

AWARD • FIELDS MEDAL

A Needle, Turning

Hong Wang (NYU Courant, IHES) received the Fields Medal at the ICM in Philadelphia on 23 July, a year after lecturing at the CRM during the Intensive Research Programme on Modern Fourier Analysis.



ALSO IN THIS ISSUE

Three CRM lectures
at the ICM in
Philadelphia

An asteroid
named after
Àngel Jorba

Jezabel Curbelo
wins the ECCOMAS
Lions Award

Mathematics on
Barcelona's H12
bus corridor

Contents

LATEST NEWS

A Needle, Turning	05
Three CRM Lectures at ICM 2026	07
Crossing Dimensional Frontiers	09
An Asteroid Named After Àngel Jorba	11
Jezabel Curbelo Wins the ECCOMAS Lions Award	13
Anna Florio, Third CRM Chair of Excellence	15
Nonlinear PDEs, for Xavier Cabré’s Anniversary	17
How to Protect Bacteriophages	19
Mathematics on Board: Forecasting the H12	21
CAVARET 2: Curves and Abelian Varieties	23
Nine Students, Eight Days: BIYSC	25
BIMR 2026: A First Taste of Research	27
The 22nd JISD at the CRM	29
Dídac Gil Rams Defends His Thesis	30

CALENDAR OF ACTIVITIES	31
------------------------------	----

FROM THE BLOG	34
---------------------	----

CRM MEDIA	39
-----------------	----





July, and then nothing

Fourteen articles in a month, and then the building goes quiet.

It was the fullest month of the year and it ends with the lights off. There is no August issue; the next one lands in September.

Some of what filled it happened elsewhere. Hong Wang, who lectured at the CRM in June 2025 during the Fourier analysis programme, received the Fields Medal in Philadelphia on 23 July, at a congress where Xavier Tolsa gave a plenary and Xavier Cabré and Joaquim Ortega-Cerdà spoke in their sections. Jezabel Curbelo collected the ECCOMAS Jacques-Louis Lions Award in Munich, two months after the National Research Award. And a main-belt asteroid is now called Àngeljorba, after the UB and CRM mathematician who died last year, whose orbital theory helped park a solar observatory a million and a half kilometres from Earth.

The rest happened here, mostly with students in it. Four weeks of BIMR, a week of JISD, eight days of BIYSC with nine teenagers from six countries, a doctoral defence, a conference for Xavier Cabré's sixtieth, and 83 arithmetic geometers at the UB for CAVARET. Anna Florio arrived from Paris for the summer as the third María de Maeztu Chair of Excellence, to work on billiards and to be visible doing it.

Two pieces of mathematics went out into the world: a model for keeping bacteriophages alive on the way to an infection, and a demand forecaster running on the H12 bus line along Gran Via since 8 July. See you in September.

— CRM Comm & Outreach

LATEST NEWS

Fourteen stories from the fullest month of the year: a Fields Medal, three ICM lectures, an asteroid, an award, and a building full of students.



Hong Wang at the CRM auditorium, June 2025

AWARD · FIELDS MEDAL

A Needle, Turning

Hong Wang (NYU Courant, IHES) received the Fields Medal at the ICM in Philadelphia on 23 July, a year after lecturing at the CRM during the Intensive Research Programme on Modern Fourier Analysis.

In 1917 Sōichi Kakeya asked how little area a needle needs in order to turn all the way round and point in every direction. Spin it about its centre and it sweeps a disc. Move it more cleverly and you do better, and by 1928 Besicovitch had shown you can get the area as close to zero as you like. What stayed open for the next half-century was what those vanishing sets are actually like.

The conjecture says that however thin they get, they never lose dimension. Hong Wang and Joshua Zahl (University of British Columbia) proved it in three dimensions in a 127-page paper posted in early 2025. A Kakeya set in $\mathbb{R}^3$ can occupy almost no volume and still have Hausdorff and Minkowski dimension exactly 3. Thin, yes. Small, no.

Fourteen weeks later she was at the CRM, in the auditorium, talking about something else: a geometric route towards Stein's restriction conjecture, joint work with Shukun Wu. Restriction is the harder problem, and still open. Kakeya in three dimensions would follow from it, though not the other way round.

Part of what made the proof hard is where it lives. "It concerns the three-dimensional space that we all live in," she said in the interview recorded that week. Change it to complex three-dimensional space and the statement is false, so any strategy has to tell real numbers from complex ones, and most familiar tools cannot. The last step, extending from a special class of sticky sets to all of them, came from an idea of Pablo Shmerkin's: that fractal structure can be found in any set at all, if you look at the right scales.

On 23 July the International Mathematical Union awarded her the medal alongside Yu Deng (Chicago), John Pardon (Stony Brook) and Jacob Tsimerman (Toronto). She is the third woman to receive it, after Maryam Mirzakhani in 2014 and Maryna Viazovska in 2022.

"You have to be honest with yourself. Sometimes you spend a long time and you need to evaluate whether you have made progress or whether things are really stuck. Not too optimistic, not too pessimistic."

HONG WANG

[READ MORE →](#)

ICM 2026

The Mathematics Behind the Three CRM Lectures at ICM 2026

Xavier Tolsa spoke as one of sixteen plenary speakers in Philadelphia, with Xavier Cabré and Joaquim Ortega-Cerdà in the PDE and Analysis sections. Their proceedings papers are out, open access.

More than 4,000 mathematicians gathered at the Pennsylvania Convention Center from 23 to 30 July, and three of the speakers are affiliated with the CRM. The

written contributions are already published by SIAM for the International Mathematical Union, and they cover territory with almost nothing in common.

Xavier Cabré (ICREA, UPC, CRM) opens his with a soap film. Stretch one between two rings and pull the rings apart, and past a certain point a pair of flat discs would have less area, yet the film keeps its catenoid shape until the neck thins and collapses. It is stable without being the true minimiser, and that is the class of solution the paper is about. The survey runs to the optimal result: stable solutions to semilinear elliptic equations are smooth up to dimension 9, and from dimension 10 an explicit singular one exists.

Joaquim Ortega-Cerdà (UB, CRM) takes an extremal problem that is easy to state and was left dangling for thirty years. In 1993 Hörmander and Bernhardsson computed a constant to ten decimal places without ever identifying the function that achieves it. Working

with Bondarenko, Radchenko and Seip, Ortega-Cerdà now has the function completely described: its zeros sit remarkably close to the half-integers, and it satisfies both a differential equation and a functional equation, either of which pins it down. The constant can now be printed to a hundred digits.

Xavier Tolsa (ICREA, UAB, CRM) surveys twenty-five years of quantitative rectifiability, from Jones's travelling salesman theorem through Carleson's ϵ^2 conjecture (proved in 2021, extended to higher dimensions in 2025) to harmonic measure on rough domains. It closes on what is still open, including a gap in the dimension of harmonic measure in space that has not narrowed in nearly forty years.

Three papers, three fields, one centre: soap films that refuse to collapse, a constant known to a hundred digits, and the geometry of a rough edge.

[READ MORE →](#)

RESEARCH · PDE

Crossing Dimensional Frontiers

Xavier Cabré, Alessio Figalli, Xavier Ros-Oton and Joaquim Serra have settled a conjecture Haim Brezis posed in the mid-1990s: stable solutions to semilinear elliptic equations are bounded, and therefore smooth, in every dimension up to 9.

Some solutions to an equation are the ones nature actually shows you. They sit at a local minimum of the energy, stable against small nudges, and they are the ones that turn up in a physical system rather than only

on paper. How well behaved they have to be, and whether the answer depends on how many dimensions you are working in, is a question that took more than twenty years to close.

Haim Brezis asked it in the mid-1990s, for a broad family of nonlinearities: are stable solutions bounded whenever the dimension is 9 or less? The answer arrived in pieces. Nedev got dimension 3 in 2000, Cabré and Capella the unit ball in 2006, Cabré dimension 4 in convex domains in 2010, Villegas dimension 4 in 2013, and so on through a decade of partial results, each one closing a case and opening a question.

The full statement is now proved, by Cabré (ICREA, UPC, CRM), Alessio Figalli (ETH Zürich), Xavier Ros-Oton (ICREA, UB, CRM) and Joaquim Serra (ETH

Zürich). What makes it striking is how little it asks for: the bounds do not depend on the particular nonlinearity, only on the L^1 norm of the solution.

Above dimension 9 it fails, and unbounded stable solutions are known, so the threshold is exact rather than an artefact of the method. The work carries a Frontiers of Science Award from 2023, and it leaves the analogous question wide open for the fractional Laplacian.

"I have been working on the subject for thirty years now. Personally, it has made me learn to be patient and persevering."

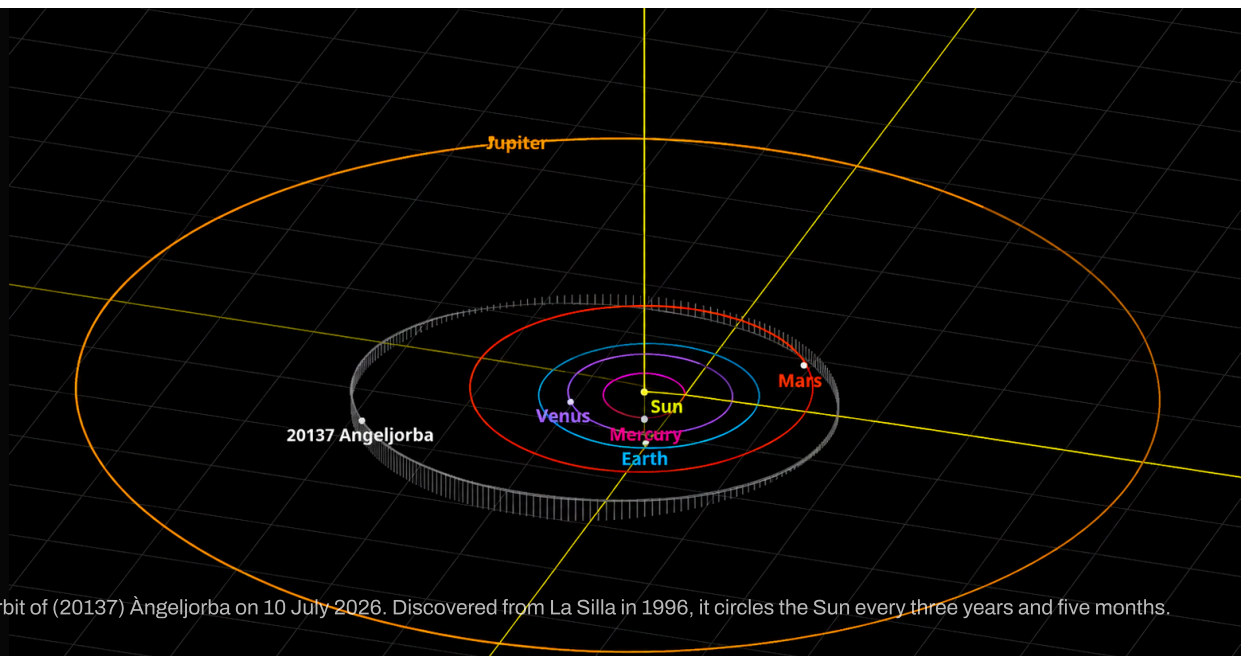
XAVIER CABRÉ

READ MORE →

IN MEMORIAM

An Asteroid Now Carries the Name of Àngel Jorba

The International Astronomical Union has approved the name (20137) Àngeljorba for a main-belt asteroid, in recognition of the UB professor and CRM affiliated researcher, who died in 2025.



The orbit of (20137) Àngeljorba on 10 July 2026. Discovered from La Silla in 1996, it circles the Sun every three years and five months.

20137 Àngeljorba
Centre de Física Matemàtica - CRM
Sun Distance: 2.984 au
2026-07-10 00:00 UTC

The name was published on 9 July in the bulletin of the IAU's Working Group for Small Bodies Nomenclature. The object was found by Eric W. Elst from La Silla in Chile on 8 August 1996, first catalogued as 1996 PX8, and it goes round the Sun every three years and five months on an orbit eccentric enough to cross that of Mars.

Àngel Jorba (1963–2025) was professor of mathematics at the Universitat de Barcelona and an affiliated researcher at the CRM. He finished his doctorate at the UB in 1991 under Carles Simó, and much of what followed was aimed at a problem with a practical edge: how do you keep a spacecraft in orbit around a Lagrange point, where there is no body to orbit in the usual sense?

With Gerard Gómez, Josep Masdemont and Simó, under contract with the European Space Agency, Jorba helped build the semi-analytical theory of those orbits and applied it to the mission analysis of SOHO, which has been watching the Sun from L1 since 1996. The four volumes the group published in 2001 are still standard in mission design.

His software outlived the papers too. The package *taylor*, written with Maorong Zou and published in 2005, builds a high-order numerical integrator from a given system of differential equations, and is still in use. The IAU citation mentions something else as well: that he was an amateur astronomer who spent years bringing astronomy and mathematics to the public.

The trajectories around a Lagrange point cannot be computed the way you compute a satellite circling a planet.

[READ MORE →](#)

AWARD



Jezabel Curbelo Receives the 2026 ECCOMAS Jacques-Louis Lions Award

The European Community on Computational Methods in Applied Sciences has given its Jacques-Louis Lions Young Investigator Award to Jezabel Curbelo (UPC, CRM), handed over at the World Congress on Computational Mechanics in Munich.

The award is named after the French mathematician who spent his last decades treating the atmosphere and the ocean as mathematical objects, and it has been given eleven times since 2004, chosen by previous

awardees from nominations across the ECCOMAS membership. It was presented in Munich between 19 and 24 July.

Curbelo works on fluids nobody can bring into a laboratory: the atmosphere, the ocean, the rock moving slowly under the crust. Her approach is Lagrangian, which means that instead of measuring the flow at fixed points on a grid, she releases fictitious particles across the whole field and follows them forwards and backwards through several days of weather, letting the organising structures show up where the particles travel furthest.

That is the machinery behind JetLag, published in April with Louis Rivoire (MIT) and Marianna Linz (Harvard), which recovers 85 years of jet stream positions by

treating a jet as a transport barrier rather than a band of fast wind. Its sensitivity to its own settings is more than fifty times lower than the wind-threshold method it competes with, which matters when the question is whether jet streams are drifting poleward in a warming climate.

The Lions award joins a long list: the AGU's Donald L. Turcotte Award and the Vicent Caselles prize in 2015, the SEMA Antonio Valle prize in 2020, a L'Oréal-UNESCO fellowship, a BBVA Leonardo grant in 2022, and the Premio Nacional de Investigación last May.

"That vision, that mathematical research can grow out of real problems and at the same time help solve them, connects deeply with the way I do research."

JEZABEL CURBELO

[READ MORE →](#)



Anna Florio, Third CRM Chair of Excellence

The dynamicist Anna Florio (CEREMADE, Université Paris Dauphine-PSL) is spending the summer at the CRM as the centre's third María de Maeztu Chair of Excellence, working on billiards with Immaculada Baldomà and Tere Martínez-Seara.

A mathematical billiard is one of the few objects in dynamics you can explain in a sentence. "You just do what you would do in a bar with friends," Florio says. Put a massless ball on the edge of a table, shoot it,

let it travel in a straight line, bounce with the angle of incidence equal to the angle of reflection, and repeat forever.

George Birkhoff turned the game into a branch of mathematics in the early twentieth century, though Florio likes to point out that the first person to think about billiards in a circular table was Lewis Carroll, a mathematician before he was a novelist. Behind those rules sit a century of open problems.

She is working with Baldomà and Martínez-Seara (both UPC and CRM) on billiards in the analytic setting, where the boundary of the table is described by an analytic function and the framework is as rigid as the theory gets. The project aims to show that even there, chaos is not the exception but what you should expect. Further out is universality: the idea that inside an analytic billiard you can find, as a first return map, essentially any dynamics of the disc.

The Chair of Excellence brings leading women mathematicians and computer scientists to the CRM for stays of up to four months, and the design is deliberately double, seeding collaborations while putting accomplished women in front of the students who come next. Florio follows Chenchang Zhu (Göttingen) and María Ángeles García-Ferrero (ICMAT).

Her colloquium on 22 July at the UB took the billiard into the dissipative regime: add friction, so each bounce bends the trajectory slightly towards the normal, and area is no longer preserved. Attractors appear. Simple or complicated ones, depending on how much energy the bounce loses.

"There is no reason why women should not go and do research in mathematics, if they love it."

ANNA FLORIO

[READ MORE →](#)

CONFERENCE

Nonlinear PDEs, on the Occasion of Xavier Cabré's Anniversary

Eight invited lectures at the Institut d'Estudis Catalans on 6 and 7 July, marking Xavier Cabré's sixtieth birthday and the community that has grown around his work.

PDEs normally stands for partial differential equations. The organisers proposed that this particular meeting might also stand for People, Discussions, Emotions and Summer, which is roughly what two days at the IEC

in early July produced: collaborators, former students and friends in one room, with eight lectures holding it together.

Alessio Figalli (ETH Zürich) opened with singular sets of stable solutions in higher dimensions, using new epsilon-regularity criteria to bound how big the singular set can get. Luis Silvestre (Chicago) presented interior regularity estimates for the fractional p-Laplacian, and Sylvia Serfaty (NYU) spoke on fluctuations in Riesz gases, particle systems interacting through inverse-power kernels. Guido De Philippis (Padova and NYU) showed a route to optimal regularity for higher-order Bernoulli free boundary problems that avoids monotonicity formulas entirely.

The second day opened with David Jerison (MIT) asking how curved the level sets of eigenfunctions are, borrowing from Hamilton and Perelman. Scott

Armstrong (NYU) introduced a scale-dependent notion of ellipticity loose enough to survive coefficient fields built from fractal measures. Francesco Maggi (Texas at Austin) proved a wetting theorem for soap films, showing that wet regions converge onto the Plateau singularities of the dry limit. Henri Berestycki (EHESS and Maryland) closed with uniqueness of positive solutions in unbounded domains.

Cabré is an ICREA researcher, professor at the UPC and affiliated with the CRM, and works on nonlinear elliptic and parabolic equations, free boundary problems and regularity theory.

While PDEs usually stands for partial differential equations, the meeting could also be described by a different meaning of the acronym: People, Discussions, Emotions and Summer.

[READ MORE →](#)

RESEARCH · MATHEMATICAL BIOLOGY

How to Protect Bacteriophages Without Trapping Them

Sílvia Cuadrado (CRM, UAB), with Carles Barril and Xavier Bardina (UAB), has modelled what happens to bacteriophages administered inside protective microcapsules, and when that protection is worth its cost.

Bacteriophages are viruses that infect and kill bacteria, and as antibiotic resistance grows they are being looked at again as a treatment. The obstacle is

logistical. Swallow them and they have to get through the stomach, where the acid destroys a good share of them before they reach an intestinal infection.

The obvious fix is to wrap them in microcapsules. The trouble is that a phage inside a capsule cannot infect anything, so capsule design turns into a trade-off with no obvious answer: make it permeable and the phages come out early but unprotected, make it tough and they arrive safe but too late to act.

Cuadrado and her colleagues built a model, using structured populations and differential equations, that tracks bacteria, phages and capsules together, from the moment of administration to the point of infection. It distinguishes the dose you administer from the effective dose, the phages that actually turn up able to work.

In a one-compartment setting, where phages can act where they land, encapsulation buys nothing: some of the load is lost on release, and the effective dose never beats the administered one. In a two-compartment model, read as the passage from stomach to intestine, it earns its keep, and the model can be asked how often to administer to get the most out of it.

The work came out of contact with the UAB microbiology group led by Montserrat Llagostera. Predictions still need experimental validation, and the authors propose interconnected bioreactors that reproduce the stages of the gastrointestinal tract.

"Our model addresses the central question of the balance between protection and release of phages to maximise therapeutic effectiveness."

SÍLVIA CUADRADO

[READ MORE →](#)

KNOWLEDGE TRANSFER



Mathematics on Board: Forecasting Demand on the H12

On 8 July, TMB switched on the eBRT2030 demonstrator on Barcelona's H12 corridor. Among the systems now running is a model from the CRM's Knowledge Transfer Unit that predicts passenger numbers at every stop, hour by hour, four days ahead.

The H12 has run along Gran Via for years. What changed in July is everything layered on top of it: traffic signal priority at 17 intersections, predictive

maintenance watching battery health across the fleet, and a demand forecaster built at the CRM.

The model starts from TMB's time series of ticket validations per stop and folds in weather, the type of day, the school calendar, trade fairs and other events, then produces hourly forecasts for the four days ahead. Most of the work was in the unglamorous parts: stops displaced by roadworks, validations that vanish or make no sense, and then the Tour de France coming through town.

eBRT2030 is a Horizon Europe project with 49 partners testing electric Bus Rapid Transit in six European cities. The CRM's involvement grew out of an earlier study for TMB on turning fixed neighbourhood lines into demand-responsive services. "That first piece of work let us understand the real challenges of operating a

network," says David Romero, who directs the Knowledge Transfer Unit, "and it opened the door to joining eBRT2030 as a partner."

The forecasts are for planning, adjusting service or moving vehicles before a peak arrives, and for finding out how far ahead peaks can be seen at all. What the model cannot do is conjure buses. Romero is blunt about the limits: it might tell you that you need five more an hour, but resources are finite and Barcelona traffic is real. The pilot feeds back too, with forecast and outcome compared continuously, and a new question on the list about whether extreme heat changes how people travel.

"The blackboard can take anything; the city, not always."

[READ MORE →](#)

CONFERENCE

CAVARET 2: 83 Researchers on Curves and Abelian Varieties

The second edition of "Curves, Abelian Varieties and Related Topics" ran at the Universitat de Barcelona from 13 to 17 July: sixteen invited lectures, ten posters, 83 registered participants.

The organisers picked the subject because of where it sits. "These are objects that already illustrate some of the very important open questions in mathematics,"

said Emiliano Ambrosi (Strasbourg).

"Even if we think of the Millennium Problems: Birch and Swinnerton-Dyer, the Hodge conjecture, and to some extent the Riemann hypothesis, they already manifest in the field of abelian varieties." The other aim was to get communities into one room who see the same object from different angles and rarely meet.

The week ran from modular curves (Jan Vonk, Juanita Duque Rosero, Sachi Hashimoto) through positive characteristic (Rachel Pries on counting non-ordinary curves, Valentijn Karemaker on the supersingular locus) to arithmetic statistics, and closed on two days of periods and motives, with Emmanuel Ullmo, Charles Vial, Olivier Benoist, Margherita Pagano, Jef Laga and Dragoș Frățilă, before Bruno Klingler ended it on Hodge theory.

Christophe Ritzenthaler traced how a conjecture of his own was sharpened, corrected and then more or less proved inside a decade: "In my field things don't usually move so fast." What participants kept naming as the distinguishing feature was method rather than topic. Pries listed the analytic, topological, lattice-theoretic and coding-theory tools that had all turned up on the same objects across a few days. She also reported that part of her talk came from work with AI systems, a first for her.

The organising committee was Ambrosi and Giuseppe Ancona (Strasbourg) with Francesc Fité and Xavier Guitart (UB and CRM), the same four who ran the 2024 edition. Fité offered a measure of that first edition's effect: at a conference in Barcelona this February, several talks presented work that had started at CAVARET.

"By its nature research is unpredictable. If you know what you're doing, what's the point of doing it?"

CHRISTOPHE RITZENTHALER

[READ MORE →](#)

OUTREACH · BIYSC



Nine Students, Eight Days

Nine secondary school students from six countries spent eight days at the CRM working through four minicourses, as part of the 10th Barcelona International Youth Science Challenge.

BIYSC is organised by Fundació Catalunya La Pedrera and puts secondary students from around the world inside working research centres for two weeks each

July. This year's edition brought more than 170 students aged 15 to 18 to sixteen institutions across Catalonia.

The CRM's project, "Advanced Mathematics: from Fundamental Theory to its Real-World Impact", ran from 8 to 16 July with nine students from Chile, Russia, Saudi Arabia, Slovenia, Spain and the United Kingdom.

Four minicourses, deliberately spread. Jezabel Curbelo (UPC, CRM) started from Euler's 1757 equations for a fluid with no viscosity, added the viscosity and then the Coriolis terms that appear once the fluid sits on a spinning planet, and then went numerical, because in practice the equations cannot be solved: students integrated trajectories, approximated their length, and drew the colour maps in which the coherent structures of a real ocean become visible.

Marc Calvo (UPC, CRM) taught the mathematics of "almost", the working method of solving an easier problem and then correcting it, with the warning that nothing can be called small until it has been stripped of its units. Kostiantyn Drach (UB, CRM) took one operation, repeated forever, from compound interest and Fibonacci's rabbits to the logistic map, its bifurcations, Feigenbaum's constant and the Mandelbrot set. Tássio Naia (CRM) ran the random walk through Markov chains, Monte Carlo estimation of π , machine learning and back to graphs, where a walker visits vertices in proportion to their edges, which is not far from how web pages get ranked.

David Romero added a session on where CRM models actually end up, from mountain risk to heat transfer in urban infrastructure.

On 17 July, in the Aula Magna of the UB law faculty, the students condensed eight days of mathematics into five minutes.

[READ MORE →](#)



BIMR 2026: A First Taste of Research

For four weeks in July, undergraduate and master's students took on real research projects at the CRM, supervised one to one, in the Barcelona Introduction to Mathematical Research.

BIMR does not explain research to students, it hands them some. Each participant spends a month on a project with a senior mathematician: reading a couple of papers, working through book chapters, or making a

first run at a small open problem. The point is less to solve anything than to find out from the inside what the work asks of a person. The 2026 edition ran from 29 June to 24 July.

The projects spread across four areas and the list reads like a tour of the building. Xavier Cabré's students followed a proof of the existence of minimal surfaces. Joan Claramunt ran one project rebuilding quantum mechanics from C^* -algebras and another on the Banach-Tarski paradox, where a ball is cut into five pieces and reassembled into two of the same size. Xavier Jarque took students into holomorphic dynamics and wandering domains.

Dolors Herbera introduced quiver representations; Roser Homs asked whether algebra can tell you how much data a statistical model needs before you pay for it; Patrick Wyndham handed out Ryser's conjecture, open since 1970. Jezabel Curbelo and Gabriel Meletti

had students chasing vortices through real flow data. Alberto Espuny Díaz set an infection loose on a graph and asked which starting configuration makes it spread slowest.

The first fortnight also carried four minicourses on how research is actually done, from Maria Alberich on the points where a plane curve stops behaving, through Gyula Csató on the calculus of variations, Joachim Kock on category theory as the mathematics of mathematics, to Pau Martín on celestial mechanics and the unsettling fact that the N-body problem contains, in some sense, every kind of dynamics there is.

Organised within the BGSMath by Natàlia Castellana, Marc Masdéu, Kostiantyn Drach and Olli Saari.

Rather than talk to them about what research is, the programme puts them to work.

[READ MORE →](#)



The 22nd JSD Brings Dynamical Systems and PDEs to the CRM

The School on Interactions between Dynamical Systems and Partial Differential Equations has run in Barcelona every summer since 2002, at the UPC first and at the CRM since 2017. The 22nd edition filled the auditorium from 29 June to 3 July with four advanced courses of about six hours each.

Rupert Frank (LMU Munich) introduced the liquid drop model, born in nuclear physics in 1930 and now studied with tools from the calculus of variations, including an application to the nuclear pasta phases of astrophysics. Raphaël Krikorian presented Birkhoff normal forms

and KAM theory applied to complex Hénon maps. Alessandra Pluda (Pisa) worked through geometric flows up to the inverse mean curvature flow and the Riemannian Penrose inequality, and Laurent Stolovitch closed on CR singularities.

Forty-seven registered participants came from Europe, the Americas, Asia and North Africa. Eight posters went up on the Monday, among them Joana Pech Alberich's proof settling a 2006 conjecture of Antunes and Freitas on the first Dirichlet eigenvalue of regular polygons.

An annual meeting point between established experts and young researchers in two closely related fields.

READ MORE →

PUBLIC DEFENCE

Dídac Gil Rams Defends His Doctoral Thesis

"When I finally decided to do a doctorate with my supervisors, I gave them a single requirement: I wanted to prove chaos." Dídac Gil Rams defended *Splitting of separatrices in generalized standard maps* on 3 July at the FME (UPC), supervised by Inmaculada Baldomà and Pau Martín, having done the work as a PhD student in the CRM's Dynamical Systems group.

The route to chaos runs through the Birkhoff-Smale theorem: show that two curves, the stable and unstable manifolds of a fixed point, cross at an angle other than zero. The difficulty is that the angle is exponentially

small, beyond what classical Melnikov theory can see, which means complexifying time and working near singularities where the curves are no longer defined.

The leading term depends on a Stokes constant, generally out of analytical reach, so the second half of the thesis builds an algorithm to enclose those constants by computer-assisted proof, using interval arithmetic. It comes out nonzero for polynomial cases up to degree 970, and for the standard and Hénon maps, which closes a gap: the Hénon result had been used for nearly twenty years without a proof. One example gives zero, which became a conjecture of its own.

"Summed up, my job is to see that two curves cross at an angle different from zero."

CALENDAR OF ACTIVITIES

What is coming up at the CRM and across the BGSMath network after the summer.



BGSMATH ACTIVITY

BMS–BGSMath Junior Meeting

WHEN 2–4 September 2026

WHERE Centre de Recerca Matemàtica

+ INFO →



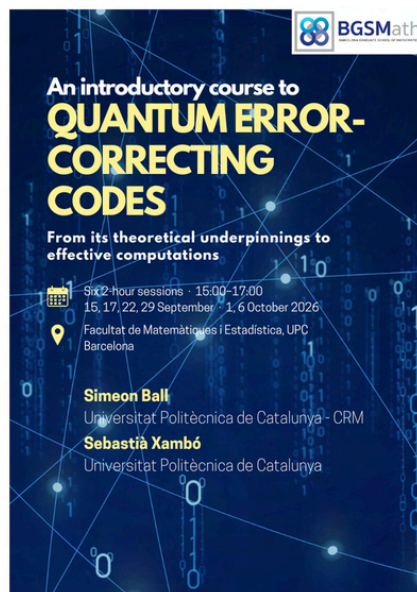
WORKSHOP

Barcelona Workshop on Kinetic and Macroscopic Models in Biology with Friends II

WHEN 7–10 September 2026

WHERE Institut d'Estudis Catalans, Sala Pere i Joan Coromines

+ INFO →



BGSMATH COURSE

An Introductory Course to Quantum Error-Correcting Codes

From its theoretical underpinnings to effective computations

WHEN 15 September – 6 October 2026

WHERE Facultat de Matemàtiques i Estadística, UPC (Room 104)

Registration closes 13 September 2026

+ INFO →



INTENSIVE RESEARCH PROGRAMME

IRP on Analysis of Free Boundary Problems

WHEN 19 October – 4 December 2026

WHERE Centre de Recerca Matemàtica

Advanced Course registration closes 2 October 2026

Workshop registration closes 12 October 2026

+ INFO →

FROM THE BLOG

El Gigant del π

TOPOLOGY

The Ball You Cannot Comb

Take a tribble, the small furry creature from Star Trek that exists mostly to be stroked, and try to comb it flat. You will not manage it, and skill has nothing to do with it. Your own head is fine because a scalp, to a topologist, is just a disc with an edge, and an edge is somewhere to hide the mess. A sphere has no edge. Flatten the fur on one side and it stands up on the other.

Poincaré ran into this in 1885 while studying where a flow gets stuck, and Brouwer proved the general case in 1912, which is its own irony: he spent the rest of his

life arguing that proofs which cannot show you the object are a bluff, and this one guarantees a cowlick somewhere without ever saying where.

The post follows the bookkeeping through Euler's characteristic, always 2 for a sphere and 0 for a doughnut, to why the wind is calm somewhere on Earth at every moment, why a perfectly isotropic antenna cannot be built, and why fusion reactors are shaped like rings.

READ MORE →

RESEARCH LIFE



Horchata, Barracudas and Differential Equations

Three members of the CRM's Knowledge Transfer Unit went to CEDYA/CMA 2026 in Valencia with the same problem: twenty minutes to explain a year of work. Axel Masó Puigdellosas solved it by removing the equations, on the grounds that the details get discussed later anyway, "over a coffee or a chocolate croissant with a blackboard in front of you". Lucía Escudero solved it by thinking about who would be in the room.

What neither expected was that building the talk would change the work: Axel realised a result he had shelved as partial was worth more than he thought,

and the group is now finishing it; Lucía got a question she could not answer, went away and investigated it, and opened a line of improvement nobody had planned.

There's also a question from a corridor that Axel has not stopped thinking about, involving an insurance company and a mountain rescue. And, between sessions, a wrecked ship at twelve metres, three octopuses and a shoal of barracuda, "though that isn't important at a congress on differential equations".

READ MORE →

CREATIVE WRITING

Threshold Day

Another of the blog's "Days". The narrator ignores message after message until one mentions rum raisin ice cream, at which point she is out of the door. At the beach, volleyballs fly overhead for an hour and nothing happens until one hits her foot.

A turtle dove pecks, follows her to the kitchen, eats from her hand, and only wins her over with something that feels remarkably like a caress.

[READ MORE →](#)

It takes a neuroscientist friend on a video call to name what has been happening all day: the firing threshold, the point below which a neuron receives input and does nothing at all, and above which the whole signal goes. The dove has thresholds too, as the relaxing playlist ends and the dance music starts.

SUMMER

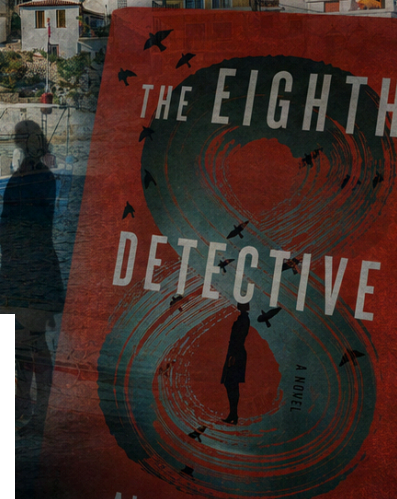
A Mathematical Summer Kit

A book, a series, a film, a song and a trip. Written on 31 July, in a building that already sounds empty, and addressed to whoever still has their office light on.

Four of the five suggestions work with the blinds down and something cold within reach. There's a novel by a mathematician about the combinatorics of detective fiction, in which a retired academic on a Mediterranean island once worked out how many structures a murder mystery can have. There's an Apple TV+ thriller about prime numbers that the post is very funny about, mostly on the subject of its PhD student having money, natural light and an emotional life.

READ MORE →

There's a 1996 Argentinian film in which a train vanishes into the Buenos Aires metro and the transport authority eventually calls a topologist. There's a techno producer with a doctorate in minimal techno building rhythms out of ratios between primes. And the fifth needs a flight: Samos, where in the sixth century BC two crews dug a tunnel through a mountain from opposite sides, without compass or maps, and met in the middle.



WATCH

CRM Media



WATCH

The Topology of the Backrooms

Why the internet's endless yellow office is flat everywhere you stand, and still cannot fit inside one building.

[▶ WATCH ON YOUTUBE](#)


WATCH

NeuroMunt: bifurcacions, sèries temporals i decisions a la muntanya

Three researchers on the mathematics behind decision-making in the mountains, from bifurcations to time series.

[▶ WATCH ON YOUTUBE](#)



www.crm.cat

Campus de Bellaterra, Edifici C
08193 Bellaterra, Barcelona

NO AUGUST ISSUE · NEXT: SEPTEMBER 2026