, 2 Convergences institutes, 4 Excellence institutes, 16 international structures and networks, 3 European projects, 17 AMIDEX projects, Cancéropôle PACA, CNRS, INSERM, Région Sud)



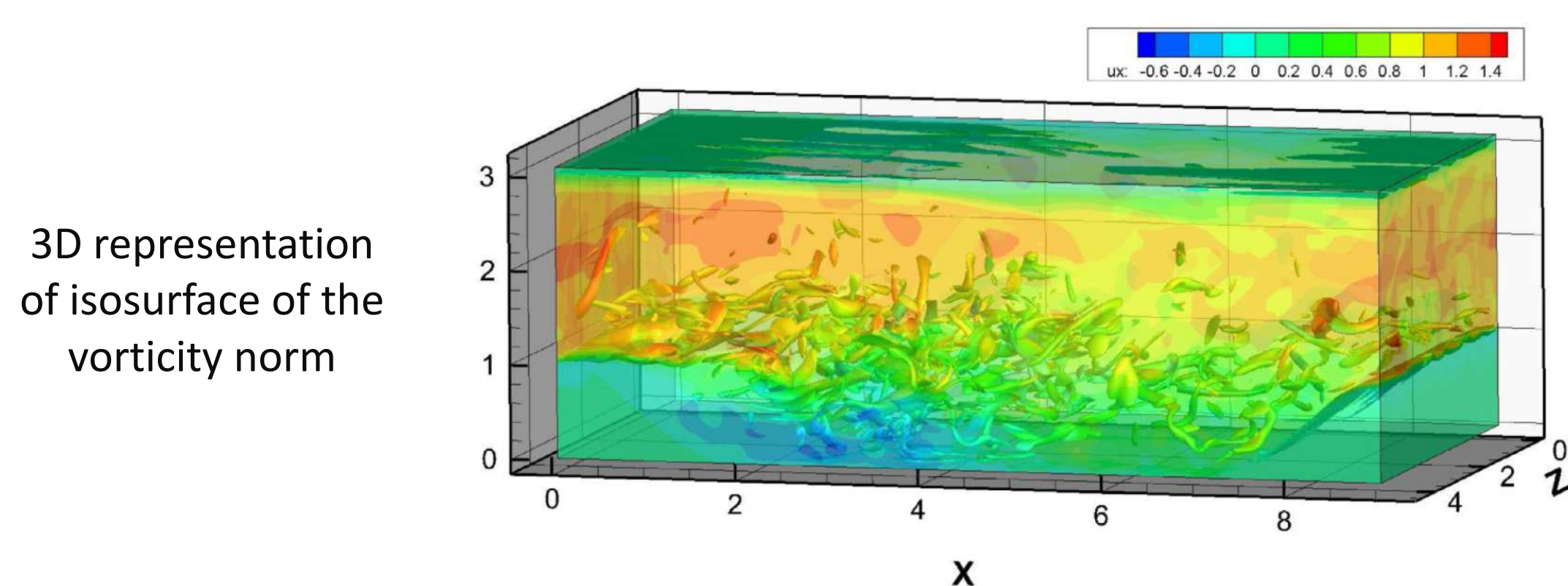
Rauzy fractal



Action of the group $SL(2, \mathbb{Z})$ on the Poincaré disc



The horned-sphere of Alexander: a famous example of « pathological » surface



3D representation of isosurface of the vorticity norm

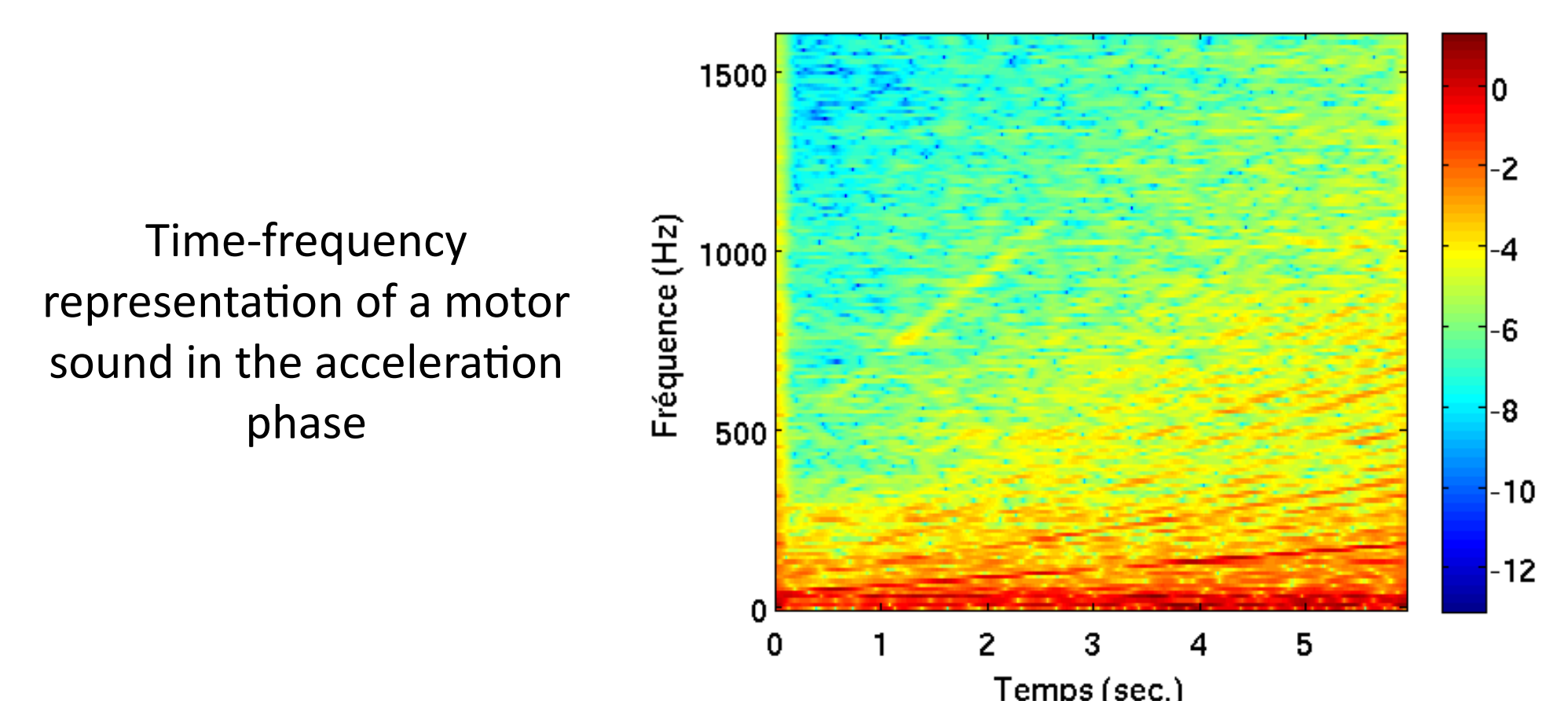
Research in Mathematics at I2M:

The institute is divided into 5 scientific groups decomposed themselves into 10 thematic teams:

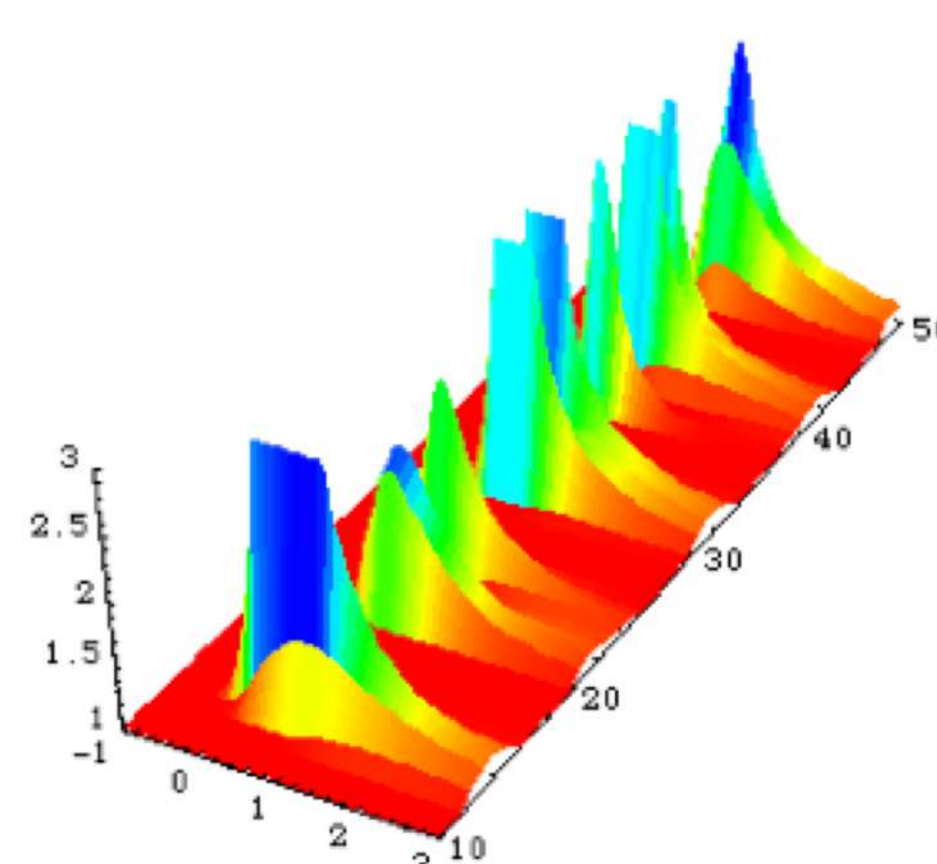
- **Applied Analysis (AA):** PDEs, Numerical schemes, Numerical methods for industry, Biology and medicine, Inverse problems
- **Arithmetic, Geometry, Logic and Representations (AGLR):** Effective algebraic geometry and Information theory, Logic of programming, Lambda-calculus, Representations of reductive groups, Arithmetic applications,...
- **Analysis, Geometry, Topology (AGT):** Analysis, Geometry, Dynamics, Singularities, Group theory, Topology, Varieties of dimension 3,...
- **Mathematics of the Random (ALEA):** Probability, Statistics, Signal and image processing, Theory of biological evolution, Population dynamics, Bioinformatics,...
- **Geometry, Dynamics, Arithmetic, Combinatorics and their interactions (GDAC):** Complexity of sequences, Tilings, Languages, Quasirandom sequences, Entropy, Genetic sequences, Invariant measures,...

Some areas of applications developed at I2M:

- **Fluid mechanics, turbulence:** multiple university and industrial collaborations (EDF, Total, Renault,...), nuclear safety (Calif3s code), IRSN Cadarache.
- **Nuclear fusion in the framework of the ITER project** (collaboration with CEA Cadarache and other French laboratories).
- **Mathematical models for oncology** (pharmacodynamics, collaboration with the Faculty of Medicine)
- **Signal processing** (collaboration with Toshiba, ST Microelectronics, Genesis, Evolix, Sopra, WattGo and other French laboratories)
- **Biomedical imaging, brain imaging, brain-machine interfaces** (collaboration with INRIA and neuroscience institutes)
- **Software development, Databases, Toolboxes** (GINsim, LTFAT, Smart Lungs...), **Embedded cryptosystems** (Terminal SNT for Thalès Alenia Space)
- **Genomics** (sequence analysis, evolution, transcriptome, interactome,...) in collaboration with Marseille laboratories
- **Creation of companies:** XEGEN (bioinformatics), Water observatory for the PACA region. **Contracts** Towers-Watson and BP2S managed by C-Innov



Time-frequency representation of a motor sound in the acceleration phase



Peaks are zeros of the zeta function (Riemann hypothesis)

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