15TH MATH COLLOQUIUM BCAM-UPV/EHU

We are glad to announce that the 15th Math Colloquium BCAM-UPV/EHU will take place on **Wednesday**, **November 22, at 11:45 (CET) "Sala Aketxe" at Sede Building at UPV/EHU campus in Leioa.** Lunch will be offered at the end.

11:45-12:45 | Xabier Cabre: Hilbert's 19th problem on the regularity of minimizers to elliptic functionals: minimal surfaces and reaction-diffusion equations

Hilbert's 19th problem asked whether minimizers of elliptic functionals are always analytic. In this lecture I will describe progress made on the problem since the late fifties. After explaining the celebrated result of De Giorgi and Nash, we will focus on minimal surfaces, from the developments in the late sixties to the recent important work of Chodosh and Li. In the last part of the lecture, I will concentrate on a recent result (joint with Figalli, Ros-Oton, and Serra) for reaction-diffusion equations. As in minimal surfaces theory, smoothness of stable solutions (and of minimizers) only holds up to a certain critical space dimension.

13:00-14:00 | Volker Diekert: Matrices everywhere!

Computing with matrices is a basic tool for many areas in mathematics. Every undergraduate student learns this for solving systems of linear equations, but matrices also appear in quantum physics, representation theory, computing shortest paths in a network, or solving many other (discrete) optimization problems. However, fundamental problems about matrices are still open. For example, given a finite set of invertible $n \times n$ matrices over rationals, decide whether the first matrix can be written as a product over the other matrices. Another example is the so-called mortality problem: given finitely many matrices over rationals, decide whether the zero matrix can be expressed as a product of these matrices. For $n = 4$ the first problem, and for $n = 3$ the mortality problem, are both undecidable. However decidability of these problems is open even for 2×2 integer-matrices. In my talk I will speak about joint work with Igor Potapov and Pavel Semukhin from Liverpool (UK). We proved various new (un-)decidability results for 2×2-matrices over the rational numbers by combining ideas from formal language theory and geometric group theory. All our results come with concrete complexity bounds.

About the speakers:

Xabier Cabre (ICREA and UPC (Barcelona)) received his PhD in Mathematics, Courant Institute, advisor Louis Nirenberg, 1994. Kurt Friedrichs Prize, 1995. Member of the Institute for Advanced Study, Princeton, 1994-95. Habilitation à diriger des recherches, Université Paris VI, 1998. Harrington Faculty Fellow and Tenure Associate Professor, The University of Texas at Austin, 2001-03. ICREA Research Professor at the Universitat Politècnica de Catalunya, since 2003. Fellow of the American Mathematical Society, inaugural class, 2013. Plenary speaker at the 8th European Congress of Mathematics, 2021. Frontiers of Science Award, The first International Congress of Basic Science, Beijing 2023.

Volker Diekert was born 1955 in Hamburg, Germany. He graduated in Mathematics in 1980 from the University of Hamburg, Germany. He spent the academic year 1977-78 at the Université des Sciences et Techniques du Languedoc in Montpellier, France, where he studied with Prof.Alexander Grothendieck and obtained a Diplôme des Études Supérieures. In 1983 he earned his PhD in mathematics at the University of Regensburg, Germany, under the direction of Prof. Jürgen Neukirch. He received his Habilitation in 1989 for Computer Science at the Technical University of Munich. Since 1991 he holds the chair for Theoretical Computer Science at the University of Stuttgart. He has been a visiting professor for extended periods in France (Paris 7, Bordeaux, and ENS Cachan), USA (Stevens Institute of Technology), Japan (Toho University), and Australia (University of Newcastle and University of Technology Sydney). His research interests include algorithmic and geometric group theory as well as algebraic foundations of computer science, ranging from formal language theory to algebraic models for concurrency. He has published more than 130 refereed journal and conference papers. His Habilitationsschrift appeared as a monograph in the Springer LNCS series. Together with Professor Grzegorz Rozenberg from Leiden University he edited "The Book of Traces" which has become the standard reference in the theory of partial commutation. He is the coauthor of two textbooks in discrete mathematics and discrete algebraic methods. He was member of the Gödel-prize committee from 2005 to 2008 and chair of the committee in 2008.